FINAL REPORT

Water Quality Monitoring During Chesapeake and Delaware Canal Dredging Activities, Pearce Creek Confined Dredged Material Containment Facility

Earleville, Maryland

United States Army Corps of Engineers
Philadelphia District

March 18, 2019

OBG
Part of Ramboll

TABLE OF CONTENTS

Tables

Figures

Appendices

1. INTRODUCTION

This report presents the results of water quality monitoring conducted at Pearce Creek Confined Dredged Material Containment Facility (Pearce Creek CDF) associated with the dredging of the Chesapeake and Delaware Canal (C&D Canal) during the winter of 2018-2019. Monitoring efforts were performed by OBG, Part of Ramboll (OBG) in accordance with state and federal requirements, and focused on the quality and quantity of the decant return water following the hydraulic placement of dredge spoils within the containment facility. This work was performed under Contract W912BU17D0015, Task Order W912BY18F0112.

1.1 BACKGROUND

The United States Army Corps of Engineers (USACE) is tasked with operating and maintaining navigable waters of the United States. In 1919, USACE took ownership over the Chesapeake and Delaware Canal (C&D Canal). The C&D Canal spans a length of 14-miles and connects the Delaware River to the Port of Baltimore. It serves as an important shipping route for vessels, servicing about 40 percent of the shipping traffic in and out of the Port of Baltimore.

As a navigable water, the C&D Canal is under the jurisdiction of USACE, which has the responsibility to maintain the channel. Routine maintenance and the Delaware River Main Channel Deepening project require USACE's Philadelphia District to dredge approximately 1.6 million cubic yards of sediment from portions of the Delaware River's main shipping channels on a reoccurring basis. Dredging activities requiring the water quality monitoring undertake for this effort began in December 2018 and took approximately two-months to complete. To improve efficiency, safety, and ease of navigation, USACE aimed to deepen the channel from 40 to 45 feet.

Dredged materials are hydraulically deposited at the Pearce Creek CDF, located in Earleville, Maryland (Figure 1). Dredged materials are pumped into a large catchment pond where sediment and solids settle-out, allowing cleaner water to remain as the top-most layer. A weir allows USACE to control the decanting of water and direct its flow using a combination of pipes and a man-made swale. Ultimately, effluent is discharged into a tributary of Pearce Creek which then discharges to the Elk River.

2. FIELD METHODS

2.1 WATER QUALITY MONITORING

OBG performed effluent monitoring, concurrent with dredging activities, to assess quality of effluent at the point of discharge. For this effort, weekly samples for a suite of analytes (Suite A; Table 4) and water quality field parameters were collected and daily samples were collected for total suspended solids (TSS). The work also included ongoing flow measurements throughout the contract performance period.

Approximately weekly grab samples were collected throughout the primary period of discharge from the facility, for a total of nine effluent grab samples and nine TSS samples over the course of 10 weeks of discharge. Sampling events were conducted on the following dates:

Table 1: Field Sampling Schedule and Activity

Date	Activity	Analytes
12/20/18	Equipment setup, sampling	Suite A; field parameters
12/28/18	Sampling	Suite A; TSS; field parameters
01/04/19	Sampling	Suite A; TSS; field parameters
01/10/19	Sampling	Suite A; TSS; field parameters
01/16/19	Sampling, slope measurement	Suite A; TSS; field parameters
01/22/19	Sampling	Suite A; TSS; field parameters
01/28/19	Sampling	Suite A; TSS; field parameters
02/01/19	Sampling	Suite A; TSS; field parameters
02/07/19	Sampling	Suite A; TSS; field parameters
02/13/19	Sampling, Equipment demobilization	TSS, field parameters

Samples were collected at the Pearce Creek CDF swale at the upstream end of the corrugated discharge pipes using a peristaltic pump and laboratory-provided bottleware. Samples were packed on ice in coolers (maintained at 4^{o}C) and transferred to laboratory courier to SGS Laboratories in Dayton, New Jersey. Samples were analyzed for TAL inorganics (both total and dissolved), total mercury, dissolved phosphate, orthophosphate, total phosphorous/phosphate, total dissolved phosphorous, nitrate/nitrite, ammonia, total Kjeldahl nitrogen (TKN), and sulfate. Weekly dissolved oxygen, temperature, and pH parameters were collected in the field using a Horiba U-52 Water Quality Meter that was calibrated before each use. Table 4 provides a list of analytes and the number of samples analyzed for each parameter.

Daily composite effluent samples for TSS analysis were collected using an Isco 6712 automatic sampler with a 24-bottle setup. The sampler was installed on the upstream side of the two 36-inch corrugated pipes that exit the swale for discharge to a tributary of Pearce Creek. The sampler was programmed to collect a water sample every six hours, for a total of four samples per day. Same-day samples were homogenized into one daily composite sample, representative of a 24-hour period. Samples (44 samples in total) were collected from the sampler approximately once per week and sent to the laboratory to be analyzed for TSS. New tubing was used in the automatic sampler to prevent contamination from previous use.

2.1.1 Sampling Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) procedures consistent with industry standard practice were employed during field sampling and laboratory analysis. Field sampling included the collection of one rinseate blank on January 16, 2019. The rinseate blank was created by pouring lab-supplied deionized water over clean field equipment and analyzing the resulting sample for total mercury, dissolved phosphate, orthophosphate, total phosphorous/phosphate, total dissolved phosphorous, nitrate/nitrite, ammonia, total Kjeldahl nitrogen, and sulfate.

SGS Laboratories conducted analytical services for this contract and is registered and accredited in the State of Maryland and by the National Environmental Laboratory Accreditation Program (NELAP). Laboratory analytical instrument calibration and inspection were conducted daily. All excess water was appropriately labeled, preserved and stored for a period of 60 days subsequent to the sampling period. All procedures required under this scope of work were conformed to a viable analytical quality assurance/quality control program. Quality assurance data that accompanies the analytical results can be found in Appendix A.

2.1.2 Field Adjustments

In general, and as requested by USACE, sampling methodology and requirements followed the Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters (see Appendix B of manual) published by the New Jersey Department of Environmental Protection in 1997. Limited departures from the plan for sampling and analysis were necessary due to challenges posed by cold weather and frozen conditions. Frozen effluent and ice blockages in tubing impeded the functionality and performance of the Isco 6712 automatic sampler, resulting in limited data gaps in concurrent TSS results.

Adjustments to the planned sampling schedule were required to adhere to TSS sample holding times. TSS samples have a holding time of 7 days, which could not be met with the originally planned 7 day sampling interval. Therefore, the sampling plan was adjusted to every 6 days so that hold times could be met with a greater temporal window. In order to compensate for the aforementioned challenges and data gaps, an additional week of TSS monitoring was appended to the sampling schedule.

2.2 EFFLUENT FLOW RATE MONITORING

The daily volume of Pearce Creek CDF effluent was measured throughout the duration of discharge. Effluent is first released from the CDF into a weir box that allows for energy dissipation and additional settling. The water exists the weir into a created vegetated swale for further water quality improvement. The water then exists the swale through two 36" diameter polyethylene corrugated pipes, and discharges into a tributary of Pearce Creek. Automatic flow monitoring equipment was provided by USACE to OBG for installation, operation and maintenance. Two 2110 Isco Ultrasonic Flow Module Sensors were installed as follows: A 1 ¼" port was drilled through the top of each pipe and a sensor was mounted flush with the inside of each pipe. The sensors were programmed to log level, flowrate, and total flow measurements every 15 minutes.

The logged information was used to compute the total volume of water discharged daily, using Manning's formula (Manning 1895). Manning's formula requires the additional parameters of slope and roughness coefficient for calculating volume. The roughness coefficient (0.011) was selected based on the value recommended by the Corrugated Polyethylene Pipe Association (CPPA 2000). The slope of the pipe (0.031) was measured in the field using a level head, measurement staff, and tripod (transit approach). The following equation was used in the calculation of discharge volume:

$$Q = (1.49/n)A(R_h^{2/3})S^{1/2}$$

Where:

Q = Flow Rate, (ft3/s)
v = Velocity, (ft/s)
A = Flow Area, (ft2)
n = Manning's Roughness Coefficient
R = Hydraulic Radius, (ft)
S = Channel Slope, (ft/ft)

3. RESULTS

Pearce Creek CDF effluent chemical quality results were screened against aquatic life and human health criteria outlined in the Code of Maryland Regulations ([COMAR] Title 26 subtitle 08 Water Pollution 26.08.02.03-2). Analytical results of effluent samples are provided below.

3.1 INORGANICS

Weekly grab sample results were screened against the inorganic substances criteria for ambient surface waters provided in COMAR. Freshwater acute and chronic aquatic life criteria for cadmium, lead, nickel, silver, and zinc were adjusted to account for water hardness. Water hardness was calculated based on the measured concentrations of calcium and magnesium, using the below equation:

Hardness (mg/l) = 2.497 [Ca, mg/l]+4.118 [Mg, mg/l]

The average water hardness over the discharge period equaled 386.11 mg/l. In order to accurately adjust the freshwater chronic and acute aquatic life criteria for cadmium, lead, nickel, silver, and zinc, the average hardness was then applied using parameters outlined by the United States Environmental Protection Agency's (USEPA) aquatic life ambient water quality criteria:

Criterion Maximum Concentration (CMC) (dissolved) = exp{mA [ln(hardness)]+ bA} (CF)

Criterion Continuous Concentration (CCC) (dissolved) = exp{mC [ln(hardness)]+ bC} (CF)

mA, bA, mC, and bC= equation constants

Table 2: Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent

Chemical	mA	bA	mC	bC	Freshwater Conversion Factors (CF)	
					CMC	CCC
Cadmium	0.9789	-3.866	0.7977	-3.909	1.136672-[(*ln*hardness)(0.041838)]	1.101672-[(*ln*hardness)(0.041838)]
Lead	1.273	-1.46	1.273	-4.705	1.46203-[(*ln*hardness)(0.145712)]	1.46203-[(*ln*hardness)(0.145712)]
Nickel	0.846	2.255	0.846	0.0584	0.998	0.997
Silver	1.72	-6.59	—	—	0.85	—
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Analytical results for dissolved and total metals can be found in Table 5. In general, aquatic life and human health criteria are based on the toxicity of metals in the dissolved fraction, thus limited criteria are available for total metals (only mercury). Total mercury was not detected at concentrations exceeding criteria for the protection of aquatic life or human health.

In the dissolved fraction, a distribution of metals was detected in all samples analyzed. Antimony, beryllium, cadmium, lead, silver, and thallium were not detected in any sample and aluminum and mercury were detected only once. Cobalt, copper, and nickel were detected in every sample. Of the metals detected, copper was the only inorganic constituent to exceed criteria for the protection of aquatic life and did so in only one (11%) sample. The detected concentration of 0.0134 mg/l exceeded both chronic (0.009 mg/l) and acute (0.013 mg/l) aquatic life criteria. Detected copper concentrations ranged from 0.002 mg/l to 0.0134 mg/l and the average detected concentration was 0.0043 mg/l.

Arsenic was the only dissolved metal to exceed criteria for the protection of human health. Detected arsenic concentrations ranged from 0.0011 mg/l to 0.0029 mg/l and the average detected concentration was 0.0019 mg/l. Arsenic exceeded the 'drinking water + organism' criteria (0.00018 mg/l) in eight instances (88% of samples). All other detected inorganic (total and dissolved) concentrations were below COMAR aquatic life and human health criteria.

3.2 AMMONIA

Weekly grab sample results were screened against the COMAR acute and chronic water quality criteria for total ammonia (salmonids absent). Acute ammonia criteria is dependent on pH and chronic ammonia criteria is dependent on both temperature and pH. Acute and chronic ammonia criteria for each sampling day were calculated using field-measured parameters and the following equations.

Acute water quality criteria for total ammonia (salmonids absent):

$$\frac{0.411}{1+10^{7.204-pH}}+\frac{58.4}{1+10^{pH-7.204}}$$

Chronic water quality criteria for total ammonia (salmonids absent):

$$\left(\frac{0.0577}{1+10^{7.688-pH}}+\frac{2.487}{1+10^{pH-7.688}}\right)\times 1.45\times 10^{0.028\times(25-MAX(T,7))}$$

Analytical results for ammonia and adjusted criteria can be found in Table 5. Detected ammonia concentrations ranged from 2.3 mg/l to 18.7 mg/l and the average detected concentration was 10.86 mg/l. Day-specific criteria developed using field parameters ranged from 6.43 – 60.00 mg/l. There were two exceedances (22% of samples) of acute ammonia criteria and five exceedances (55% of samples) of chronic ammonia criteria (3.05-11.35 mg/l). No criteria for human health is provided in COMAR.

3.3 TOTAL MERCURY

Results for total mercury (low level) can be found in Table 5. Detected concentrations ranged from 3.5 ng/l to 22.6 ng/l and the average detected concentration was 10.475 ng/l. All detected concentrations were below COMAR aquatic life and human health criteria.

3.4 TOTAL KJELDAHL NITROGEN

Results for TKN can be found in Table 5. Detected TKN concentrations ranged from 4 mg/l to 22.4 mg/l and the average detected concentration was 12.56 mg/l. No criteria for aquatic life or human health is provided in COMAR.

3.5 DISSOLVED ORTHOPHOSPHATE

Results for dissolved orthophosphate can be found in Table 5. Detected dissolved orthophosphate concentrations ranged from 0.022 mg/l to 0.21 mg/l and the average detected concentration was 0.0818 mg/l. No criteria for aquatic life or human health is provided in COMAR.

3.6 NITRATE/NITRITE

Results for nitrate/nitrite can be found in Table 5. Detected nitrate + nitrite concentrations ranged from 0.18 mg/l to 1.3 mg/l and the average detected concentration was 0.55 mg/l. Detected nitrate concentrations ranged from 0.15 mg/l to 1.2 mg/l and the average detected concentration was 0.53 mg/l. Detected nitrite concentrations ranged from 0.0034 mg/l to 0.64 mg/l and the average detected concentration was 0.028 mg/l. No criteria for aquatic life or human health is provided in COMAR.

3.7 PHOSPHORUS (TOTAL AND DISSOLVED)

Results for phosphorus (total and dissolved) can be found in Table 5. Detected dissolved phosphorus concentrations ranged from 0.04 mg/l to 0.35 mg/l and the average detected concentration was 0.17 mg/l. Detected total phosphorus concentrations ranged from 0.047 mg/l to 0.4 mg/l and the average detected concentration was 0.188 mg/l. No criteria for aquatic life or human health is provided in COMAR.

3.8 SULFATE

Results for sulfate can be found in Table 5. Detected sulfate concentrations ranged from 74.7 mg/l to 388 mg/l and the average detected concentration was 177.46 mg/l. No criteria for aquatic life or human health is provided in COMAR.

3.9 FIELD PARAMETERS

Weekly dissolved oxygen, temperature, and pH parameters were collected in the field using a Horiba U-52 Water Quality Meter that was calibrated before each use. Field parameters were collected at the Pearce Creek CDF swale at the upstream end of the corrugated discharge pipes. The following field parameter measurements were recorded in the field:

Table 3: Field Parameter Results for Chesapeake & Delaware Canal Maintenance Dredging Project

	pH (s.u.)	Temperature (°C)	Dissolved Oxygen (mg/l)
12/20/18	7.17	5.18	8.78
12/28/18	7.21	8.02	7.37
01/04/19	7.65	5.73	8.56
01/10/19	7.59	2.28	15.83
01/16/19	7.09	3.09	10.11
01/22/19	5.84	0.69	14.66
01/28/19	7.66	1.54	7.00
02/01/19	7.63	0.5	6.78
02/07/19	8.12	3.59	8.24
02/13/19	8.14	-0.37	15.42

3.10 TOTAL SUSPENDED SOLIDS

Results for TSS can be found in Table 6. TSS ranged from 13.2 mg/l to 359 mg/l. The average TSS value was 105.21 mg/l and the median TSS value was 96.75 mg/l. No TSS criteria for aquatic life or human health is provided in COMAR.

3.11 TOTAL DAILY DISCHARGE VOLUME

Results for total daily discharge volume can be found in Table 7. A total of 394,093,380 gallons were discharged between December 20, 2018 and February 12, 2019.

4. SUMMARY

Analytical results were screened against COMAR criteria for aquatic life and human health. All detected concentrations of total mercury were below aquatic life and human health criteria. Antimony, beryllium, cadmium, lead, silver, and thallium were not detected in any sample. Aluminum and mercury were detected only once, but detections were below criteria. Cobalt, copper, and nickel were detected in every sample.

Dissolved copper was detected in one sample that exceeded both freshwater chronic and freshwater acute criteria for aquatic life. Detected concentrations of dissolved arsenic were found in eight samples that exceeded 'drinking water + organism' criteria. All other detected inorganic (total and dissolved) concentrations were below COMAR aquatic life and human health criteria.

Ammonia concentrations were screened against COMAR criteria for aquatic life. Detected concentrations of ammonia were found in nine samples; two samples exceeded acute ammonia criteria and five samples exceeded chronic ammonia criteria. No criteria for human health is provided in COMAR. No criteria for aquatic life or human health is provided in COMAR for the following analytes: TSS, sulfate, phosphorous (total and dissolved), nitrate/nitrite, dissolved orthophosphate, TKN, and field parameters.

A total of 394,093,380 gallons were discharged between December 20, 2018 and February 12, 2019.

5. REFERENCES

CPPA. (2000). Hydraulic Considerations for Corrugated Polyethylene Pipe. *Hydraulics,* 14. Retrieved February 1, 2019, from https://plasticpipe.org/pdf/tr-36_hydraulics_for_corrugated_polyethlene_pipe.pdf

Manning, R. (1895). On the Flow of Water in Open Channels and Pipes. *Transactions of the Institution of Civil Engineers of Ireland*, 179-207.

Tables

TABLE 4: Summary of Chemical Analyses and Quantities
Water Quality Monitoring During Chesapeake and Delaware Canal Dredging Activities,
Pearce Creek Confined Disposal Facility
Earleville, MD

Analyte	Chemical Analysis	Effluent	QA/QC	Total
Inorganics				
TAL Inorganics (Total)	SW846- 6020	9	1	10
TAL Inorganics (Dissolved)	SW846- 6020	9	1	10
Total Mercury	USEPA method 1631E	9	1	10
General Chemistry				
Dissolved Phosphate	SM18 4500-PE	9	1	10
Nitrate/Nitrite	MCAWW 353.2	9	1	10
Sulfate	USEPA method 375.4, 375.3	9	1	10
Orthophosphate	MCAWW 300.A	9	1	10
Total Phosphorus/Phosphate	Method 365	9	1	10
Total Dissolved Phosphorus	SM18 4500-PE	9	1	10
Total Kjeldahl Nitrogen	MCAWN 351.2	9	1	10
Ammonia	MCAWW 350.1	9	1	10
Totals Suspended Solids	USEPA method 160.2	44	0	44
Field Parameters				
pH	-	10	0	10
Dissolved Oxygen	-	10	0	10
Temperature	-	10	0	10

TABLE 5: Data Summary of Analytical Results for Chesapeake Delaware Canal Maintenance Dredging Project
Water Quality Monitoring During Chesapeake and Delaware Canal Dredging Activities,
Pearce Creek Confined Disposal Facility
Earleville, MD

Client Sample ID:			PC-01_122018		PC-01_122818		PC-01_010419		PC-01_011019		PC-01_011619		PC_01_012219		PC-01_012819		PC-01_020119		PC-01_020719		PC-01_021319	PC-FB_011619	Limit of Detection	Aquatic Life				Human Health for Consumption of:			Summary Statistics			
Lab Sample ID:			JC80132-1		JC80614-1		JC80843-1		JC81166-1		JC81444-1		JC81698-1		JC81932-1		JC82216-3		JC82500-1			JC81444-2		Freshwater Acute (mg/L)	Freshwater Chronic (mg/l)	Freshwater Acute (adjusted for hardness) (mg/l)	Freshwater Chronic (adjusted for hardness) (mg/l)	Drinking Water+Organism (mg/l)	Organism Only (mg/l)	Drinking Water MCL (mg/l)	Detections	Average	Minimum	Maximum
Date Sampled:			12/20/2018		12/28/2018		1/4/2019		1/10/2019		1/16/2019		1/22/2019		1/28/2019		2/1/2019		2/7/2019			1/16/2019												
Matrix:			Water		Water		Water		Water		Water		Water		Water		Water		Water			Field Blank												
Totals Metals																																		
Aluminum	mg/l	7429-90-5	1.44		4.78		5.84		4.74		1.3		1.72		4.94		0.797		3.89		-	ND	0.04	-	-	-	-	-	-	-	9	3.271888889	0.797	5.84
Antimony	mg/l	7440-36-0	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.003	-	-	-	-	-	-	-	0	0	0	0
Arsenic	mg/l	7440-38-2	0.0015	J	0.0071		0.006		0.0055		0.0031		0.0026	J	0.0045		0.0021	J	0.0052		-	ND	0.002	-	-	-	-	-	-	-	9	0.004177778	0.0015	0.0071
Barium	mg/l	7440-39-3	0.0159	J	0.0514		0.0653		0.0665		0.0477		0.0506		0.0777		0.0483		0.0649		-	0.0016	J 0.001	-	-	-	-	-	-	-	9	0.054255556	0.0159	0.0777
Beryllium	mg/l	7440-41-7	ND		0.00041	J	0.00045	J	0.00047	J	0.00015	J	0.00019	J	0.00032	J	ND		ND		-	ND	0.0005	-	-	-	-	-	-	-	7	0.000327143	0.00015	0.00047
Cadmium	mg/l	7440-43-9	ND		0.00027	J	0.00017	J	0.00017	J	0.00017	J	0.00019	J	0.00021	J	ND		ND		-	ND	0.004	-	-	-	-	-	-	-	6	0.000196667	0.00017	0.00027
Calcium	mg/l	7440-70-2	65.1		34.4		23.3		25.9		35.2		41.1		51.6		57.3		41.2		-	ND	0.5	-	-	-	-	-	-	-	9	41.67777778	23.3	65.1
Chromium	mg/l	7440-47-3	0.0039	J	0.0078	J	0.0139		0.0102		0.0033	J	0.0035	J	0.0086		0.0022	J	0.0078	J	-	0.00097	J 0.006	-	-	-	-	-	-	-	9	0.0068	0.0022	0.0139
Cobalt	mg/l	7440-48-4	0.0048	J	0.01		0.0087		0.0081		0.0052		0.0073		0.0095		0.0077		0.0093		-	ND	0.0005	-	-	-	-	-	-	-	9	0.007844444	0.0048	0.01
Copper	mg/l	7440-50-8	0.0096	J	0.0118		0.0118		0.0085	J	0.0066	J	0.006	J	0.0156		0.0053	J	0.0082	J	-	ND	0.008	-	-	-	-	-	-	-	9	0.009266667	0.0053	0.0156
Iron	mg/l	7439-89-6	1.73		7.43		9.54		7.86		2.81		2.48		5.55		1.99		6.01		-	ND	0.025	-	-	-	-	-	-	-	9	5.044444444	1.73	9.54
Lead	mg/l	7439-92-1	ND		0.0091		0.0108		0.0087		0.0027	J	0.0026	J	0.0054		0.0012	J	0.0064		-	ND	0.002	-	-	-	-	-	-	-	8	0.0058625	0.0012	0.0108
Magnesium	mg/l	7439-95-4	74.7		64.9		33.2		38		41.5		56.6		85		86.1		79.6		-	ND	1.3	-	-	-	-	-	-	-	9	62.17777778	33.2	86.1
Manganese	mg/l	7439-96-5	10.6		5.04		3.57		4.29		7.54		9.91		11.1		12.6		6.75		-	ND	0.2	-	-	-	-	-	-	-	9	7.933333333	3.57	12.6
Mercury (ng/l)	ng/l	7439-97-6	-		13.7		22.6		11.7		4.9		6.5		10.5		3.5		10.4		-	ND	0.33	1400 (ng/l)	770 (ng/l)	-	-	-	-	2000 (ng/l)	8	10.475	3.5	22.6
Mercury (mg/l)	mg/l	7439-97-6	ND		ND		ND		ND		ND		0.00017	J	0.00011	J	ND		ND		-	ND	0.00015	0.0014	0.00077	-	-	-	-	0.002	2	0.00014	0.00011	0.00017
Nickel	mg/l	7440-02-0	0.0194		0.0193		0.0154		0.0147		0.0093		0.0136		0.0187		0.014		0.0189		-	ND	0.006	-	-	-	-	-	-	-	9	0.015922222	0.0093	0.0194
Potassium	mg/l	7440-09-7	23.8		23.7		12.3		13.7		12.3		16.9		22.6		20.9		22.4		-	ND	0.5	-	-	-	-	-	-	-	9	18.73333333	12.3	23.8
Selenium	mg/l	7782-49-2	ND		0.00073	J	0.00072	J	0.0009	J	ND		ND		0.0017	J	0.00063	J	0.0007	J	-	ND	0.001	-	-	-	-	-	-	-	6	0.000896667	0.00063	0.0017
Silver	mg/l	7440-22-4	ND		0.00018	J	ND		ND		ND		ND		ND		ND		ND		-	ND	0.001	-	-	-	-	-	-	-	1	0.00018	0.00018	0.00018
Sodium	mg/l	7440-23-5	339		424		192		233		193		335		487		510		527		-	ND	20	-	-	-	-	-	-	-	9	360	192	527
Thallium	mg/l	7440-28-0	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.001	-	-	-	-	-	-	-	0	0	0	0
Vanadium	mg/l	7440-62-2	0.0058	J	0.0088		0.0166		0.0148		0.0049		0.0044		0.0108		0.0025	J	0.0099		-	ND	0.002	-	-	-	-	-	-	-	9	0.008722222	0.0025	0.0166
Zinc	mg/l	7440-66-6	0.061		0.05		0.0528		0.0425		0.0166	J	0.0231		0.0365		0.0129	J	0.0309		-	ND	0.015	-	-	-	-	-	-	-	9	0.036255556	0.0129	0.061
Inorganics (Dissolved)																																		
Aluminum	mg/l	7429-90-5	ND		ND		0.0504		ND		ND		ND		ND		ND		ND		-	ND	0.04	-	-	-	-	-	-	-	1	0.0504	0.0504	0.0504
Antimony	mg/l	7440-36-0	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.003	-	-	-	-	0.0056	0.64	0.006	0	0	0	0
Arsenic	mg/l	7440-38-2	ND		0.0029	J	0.0017	J	0.0014	J	0.0017	J	0.0014	J	0.0021	J	0.0011	J	0.0029	J	-	ND	0.002	0.34	0.15	-	-	0.00018	-	0.01	8	0.0019	0.0011	0.0029
Barium	mg/l	7440-39-3	ND		0.0331		0.0364		0.0373		0.0442		0.0505		0.0508		0.0445		0.0477		-	0.0014	J 0.001	-	-	-	-	1	-	2	8	0.0430625	0.0331	0.0508
Beryllium	mg/l	7440-41-7	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.0005	-	-	-	-	0.004	-	0.004	0	0	0	0
Cadmium	mg/l	7440-43-9	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.004	0.002	0.00025	0.006	0.002	0.005	-	0.005	0	0	0	0
Calcium	mg/l	7440-70-2	65.3		38.9		26.3		25.7		38.8		49.6		52.2		61		44.7		-	ND	0.5	-	-	-	-	-	-	-	9	44.72222222	25.7	65.3
Chromium	mg/l	7440-47-3	0.0072	J	ND		ND		ND		ND		0.00071	J	0.00079	J	0.00069	J	0.00078	J	-	ND	0.006	0.016[a]	0.011[a]	-	-	0.1	-	0.1	5	0.002034	0.00069	0.0072
Cobalt	mg/l	7440-48-4	0.0035	J	0.0039		0.0028		0.0033		0.0049		0.0064		0.0056		0.0073		0.0052		-	ND	0.0005	-	-	-	-	-	-	-	9	0.004766667	0.0028	0.0073
Copper	mg/l	7440-50-8	**0.0134**		0.0033	J	0.0021	J	0.002	J	ND		0.0032	J	0.0026	J	0.004	J	0.0039	J	-	ND	0.008	0.013	0.009	-	-	1.3	-	1.3	8	0.0043125	0.002	0.0134
Iron	mg/l	7439-89-6	ND		0.0322	J	0.0619		0.0289	J	0.0429	J	0.0218	J	0.0231	J	0.0247	J	0.0283	J	-	ND	0.025	-	-	-	-	-	-	-	8	0.032975	0.0218	0.0619
Lead	mg/l	7439-92-1	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.002	0.065	0.0025	0.27	0.011	-	-	0.015	0	0	0	0
Magnesium	mg/l	7439-95-4	74.8		73		35.4		37.5		47.1		68.3		85.4		90.7		87.6		-	ND	1.3	-	-	-	-	-	-	-	9	66.64444444	35.4	90.7
Manganese	mg/l	7439-96-5	10.7		5.25		3.56		3.92		8.35		11.5		10.9		13.5		7		-	ND	0.2	-	-	-	-	-	-	-	9	8.297777778	3.56	13.5
Mercury (mg/l)	mg/l	7439-97-6	ND		ND		ND		ND		ND		0.00016	J	ND		ND		ND		-	0.00013	J 0.00015	0.0014	0.00077	-	-	-	-	0.002	1	0.00016	0.00016	0.00016
Nickel	mg/l	7440-02-0	0.0195		0.0112		0.0064	J	0.0072	J	0.0085		0.0122		0.0123		0.0135		0.0131		-	ND	0.006	0.47	0.052	1.47	0.16	0.61	4.6	-	9	0.011544444	0.0064	0.0195
Potassium	mg/l	7440-09-7	23.6		27.1		12.8		13.3		13.7		21.9		21.7		21.9		24.2		-	ND	0.5	-	-	-	-	-	-	-	9	20.02222222	12.8	27.1
Selenium	mg/l	7782-49-2	ND		0.00062	J	ND		0.00077	J	ND		ND		0.00055	J	ND		0.0008	J	-	ND	0.001	0.02	0.005	-	-	0.17	4.2	0.05	4	0.000685	0.00055	0.0008
Silver	mg/l	7440-22-4	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.001	0.0032	-	0.033	-	-	-	0.1	0	0	0	0
Sodium	mg/l	7440-23-5	346		498		223		238		221		392		494		544		582		-	ND	20	-	-	-	-	-	-	-	9	393.1111111	221	582
Thallium	mg/l	7440-28-0	ND		ND		ND		ND		ND		ND		ND		ND		ND		-	ND	0.001	-	-	-	-	0.00024	0.00047	0.002	0	0	0	0
Vanadium	mg/l	7440-62-2	0.0053	J	ND		ND		ND		ND		ND		ND		ND		0.0018	J	-	ND	0.002	-	-	-	-	-	-	-	2	0.00355	0.0018	0.0053
Zinc	mg/l	7440-66-6	0.0432		ND		ND		ND		ND		0.0054	J	0.0058	J	ND		ND		-	ND	0.015	0.12	0.12	0.368	0.371	7.4	26	-	3	0.018133333	0.0054	0.0432
Other Analytes																																		
Nitrogen, Nitrate + Nitrite	mg/l		1.3		0.65		0.65		0.63		0.3		0.56		0.18		0.46		0.22		-	ND	0.1	-	-	-	-	-	-	-	9	0.55	0.18	1.3
Nitrogen, Nitrate	mg/l	14797-55-8	1.2		0.63		0.63		0.63		0.3		0.56		0.15		0.43		0.22		-	ND	0.11	-	-	-	-	-	-	-	9	0.527777778	0.15	1.2
Nitrogen, Nitrite	mg/l	14797-65-0	0.064		0.019		0.023		ND		ND		0.0034	J	0.031		0.028		ND		-	ND	0.005	-	-	-	-	-	-	-	6	0.028066667	0.0034	0.064
Sulfate	mg/l	14808-79-8	388		105		78.7		74.7		175		230		196		251		98.7		-	ND	1	-	-	-	-	-	-	-	9	177.4555556	74.7	388
Nitrogen, Ammonia	mg/l	7664-41-7	**2.3**		18.1		7.5		7.3		5.5		9.8		18.7		12.5		16		-	ND	1	6.43-60.00	3.05-11.35	-	-	-	-	-	9	10.85555556	2.3	18.7
Phosphorus (total)	mg/l		0.2		0.4		ND		0.26		0.16		0.062		-		0.047	J	ND		-	ND	0.04	-	-	-	-	-	-	-	6	0.188166667	0.047	0.4
Phosphorus (dissolved)	mg/l		0.14		0.35		ND		0.21		0.14		0.15		-		0.04	J	ND		-	ND	0.04	-	-	-	-	-	-	-	6	0.171666667	0.04	0.35
Nitrogen, Total Kjeldahl	mg/l		4		22.4		10.4		9.2		6.9		11.8		15.5		14.6		18.2		-	ND	1.1	-	-	-	-	-	-	-	9	12.55555556	4	22.4
Orthophosphate (total)	mg/l	14265-44-2	-		-		-		-		-		-		-		-		-		-	ND	0.025	-	-	-	-	-	-	-	0	0	0	0
Orthophosphate (dissolved)	mg/l		0.085		0.022	J	ND		ND		ND		0.048	J	0.21		ND		0.044	J	-	ND	0.025	-	-	-	-	-	-	-	5	0.0818	0.022	0.21
Field Parameters																																		
pH	s.u.		7.17		7.21		7.65		7.59		7.09		5.84		7.66		7.63		8.12		8.14	7.09	-	-	-	-	-	-	-	-	9	7.41	5.84	8.14
Temperature	°C		5.18		8.02		5.73		2.28		3.09		0.69		1.54		0.50		3.59		-0.37	3.09	-	-	-	-	-	-	-	-	9	3.03	-0.37	8.02
Dissolved Oxygen	mg/L		8.78		7.37		8.56		15.83		10.11		14.66		7		6.78		8.24		15.42	10.11	-	-	-	-	-	-	-	-	9	9.703333333	6.78	15.83

Notes:

Aquatic Life and Human Health Criteria are listed from Code of Maryland Regulations (COMAR) Title 26 subtitle 08 Water Pollution 26.08.02.03-2 Numerical Criteria for Toxic Substances in Surface Waters

[a] No criterion provided for total chromium. Criteria for chromium VI utilized.

ND = Not Detected

--- No applicable standard

mg/l = milligrams per liter; ng/l = nanograms per liter

Average hardness = 386.11 mg/L, based on average of calcium and magnesium concentrations, where hardness, mg equivalent CACO3/L = 2.497 [Ca, mg/L]+4.118 [Mg, mg/L]

Orange highlight indicates result exceeds Drinking Water + Organism criteria.

Green highlight, double underline, and bold text indicates result exceeds both Freshwater Acute and Freshwater Chronic Aquatic Life criteria.

Green highlight and double underline indicates result exceeds Freshwater Acute Aquatic Life criteria.

Green highlight indicates result exceeds Freshwater Chronic Aquatic Life criteria.

Data Qualifiers:

J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

TABLE 6: TSS for Effluent Monitoring
Water Quality Monitoring During Chesapeake and Delaware Canal Dredging Activities,
Pearce Creek Confined Disposal Facility
Earleville, MD

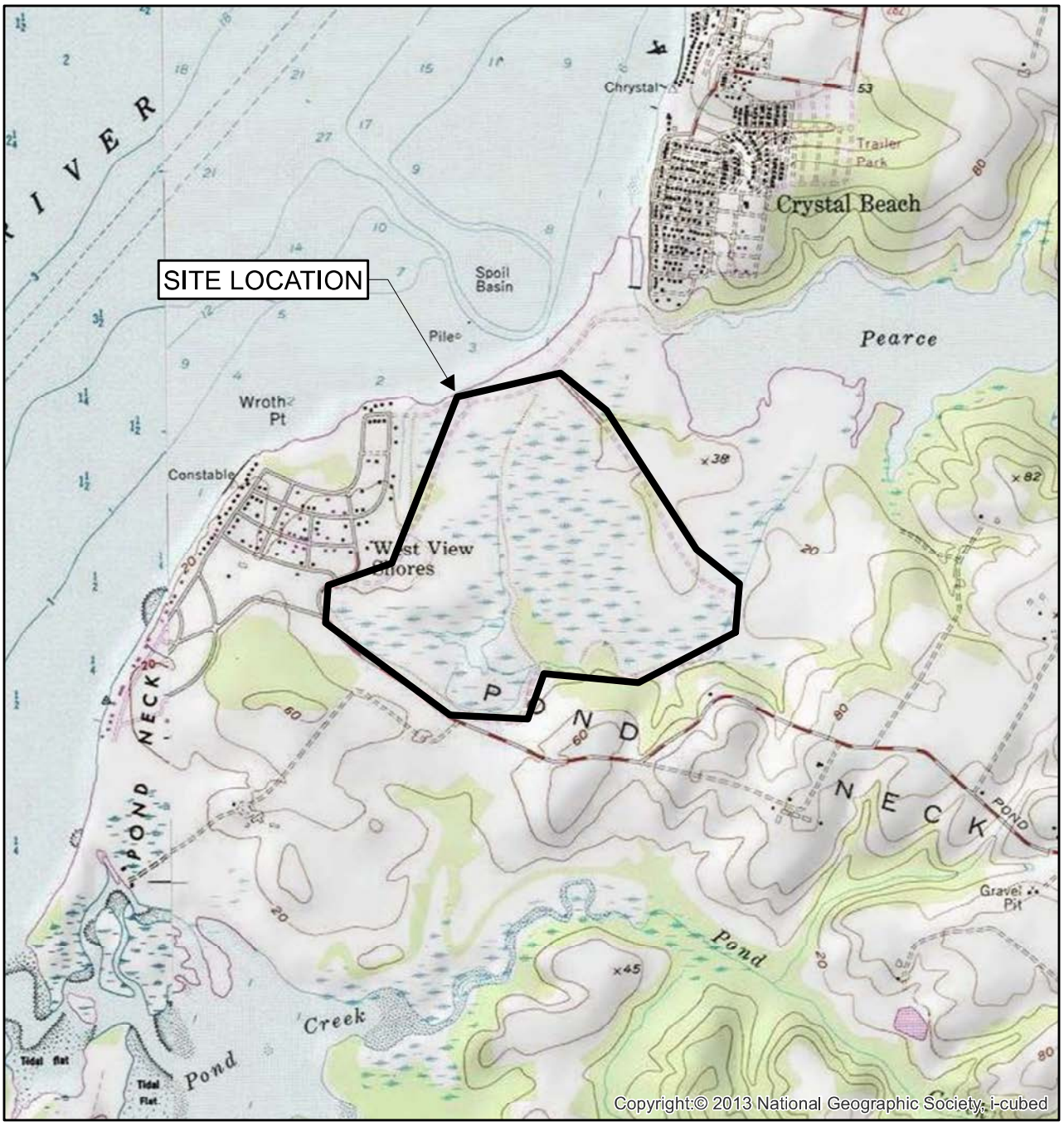
Sample ID	TSS (mg/L)
PC-01_122118	21.1
PC-01_122218	31.4
PC-01_122318	55
PC-01_122418	70
PC-01_122518	79.5
PC-01_122618	77
PC-01_122718	94.5
PC-01_122818	99
PC-01_122918	324
PC-01_123018	258
PC-01_123118	174
PC-01_010119	137
PC-01_010219	165
PC-01_010319	169
PC-01_010419	121
PC-01_010519	146
PC-01_010619	176
PC-01_010719	127
PC-01_010819	125
PC-01_010919	106
PC-01_011019	114
PC-01_011119	106
PC_01_011619	38.1
PC-01_012219	47.3
PC-01_012319	32.7
PC-01_012419	74
PC-01_012519	87
PC-01_012619	138
PC-01_012719	87.1
PC-01_012819	158
PC-01_012919	120
PC-01_020119	24.3
PC-01_020219	13.3
PC-01_020319	15.8
PC-01_020419	13.2
PC-01_020519	37.7
PC-01_020619	100
PC-01_020719	180
PC-01_020819	359
PC-01_020919	150
PC-01_021019	40.4
PC-01_021119	16.4
PC-01_021219	33.6
PC-01_021319	88

TABLE 7: Daily Discharge Volume
Water Quality Monitoring During Chesapeake and Delaware Canal Dredging Activities,
Pearce Creek Confined Disposal Facility
Earleville, MD

Date	Total Daily Discharge Volume (Gallons)	
	Pipe 1	Pipe 2
12/20/18	2,137,900	2,387,450
12/21/18	3,432,960	4,969,090
12/22/18	4,329,730	6,062,770
12/23/18	1,940,590	2,064,810
12/24/18	1,659,360	1,600,230
12/25/18	2,390,580	2,860,620
12/26/18	2,028,420	2,104,420
12/27/18	4,382,510	6,877,640
12/28/18	9,334,940	13,693,400
12/29/18	8,911,250	13,063,800
12/30/18	8,319,030	12,558,600
12/31/18	6,429,140	9,992,390
01/01/19	8,273,990	12,138,200
01/02/19	8,045,290	11,610,900
01/03/19	6,651,050	9,968,510
01/04/19	7,549,990	10,825,500
01/05/19	9,844,220	13,107,900
01/06/19	4,724,430	6,741,740
01/07/19	2,615,670	3,014,390
01/08/19	2,325,320	2,581,900
01/09/19	2,278,490	2,477,060
01/10/19	1,954,880	2,021,420
01/11/19	5,288,370	7,458,500
01/12/19	4,632,730	6,652,950
01/13/19	6,532,810	9,252,240
01/14/19	4,915,720	7,176,720
01/15/19	4,424,510	6,262,700
01/16/19	3,064,220	3,760,980
01/17/19	1,825,290	1,725,290
01/18/19	1,629,610	1,452,420
01/19/19	3,331,490	4,363,210
01/20/19	3,195,880	4,003,050
01/21/19	634,045	663,040
01/22/19	149,009	162,005
01/23/19	236,637	364,962
01/24/19	5,165,280	6,966,750
01/25/19	1,730,350	1,569,460
01/26/19	748,603	795,219
01/27/19	398,171	559,871
01/28/19	206,808	420,995
01/29/19	491,417	586,226
01/30/19	538,885	622,199
01/31/19	184,586	151,018
02/01/19	117,078	44,754
02/02/19	196,261	101,866
02/03/19	152,147	84,794
02/04/19	79,905	211,534
02/05/19	485,101	524,481
02/06/19	1,676,420	1,856,720
02/07/19	1,053,510	962,608
02/08/19	1,179,860	1,145,700
02/09/19	131,763	267,469
02/10/19	26,435	104,507
02/11/19	33,994	118,407
02/12/19	2,948,440	4,012,920
Total Per Pipe	166,965,075	227,128,305
Total Event	394,093,380	

Figures

3/14/2019 10:18:38 AM



ADAPTED FROM: EARLEVILLE AND SPESUTIE, MARYLAND USGS QUADRANGLES

UNITED STATES ARMY CORPS OF ENGINEERS
PHILADELPHIA DISTRICT
PEARCE CREEK CONFINED DREDGED MATERIAL CONTAINMENT FACILITY
EARLEVILLE, MARYLAND

N

MAP LOCATION

SITE LOCATION

0 1,000 2,000 4,000
Feet

12124/70981
MARCH 2019

1:24,000

O'BRIEN & GERE ENGINEERS, INC.

I:\Us-Acoe-Phila.12124\STDS\GIS\PearceCreek\Figure1_Pearce_Creek.mxd

FIGURE 2

UNITED STATES ARMY CORPS OF ENGINEERS
PHILADELPHIA DISTRICT
PEARCE CREEK CONFINED DREDGED MATERIAL CONTAINMENT FACILITY (CDF)
EARLEVILLE, MARYLAND

N

CDF DISCHARGE

12124/70981
MARCH 2019

0 150 300 600
Feet

O'BRIEN & GERE ENGINEERS, INC.

3/13/2019 3:07:09 PM

I:\Us-Acoe-Phila.12124\STDS\GIS\PearceCreek\Figure2_CDFDischarge.mxd

Appendix A:

Lab Analytical Reports

Appendix A
Laboratory Data
Not Included in Electronic Submittal

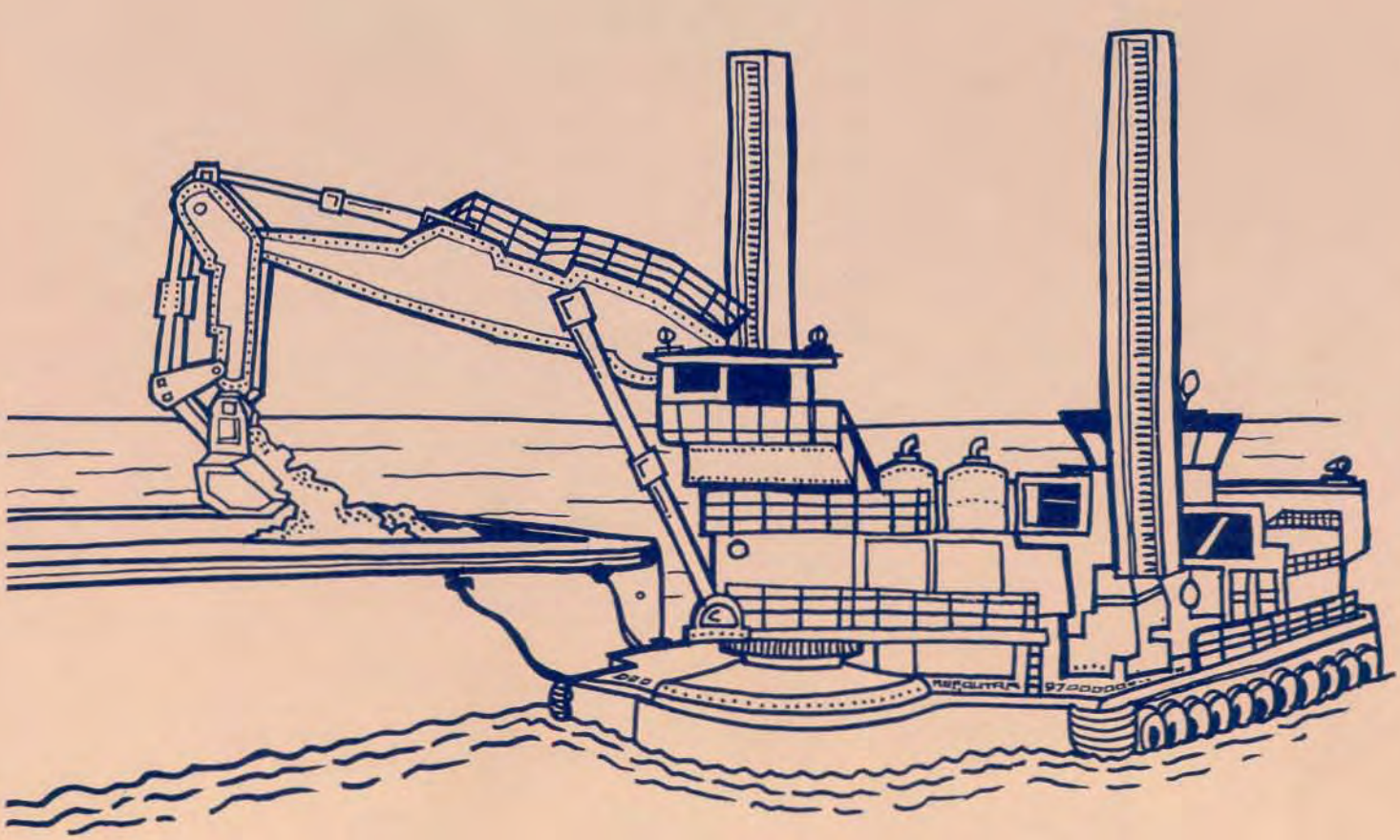
Appendix A:

Sampling Methodology and Sampling Requirements

The Management and Regulation of

Dredging Activities and Dredged Material

in New Jersey's Tidal Waters



October 1997

Thanks to Dutra Dredging and Materials for use of the Antone as reference for our cover illustration

The Management and Regulation of
Dredging Activities and Dredged Material
in New Jersey's Tidal Waters

State of New Jersey
Christine Todd Whitman
Governor

Department of Environmental Protection
Robert C. Shinn, Jr.
Commissioner

MISSION STATEMENT

Vision: The Department of Environmental Protection is committed to providing a high quality of life for the residents of New Jersey.

Mission: To assist the residents of New Jersey in preserving, sustaining, protecting and enhancing the environment to ensure the integration of high environmental quality, public health and economic vitality. We will accomplish our mission in partnership with the general public, business, environmental community and all levels of government by:

- Developing and integrating an environmental master plan to assist the Department and our partners in decision-making through increased availability of resource data on the Geographic Information System.
- Defining and publishing reasonable, clear and predictable scientifically-based standards.
- Achieving the Department's goals in a manner that encourages compliance and innovation.
- Employing a decision-making process that is open, comprehensive, timely, predictable and efficient.
- Providing residents and visitors with affordable access to safe and clean open space, historic and natural resources.
- Assuring that pollution is prevented in the most efficient and practical way possible.
- Assuring that the best technology is planned and applied to achieve long-term goals.
- Assuring that non-treatable wastes are isolated, managed and controlled.
- Enhancing environmental awareness and stewardship through education and communication.
- Fostering a work environment that attracts and retains dedicated and talented people.
- Committing to an ongoing evaluation of the Department's progress toward achieving our mission.

Printed on Recycled Paper

THE MANAGEMENT AND REGULATION OF DREDGING ACTIVITIES AND DREDGED MATERIAL IN NEW JERSEY'S TIDAL WATERS

October 1997

This Technical Manual has been produced by the New Jersey Department of Environmental Protection to make the permitting process for dredging activities and the management of dredged material clearer, less complicated and more efficient. This document is one of a series of technical manuals produced by the Department under the requirements of the Environmental Management Accountability Plan (P.L. 1991, Chapter 422) with the goal of making the permitting process more consistent and predictable. This technical manual includes summaries and explanations of policies that may not be fully described or explained in environmental laws or regulations. In addition, the document contains guidance on how the Department defines other standards, such as "best management practices".

Unless otherwise required by federal or State law, the policies and procedures contained in the technical manual on the date an application is filed will be binding on both the Department and the applicant. The technical manual may be updated every six months or whenever a regulatory change requires revisions. Any revision made to the technical manual will have no effect upon a permit application that was submitted to the Department prior to the adoption of the revision.

This document is a technical manual prepared pursuant to N.J.S.A. 13:1D-111 to 1D-113. The technical manual, by necessity, condenses and summarizes statutes, regulations, and other documents, and therefore may not always precisely reflect all the requirements set forth in same. In the case of any inconsistency between this technical manual and any statutes, regulations, or policy determinations based upon same, the requirements of the statutes, regulations, or policy determinations shall prevail. Accordingly, this technical manual should not be used as a substitute for a thorough analysis of the law and the facts as they apply to any specific project or proposal. The State of New Jersey, including its Department of Environmental Protection and all agents and employees thereof, hereby disclaims any warranties (express or implied) and any legal liability for the accuracy, completeness, or usefulness of any of the information set forth in this technical manual.

The Department welcomes suggestions for improving this Technical Manual. Please direct your comments to Joel A. Pecchioli, Office of Program Coordination, New Jersey Department of Environmental Protection, P.O. Box 418, Trenton, NJ, 08625.

You may request additional copies of this manual by sending a check or money order, made payable to the Treasurer, State of New Jersey for $10.00 (this includes first class mailing by the U.S. Postal Service) to:

New Jersey Department of Environmental Protection
Map Sales & Publication Office
P.O. Box 420
Trenton, NJ 08625

For information about other technical manuals offered by the Department, contact either the Office of Pollution Prevention and Permit Coordination at (609) 984-0857, or the Map Sales & Publication Office at (609) 777-1038.

As stated previously, the technical manual may be updated every six months or whenever a regulatory change requires it. Therefore, if the publication date of the manual is more than six months old or if you are aware of a regulatory change, you should contact the Maps and Publication Office for a copy of the appropriate revision.

Notice: This manual contains forms and applications that are provided as a convenience to the applicant. These forms are included for illustrative purposes only, are not subject to the limitation of N.J.S.A. 13:1D-112(b), and may be updated as often as necessary. Prior to submitting any forms to the Department, an applicant should contact the appropriate bureau or make certain that he or she is using the most up-to-date version.

This Technical Manual was developed by the New Jersey Department of Environmental Protection Dredging Task Force. The Department recognizes the time, effort, and talents of the members of the Task Force:

Lawrence Baier, Land Use Regulation
Fred Bowers, Watershed Permitting
Kevin Broderick, Land Use Regulation
John Castner, Solid and Hazardous Waste
Robert Confer, Solid and Hazardous Waste
Richard DeWan, Watershed Permitting
Ruth Ehinger, Land Use Regulation
Beverly Fedorko, Special Assistant to the Commissioner
Nelson Hausman, Solid and Hazardous Waste
Gene Keller, Engineering and Construction
Paul Kurisko, Site Remediation Program
Barbara Marshall, Policy and Planning
Jeanne Mroczko, Office of Pollution Prevention and Permit Coordination
Stuart Nagourney, Science and Research
Lewis Nagy, Assistant Commissioner, Policy and Planning
Joel A. Pecchioli, Office of Program Coordination (Technical Editor)
Robert Piel, Land Use Regulation
David Risilia, Land Use Regulation
John Roe, Watershed Permitting
Kevin Schick, Site Remediation Program
Lawrence Schmidt, Office of Program Coordination
Mark Searfoss, Solid and Hazardous Waste
Gary Sondermeyer, Solid and Hazardous Waste
Teruo Sugihara, Site Remediation Program

The NJDEP Dredging Task Force acknowledges the assistance of Ruth Prince and Eric Rau in the development of this Technical Manual.

EXECUTIVE SUMMARY

This Technical Manual has been prepared by the New Jersey Department of Environmental Protection Dredging Task Force in order to establish clear and comprehensive policies and procedures for reviewing proposed dredging activities, and the management of the dredged material. This document provides Departmental staff and project applicants with guidance and criteria for the required sampling, testing, and permitting of proposed dredging projects and various dredged material management/disposal/use alternatives. Dredged material can be considered a resource, and the Department strongly supports its use, wherever possible.

This Technical Manual has been developed in response to Governor Christine Whitman's Dredged Material Management Team and Departmental commitments included in the New York-New Jersey and Delaware Estuary Program Comprehensive Conservation and Management Plans. A March 1996 draft version of this document was subject to public review and comment; a companion Comment/Response Document (October 1997) has also been prepared by the Department. This Technical Manual has been developed in consideration of the comments received on the March 1996 draft document.

The regulatory review of permit applications for dredging operations and/or the management of dredged material will be coordinated by the Department's Land Use Regulation Program.

Chapter II of the Technical Manual includes a brief discussion of the authorities under which the Department will regulate dredging activities and the management/disposal/use of dredged material. It also includes a discussion of the permit review process and solid waste issues related to the regulation of dredged material.

Chapter III of the Technical Manual identifies the background information which must be submitted in support of all permit applications for dredging and dredged material management activities. For some project evaluation purposes, the tidal waters of New Jersey have been divided into three geographical regions; these are presented in Section III-B. Testing of dredged material for contaminants will not always be necessary; Testing Exclusions are discussed in Section III-C and Figure 2 is a schematic diagram of the required test procedures. In general, small dredging projects along the State's Atlantic Ocean coast, projects in which the dredged material is greater than 90% sand, and small projects in which the dredged material will be placed in a Subaqueous Disposal Pit will be excluded from extensive testing requirements. The development and implementation of sediment sampling plans and compositing schemes is discussed in Section III-D.

Section IV-B discusses the Department's program for managing and regulating dredging operations, including the use of Best Management Practices and the overland transport of dredged material. In most cases, dredging projects in New Jersey's navigable tidal waters will require a Waterfront Development Permit and a Water Quality Certificate (pursuant to Section 401 of the federal Water Pollution Control Act). Any discharge of dredged material will also require a permit from the U.S. Army Corps of Engineers pursuant to Section 404 of the federal Water Pollution Control Act. Dredging activities are also regulated by the federal government pursuant to Section 10 of the Rivers and Harbors Act of 1899. Federally-conducted, funded, or permitted activities, which have a direct impact on New Jersey's Coastal Zone, will require a federal consistency determination from the Department, pursuant to the Coastal Zone Management Act.

A variety of potential alternatives exist for the management, disposal, and/or use of dredged material. These include open water (including ocean) disposal sites, upland confined disposal facilities (CDFs), subaqueous disposal pits, and containment areas. Table 1 identifies the potential sediment testing and permitting requirements for these options.

Section IV-C of the Technical Manual discusses Open Water disposal alternatives. Disposal of dredged material in ocean waters is regulated by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. The Department will coordinate its review of proposed ocean disposal operations with these federal agencies. The Department's regulatory program for proposed reprofiling operations is also discussed in this section of the document.

Section IV-D discusses the design, construction, operation, closure, and permitting of upland confined disposal facilities (CDFs). Regulation of upland CDFs will be administered by the Department's Land Use Regulation Program, pursuant to the Waterfront Development Law and the State and federal Water Pollution Control Acts. In New Jersey's designated Coastal Zone, siting of a proposed upland CDF will be evaluated using the Rules on Coastal Zone Management. The Department will require the owner/operator of an upland CDF to submit an annual report to the Department, summarizing the past year's activities at the facility. In addition, Final (and Interim, if needed) Closure Plans must be developed and approved by the Department for each proposed upland CDF.

The major potential adverse environmental impacts associated with upland CDFs are surface and ground water contamination. Dredged material dewatering effluent returning to the same water body from which the material was originally dredged will require a Water Quality Certificate. A New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water permit will be required for discharges from upland CDFs accepting material from single or multiple dredging sites located in a different surface water body. The NJPDES-Discharge to Ground Water permitting process for upland CDFs will consider the source and degree of contamination of the dredged material, as well as the use(s) and value(s) (i.e. classification) of the underlying aquifer. This process may include the following components: preliminary determination of leachate quality from dredged sediments, Ground Water Protection Plans, and a NJPDES-Discharge to Ground Water permit. A NJPDES-DGW permit will only be required where the maximum leachate quality of any contaminant is predicted to violate the

Ground Water Quality Criteria applicable to the underlying aquifer, thus potentially adversely impacting the designated use(s) and value(s) of the aquifer.

Potential impacts to the terrestrial ecosystem and public health resulting from the use of upland CDFs are also discussed in Section IV-D of the Technical Manual.

Section IV-E discusses the use of subaqueous disposal pits for contaminated dredged material. Use of such pits will be evaluated by the Land Use Regulation Program using the Rules on Coastal Zone Management. Designing a pit to be properly capped, and maintaining the integrity of the cap, is essential. Thus, long-term monitoring of the subaqueous disposal pit, its final cap, and the surrounding environment will be required.

Section IV-F of the Technical Manual discusses the construction and use of in-water/aquatic containment areas for dredged material. Permitting requirements are generally similar to those associated with upland CDFs.

Dredged material can be considered a resource, and the Department strongly supports its use, wherever possible, as opposed to exclusive reliance on disposal facilities. Potential use alternatives for dredged material are discussed in Chapter V. Potential uses include beach nourishment, structural and non-structural fill, habitat development, landfill cover, agricultural uses, and capping open water disposal sites. The suitability for dredged material for any of these uses will depend on its characteristics, particularly grain size and degree of contamination. Appendix E presents the Acceptable Use Determination (AUD) Process the Department will apply to authorize the use of dredged material. The AUD will be attached to the Waterfront Development permit issued for a particular dredging operation or a dredged material processing facility.

Appendix A of the manual discusses required sediment sampling methodologies, and Appendix B presents the associated analytical procedures and quality assurance/quality control measures. Appendix C contains the Department's Dredged Material Data Form.

TABLE OF CONTENTS

List of Figures

List of Tables

THE MANAGEMENT AND REGULATION OF DREDGING ACTIVITIES AND DREDGED MATERIAL IN NEW JERSEY'S TIDAL WATERS

October 1997

Chapter I - Purpose of Document

This Technical Manual establishes the policies and procedures under which the New Jersey Department of Environmental Protection will conduct regulatory reviews of dredging activities in tidal waters of the State of New Jersey and the management of the dredged material. This document also provides Departmental staff and project applicants with general guidance and criteria for the required sampling, testing, and permitting of dredged material for various identified management alternatives, including potential use options. These policies and procedures have been developed to ensure that proposed dredging projects and the management of dredged material are conducted so as to minimize the potential for adverse impacts to the environment and public health. This Technical Manual has been developed by the Department under the requirements of the Environmental Management Accountability Plan (P.L. 1991, Chapter 422) with the goal of making the permit application process more consistent and predictable.

Chapter II - Overview

A: Introduction - Given the shallow natural depths of many tidal waterbodies and high rates of sedimentation/shoaling, dredging is needed to provide safe navigation conditions and to maintain vessel berthing areas. Many components of New Jersey's economy including marine commerce, commercial and recreational fishing, boating, and tourism are dependent on dredging.

In many areas of the state sediments have become contaminated with a variety of toxic substances, including dioxin, polychlorinated biphenyls (PCBs), heavy metals, pesticides, and polycyclic aromatic hydrocarbons (PAHs). Sediments in tidal water bodies may be contaminated as a result of discharges from industrial, municipal, and storm sewer sources, marina and boating operations, and atmospheric deposition. The dredging and subsequent disposal or use of these sediments, if not properly managed and regulated, could result in adverse impacts to the environment and public health.

In contrast, tidal waters in some areas of New Jersey (particularly along the Atlantic Ocean coast) have been impacted to a lesser degree by pollutant discharges. As a result, sediments in these water bodies have a lower potential to be contaminated at levels warranting a high degree of regulatory concern. Likewise, coarser-grained sediments do not bind contaminants as strongly as finer-grained and more organic sediments. Finally, all else being equal, the potential for adverse impacts from smaller dredging and dredged material management projects can be comparatively lower than that from larger projects.

B: Authorities - The New Jersey Department of Environmental Protection (NJDEP) is responsible for the evaluation and permitting of all dredging-related activities that occur in the waters of the State of New Jersey. As part of that review the Department evaluates the proposed dredged material management option. Existing management options include in-water disposal, upland containment/disposal, and/or various potential uses of the dredged material. The objectives of the Department's regulatory programs overseeing dredged material management activities include:

(1) the identification of potential adverse impacts to the environment and public health which could result from a proposed activity;

(2) the regulation/management of a proposed activity to ensure that any potential adverse impacts are minimized;

(3) the development of appropriate programs to monitor for potential adverse impacts.

The authority to regulate proposed dredging activities and the management of dredged material is derived from the following statutes:

Waterfront Development Law (N.J.S.A. 12:5-3 *et seq.*)
Riparian Interests (N.J.S.A. 12:3-1 et seq. & 18:56-1 *et seq.*)
New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 *et seq.*)
Federal Water Pollution Control Act (Clean Water Act Amendments of 1977; 33 U.S.C. 1251, Section 401)
Federal Coastal Zone Management Act (16 U.S.C. 1451 *et seq.*)

The siting of upland confined disposal facilities may also be regulated by the following:

Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 *et seq.*)
Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 *et seq.*)
Wetlands Act of 1970 (N.J.S.A. 13:9A-1 *et seq.*)
Coastal Area Facility Review Act (N.J.S.A. 13:19-1 *et seq.*)

C: Permit Review Process - The regulatory review of permit applications for dredging operations and the management of dredged material will be coordinated by the Department's Land Use Regulation Program. **Pre-application discussions with the Land Use Regulation Program are required prior to the actual submittal of a permit application, to discuss the proposed project, required permits, sampling and testing protocols, and other information which must be submitted with the application.**

In most cases, dredging projects in New Jersey's navigable tidal waters will require a Waterfront Development Permit and a Water Quality Certificate (WQC; pursuant to Section 401 of the Clean Water Act Amendments of 1977); the WQC is issued jointly with the Waterfront Development Permit. While a WQC is not required for the actual dredging operation, it is required for any discharge of dredged material into "Navigable Waters of the United States" associated with the dredging operation. Any such discharge will also require a permit from the US Army Corps of Engineers pursuant to Section 404 of the federal Clean Water Act; the Section 404 Permit triggers the requirement for a WQC. Federally-conducted, funded, or permitted activities, including federal navigation projects, which have a direct impact on New Jersey's Coastal Zone, will require a federal consistency determination from the Department, pursuant to the Coastal Zone Management Act. The U.S. Army Corps of Engineers also has authority over dredging

activities conducted in "Navigable Waters of the United States" pursuant to Section 10 of the Rivers and Harbors Act of 1899.

Disposal of dredged material in ocean waters is regulated by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA) pursuant to the Marine Protection, Research, and Sanctuaries Act (MPRSA). Ocean waters are located offshore of the "baseline" established by the USEPA pursuant to the MPRSA -- offshore of Long Island and New Jersey connected by the transect between Rockaway Point and Sandy Hook, offshore of New Jersey and Delaware connected by the transect between Cape May Point and Cape Henelopen Point. Dredged material may be disposed of in ocean waters only at sites designated by the USEPA, with permits issued by the USACE pursuant to Section 103 of the MPRSA. The State of New Jersey has discretionary authority to review disposal activities at ocean disposal sites pursuant to the Federal Coastal Zone Management Act. The review of proposed ocean disposal operations at currently designated ocean disposal sites will be coordinated with the USACE and USEPA. In inland (i.e. "non-ocean") waters the actual dredging operation, or any associated dredged material disposal/management/use alternative, which results in the placement of dredged material into "Navigable Waters of the United States" requires a Clean Water Act Section 404 permit from the USACE.

The Department will regulate the management of dredged material from out-of-state waters pursuant to the permits issued for the New Jersey facility which will handle the dredged material. These permits identify the dredged material suitable for management at the facility (locations of origin, sediment quality characteristics, quantities, etc.). Any dredged material originating in out-of-state waters would have to meet the requirements specified in the permits for the New Jersey management facility. The sediments to be dredged must comply with all of the sampling and testing requirements and protocols applicable to projects in New Jersey waters. However, note that only Testing Exclusion Case #1 (see Section III-C) will be applicable to dredged material originating in out-of-state waters. The specific evaluative criteria applied will vary with the proposed disposal/management/use alternative and its location. Likewise, dredged material from out-of-state waters proposed to be used in New Jersey would have to meet the same regulatory, sampling, and testing requirements as that of dredged material from New Jersey waters. **Given these requirements, any out-of-state applicant(s) proposing to dispose/manage or use dredged material in New Jersey must contact the Land Use Regulation Program to discuss the project prior to the submittal of permit applications. The background information listed in Section III-A must be submitted to the Department prior to this discussion.**

In general, an applicant proposing to dispose of or use dredged material originating in New Jersey at an out-of-state location would have to demonstrate to the Department that this option is approved by the State-in-question. This would consist of a letter from the appropriate regulatory agencies of the state where the disposal facility or use option is located, or copies of current facility permits, verifying that the facility is operating in accordance with applicable rules and regulations and can lawfully accept the dredged material for the declared disposal or use option. Note that the State-in-question may have different sediment sampling and testing requirements and evaluative criteria than those of the Department.

A number of factors are considered by the Department in its evaluation of a dredging project and proposed dredged material management alternatives. In general, each proposed project has its own set of potential problems and impacts to the environment and public health. Thus, not all of the concerns or regulatory requirements discussed in this Technical Manual are applicable to all projects. To some degree, each proposed project will be evaluated by the Department on a "case-by-case" basis.

The Department will ensure the logical application of this Technical Manual in its regulatory reviews. For example, the Department has divided the tidal waters of New Jersey into three geographical regions based on the expected degree and type of sediment contamination, and historic/potential dredged material management alternatives (see Figure 1 and Section III-B). In general, the applicable regulatory requirements vary between these regions, but are similar for projects located within any one region.

Finally, the Department will periodically revise the Technical Manual as its knowledge and experience increases, additional research is completed, new dredging and dredged material management alternatives become available, and in response to comments from the public. These revisions will also consider the Department's regulatory decisions to further ensure consistency in the Department's regulatory program. In the future, it is expected that many of the case-by-case decisions now required of the Department will be eliminated, and more specific regulatory criteria will be developed for various types of dredging projects and dredged material management alternatives.

D - Solid Waste Issues

The Department has carefully reviewed the issue of whether dredged material constitutes "solid waste" and whether dredging activities/disposal should be regulated under the provisions of the New Jersey Solid Waste Management Act (NJSWMA). The term "solid waste" is defined broadly to include "garbage, refuse and other discarded materials resulting from industrial, commercial and agricultural operations, and from domestic and community activities...".

In order to address the appropriateness of regulating dredging activities and dredged material under the solid waste regulatory program at N.J.S.A. 13:1E-1 *et seq.* and N.J.A.C. 7:26-1 *et seq.*, the Department carefully evaluated the implications of such a decision. Historically, as a result of Administrative Order No. 36, issued in 1983 by former NJDEP Commissioner Robert E. Hughey, permitting and regulatory control of dredging activities and associated in-water and upland disposal of dredged material has been managed under the provisions of the New Jersey Water Pollution Control Act. Dredging has not been regulated under solid waste law for over 14 years and has never been a component of the NJSWMA district planning process.

Following a careful review of solid waste regulatory issues, the Department has concluded that the NJSWMA does not apply, and it will continue to regulate upland containment/disposal of dredged material under the provisions of the New Jersey Water Pollution Control Act, Waterfront Development Law, and the other relevant statutory and regulatory authorities listed in Section II-B. The Department will propose an amendment to N.J.A.C. 7:26-1 *et seq.* to codify the class exemption of upland containment/disposal facilities. The use of dredged material will be authorized on a case-by-case basis in accordance with the Acceptable Use Determination Process presented in Appendix E.

Since the Department will not regulate dredged material as a solid waste pursuant to the Solid Waste Management Act, it will not regulate dredged material processing or staging/transfer facilities as it would analogous solid waste facilities. These facilities will most likely require a Waterfront Development permit and an Acceptable Use Determination (AUD) in accordance with the requirements of Appendix E. Depending on the type of dredged material management activities undertaken at the facility (for example, dewatering), additional permits -- such as NJPDES-Discharge to Surface Water and/or Ground Water, Air Quality -- may be required.

Chapter III - Information Required of All Projects

A - Background Information

In order for the Land Use Regulation Program to determine what specific sampling and testing are required for a proposed dredging project and the management of the dredged material, background information must be submitted to the Department. The following information shall be submitted to the Land Use Regulation Program with the preapplication request:

1. Completed Dredged Material Data Form (see Appendix C).

2. A USGS quadrangle or county map identifying the dredging project area.

3. The proposed dredging method, project depth and areal extent of project.

4. A hydrographic survey of the dredging site taken within the past 6 months. All hydrographic surveys shall be performed by an ACSM (American Congress of Surveying and Mapping) certified hydrographer, a licensed land surveyor with 5 years hydrographic experience, or a professional engineer. For detailed information on how to conduct these surveys, see U.S. Army Corps of Engineers (1994), Engineer Manual for Hydrographic Surveying. This USACE manual provides information on levels of accuracy, transect line spacing, acceptable surveying methods, and the class of survey applicable for a specific project. The hydrographic survey and plans of the dredging project submitted to the Department should also be consistent with the following criteria:

- all hydrographic/survey plans submitted shall be of a scale no greater than 1 inch equals 100 feet;
- all plans shall be submitted folded with an accompanying site location map (a USGS quadrangle is preferred);
- all projects must provide precision bathymetry (accurate to 0.10 foot vertically and 1 foot horizontally);
- all plans submitted shall show nearby outfalls, bulkheads, dolphins, mooring areas, turning basins, and any other prominent surface or bottom features;
- all plans must accurately identify proposed core sampling locations;
- hydrographic plans must be dated indicating the time the survey was taken and when the plan(s) was prepared;
- all plans must identify the areas to be dredged;
- all plans shall identify project depths in feet below Mean Low Water;

5. The location of the proposed disposal/management area, photographs of the disposal site, and method of transporting material to the disposal area. For proposed use options, a description of how the dredged material is to be used must be provided.

6. The estimated volume of dredged material and length of time necessary to conduct the dredging project, including approximate number of barge trips, if applicable.

7. An inventory of aquatic resources in the area to be dredged such as shellfish beds, eel grass beds, wetlands, shorebird nesting habitat, migratory pathways for finfish, and other aquatic organisms. Mapping of many resources is available from the Land Use Regulation Program. The Program may require surveys at the application stage if insufficient data are available for the Program to determine the

project's compliance with the Rules on Coastal Zone Management (such a determination will be made on a project-specific basis).

The Department recommends that the following information also be submitted with the preapplication request. This information will be utilized by the Department as part of its review to determine the potential of sediments in the dredging project area to contain contaminants, in an effort to minimize the sampling and testing requirements for applicants, and to develop a sampling plan. Any additional available information related to potential contamination or non-contamination of the sediments should also be submitted.

8. The location and type of all existing outfalls to surface waters on site and within 500 feet of the site.

9. Where available, a ten year history and summary of past dredging events, including grain size, Total Organic Carbon, percentage moisture, and bulk sediment chemistry analysis data.

10. The past history of on-site and adjacent land uses, and documented spills (including type, volume, and date) either on land or into surface waters.

11. An inventory of known and suspected historic upstream and downstream spills and unauthorized discharges of pollutants.

12. The location of any potable water intakes within one mile of the disposal site.

Pre-application discussions with the Land Use Regulation Program are required prior to the actual submittal of a permit application, to discuss the proposed project, required permits, sampling and testing protocols, and other information which must be submitted with the application. At this time, a project manager from the Land Use Regulation Program will be assigned to the proposed project and will act as the Department's point of contact with the applicant. The purposes of the preapplication discussions are (1) to preliminarily identify potential project impacts and areas of concern, (2) to identify the permits required for the proposed project, (3) to develop the sampling and testing plans needed to obtain the data required by the Department to properly characterize the sediments to be dredged (which will, in part, be used to evaluate the potential impacts of the dredging operation and the applicant-selected dredged material management alternative), (4) to identify other information the Department will need as part of its regulatory review process, and (5) to develop a plan of action and tentative schedule for completing data-gathering and review activities, ultimately leading to a regulatory decision by the Department.

B - Geographical Regions

Based on existing information and experience, the department has divided the tidal waters of New Jersey into three geographical regions (see Figure 1). In general, the expected degree and type of sediment contamination, and historic/potential dredged material management alternatives are similar within each region. Likewise, the applicable regulatory requirements are expected to be generally similar for projects located within any one region, but will vary between the regions.

The three regions are described as follows:

Region 1 - North of Sandy Hook (including Raritan Bay, Sandy Hook Bay, Raritan River, Arthur Kill, Kill Van Kull, Newark Bay, Passaic River, Hackensack River, Upper and Lower New York Bays, Hudson River, and associated tributaries)

Region 2 - the Atlantic Ocean coast from Sandy Hook to the western entrance of the Cape May Canal, including the Navesink and Shrewsbury Rivers, Barnegat Bay and associated tributaries, Mullica River, and Great Egg Harbor River;

Region 3 - Delaware Bay, tidal Delaware River, and associated tributaries.

C - Testing Exclusions

Testing of dredged material for contaminants will not always be necessary. Based on the volume of dredged material, the potential for contaminants to be present, and the proposed management alternative, the Department has developed the following five cases in which dredged material will be excluded from bulk sediment chemistry, elutriate, modified elutriate, and biological testing (see Figure 2). For exclusions from testing for evaluation of ground water impacts, see Section IV-D(4).

Case 1 - Sand:

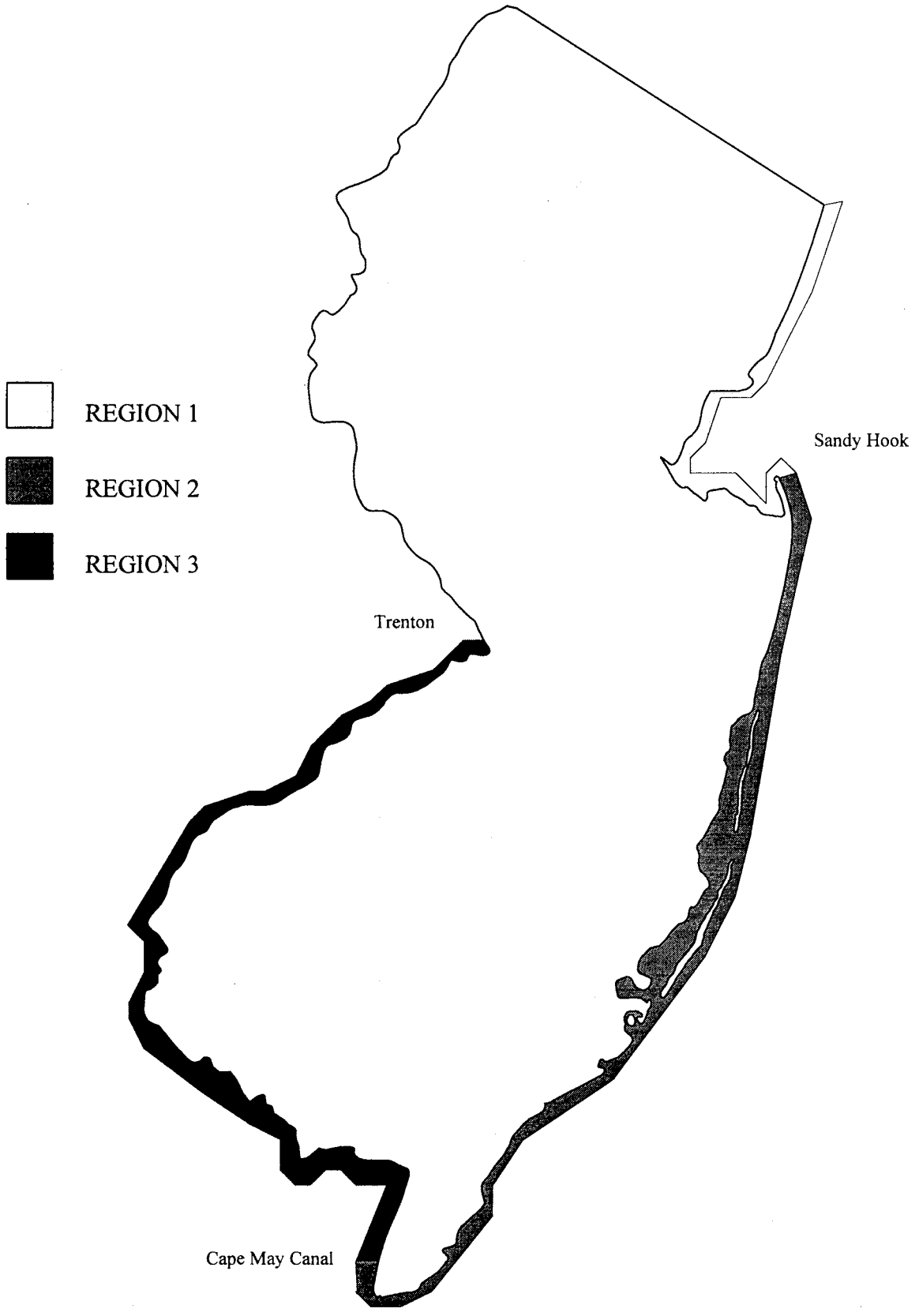
No further testing will be required if:

- the material to be dredged is greater than 90% sand (grain size >0.0625 mm) and
- other background information (for example, no known historical spills or discharges of pollutants in the project area, previous sediment chemistry data, etc.) do not lead the Department to believe the material may be contaminated.

Case 2 - Subaqueous Disposal Pits:

No further testing will be required for dredging projects where less than 1,000 cubic yards of dredged material will be removed over the 5-year life of the Waterfront Development Permit and disposal will occur in a Subaqueous Disposal Pit approved by the Department.

Figure 1: Schematic Diagram Depicting Three Geographic Regions of New Jersey
(for detailed description - see text)



Case 3 - Residential Properties in Region 2:

No further testing will be required for dredging projects in Region 2 which meet all of the following requirements:

- less than 500 cubic yards of dredged material will be removed over the 5-year life of the Waterfront Development permit;
- the dredged material will be placed on the upland portion of the residential property adjacent to the area being dredged;
- the dredging site contains 4 or less boat slips;
- the upland property is residential and owned by the same person(s) as the dredging site.
- the dredged material will be capped with a 6-inch layer of clean fill.

Case 4 - Small Projects in Region 2:

For dredging projects in Region 2, no further testing of dredged material will be required if all of the following requirements are met:

- less than 1,000 cubic yards of dredged material will be removed over the 5-year life of the Waterfront Development permit, and
- disposal is proposed in an area which will not be subject to residential or active recreational use.

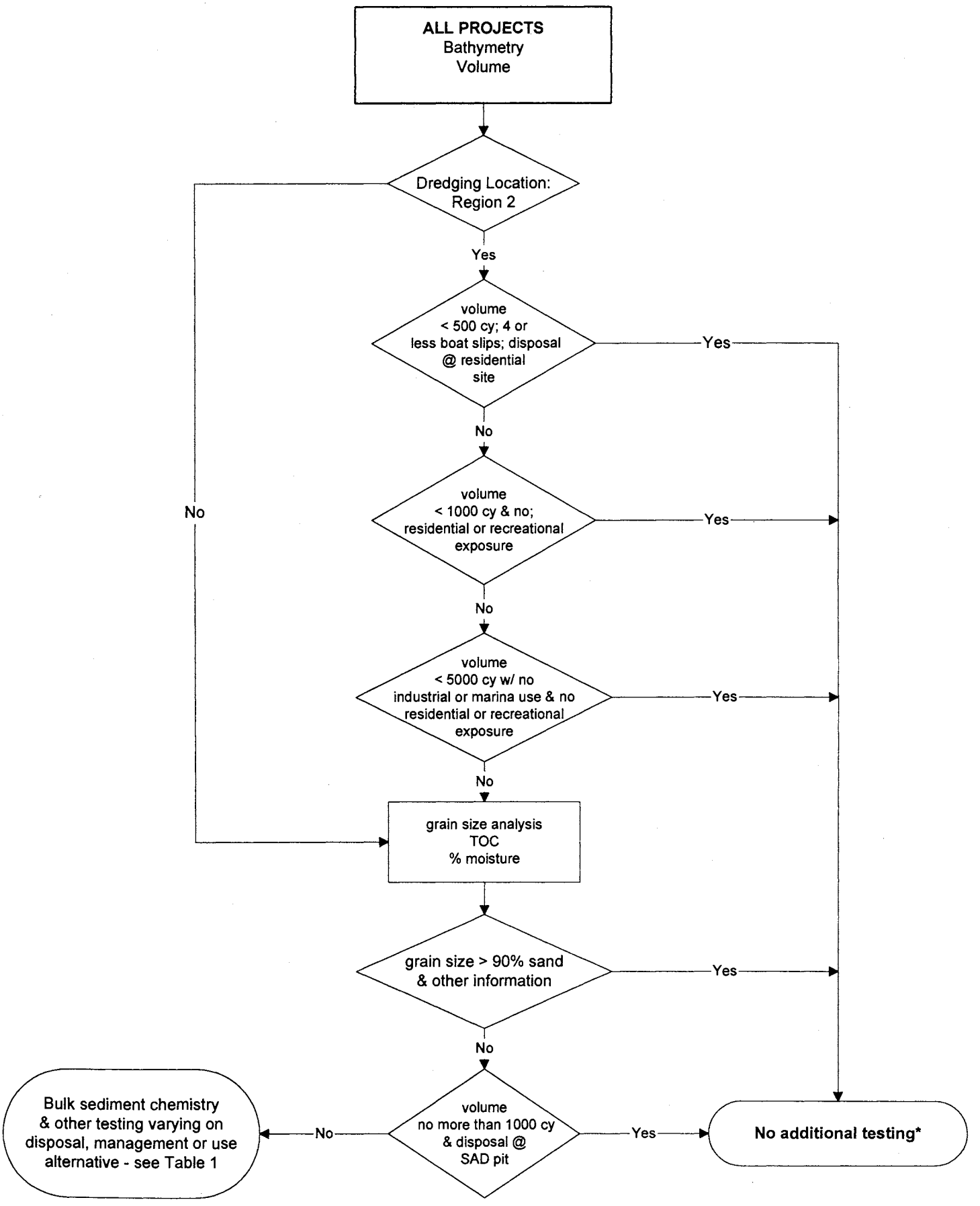
Case 5 - Small Marinas, Channels, and Other Projects in Region 2:

For dredging projects in Region 2, no further testing of dredged material will be required if all of the following requirements are met.

- less than 5,000 cubic yards of dredged material will be removed over the 5-year life of the Waterfront Development permit, and
- there has not been an historic or current upland industrial use, there is no history of spills or discharges of pollutants in the area, and the site is not now or previously occupied by a marina/marine basin of 25 or more boat slips, and
- disposal is proposed in an area which will not be subject to residential or active recreational use.

For the purposes of these testing exclusions, areas of "active recreational use" refer to those locations and/or facilities visited/used by the general public on a frequent basis. Such recreational areas include sports facilities (for example baseball fields, basketball and tennis courts, golf courses), playgrounds, picnic sites, swimming areas (pools, beaches, shores), and fishing areas. This term does not include more "passive recreational areas", such as hiking trails and open space areas.

Figure 2: Dredged Material Testing Schematic



*Note: Additional testing will be required for ocean disposal or placement at the Historic Area Remediation Site

D - Sampling of Sediments

The proposed sampling plan must be presented to the Land Use Regulation Program for review and approval prior to samples being taken. In addition to the required information discussed in Section III-A, Sections A and B of the Department's Dredged Material Data Form (see Appendix C) must be completed and submitted to the Land Use Regulation Program with the proposed sampling plan. The sampling plan must include the following information.

(1) Development of the Sampling Plan

a. Sample locations should be chosen so as to provide representative information on the volume, potential contamination, grain size, Total Organic Carbon, and percentage moisture of the sediments to be dredged.

b. In order to evaluate contamination of the sediments by pollutants, the sampling plan should include locations near the positions of any outfalls, tributaries, industrial sources, and historical spill areas. Previous test data for maintenance dredging projects should also be taken into account when choosing sampling locations.

c. The required number of sediment core samples to be taken per volume of sediment to be dredged, and the maximum number of core samples per analytical composite, is based (in part) on the application of guidelines developed for the Puget Sound Dredged Disposal Analysis Program (U.S. Army Corps of Engineers, Seattle District et al., 1997). This guidance has been used to determine the total number of core samples which will be necessary to fully characterize the dredging project. In most cases, individual core samples may be composited for analytical purposes.

d. For all projects (that do not meet Testing Exclusion Cases #3, #4, or #5 -- see Section III-C), a minimum of three (3) core samples must be collected. For general guidance on the required number of core samples to be taken per volume of sediment to be dredged and the maximum number of core samples which may be composited, use the following table:

	Maximum Project Size	Max Volume per Core	Max # Cores per Composite
Region 1 (except Ambrose and Sandy Hook Channels)	60,000 CY	4,000 CY	3
Region 2	72,000 CY	8,000 CY	3
Region 3	64,000 CY	8,000 CY	2

For dredging projects of larger volumes than that stated above, sampling plans and compositing scheme will be developed on a case-by-case basis by the Department in conjunction with the project applicant. Note, however, that each project (regardless of size) should be assessed on a site-specific basis, taking into consideration reach boundaries and the areal extent of the project, the location(s) of outfalls and tributaries, as well as the volume of dredged material.

e. Samples may be composited using the following general guidelines. The Department will determine the sample compositing scheme for the project:

1. Separate cores may be composited only if the grain size and likelihood of contamination is similar based on depositional characteristics, spill history, location of outfalls, etc. If a group of cores is greater than six (6) feet in length, similar strata occurring at approximately the same depths may be composited; dissimilar strata cannot be composited [see Section III-D(2)(d)].

2. The number of cores to be composited should be kept to a minimum. Minimal compositing will serve to fully characterize the sediments proposed for dredging and disposal/management/use.

3. Compositing will be conducted on a reach-by-reach basis. A reach is a continuous stretch of waterway not separated by any structure and subject to similar hydrodynamic and depositional features as well as similar upland inputs. Reach boundaries must be approved by the Department.

f. For proposed uses of dredged material (see Chapter V and Appendix E), the general sampling and compositing requirements specified above may not be appropriate. The Department will develop the sampling plan and compositing scheme for such projects on a cases-by-case basis in conjunction with the project applicant.

g. The Department will coordinate with the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency on the approval of sampling plans and testing for ocean disposal projects in New Jersey waters.

(2) Operational Aspects of Sampling and Compositing

a. In order for the data to be valid, all sediment core samples must be taken in accordance with the approved sampling plan, and the guidance specified in this Section and in Appendix A.

b. Core samples are to be taken to the proposed project depth plus allowable overdredge (2 feet).

c. Field logs of each core shall be submitted. Grain size analysis shall be conducted, using the method of R.L. Folk, 1980.

d. Core samples six (6) feet or less in length may be homogenized. Separate cores may be composited only if the grain size and likelihood of contamination is similar based on depositional characteristics, spill history, location of outfalls, etc.

e. Cores greater than six (6) feet in length may be homogenized unless there are distinct visual strata in grain size and composition which are at least 2 feet in depth. The Department shall be notified of any such cores that show grain size stratification prior to homogenizing. For those cores that show grain size stratification, each strata with a depth of 2 feet or greater must be analyzed separately (i.e. the entire core should not be homogenized for testing purposes if distinct strata are present). If a group of cores is greater than six (6) feet in length, similar strata occurring at approximately the same depths may be composited; dissimilar strata cannot be composited.

f. The compositing scheme associated with a sampling plan approved by the Department may need to be modified based on the actual core samples collected. If there are large differences in the grain size characteristics of the individual cores -- and thus potentially large differences in the degree of contamination of the sediments -- it is not appropriate to composite the individual cores, even if so required by the approved sampling plan and compositing scheme. In such cases, before proceeding to composite and analyze the samples, immediately contact the Department in order to obtain a revised compositing scheme.

g. In those cases in which there is a potential for the uncovering of more contaminated sediment, such as new work dredging projects in shoaling zones, the bottom 6 inches of each core will be separated from the remainder of the core and reserved. The material shall be visually inspected to determine if it is predominantly sand, gravel, silt or clay. The bottom 6 inches is considered representative of the material that will be exposed as a result of dredging. If the 6 inch sample is less than 90% sand, as determined by grain size analysis, bulk sediment chemistry analysis will be required. If the bottom 6 inches of each core is similar in grain size and visual characteristics, this material may be composited for analysis.

The purpose of testing the bottom six inches of a sediment core is to identify a potential problem - that more contaminated sediments will be exposed by the dredging project, and thus available to biota. If such contaminated sediments are found, a number of management/regulatory options are available to the project applicant and the Department:

- not permit the dredging project as proposed;
- dredge to a shallower depth than proposed, so as not to expose the more contaminated sediments;
- over-dredge the project area, removing and disposing of the contaminated sediments (i.e. "remedial/environmental dredging").

The Department will work with the project applicant to develop an appropriate plan of action in the event the proposed dredging project will uncover more contaminated sediments.

Chapter IV - Management of Dredging Activities and Dredged Material

A - Overview

Section IV-B discusses the Department's program for managing and regulating dredging operations and activities, including the use of Best Management Practices.

A variety of potential alternatives exist for the disposal/management or use of dredged material. These include open water (including ocean) disposal sites, upland confined disposal facilities (CDFs), subaqueous disposal pits, and containment areas. Potential use alternatives include beach nourishment, habitat development, construction material, landfill cover, agricultural uses and capping open water disposal sites.

These dredged material management alternatives and applicable regulatory requirements and procedures are discussed in detail in this section and Chapter V. Figure 3 is a schematic diagram of potential dredged material disposal alternatives. Table 1 summarizes the potential sediment testing and permitting requirements for these alternatives. Appendices A and B include additional information on sampling and testing requirements and methodologies, target analytes, and quality assurance/quality control procedures.

Permit application procedures for dredging operations and the dredged material management alternatives, including sediment sampling protocols and testing exclusions, were discussed in Chapter III.

(Note: the construction and operation of dredged material containment islands and the use of decontamination technologies are currently under investigation by the State of New Jersey, and various federal agencies. As these dredged material management alternatives are not currently available, they are not discussed in this Technical Manual.)

B - Management of Dredging Activities and Transport of Dredged Material

(1) Authority/Permitting Process: refer to Sections II-B,C for a discussion of relevant statutes, regulations, and an overview of the permitting process. The Department's Land Use Regulation Program will review proposed dredging operations under the Rules on Coastal Zone Management (N.J.A.C. 7:7E). These Rules provide the basis for the Department's review, including an evaluation of the locational requirements for the issuance of permits for maintenance and new dredging projects.

The riparian statutes contained within Titles 18A (N.J.S.A. 18A:56-1 *et seq.*) and 12 (N.J.S.A. 12:3-1 *et seq.*) may also apply to a dredging project. Tidelands conveyances are not required when dredged material is removed from tidelands and placed in a different tidelands location. This would include ocean disposal operations, reprofiling, or disposal into subaqueous disposal pits. It would also include placement on upland sites which are State-owned formerly flowed tidelands.

Construction of a subaqueous disposal pit by the removal of material may require a tidelands conveyance to transfer ownership of the tidelands from the State of New Jersey to the owner/operator of the pit. A conveyance may also be needed for a nearshore diked containment area. If dredged material having an economic value is placed in an upland location by an entity other than the State or federal government, a commercial dredging license must be issued by the Tidelands Resource Council. An example would be dredged material that could be subsequently used or sold as construction aggregate or fill material.

Figure 3: Schematic Diagram of Dredged Material Disposal Alternatives

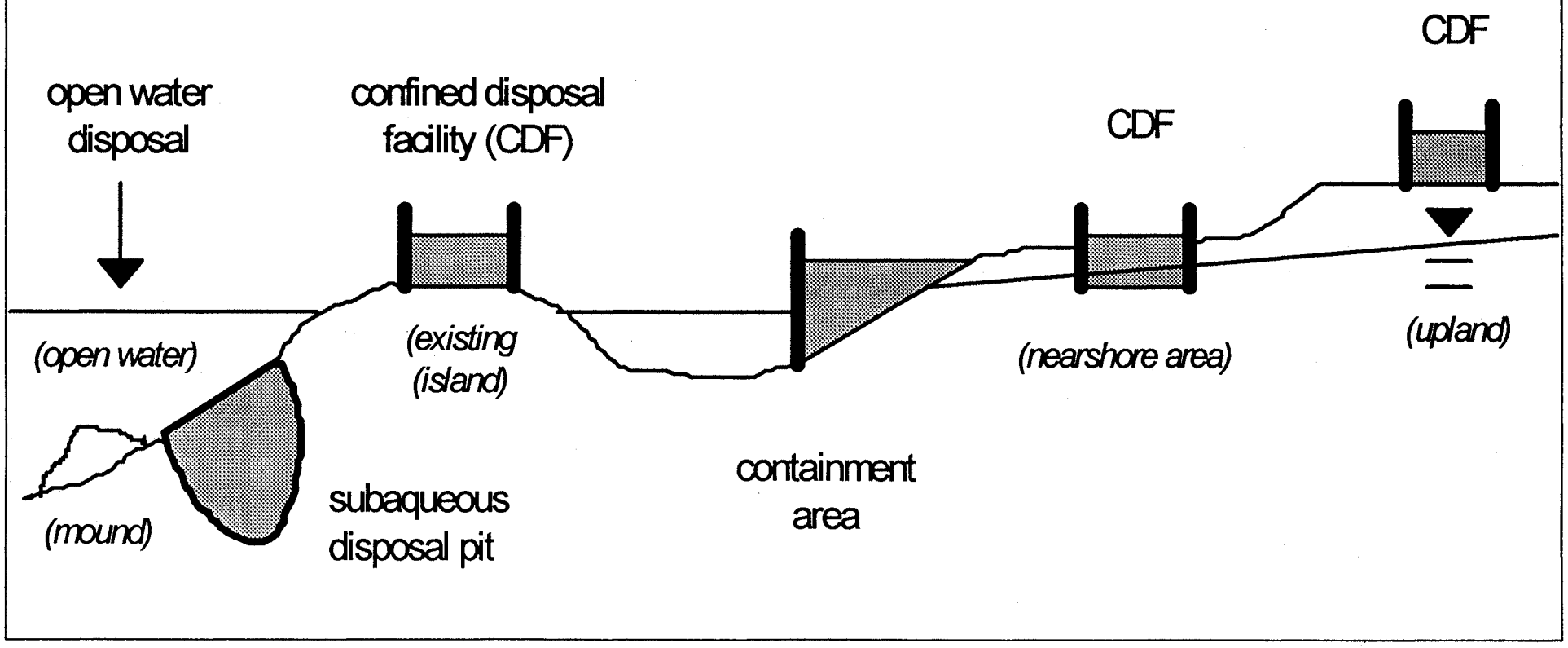


Table 1: Potential Sediment Testing and Permitting Requirements for Various Dredged Material Management Alternatives

Management Alternative	Open Water	Subaqueous Disposal Pit	Containment Area	Upland CDF	Use
TESTS					
Grain Size, TOC, & Percent Moisture	R	R	R	R	R
Bulk Sediment Chemistry	R*	R*	R*	R*	R
Modified Elutriate	(1)	(1)	R*	R*	-
Leaching Test	-	-	(2)	(2)	(2)
Biological Testing	?	-	?	?	(3)
PERMITS					
Waterfront Dev.	R	R	R	PR	PR
Tidelands Instrument	R	R	R	PR	PR
Water Quality Cert.	R	R	R	PR	PR
NJPDES-DSW	-	-	(1)	(1)	-
NJPDES-DGW	-	-	(2)	(2)	-
Stream Encroach.	-	-	PR	PR	PR
CAFRA	-	-	PR	PR	PR
Fresh. Wetlands	-	-	PR	PR	PR
Coastal Wetlands	-	-	PR	PR	PR

Key:
R - required in all cases
R* - required except where sediments meet an applicable testing exclusion (see Section III-C)
(1) - may be required when dredged material originates in a waterbody different from that in which the management site is located
(2) - may be required depending upon the results of site specific groundwater impact evaluations and/or sediment characteristics
(3) - may be required depending on the proposed use
? - may be required depending on bulk sediment chemistry data; to be coordinated with USACE
PR - potentially required if the facility is to be located in an area regulated by the listed program

[Note: In addition to required State permits, permits will be required from the USACE pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the federal Clean Water Act.]

(2) Potential Impacts/Regulatory Objectives: potential adverse environmental impacts associated with dredging operations arise from the alteration of benthic habitat as a direct result of the operation and the dispersal of sediments and associated contaminants away from the dredging area. The Department's objective in regulating dredging operations is to minimize the potential for such impacts to occur.

The dispersal of sediments away from the dredging area may result in adverse impacts. Impacts could result from the direct physical settlement of the dispersed sediments onto sensitive benthic areas. Dispersal of contaminants associated with these sediments could have impacts to both benthic and water column food webs. The Department has developed a list of Best Management Practices which should be used to minimize the creation and dispersal of suspended sediments during dredging operations.

New dredging should avoid impacting areas of ecological importance. The Rules on Coastal Zone Management provide the basis for the Department's review of proposed dredging projects and evaluation of the potential impact of dredging projects. In its review of the location and need for any dredging operation, the Land Use Regulation Program will consider direct and indirect impacts to sensitive areas, such as shellfish beds and finfish migratory pathways. To evaluate potential impacts to estuarine benthic communities as a result of the dispersal of contaminated suspended sediments, the Department will compare the bulk sediment chemistry data with the guideline values developed by Long et al. (1995) and other literature sources, on a case-by-case basis.

The Department is also concerned about the potential long-term and cumulative impacts of dredging operations. The potential for such impacts will be evaluated as part of the Land Use Regulation Program's review of proposed dredging projects.

(3) Best Management Practices (BMPs): the Department has identified a number of BMPs which should be used to minimize the potential for, and magnitude of, adverse environmental impacts that could result from dredging operations. The need for any BMPs will be determined by the Department and will be included as permit conditions. The applicability of the use of a particular BMP for a dredging project will be evaluated by the Department in consultation with the permit applicant.

The effectiveness of a particular BMP to minimize potential adverse impacts will vary with the conditions present at a particular dredging operation. Thus, the Department will consider this list of BMPs as a "menu", from which those practices anticipated to be most effective and implementable for a particular dredging project can be selected. The use of these BMPs would then be incorporated as conditions into the permits issued by the Department for the dredging operation.

The following BMPs have been identified by the Department. This list is not intended to be all inclusive, and additional BMPs will be considered by the Department.

*Hydraulic Dredging - this method can be used when the channel or berthing area configuration, the type of sediments to be dredged, and the volume of dredged material allows it. Hydraulic dredging is preferable when an acceptable upland confined disposal facility (CDF) is available within pumping distance of the dredging area. It reduces the generation of suspended sediments at the dredging site. However, this method results in the production of large volumes of a high percent water content dredged material slurry. Thus, the proposed upland CDF must be designed and operated to accept such material.

*Closed Clamshell - the use of a closed, watertight clamshell reduces the production of suspended solids at the dredging site. An example of an acceptable closed clamshell device is described in Raymond (1993). A closed clamshell will be required by the Department when the sediments to be dredged are contaminated at levels warranting concern. A closed clamshell would also be required by the Department whenever a no-barge-overflow permit condition is in effect. The Department has identified a number of areas in the New York-New Jersey Harbor portion of Region 1 where existing information shows the sediments to be contaminated at levels warranting concern; dredging operations in these areas will require the use of no-barge overflow or shunting, and thus also a closed clamshell.

*Dredging Practices - a number of procedures can be employed by the dredging contractor to minimize the creation and dispersal of suspended sediments when using a clamshell dredge. These include:

(1) maximizing the size of the "bite" taken by the clamshell. This also results in a minimization of the number of "bites" needed to dredge a particular volume of sediment;

(2) slowly withdrawing the clamshell through the water column;

(3) not hosing down or rinsing sediments off the sides and gunwales of the barge.

*No-Barge-Overflow - this BMP reduces the creation and dispersal of suspended sediments when finer-grained sediments are dredged. It will be required by the Department when the dredged material is contaminated at levels warranting concern. This condition will always apply to dredging operations in Newark Bay, the Passaic River and its tidal tributaries from Newark Bay to Dundee Dam, the Hackensack River and its tidal tributaries from Newark Bay to Oradell Dam, the Kill Van Kull, the Arthur Kill, Elizabeth Channel, City Channel, and Upper New York Bay. This condition will also apply when the dredged material is to be rehydrated as part of its disposal/management.

The purpose of this BMP is to limit the dispersal of contaminated sediments from the dredging site. If the applicant for a specific project can demonstrate that State Water Quality Criteria can be met at the dredging site with barge overflow, the Department will not require this BMP. This "demonstration" must include detailed project- and site-specific evaluations, monitoring, and/or modeling.

*Shunting - this BMP involves the active pumping of free water in a barge to the bottom of the water column at the dredging site. It may act to reduce turbidity in the upper water column. The discharge end of the shunting system must include a diffuser in order to minimize the potential for additional disruption of benthic sediments. Additionally, the pumping rate and location of the discharge must not result in the disruption of in-place sediments. This BMP could be used as an alternative to barge-overflow in reducing the volume of water in the barge.

*Seasonal/Migratory Periods - depending on the location of the dredging area, the Department may prohibit operations during certain times of the year to minimize potential adverse impacts to anadromous or other migratory finfish, nesting shorebirds, etc.

*In certain semi-enclosed water bodies, dredging only on the incoming tide may provide additional time for suspended sediments to settle, thus minimizing the dispersal of contaminated sediments out of the water body.

*Dredging contractors may be required to employ independent, on-board dredging inspectors certified by the USACE. These inspectors will observe the dredging and disposal operations to ensure compliance with all permit conditions. [Note: the federal government requires such inspectors for all ocean disposal projects.]

*Silt curtains may be practical for use in areas where the water current is less than one (1) knot. The use of silt curtains may minimize the upper water column dispersal of sediments from the dredging area. This BMP can also be used to protect tidal creeks, interpier areas, etc. adjacent to the dredging area.

*Split-hull barges should only be used in dredging projects which will use open water disposal methods or subaqueous disposal pits.

* Dredged Material Pumping Systems - the use of a number of pumping systems can provide for more precise dredging operations and minimize the resuspension of sediments at the dredging site. In addition, these systems can reduce the volume of the dewatering discharge from an upland CDF, thus reducing the potential for impacts to surface water quality. The greatest percent solids transfer is obtained using positive displacement pumps which move material at *in situ* moisture levels. Typically used for concrete, these devices can achieve pumping capacities in excess of 140 cubic yards per hour. Reduced water content of dredged material can also be achieved through the use of vortex type pumps, which in combination with a directional control system serve the same function as a closed clamshell or a hydraulic cutterhead. However, the material removed has an increased solids content compared to typical hydraulic dredges, and is similar (if not greater than) a closed clamshell, but with far less sediment disturbance and turbidity generation.

(4) Testing Requirements: Chapter III discusses the sampling required for all proposed dredging projects. Sediments which do not qualify for a testing exclusion, as described in Section III-C, will require additional testing (bulk sediment, modified elutriate, etc.) as discussed in Chapters IV and V.

(5) Overland Transport of Dredged Material: The Department's major concern with the transport of dredged material, by truck or rail, is the prevention of spills and leaks. Dredged material transported in trucks must be managed so as to preclude spillage or leakage onto public roadways. It is recommended that dredged material be dewatered prior to transport by truck. Dredged material that has been dewatered (i.e. no free water) should be transported in lined or watertight trucks, adequately covered/tarped over the top, to prevent the spilling or air dispersal of fugitive material. Dredged material shall be considered to contain free water unless it has been dewatered, amended and/or otherwise stabilized/processed, and/or it has been demonstrated to the Department that the dredged material has no free water.

If dewatering is not possible, dredged material containing free water must be transported in trucks with water-tight tailgates, liners, or other methods to prevent leakage. When filling the trucks, sufficient freeboard must be maintained to prevent spillage over sideboards.

Measures must also be implemented to prevent the off-site tracking of dredged material from the loading and unloading operation sites. This can be accomplished with the use of a stone tracking pad and/or a truck wash station. All trucks, equipment, and staging areas used in the loading and transport of contaminated dredged material should be thoroughly cleaned and/or decontaminated, as appropriate. In addition, all efforts must be made to keep streets free of any dredged material released during transport operations; if needed, routine/periodic sweeping and street cleaning should be undertaken.

C - Open Water Alternatives

(1) Authority: refer to Sections II-B, C for a discussion of relevant statutes and regulations.

Open Water disposal refers to disposal in tidal waters. While the USEPA/USACE Draft Inland Testing Manual (1993) refers to all tidal waters which are not ocean waters as inland waters, the Department will refer to these tidal waters as Open Waters.

All Open Water disposal operations in State waters require a Water Quality Certificate (this is required in conjunction with the permit issued by the USACE pursuant to Section 404 of the Clean Water Act). Non-federal projects also require a Waterfront Development permit (which is a federal consistency determination). Federally-conducted projects require a federal consistency determination (but not a Waterfront Development permit). All of these permits are issued by the Land Use Regulation Program.

(2) Ocean Disposal:

(a) Overview. There are currently 6 federally authorized ocean disposal sites in proximity to New Jersey. They are the Mud Dump/Historic Area Remediation Site (approximately six miles offshore of Sea Bright), sites at Shark River Inlet, Manasquan Inlet, Cold Spring/Cape May Inlet, and Absecon Inlet (the Inlet sites may only be used for the disposal of sediments dredged from each inlet), and Buoy 10 in Delaware Bay (the Buoy 10 site may only be used for disposal of dredged material from specific reaches on the Delaware River). The expansion of any of these sites or the designation of new sites will require a federal consistency determination from the Land Use Regulation Program. In addition, individual disposal operations will require a federal consistency determination.

(b) Testing Requirements. Disposal of dredged material in ocean waters is regulated by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA) pursuant to the Marine Protection, Research, and Sanctuaries Act. The State of New Jersey has discretionary authority to review disposal activities at ocean disposal sites pursuant to the Federal Coastal Zone Management Act. The review of proposed ocean disposal operations at currently designated ocean disposal sites will be coordinated with the USACE and USEPA.

(3) Other Open Water Disposal Areas:

(a) Overview. Dredged material can be placed in nearshore waters through sidecasting, reprofiling, interpier disposal or other means. If the material will be contained by a bulkhead, berm, etc., it will not be considered Open Water disposal, but will be regulated as a Containment Area (see Section IV-F).

The following Open Water disposal sites have been approved by the Department and used repeatedly for the disposal of sediments dredged from the Intracoastal Waterway or adjacent channels. Proposals for Open Water disposal at these sites (or new proposed sites) will be reviewed by the Department on a case-by-case basis:

- Great Sound site, located north of Gull Island, Cape May County;
- Great Bay site, located behind Little Beach Island, Atlantic County.

(b) Permitting Process. Open Water disposal is currently acceptable only in the designated areas. Where the dredged material is less than 90% sand, additional testing will be required. [Note: this criteria of 90% sand is not based on the mean of the samples/cores collected for a project. This criteria applies to each distinct portion (i.e. Reach) of the dredging project "represented" by an individual sample/core.] Further, practicable upland disposal alternatives must not be available. Disposal at a designated Open Water site requires a Waterfront Development permit (with the exception of federal projects), a Water Quality Certificate, and a federal consistency determination. (Note: a Clean Water Act Section 404 Permit will also be required from the USACE.)

(c) Potential Impacts/Regulatory Objectives. Disposal at an Open Water site requires a demonstration that no practicable alternative site exists, federal and State Water Quality Standards will be met, and potential adverse environmental impacts will be minimized. An evaluation of the proposed disposal operation will be made using the Rules on Coastal Zone Management (N.J.A.C. 7:7E) to ensure that sensitive areas will not be adversely affected. Sensitive areas include but are not limited to shellfish habitat, prime fishing areas, submerged vegetation, shallow water habitat, and threatened and endangered species habitat. Open Water disposal is prohibited in tidal guts, man-made harbors, medium rivers, streams, and creeks due to the inability of smaller waterways to assimilate many pollutants (refer to the Rules on Coastal Zone Management for definition/identification of these types of water bodies). Disposal is discouraged in all other waterways, except the ocean and bays greater than 6 feet deep.

(d) Testing Requirements. Required testing of dredged material to be disposed of at an Open Water Site includes an analysis of sediment cores for grain size, Total Organic Carbon and percent moisture. If the dredged material is greater than 90% sand, no additional testing will be required. If the dredged material is less than 90% sand, the Department may require additional testing, such as that contained in the USEPA/USACE Draft Inland Testing manual (1993). See Section III-D for sampling procedures.

(4) Reprofiling Operations

(a) Definition. Reprofiling is a method of maintenance dredging which consists of the movement of sediments from one location to a specific adjacent and deeper location, without removing the sediments from the water, resulting in a recontouring of both the reprofiled and depositional areas. It is usually performed by a crane or tug boat dragging a steel I-beam across the area to be reprofiled. The drag is terminated in the adjacent, deeper area, where the sediments are deposited (see Figure 4). Reprofiling operations are limited to the displacement of accumulated sediments within a previously dredged area to the previously approved depth. Overdredging will not be permitted.

(b) Permitting Process. The Department considers the use of reprofiling only as an interim management technique suitable for smaller projects (generally less than 5,000 cubic yards in size). Its use requires a demonstration that no other dredged material management alternative discussed in this Technical Manual is practicable. Further, reprofiling will be restricted to the New York-New Jersey Harbor area of Region 1, excluding Raritan Bay and its tributaries east of the Cheesequake Creek. A reprofiling operation will require a Waterfront Development Permit, a Water Quality Certificate, and a federal consistency determination from the Land Use Regulation Program.

Figure 4a: Schematic Diagram of Reprofiling at Berthing Area

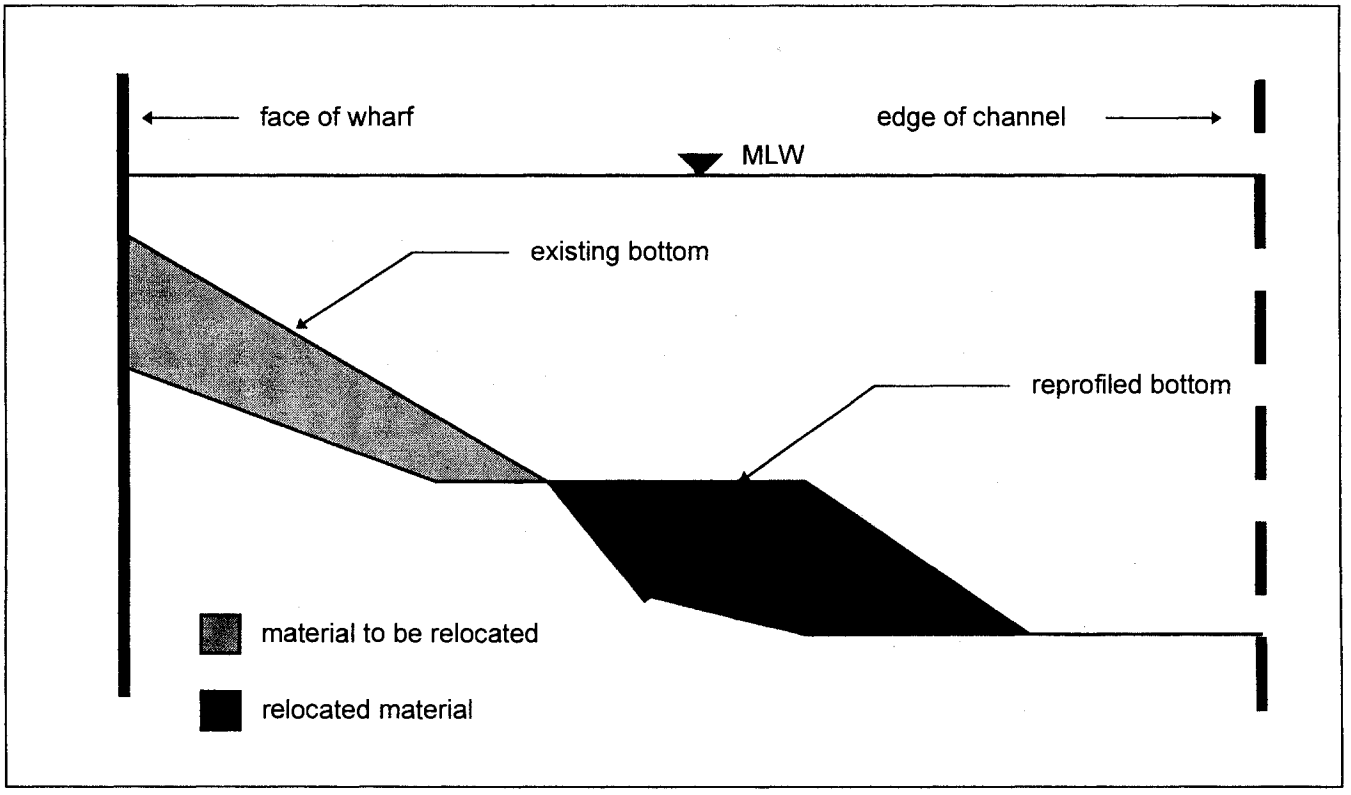
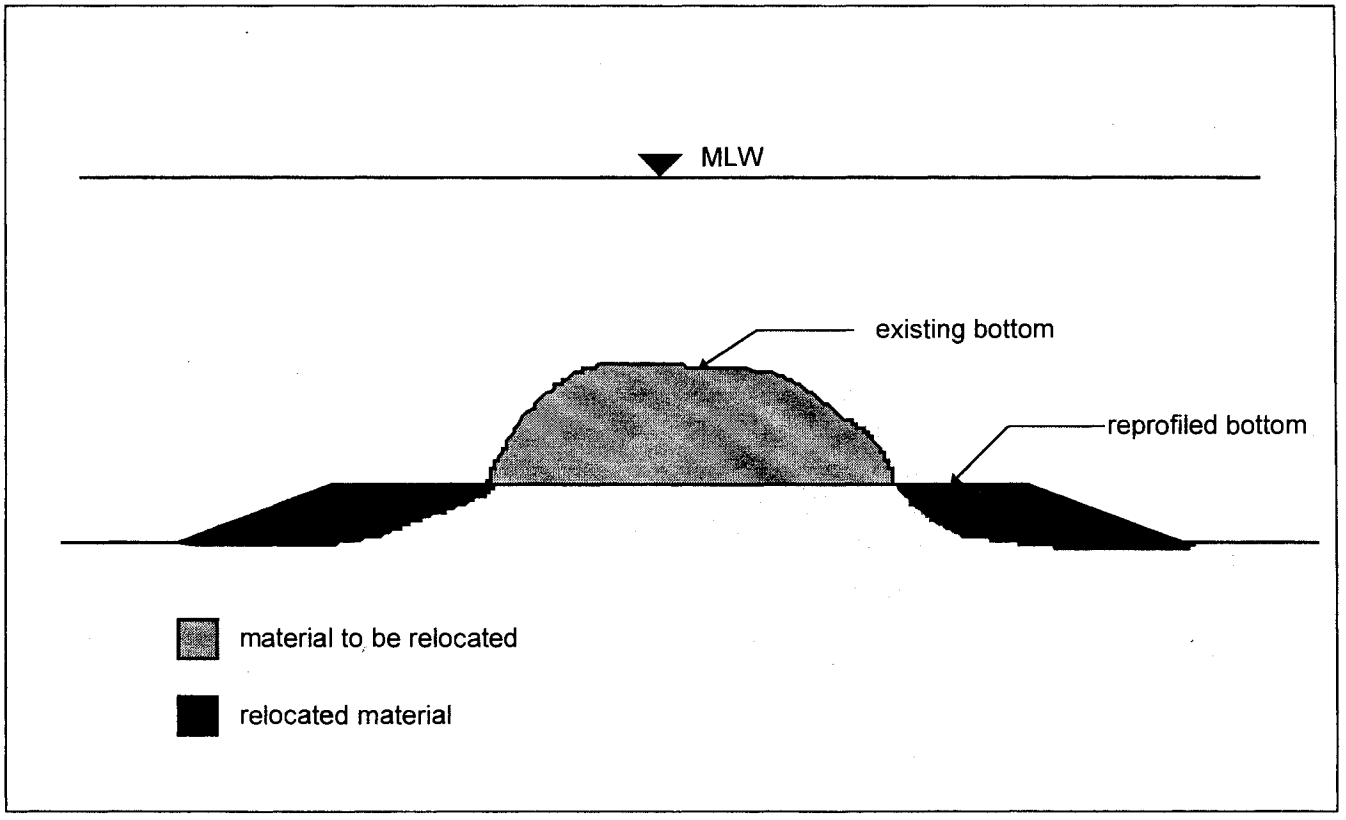


Figure 4b: Schematic Diagram of Reprofiling in Channel Area



(c) Potential Impacts/Regulatory Objectives. The Department's main concern with reprofiling operations is to ensure that the proposed depositional area is of sufficient size and depth to contain the relocated sediments. In addition, since reprofiling only moves sediments from one location to another, the Department is concerned that the sediments may be resuspended and redeposited in other areas, particularly adjacent berths and navigation channels. The redeposition of sediments may also adversely impact existing benthic communities in the vicinity of the project area. Whereas conventional dredging operations remove contaminated sediments from the aquatic ecosystem, reprofiling does not and further, may result in the redistribution of such sediments. The potential for, and magnitude of, these impacts can be reduced by employing techniques to ensure that the resuspension/redeposition of the relocated sediments is minimized.

Reprofiling does not remove sediments from the aquatic environment, and thus is not a long-term solution to navigational problems caused by shoaling. Simply put, reprofiling begets more reprofiling.

(d) Management/Regulatory Process. The following criteria apply to proposed reprofiling operations and the identified information must be submitted with the permit application and/or reprofiling request:

i. the applicant must contact the Department to determine the boundaries of the area within which to conduct pre- and post-work hydrographic surveys. This survey area will typically include an area larger than the reprofiling and depositional locations, and will show bathymetry to any existing navigable channels and berths up to 500 feet from the work area.

a. the applicant must submit a pre-work precision hydrographic survey (accurate to 0.10 feet vertically and 1 foot horizontally), completed no more than 60 days prior to the submission of the permit application or reprofiling request.

b. the applicant must demonstrate that there is adequate capacity at the proposed adjacent depositional area(s) for the sediments to be relocated. This shall be accomplished through the submission of a cut and fill calculation prepared by a licensed land surveyor or a professional engineer.

ii. the cut limit for a reprofiling operation shall be a maximum of 3 feet.

iii. a second pre-work precision hydrographic survey must be completed no more than 48 hours prior to the start of the reprofiling operation. This survey shall be used in the additional quantitative cut and fill calculations stipulated in Item iv.

iv. within 48 hours of the completion of the reprofiling operation, a post-work precision hydrographic survey must be completed. This post-work survey area shall be identical to the pre-work survey area, including the same survey stations. The bathymetric data collected shall be used to provide cross sections of the reprofiled and depositional areas, and to prepare a quantitative calculation to compare the actual volumes of cut and fill material.

v. a second post-work hydrographic survey of the survey area shall be conducted 30 days after the completion of the reprofiling operation, and plotted in cross section on the same stations as the pre- and post-work hydrographic surveys. No cut and fill calculations are required for this survey data.

vi. the survey data, cross sections and quantitative cut and fill calculations for the post-work hydrographic survey (Item iv only) shall be submitted to the Land Use Regulation Program within 60 days of the completion of the reprofiling operation. Should the results of the hydrographic surveying/monitoring or cut and fill calculations demonstrate that sediments from the reprofiling operation are entering adjacent channels or berths, the Department may require that these sediments be removed, and/or may not approve further reprofiling operations in the project area.

vii. reprofiling shall be accomplished by dragging a steel beam or pipe across the berth/channel bottom, thereby leveling accumulated sediment to a uniform, specified depth. Alternative procedures will be considered only under special instances where the use of a drag bar is impractical due to limited space in the project area.

viii. sediment depositional areas used for all reprofiling operations must be a minimum of 100 feet from established navigation channels, unless otherwise deemed suitable by the Department.

The permits issued by the Department for reprofiling operations are usually effective for a period of five years. However, only the initial reprofiling operation will be approved upon issuance of the permits. Subsequent operations must receive specific approval (this will be a condition of the permits). If the hydrographic surveys required by the Department show that the reprofiled sediments do not stay in the depositional area, future reprofiling operations may not be approved by the Department.

(e) Testing Requirements. Testing of the sediments to be reprofiled is not required.

D - Upland Confined Disposal Facilities

(1) Overview: Sediments in New Jersey's tidal waters may be impacted to varying degrees by a number of pollutants. Not all sediments are considered to be "contaminated". In order to place dredged material in an upland confined disposal facility (CDF), it must be demonstrated that the placement of the dredged material would not result in significant adverse impacts to terrestrial or aquatic ecosystems or pose risks to public health. The Department's regulatory programs are designed to identify and minimize potential adverse environmental impacts resulting from proposed activities. For dredged material upland CDFs, the magnitude of these impacts are dependent upon the following:

(a) location of the facility and site-specific conditions (including compatibility with adjacent and nearby land uses);

(b) characteristics of the dredged material proposed for placement at the facility;

(c) design and construction of the facility;

(d) operation of the facility;

(e) final closure and use of the facility site.

These five factors will be considered collectively, as regulatory decisions will be based on a comprehensive review of a proposed upland CDF. With proper design and operation of the upland CDF, the potential for adverse impacts can be reduced significantly. Upland CDFs will be designed, permitted, and operated on a case-by-case basis.

Siting of a proposed upland CDF will be addressed by the Department's Land Use Regulation Program. In New Jersey's designated Coastal Zone, the Rules on Coastal Zone Management will be applied to proposed sites. These Rules include constraints on the types of activities which can occur in various types of coastal areas. In addition, a number of regulatory programs, such as the Freshwater Wetlands Protection Act and the Flood Hazard Area Control Act, may restrict the use of a particular site.

The major potential adverse environmental impacts associated with the upland containment of dredged material are surface and ground water contamination. Testing of dredged material for upland containment is driven, in large part, by the potential for contamination of surface and groundwaters. The discharge of contaminants from upland CDFs to surface water must be controlled to minimize potential adverse impacts to the aquatic ecosystem. The Department's testing requirements and evaluation protocols for surface and groundwater discharges are discussed in detail in Sections IV-D(3) and IV-D(4), respectively.

Potential adverse impacts could result from the dispersal of contaminants into terrestrial ecosystems effecting receptor organisms. The upland CDF must be designed and operated to minimize the dispersal of contaminants. A number of management techniques are available to address this concern. This topic is discussed in more detail in Section IV-D(5).

Potential adverse impacts to public health could result from human exposure to dredged material contaminated at levels which have been identified as being of concern. Potential exposure pathways with contaminated dredged material must be identified and controlled. This topic is discussed in more detail in Section IV-D(6).

End-use(s) and final closure of the upland CDF site must also be addressed in the regulatory process. Long-term impacts of the facility will be evaluated and appropriate management actions to minimize such impacts will be required. These concerns are discussed in more detail in Section IV-D(2).

This Technical Manual reflects the "Criteria for Upland Dredged Material Confined Disposal Facilities" (January 1997) developed by the Containment Work Group of the New York-New Jersey Harbor Estuary Program Dredged Material Management Forum.

(2) Design, Construction, Operation, and Closure:

(a) Authority. The Department will regulate the design, construction, operation, and closure of upland CDFs pursuant to the Waterfront Development statute. The New Jersey Flood Hazard Regulations and the Coastal Area Facilities Review Act may also be applicable. The Division of Solid and Hazardous Waste will conduct the technical/engineering review of proposed facilities.

(b) Potential Impacts/Regulatory Objectives. Potential adverse impacts which could result from the operation and interim/final closure of an upland CDF would be caused by the dispersal of contaminants out of the upland CDF into the environment. These potential impacts are discussed in detail in Sections IV-D(1), (3), (4), (5), and (6). Potential contaminant migration pathways and exposure hazards can be minimized and controlled through oversight of the design, construction, operation, and interim/final closure of the upland CDF.

i. Design and Construction - an upland CDF is not fundamentally different in the structural aspects of its design from any earthen berm/dike. It must be capable of resisting the forces exerted by the weight of the dredged material placed within it and the hydraulic forces exerted by adjoining surface water bodies, underlying ground water, stormwater discharges, and dewatering effluent. The containment structure must be able to withstand the effects of erosion, settlement, provide a stable platform for the operation of equipment, and allow for the potential vertical expansion of the containment structure.

The USACE has considerable experience in the design of upland CDFs. The Department will use the technical standards in the following documents as the basis for its engineering review of the design and construction of proposed upland CDFs:

Confined Disposal of Dredged Material - Engineer Manual (EM 1110-5027), September 1987.

Confined Disposal Guidance for Small Hydraulic Maintenance Dredging Projects - Design Procedures, Environmental Effects of Dredging Technical Note EEDP-02-8, December, 1988.

Where circumstances, as described in Section IV-D(4)(c), require the use of liners and leachate collection systems within the design of an upland CDF to control discharges to groundwater, the Department's regulatory standards for the design, construction, and quality control of landfill liners and leachate collection systems (N.J.A.C. 7:26-2A.7) will be used for technical guidance. The Department does not anticipate that the multiple liner system required for certain landfills will be needed in the design of upland CDFs.

Erosion control of all external surfaces of an upland CDF will be necessary to prevent undermining of the containment berms and to control sediment transport to adjoining surface waters. Erosion may be caused by wind and wave action, stormwater runoff, discharge of dewatering effluent, and infiltration of water through the containment berm. The New Jersey Standards for Soil Erosion and Sediment Control (N.J.A.C. 2:90) shall be applied to the design and construction of a proposed upland CDF. If required by the appropriate regional office of the Soil Conservation Service, a Certified Soil Erosion and Sediment Control Plan shall be obtained for the upland CDF.

The importance of following all aspects of the approved engineering design for an upland CDF must be emphasized. Accordingly, the Department will require the filing of "as built" plans, with a certification by a professional engineer licensed to practice in New Jersey that the approved engineering design plans have been adhered to.

ii. Operation - it will be necessary for the Department to have adequate operational oversight of an upland CDF in order to ensure that the stability and integrity of the containment structure is maintained, and to prevent the uncontrolled release of dredged material, ponded water, and associated contaminants. Additional oversight and/or monitoring may be needed to control the rate at which the upland CDF is filled, the manner in which it is filled, and how dewatering occurs in order to address potential requirements relating to surface water (Section IV-D[3]) and ground water (Section IV-D[4]) discharges. Additional oversight may be needed to address potential human and terrestrial ecosystem exposure concerns as they may arise on a case-by-case basis (see Sections IV-D[5] and [6]).

To maintain oversight, the Department will require the owner and/or operator of an upland CDF to submit an annual report to the Department. The report will summarize the past year's activities at the upland CDF. Projected activities for the next five (5) years shall also be identified. The report shall document the following information:

(1) Condition of containment berms, dewatering and stormwater discharge weirs, and other engineering structures critical to the operation of the upland CDF. Any changes to the upland CDF must be first approved by the Department and revised "as built" plans documenting any significant changes submitted.

(2) Summary of disposal operations at the upland CDF, including a listing of all dredging projects and their volumes.

(3) Summary of maintenance and management activities conducted at the upland CDF, including regrading, ditching, crust management, and interim closure procedures, if required (see Section iii below).

(4) Summary of any dredged material removed from the upland CDF and its final use/destination.

(5) An analysis of available disposal capacity in the upland CDF. This will be compared with the projected disposal activities for the next five (5) years and a running total of available capacity for the next five years estimated.

(6) Summary of surface and ground water discharge monitoring programs for all required parameters.

(7) Any additional monitoring or certifications required pursuant to Sections IV-D(5) and (6) of this guidance document.

The USACE Engineer Manual EM 1110-2-5027, Confined Disposal of Dredged Material includes discussions of a variety of concerns critical to the proper operation and maintenance of an upland CDF.

iii. Closure - it is expected that most of the dredged material placed in upland CDFs will be contaminated by organic and inorganic pollutants at various levels. It is necessary to assure long-term containment of the dredged material, in order to prevent the dispersal of contaminants into the environment. Potential human health exposure pathways include direct contact and inhalation (particulate transport via dust) routes (refer to Section IV-D[6]). Potential uptake of contaminants by plants and animals which colonize or use the upland CDF is also of concern (see Section IV-D[5]). Upland CDFs may erode, resulting in the transport of contaminants into surface waters. Infiltration will also continue to

occur, with the resulting generation of leachate and surface water runoff, which may impact ground or surface water resources.

This section discusses the closure requirements for those upland CDFs which accept any dredged material which does not meet the testing exclusion criteria listed in Sections IV-D(4) and III-C.

To control or mitigate these potential adverse impacts, the Department will require interim/final closure of the upland CDF. Final closure refers to the implementation of practices after the cessation of dredged material disposal operations at the upland CDF. Interim closure practices may be needed if there will be a long (generally greater than 6 months) interval between disposal or management activities at the upland CDF.

Interim Closure

Interim closure procedures are largely concerned with minimizing the potential for direct human and plant/animal exposure to contaminated dredged material. These are discussed in Sections IV-D(5) and (6).

The need for interim closure procedures will be determined by the Department on a case-by-case basis. The Department will require the submittal and approval of a formal plan to address interim closure requirements. Such a determination will be based on the testing data available for the dredged material; alternatively, additional testing of the exposed dredged material may be needed (see Section [d] below).

Interim closure procedures include the implementation of measures to control the generation of dust. Site access controls (for example, fencing) shall be maintained. The need for capping of exposed dredged material with clean fill will be determined by the Department on a case-by-case basis. The requirements of any Water Quality Certificate (WQC) or New Jersey Pollutant Discharge Elimination System (NJPDES) permits for discharges to surface or ground water from the upland CDF must be maintained during the interim closure period. Likewise, required soil erosion and sediment control measures must be maintained.

The annual report on the status of the upland CDF, discussed in Section ii-Operation, shall include a summary of interim closure procedures implemented at the facility. An interim closure period will not last longer than five (5) years; implementation of final closure procedures will be required for such situations.

Final Closure

Upland CDFs are expected to contain dredged material contaminated with pollutants at various levels of concern. Thus, long-term containment of these contaminants must be assured. The owner of record of the property on which the upland CDF is constructed is ultimately responsible for the final closure of the facility and any required post-closure monitoring.

The Department will require the submittal and approval of formal plans that address final closure, post-closure maintenance and monitoring, and site development or use for all upland CDFs. This requirement does not apply to those upland CDFs permitted and used solely for the disposal of dredged material which meets the exclusion criteria listed in Sections IV-D(4) and III-C. A preliminary final closure plan should be submitted with the permit application to construct and operate the upland CDF. A Final Closure Plan shall be submitted to the Department no later than 60 days following the issuance of Departmental approval to construct and operate the upland CDF. The Final Closure Plan must propose all engineering controls designed to contain the contaminated dredged material and prevent direct contact with, and off-site transport of, contaminants of concern. The Final Closure Plan must also include provisions for post-

closure monitoring of the upland CDF and a Financial Plan. The Financial Plan shall be prepared following the general guidance in the Department's landfill closure regulations (N.J.A.C. 7:26-2A.9), adapted to the specific design and closure features of the upland CDF. In the event of a proposed transfer of ownership of property containing an upland CDF, a new Final Closure Plan (including a Financial Plan), to be implemented by the prospective purchaser, shall be submitted to the Department for approval prior to the final change of Title.

A major component of the Final Closure Plan will relate to the cap design for the upland CDF. The exact nature of the cap construction must be included in the Final Closure Plan. Cap requirements will be determined on a case-by-case basis by the Department, in consultation with the owner/operator of the upland CDF. In general, a minimum thickness of two feet of cover, consisting of 18 inches of clean fill overlain by 6 inches of topsoil, with a complete vegetative cover, will be required. Clean fill and top soil shall be considered material demonstrated to have an origin from a non-contaminated source or material which has been tested and shown to attain the appropriate Direct Contact Soil Cleanup Criteria. In situations where all the dredged material placed in the upland CDF meets the appropriate Direct Contact Soil Cleanup Criteria, or if such material is used as a substantial top cover on the upland CDF, reduced cap design criteria may be warranted.

Generally, the final cap should be placed as soon as the dredged material has dried and consolidated to the point where it can support placement of the cap. This will vary with the characteristics of the dredged material and the type of dewatering operations conducted at the upland CDF. In general, the Department anticipates that the final cap will be placed no later than 3 years after the cessation of disposal operations at the upland CDF.

The Final Closure Plan, where warranted, shall include provisions to restrict site access, including fencing, and future site use using a Declaration of Environmental Restrictions, Deed Restrictions, or other site use restriction documentation. It is possible that at some point following final closure of the upland CDF, reuse of the property may be proposed (the potential for such reuse should be identified in the Final Closure Plan, and continually investigated during the operational lifetime of the facility). If a final reuse (other than the creation of habitat via natural succession processes) is proposed, the owner of the property will be required to submit a modified Final Closure Plan to the Department. The contents of this plan will vary with the upland CDF and the proposed final reuse, and will be determined on a case-by-case basis by the Department, in consultation with the owner of the property. The main objective of the Final Closure Plan is to ensure that the proposed project design will not in any way reduce the effectiveness of the dredged material containment provided by the upland CDF.

Additional components of the Final Closure Plan could include provisions for the maintenance and monitoring of the following parameters:

(1) surface and/or ground water discharge monitoring required pursuant to any WQC or NJPDES permits issued for the upland CDF;

(2) erosion, stormwater run-off, and drainage controls;

(3) stabilization and vegetation of the final cover;

(4) weir and other outlet structures;

(5) security and access restrictions;

(6) leachate collection and/or control (if required).

The submission of an annual Post-Closure Maintenance Report, summarizing the status of the upland CDF and activities associated with its final closure, and updating the Financial Plan, may be required by the Department.

(c) Permitting Process. Applications to construct, operate, and close upland CDFs will be reviewed by the Department's Land Use Regulation Program pursuant to the Waterfront Development statute, the Coastal Area Facilities Review Act, and the New Jersey Flood Hazard Regulations, as applicable. The Division of Solid and Hazardous Waste will conduct the technical/engineering review of proposed upland CDFs and will develop appropriate conditions to be placed on the Waterfront Development Permit. The review conducted by the Land Use Regulation Program will be coordinated with other Departmental programs, as needed, to address the concerns discussed in Sections IV-D(3), (4), (5), and (6).

(d) Testing Requirements. Design of the upland CDF containment structures must consider the engineering properties (for example, soil density, grain size, percent compaction) of the material to be used. In those cases where dredged material is to be used to construct, or enlarge, containment berms, the material on the exposed surfaces of the berm must meet the appropriate Direct Contact Soil Cleanup Criteria. Additional bulk sediment analyses of any dredged material proposed for such use may be required, as determined by the Department on a case-by-case basis.

Given that the dredged material in the upland CDF has already been tested, with prompt capping of the exposed dredged material, no additional sampling other than that required to ensure the use of clean fill and soil cover in the cap, will be required. If a reduction in the design cap criteria are proposed by the owner and/or operator based upon site-specific conditions, then sampling and testing of the exposed dredged material will be required. In general, a minimum sampling frequency of one sample per two acres will be required. Analysis must include all the target compounds listed in Appendix A of this Technical Manual.

Should off-site transport of dredged material or its contaminants become evident, the sampling of the media (including surface waters, sediments, and soils) surrounding the facility shall be required. Such sampling would require analysis for all of the target compounds listed in Appendix B of this Technical Manual.

(3) Surface Water Discharges:

(a) Authority. The authority to issue permits for direct point source surface water discharges is derived from both the federal and state Water Pollution Control Acts, also known as the Clean Water Act(s). The New Jersey Pollutant Discharge Elimination System (NJPDES) regulations (N.J.A.C. 7:14A) are the operating regulations that implement the State Clean Water Act.

Additionally, authority for the permitting of the effluent from dewatering dredged material to surface waters of the State can be found in Section 401 of the federal Clean Water Act for the issuance of Water Quality Certificates (WQCs).

(b) Potential Impacts/Regulatory Objectives. The objectives of any regulatory oversight document (i.e. NJPDES permit or WQC) for the point source discharge of effluent from the dewatered dredged material is to prevent any adverse impacts of the discharge on the receiving water body. Adverse impacts to the receiving water body may include toxic effects or bioaccumulation of contaminants in aquatic organisms, as well as adverse effects in humans through finfish and shellfish consumption or water exposure. To ensure that no adverse impacts occur, the amount and type of potential pollutants (as defined by N.J.S.A. 58:10A-3) that could be discharged to the receiving water body will be regulated. The two principal methods of controlling the amount and type of potential pollutants that could be discharged are

by having either technology based discharge criteria or water quality based discharge criteria in either the NJPDES permit or the WQC. Either of these two methods of developing discharge criteria will serve to protect the water quality of the receiving water body.

i. Technology Based Discharge Criteria - The rationale for technology based numbers is that compliance with either NJPDES permit or WQC discharge conditions can be demonstrated through the use of engineering solutions such as retention basins, flocculents, and other innovative methods. Any particular type of treatment that will achieve pollutant reduction to a defined and/or acceptable level(s) is satisfactory. These criteria may be utilized when the source dredged material is from a waterbody other than the discharge receiving water body. The effluent from the dewatered dredged material must meet these NJPDES permit or WQC conditions at all times.

ii. Water Quality Based Discharge Criteria - These types of discharge criteria are based on the existing water quality of the receiving water body as well as the ability of the receiving water body to assimilate any additional loading(s) of pollutants without any adverse effects. The rationale for this method of permit development for the effluent from the dewatered dredged material is to set the discharge criteria of the effluent to ambient levels of the receiving water. In this way no additional loading(s) of potential pollutants will be discharged to the receiving water body in excess of what is already presumably present in the receiving water body. The procedures to establish ambient conditions can be found in the following three reference documents:

(1) Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring. (OWRS QA-1), Office of Water Regulations and Standards, USEPA.

(2) Field Sampling Procedures Manual. NJDEP, 1992.

(3) USEPA Handbook - Stream Sampling for Waste Load Allocation Applications.

Additionally, this method can utilize indicator parameters such as Total Suspended Solids (TSS) as action levels in the permit or WQC. Indicator parameters are indicative of groups of individual pollutants; the use of an indicator parameter serves to limit the discharge of the target group of pollutants. The use of indicator parameters will allow for more rapid data generation for compliance purposes.

The criteria established by the Department for dewatering effluent discharges include consideration of ambient surface water quality criteria and/or State Water Quality Criteria. In addition, the Department will consider requests to incorporate a mixing zone approach to the discharge of dewatering effluent from an upland CDF. These criteria will be based on a daily maximum or appropriate average discharge levels. Monitoring for compliance with the WQC or NJPDES permit must be representative of the dewatering discharge. Monitoring requirements will be developed by the Department on a site-specific basis, and may include monitoring for daily maximum and/or appropriate average discharge levels. For most upland CDFs, it is anticipated that monthly average monitoring will be required, however this would vary with the length of the activity and operations at the upland CDF.

The setting of action levels as permit conditions is consistent with the Department's direction of emphasizing compliance with permit conditions instead of monetary penalties for numerical permit violations. Exceedances of action levels trigger corrective action measures such as additional treatment of the effluent or increased retention time prior to effluent discharge. The permit and WQC will contain language that reflects the action level concept so that permission to discharge is contingent upon compliance with either action levels or corrective action measures. This is the method of choice when the dredged material originates in the same water body to which the effluent from the dewatered dredged material is being discharged.

(c) Permitting Process. The point source discharge of the effluent from the dewatering dredged material to surface waters of the state will fall into one of two categories:

(1) dredged material dewatering effluent returning to the same water body from which the material was originally dredged will require a WQC. This WQC will have discharge conditions similar, if not identical, to those which would be found in a NJPDES/DSW permit.

(2) a NJPDES/Discharge to Surface Water (DSW) permit will be required for discharges from facilities accepting material from single or multiple dredging sites located in a different surface water body, or from "unidentified" sites.

(d) Testing Requirements. Exclusionary criteria for the testing requirements are described in Section III-C. Any project which does not qualify for a testing exemption as described in Section III-C will be subject to the following requirements.

Initially, the background information submitted for a dredging project proposing upland disposal/containment will be evaluated to determine the testing necessary to characterize potential adverse impacts of the dewatering discharge to the receiving waterbody. A list of the required background information is provided in Section III-A. The primary information used to assess potential surface water impacts are previous and current bulk sediment chemistry and modified elutriate analyses of site sediments.

Unless the bulk sediment chemistry data shows no detections for the target analytes listed in Appendix B, the Modified Elutriate Test will be required to predict pollutant concentrations in the discharge, both soluble and particulate-bound. Modified Elutriate Test results will be considered valid only if:

(1) the Standard Operating Procedure (SOP) found in the U.S. Army Corps of Engineers Waterways Experimental Station Environmental Effects of Dredging Technical Note, EEDP-04-2 (June 1985; or most recent version) is followed, in conjunction with the Department-approved use of a site-specific field retention time, analysis of both dissolved and suspended fractions, and

(2) sediment core sampling, homogenizing, and compositing follows Section III-D, and

(3) the total suspended solids value required for the final calculation in the Modified Elutriate Test data analysis does not exceed either ambient TSS concentrations for the receiving waterbody or state Surface Water Quality Standards for TSS for the receiving waterbody.

As described in Section IV-D(3)(b)ii, the applicant, in pre-application consultation with the Land Use Regulation Program, may choose to determine ambient pollutant/parameter concentrations in the receiving waterbody for setting discharge criteria; the methods required for this determination are referenced in this section. Ambient condition determinations will be reviewed by the Department on a case-by-case basis. Should existing information lead the Department to believe that surface water discharges from an upland CDF will not result in adverse impacts, the Modified Elutriate Test may not be required.

If the applicant proposes to use a flocculent to increase the settling of solids in the upland CDF, this should be incorporated into the Modified Elutriate Test procedure.

(4) Ground Water Discharges:

(a) Authority. The New Jersey Water Pollution Control (WPC) Act includes "dredge spoils" in its definition of a "pollutant". The placement of dredged material in an upland CDF represents a potential discharge of pollutants, and is subject to regulation pursuant to the authority of the New Jersey Pollutant Discharge Elimination System (NJPDES) regulations (N.J.A.C. 7:14A-1) and the Ground Water Quality Standards (GWQS; N.J.A.C. 7:9-6).

(b) Potential Impacts/Regulatory Objectives. When dredged material is placed at upland locations, contaminants may become soluble and can be transported into the subsurface terrestrial environment by leachate generation and seepage. The introduction of contaminants into the subsurface terrestrial environment may degrade ground water quality and may threaten potable water supplies. The susceptibility of ground water to contamination and the degree to which it can be degraded is dependent upon the hydrogeologic characteristics of ground water resource and the designated use. The impact of upland confined disposal facilities (CDFs) on ground water resources can be limited through an integrated approach of ground water resource classification, engineering of upland CDFs, dredged material testing and leachate analysis, and site-specific geotechnical evaluation. Through this approach, ground water resources can be protected at an appropriate level relative to their sensitivity and use, and the objectives of the NJPDES regulations and the GWQS can be achieved.

(c) Permitting Process. The degree to which the discharge to ground water (DGW) emanating from the upland disposal of dredged material will be regulated pursuant to the NJPDES regulations and the GWQS is dependent upon the following characteristics:

- the classification of the ground water (Table 2);
- the nature of the upland CDF (Type A or B);
- the source and quality of the dredged material; and
- the management of the dredged material.

The NJPDES-DGW permitting process involving the upland disposal of dredged material will include any or all of the following components:

- determination of leachate quality from dredged material;
- Ground Water Protection Plans; and/or
- NJPDES-DGW permit.

In order to determine which components of the NJPDES-DGW permitting process apply, it must be determined whether the project involves a Type A or Type B upland CDF as defined below:

Type A upland CDFs involve projects where the specific location(s) from which sediments are to be dredged is known prior to preceding with the development of a Ground Water Protection Plan and issuance of a NJPDES-DGW permit. In these cases, leachate quality from the sediments to be dredged can be evaluated on a preliminary basis allowing for a wider variety of management and/or permitting alternatives.

Type B upland CDFs are constructed independent of any specific dredging project(s). As such, the leachate quality of all sediments to be placed within the upland CDF cannot be determined prior to development of a Ground Water Protection Plan and issuance of a NJPDES-DGW permit. Therefore, the only regulatory options available are those detailed below at IV-D(4)(c)ii and iii.

i. Determination of Leachate Quality from Dredged Sediments: Leachate quality from dredged sediments to be placed in upland CDFs can be determined preliminarily for Type A upland CDFs, or as a monitoring condition of a NJPDES-DGW permit for Type B upland CDFs. Leachate quality shall be evaluated according to the procedure outlined in IV-D(4)(d).

Where leachate testing is conducted on dredged sediments to be managed in a Type A upland CDF, and the maximum leachate quality for any parameter exceeds the Ground Water Quality Criteria in Table 2, a Ground Water Protection Plan will have to be developed and implemented through a NJPDES-DGW permit. Where leachate testing is conducted on dredged sediments to be managed in a Type A upland CDF, and the maximum leachate quality for all parameters does not exceed the Ground Water Quality Criteria in Table 2, the project will be exempt from both the requirement to develop a Ground Water Protection Plan and to obtain an individual NJPDES-DGW permit.

Table 2: Ground Water Quality Criteria

		Aquifer Classification	
	Class I: Ground Water of Special Ecological Significance	**Class II**: Ground Water for Potable Water Supply	**Class III**: Ground Water with Uses Other Than Potable Water Supply
Ground Water Quality Criteria	Site specific ground water constituent standards determined as per N.J.A.C 7:9-6.8	IIA Ground Water Quality Criteria (Appendix A) or site specific criteria based upon ground water constituent standards determined as per N.J.A.C 7:9-6.8	IIA Ground Water Quality Criteria (Appendix A) or site specific criteria based upon ground water constituent standards determined as per N.J.A.C 7:9-6.8

ii. Ground Water Protection Plans: Ground Water Protection Plans shall be developed for:

- all Type B upland CDFs; and
- all Type A upland CDFs where the anticipated quality of the leachate, determined as per IV-D(4)(c)i and in accordance with IV-D(4)(d), exceeds the Ground Water Quality Criteria for any parameter.

The Ground Water Protection Plan for any upland CDF must comply with the general provisions of N.J.A.C. 7:14A-7.6, which includes the following:

- an engineering design and construction plan of the proposed CDF;
- an operation and maintenance plan which details the use of the proposed CDF;
- detailed evaluation of potential contaminant migration pathways which considers at a minimum the following:

  - Regional physiography;
  - Site specific geology and hydrogeology; and
  - Regional ground water use and receptors

- annual leachate discharge and contaminant loading into ground water from the upland CDF in consideration of

  - maximum leachate concentration determined as per IV-D(4)(c)i;

  - annual leachate volume estimated using the Hydrologic Evaluation of Landfill Performance (HELP) Model, EPA/600/9-94/xxx, U.S. Environmental Protection Agency Risk Reduction Engineering Laboratory, Cincinnati, OH;

- submission of results of a physical or mathematical ground water flow and/or contaminant transport model that depicts the fate of the DGW.

iii. NJPDES-DGW Permitting: A NJPDES-DGW permit will be issued for every facility which must develop a Ground Water Protection Plan according to IV-D(4)(c)ii. Dependent upon the results of the Ground Water Protection Plan, a NJPDES-DGW permit may require any or all of the following:

- installation and periodic sampling of ground water monitoring wells;
- in-situ leachate monitoring through lysimetry;
- liner and/or leachate collection system monitoring;
- leachate quality analysis of the dredged material.

iv. Exclusions: Projects which qualify and meet either of the three criteria listed below are exempt from the requirements outlined in IV-D(4)(c)i-iii because they represent insignificant discharges to ground water and are not considered likely to contravene ground water quality standards. These exclusions only apply to upland CDFs which do not discharge into Class I ground waters or wellhead protection areas as delineated by the Department.

(1) Projects in Region 2 where:

- less than 5,000 cubic yards (yd^3) of dredged material will be placed in an upland CDF over the five (5) year life of the associated permit; and
- the sediments are dredged from a waterway(s) where there has not been an historic or current upland industrial use and the site is not currently or previously occupied by a marina of 25 or more boat slips.

(2) Any project is excluded from NJPDES-DGW permit requirements where:

- less than 1,000 cubic yards (yd^3) of dredged material will be placed within an upland CDF over the five (5) year life of the associated permit; and
- the sediments are placed over impervious soils, or are underlain by a liner that has a hydraulic conductivity less rapid then 10^{-7} centimeters per second (cm/sec)

(3) Any project is excluded from NJPDES-DGW permit requirements where:

- the dredged material to be placed in the upland CDF is >90% sand (grain size >62.5 um) and
- other background information does not lead the Department to believe the material is contaminated.

(d) Testing Requirements. Leachate quality shall be determined using the Sequential Batch Leaching Test (SBLT) procedure (for freshwater and estuarine sediments) or the Column Leaching Test (CLT) procedure (for estuarine sediments) developed by the United States Army Corps of Engineers, Waterways Experiment Station (USACE-WES), or other tests as approved by the Department in advance. Leaching tests shall be conducted in accordance with Departmental standard operating procedures, as available, or the guidelines established by USACE-WES (Myers et al., 1996; Brannon et al., 1994).

For Type A upland CDFs leachate quality shall be determined for a representative number of samples for the parameters listed in Appendix B, in each location to be dredged prior to proceeding with the development of a Ground Water Protection Plan and issuance of a NJPDES-DGW permit.

For Type B upland CDFs, leachate quality shall be determined for a representative number of samples for the parameters listed in Appendix B on all sediments to be received as a condition of the NJPDES-DGW permit.

(5) Terrestrial Ecosystem Impacts:

(a) Authority. The Department's authority to regulate terrestrial ecosystem impacts which may occur during the operation of an upland CDF depends on the location of the facility. The Department may have regulatory authorities pursuant to the Flood Hazard Area Control Act, the Freshwater Wetlands Protection Act, the Wetlands Act of 1970, the Waterfront Development Act, and the Coastal Area Facility Review Act. Additional Department authority may also be derived from both the federal and State Water Pollution Control Acts and the federal Coastal Zone Management Act.

(b) Potential Impacts/Regulatory Objectives and the Management/Regulatory Process. The regulatory objectives of the Department are to identify and minimize the potential for contaminant mobility and transport into terrestrial ecosystems resulting from the upland disposal of contaminated dredged material. Potential adverse impacts will be evaluated on a case-by-case basis, initially considering the bulk sediment chemistry analyses of the dredged material placed in the upland CDF and the proposed schedule for future disposal and management operations at the facility. Additional discussions of potential impacts to the terrestrial ecosystem can be found in Section IV-D(2).

When dredged material is allowed to dry in an upland CDF, there is potential for dust generation. This potential is greater when the dredged material consists of fine particles and has not revegetated. Dust generation could facilitate the dispersal of contaminants into the terrestrial ecosystem. Management techniques will be required, as necessary, to control the generation and dispersal of dust from an upland CDF. Potential management techniques include interim/final capping of contaminated and exposed dredged material and the use of erosion control mats.

The potential impacts to terrestrial ecosystems associated with the upland disposal of contaminated dredged material also include the possibility of increased contaminant mobility through uptake by colonizing plants and animals. This potential is enhanced by the physicochemical changes which occur when dredged material is disposed of in an upland setting. Such chemical changes include the oxidation associated with drying, leaching by rainwater, and a decrease in pH, resulting in increased availability of metal contaminants.

The Department has identified a number of possible scenarios for the operation of upland CDFs. These scenarios, described in the following sections, have different potentials to produce adverse impacts to the terrestrial ecosystem. During the operation of an upland CDF, management techniques can be utilized to minimize potential adverse impacts. Appropriate management techniques, summarized and briefly discussed in the following sections, will be evaluated as part of the project-specific review and permitting of an upland CDF. In general, potential impacts to the terrestrial ecosystem as a result of the upland disposal of contaminated dredged material will be evaluated on a case-by-case basis.

i. Upland CDFs Maintained in Continuous Operation

For most large upland CDFs, it is expected that the facility will be operated in a continuous active mode during its operational lifetime. This would involve the continual placement of dredged material in the upland CDF, followed by periods of dewatering, drying, crust management, etc. - with subsequent repetitions of this cycle. This active mode of operation, in which the dredged material placed in an upland CDF remains in a disturbed condition, should effectively limit the ability of plants and animals to recolonize the site. However, wildlife may forage at the site because of the easy availability of aquatic organisms in dredged material. For such facilities, the permittee will be required to submit an annual report (see Section IV-D(2)(b)ii) to the Department, summarizing the disposal and management operations at the upland CDF, and further certifying that the site has not been recolonized to any significant extent by terrestrial plants or animals for extended periods of time (generally considered to be 6 months or longer).

This certification shall include photographs of the upland CDF documenting site conditions. In addition, the owner/operator of the facility must implement measures to minimize foraging activities at the site if they are observed.

ii. Upland CDFs Operated Intermittently

Upland CDFs which are operated intermittently, such that the dredged material placed on the site is allowed to dry out for a period of time exceeding 6 months in an undisturbed condition, will be more available for use and/or recolonization by plants and animals. Such upland CDFs therefore have the potential to result in increased contaminant mobility and transport into terrestrial ecosystems.

a. Maintaining an upland CDF in a ponded condition would serve to reduce the potential for increased contaminant mobility through plant and animal colonization. This may be practicable in situations where the upland CDF will be used infrequently, with long periods of time between disposal operations. However, there is a concern that birds may use a ponded CDF. If this occurs, methods could be employed to discourage such use. For such facilities, the permittee will be required to submit an annual report (see Section IV-D(2)(b)ii) to the Department, summarizing the disposal and management operations at the upland CDF, and further certifying that the site has not been recolonized or used by terrestrial plants or animals for an extended period of time.

b. In those cases where an upland CDF will be used only intermittently and allowed to dry out and remain undisturbed for time periods exceeding 6 months between disposal operations, the potential exists for the site to be recolonized and/or used by plants and animals. The greater the contamination of the dredged material, and the longer the site remains undisturbed (and thus available for recolonization and use), the greater the potential for adverse terrestrial ecosystem impacts to occur.

Potential adverse impacts will be evaluated on a case-by-case basis, initially considering the bulk sediment chemistry analyses of the dredged material placed in the upland CDF and the proposed schedule for future disposal and management operations at the facility. The permittee will be required to submit an annual report (see Section IV-D(2)(b)ii) to the Department, summarizing the anticipated disposal and proposed management operations at the upland CDF. Interim management operations (between disposal operations) may be required to minimize potential adverse terrestrial ecosystem impacts. These could include interim capping measures to isolate contaminated dredged material (see Section IV-D[2]).

(c) Testing Requirements. Section III-C of this document identifies those sediments which are excluded from the Department's testing or reporting requirements; these exclusions also apply to any additional testing required for an evaluation of potential terrestrial ecosystem impacts. Any dredged material which does not qualify for a testing exemption as described in Section III-C may be subject to additional testing.

Section (b)-ii discusses "Upland CDFs Operated Intermittently". If recolonization and/or use of such CDFs by plants or animals occurs, there is potential for increased contaminant mobility and transport into the terrestrial ecosystem. To evaluate the potential for such impacts, predictive animal and plant uptake bioassays may be required. Specific contaminants of concern will be determined by the Department on a site-specific basis, and will vary with the dredged material placed in the upland CDF. In particular, the Department will consider the contaminants present in the last-placed dredged material, along with proposed capping measures, in its evaluation of the potential bioaccumulation of contaminants by terrestrial organisms. The Department will determine the need for such testing on a case-by-case basis.

[Note: the Department is currently further investigating the potential impacts of contaminated dredged material disposal at upland CDFs on the terrestrial ecosystem. Additional and more detailed guidance may be developed and incorporated into this guidance document at some future date.]

(6) Public Health Impacts:

(a) Authority. The Department's authority to control potential public health impacts which may be associated with the disposal of dredged material at an upland confined disposal facility is derived from the federal and State Water Pollution Control Acts, the New Jersey Waterfront Development Law, and the Federal Coastal Zone Management Act.

(b) Potential Impacts/Regulatory Objectives. The potential impacts to public health associated with the upland disposal of dredged material include the potential for direct human contact with contaminated dredged material, dust generation from drying dredged material with a potential inhalation exposure pathway, and surface and ground water impacts. The frameworks for regulating potential surface and ground water impacts are described in Sections IV-D(3) and IV-D(4), respectively.

The regulatory objectives of the Department are to identify and control public health impacts originating from the upland disposal of contaminated dredged material. The Department discourages the use of upland CDF sites for agricultural activities, unless such use can be demonstrated not to have potential adverse impacts to public health.

(c) Management/Regulatory Process. The Department will use the Rules on Coastal Zone Management in evaluating the siting of upland confined disposal facilities (CDFs). These rules serve to minimize potential public health impacts.

During the operation of an upland CDF, management techniques can be applied to control and minimize potential public health impacts. Management techniques will be required, as necessary, to control the generation and dispersal of dust. This will further serve to minimize the inhalation pathway for human exposure. Direct human contact will be controlled through access restrictions to the upland CDF. Facility personnel will be required to use the appropriate precautionary measures to avoid direct contact with contaminated dredged material.

(d) Testing Requirements. Section III-C of this document identifies those sediments which are excluded from the Department's testing requirements. Any dredged material which does not qualify for a testing exemption as described in Section III-C will be subject to the following requirements.

Bulk chemical analysis of the sediments to be dredged will be required. Potential public health impacts will be evaluated by comparison to the appropriate Direct Contact Soil Cleanup Criteria. These analyses will be conducted to determine if the dredged material to be disposed of requires precautions to avoid direct human exposure pathways during and after disposal in an upland CDF.

Results of the bulk sediment chemistry analyses will be considered valid only if:

(1) the bulk sediment chemistry analysis includes all target analytes for which appropriate Direct Contact Soil Cleanup Criteria exist (which is included in the list in Appendix B), and

(2) sediment core sampling, homogenizing, and compositing follows Section III-D sampling procedures.

E - Subaqueous Disposal Pits

(1) Overview: Subaqueous disposal pits are submarine trenches or pits excavated below the ocean/bay bottom for the specific purpose of containing contaminated dredged material. This also includes pits excavated under navigation channels. Existing subaqueous borrow pits created as a result of past sandmining activities, or natural pits and depressions, could also be used as subaqueous disposal pits. The effective function of a subaqueous disposal pit is predicated upon its ability to contain the contaminated dredged material which will be placed in it.

Subaqueous disposal pits are considered distinct from open water disposal sites (discussed in Section IV-C).

(2) Authority: Refer to Section II-B for a listing of relevant statutes and regulations.

(3) Potential Impacts: The potential adverse environmental impacts of a subaqueous disposal pit depend directly upon the location (including physical conditions and hydrodynamics) and existing ecological functions of the pit site. Potential impacts which may require evaluation include physical disruptions during construction and disposal operations (resulting in, for example, temporary interference with existing benthos, fisheries, or anadromous fish migrations), short-term benthic and water column toxicity impacts as a result of the disposal of contaminated dredged material, and water column impacts associated with the resuspension of sediment. In addition, long-term impacts to biota and the ecosystem may result if the contaminated dredged material placed in a subaqueous disposal pit is not adequately contained and isolated from the marine environment.

(4) Regulatory Objectives/Management Process: Short-term regulatory concerns lie primarily with minimizing the potential adverse environmental impacts associated with the construction of a subaqueous disposal pit and dredged material disposal operations. Submarine excavation of bay/ocean bottom or the use of existing pits/depressions to create a subaqueous disposal pit will be evaluated using the Rules on Coastal Zone Management. In general, it is preferable that subaqueous disposal pits be located in areas where existing surficial sediments have similar levels of contamination as the dredged material proposed for disposal in the pit.

Short-term impacts can result from the dispersal of dredged material during disposal operations. Such impacts include physical disruption of benthos surrounding the subaqueous disposal pit, as well as water column and benthic toxicity and contamination. With proper design and management of the subaqueous disposal pit, these impacts can be limited. The use of Best Management Practices (BMPs) during disposal operations will be required and permit conditions will be applied to ensure these impacts are minimized.

The filling of a subaqueous disposal pit with contaminated dredged material will employ BMPs which reduce suspension and dispersal of the dredged material during the disposal operation. These include adherence to strict navigation requirements to ensure point disposal of the dredged material. Additionally, restrictions on conducting disposal operations during severe weather/tidal conditions may also serve to minimize the dispersal of dredged material. The use of geotextile containers (see Clausner et al., 1996) or the direct shunting of dredged material into the pit should be considered.

Potential long-term impacts can be minimized, and mitigated upon closure of the subaqueous disposal pit. Designing the pit to be properly capped, and maintaining the integrity of the cap, is an essential regulatory goal to ensure the long-term isolation of contaminants. In general, one meter of suitable clean material (as defined in Section V-I) will be required as a final cap. The placement of interim caps may also be required between dredged material disposal operations. Long-term monitoring of the subaqueous disposal

pit, its final cap, and the surrounding environment will be required to ensure cap integrity is maintained. For additional discussion of generally applicable capping requirements, see Section V-I. In addition, restoration of the natural bathymetry of the subaqueous disposal pit site using appropriate clean material as a final cap will serve as de facto mitigation for the temporary loss of benthic habitat resulting from the construction of the pit.

Some of the techniques and designs which should be considered when constructing a subaqueous disposal pit are:

(a) Existing Pit with Capping - involves locating a subaqueous disposal pit in a natural bottom depression or existing subaqueous borrow pit. This reduces the need to excavate. Dredged material is placed in the pit up to a predetermined level. The site is then capped with clean material up to the level of the surrounding bay/ocean bottom.

(b) Contained Subaqueous Disposal - involves constructing a berm opposite an existing subaqueous ledge or wall. The cavity formed between these features is then filled and capped with clean material.

(c) New Excavation - entails the construction of a new subaqueous disposal pit, designed specifically for the containment of contaminated dredged material. In theory, such a pit may provide for better containment compared to that offered by existing borrow pits or natural depressions.

(5) Testing Requirements: Section III-C discusses general testing exclusions. Where the dredged material originates in the same waterbody as the subaqueous disposal pit, required testing will consist of grain size analysis, Total Organic Carbon, and bulk sediment chemistry. In general, the disposal capacity of subaqueous disposal pits should be "reserved" for projects for which other dredged material management alternatives are not available or acceptable. The bulk sediment chemistry data will be used to ensure that only contaminated dredged material is placed in the subaqueous disposal pit. It will also be used in the development of the monitoring and management plan for the pit.

If the dredged material originates in a waterbody different from that of the subaqueous disposal pit, testing requirements will be determined on a case-by-case basis. Testing may include bulk sediment chemistry and modified elutriate testing (with retention time to be specified; ambient water quality testing of the subaqueous disposal pit site may also be needed), depending on the dredging site, subaqueous disposal pit site characteristics, and the volume of dredged material to be placed in the pit. Section III-D includes general guidance on sampling and testing the dredged material.

Precision bathymetry (accuracy to 6 inches or better) of the subaqueous disposal pit site will be required prior to initial site disturbance/pit construction, upon the completion of the construction of the pit, and may be required prior to and after any dredged material disposal operation. This will provide information on existing subaqueous disposal pit capacity and help ensure the dredged material is contained within the pit.

F - Containment Areas

(1) Overview: Dredged material containment areas are features artificially created in open water or wetlands and include any structure which, upon the completion of its filling with dredged material, would result in an extension of existing upland into open waters (i.e. the creation of "fastland"). In addition, a containment area could be constructed so as to form the substrate on which a wetland could develop. They are usually created by constructing a retaining structure (berm or bulkhead) in an open water area and filling the enclosed area with dredged material.

(2) Authority: The near-shore disposal of dredged material into a containment area is subject to the Waterfront Development Act, the Rules on Coastal Zone Management (N.J.A.C. 7:7E), federal consistency determinations pursuant to the Federal Coastal Zone Management Act, Water Quality Certification pursuant to Section 401 of the Clean Water Act, and Riparian Interests. Disposal into open waters or wetlands is also regulated by the federal government pursuant to Section 404 of the federal Clean Water Act.

In all cases, either a Water Quality Certificate (WQC) or NJPDES-Discharge to Surface Water permit will be required for a containment area. A NJPDES Discharge to Surface Water permit may be required for the effluent from the dewatering dredged material if the dredged material is not from the same waterbody as the containment area. A WQC will be required for the effluent from a containment area which only accepts dredged material from the waterbody in which it is located.

A NJPDES Discharge to Groundwater Permit may be required pursuant to N.J.A.C. 7:14A-1, subject to a determination by the Department's Bureau of Operational Ground Water Permits.

(3) Potential Impacts: The potential adverse environmental impacts of a dredged material containment area depend directly upon the location and existing ecological functions of the site. Potential impacts which require evaluation include the destruction and permanent loss of benthic, open water, or wetlands habitats, and temporary physical disruptions during construction of the containment area (resulting in, for example, interference with existing benthos, fisheries, or anadromous fish migrations). Potential short-term surface water quality and benthic toxicity impacts may result from the dispersal of sediments and associated contaminants due to the construction of the containment area.

Potential impacts to surface water quality during the filling of the containment area with contaminated dredged material resulting from the discharge of effluent from the dewatering dredged material, are similar to those for upland confined disposal facilities [CDFs; see Section IV-D(3)]. In addition, potential water quality impacts resulting from the permeability of the berm/bulkhead will be considered on a case-by-case basis.

Potential long term impacts to ground water quality are also similar to those for upland CDFs, and are discussed in Section IV-D(4). Long term impacts to aquatic biota and the marine ecosystem may result if contaminated dredged material placed in a containment area is not adequately contained and isolated. In addition, filling of the containment area ultimately results in the creation of additional upland. Potential impacts to the terrestrial environment are essentially the same as those associated with upland CDFs [see Sections IV-D(2), (5), and (6)].

(4) Regulatory Objectives/Management Process: The creation of upland (or wetlands) areas by filling open water/wetland environments is a regulatory concern. Based upon the Rules on Coastal Zone Management at N.J.A.C. 7:7E-4.2(j) filling in natural water areas is discouraged and filling wetlands areas is prohibited. Such activity requires a demonstration that there is no practicable or feasible land alternative. In addition, minimal interference to Special Areas enumerated at Subchapter 3 of the Rules on Coastal Zone Management (such as Intertidal Shallows, Finfish Migratory Pathways, and Submerged Vegetation Habitats) must be demonstrated.

Short-term regulatory concerns lie primarily with minimizing the potential adverse environmental impacts associated with the construction of the containment area and dredged material disposal operations. It is preferable that containment areas be located in areas impacted by similar levels of existing sediment contamination as the dredged material proposed for disposal in the area. Locating a dredged material containment area site will be evaluated using the Rules on Coastal Zone Management.

Short-term impacts can result from the dispersal of contaminated dredged material during disposal operations. Such impacts include physical disruption of benthos surrounding the containment area, and water column and benthic toxicity and contamination. With proper design and management of the containment area, these impacts can be minimized. The use of best management practices (BMPs) during disposal operations will be required and permit conditions will be applied to ensure these impacts are minimized. Such BMPs could include controlling the rate of dredged material placement in the containment area to allow for adequate settling of suspended solids. The use of geotextile containers or liners (see Clausner et al., 1996), and the pumping of free water to upland water quality basins to provide settling of suspended solids prior to discharge, could also be used.

Potential long-term impacts could result if the containment area does not adequately isolate contaminated dredged material from the surrounding aquatic and terrestrial environments. The containment area berm/bulkhead must be designed and constructed to ensure maximum isolation of contaminants. If the containment area is filled with contaminated dredged material, final capping of the created upland (or wetlands substrate) area is required to ensure the long-term isolation of contaminants from the environment. Potential impacts to the terrestrial environment and public health are similar to those for upland CDFs, and are discussed in Sections IV-D(5) and (6). In addition, site closure/final use considerations are discussed for upland CDFs in Section IV-D(2). Long-term monitoring of the containment area site and the surrounding environment may be required to ensure that contaminated dredged material has been adequately isolated.

The use of dredged material in habitat development (including wetlands) is discussed in section V-E.

Construction of the containment area will result in the loss of open water habitat and/or wetlands. In some cases, mitigation for this loss by means of in-kind replacement will not be possible. Thus, construction and operation of a dredged material containment area may result in the permanent loss of aquatic habitat. Proposals for out-of-kind mitigation may be considered by the Department during the regulatory review of proposed containment areas.

(5) Testing Requirements: Section III-C discusses general testing exclusions. Regulatory concerns with potential impacts to surface and ground water quality, the terrestrial ecosystem, public health, and site closure/final use are essentially similar to those for uplands CDFs; see Sections IV-D(2), (3), (4), (5) and (6) for applicable guidance.

Chapter V - Use Alternatives

A - Overview

Dredged material can be considered a resource, and the Department strongly supports its use, wherever possible, as opposed to exclusive reliance on disposal facilities. While new dredged material disposal facilities are needed, it is essential to test and cultivate emerging use strategies to ensure a multi-faceted and integrated long-term program for the management of dredged material.

In New Jersey, the concept of the beneficial use of various materials that would otherwise require disposal was first applied in the area of sewage sludge management where, depending on its quality, sludge has been applied directly to the land or mixed to create soil enhancement products. Many additional materials have since been approved for beneficial use applications including coal ash from power plants, contaminated soils, wastewater treatment plant residuals, and other industrial/commercial by-products.

Depending on its characteristics, particularly grain size and degree of contamination, dredged material may be suitable for use in beach nourishment projects, as structural or non-structural fill, as landfill cover, in habitat development projects, to cap open water disposal areas, or in a variety of other uses. The USACE Engineer Manual No. 1110-2-5026, Beneficial Uses of Dredged Material (30 June 1987), provides guidance for planning, designing, developing, and managing dredged material for potential uses.

B - Authority

Requests to beneficially use a variety of materials have been handled on a case-by-case basis through various Departmental programs. In many cases, beneficial use applications have been authorized as pilot or demonstration projects or have been exempted from regulation under the broad authority of the non-hazardous waste regulations at N.J.A.C. 7:26-1.1, et seq. Under these authorizations, the Department has required a series of steps to be followed in order to demonstrate that the beneficial use option is environmentally sound and consistent with current law in New Jersey or in the state where the material is to be used. In addition, the applicant must demonstrate that markets will accept the material and maintain suitable records of the weight and/or volume of material beneficially used. Since dredged material will not be regulated as a solid waste, the Department will evaluate and authorize proposed uses of dredged material pursuant to the process described in Appendix E of this Technical Manual. This Acceptable Use Determination process is intended to streamline the approval of use activities.

Authority to regulate potential uses of dredged material can be found in the State and federal Water Pollution Control Acts, the Waterfront Development Law, the Flood Hazard Area Control Act, and the federal Coastal Zone Management Act. The Rules on Coastal Zone Management are also applicable to these use options.

C - Linkages with Other Management Alternatives

The use options discussed in Sections V-D through V-I can be divided into three general categories. These categories reflect the degree to which the dredged material must be processed/amended prior to its use, or the use of dredged material to support another dredged material management alternative (discussed in Section IV of this document):

(1) use options supporting other dredged material management alternatives - capping open water disposal sites;

(2) use options requiring minimal processing of the dredged material - beach nourishment, aquatic and wetland habitat development.

(3) use options requiring substantial processing or amendment of the dredged material - structural and non-structural fill material, landfill cover, agricultural use, and terrestrial habitat development.

For uses 1 and 2, the dredged material would have to meet applicable testing requirements to verify its suitability for the proposed use. Suitability criteria would include grain size and contaminant characteristics. Rehandling of this material would be limited to its transport to the use site and its placement in accordance with the applicable engineering design and regulatory requirements.

In most cases, dredged material proposed for the use 3 options noted above would first have to be dewatered. This would most likely occur at an upland confined disposal facility (CDF). A "use train", involving sequential placement of dredged material in an upland CDF, dewatering over a period of time, and then removal from the upland CDF for use purposes, could be developed. Olin and Bowman (1996) discuss the potential of soil washing and other techniques to isolate the coarser-grained and less-contaminated fractions of dredged material placed in upland CDFs. Such activities would not only provide a useable product, but would enable an upland CDF to remain in operation for a longer period of time before it reached its design capacity. Dredged material contaminated to various degrees could be suitable for these use options; testing requirements, evaluation criteria and site-specific authorization of potential use projects are discussed in the appropriate sections of this document.

D - Beach Nourishment

(1) Authority: the Department's authority to regulate the use of dredged material for beach nourishment is derived from the Waterfront Development Act, the Coastal Area Facilities Review Act, the federal Coastal Zone Management Act, and the Water Quality Certification provisions (Section 401) of the Clean Water Act.

(2) Potential Impacts/Regulatory Objectives: The Department encourages the renourishment of eroding beaches through the placement of clean sand of acceptable grain size composition.

Beach nourishment operations usually involve the borrowing of sand from inshore or offshore locations and transporting it by truck or hydraulic pipeline to an eroding beach for the purpose of restoration. A hopper dredge, with or without pumpout capability, can also be used. This can result in displacement of existing substrate, the destruction of non-motile benthic communities, and changes in the topography of both the placement and borrow areas. However, a beach nourishment operation also creates new habitat which is usually rapidly recolonized by benthic organisms. Significant impacts to offshore organisms can be minimized by selecting borrow areas to avoid important benthic habitats, not creating deep/anoxic borrow pits, and maintaining substrate quality in the borrow area (i.e. grain size characteristics, Total Organic Carbon, etc.).

Potential adverse impacts could also result from the placement of dredged material with excessive organic content on beaches. This situation is aesthetically unpleasant, but temporary in duration. In addition, placement of dredged material contaminated by chemical or biological pollutants may affect nearby benthic and open water habitats, and may pose a public health concern. The Department's objectives in regulating the placement of dredged material on beaches are to prevent any adverse impacts to the beach area, be they aesthetic (human interest), public health, or to nearby benthic and open water communities.

(3) Permitting Process: permitting for this use of dredged material is conducted by the Land Use Regulation Program. The Rules on Coastal Zone Management govern beach nourishment and dune construction activities.

In terms of grain size, suitable material must be comprised of 75% or greater sand (grain size larger than 0.0625 mm) with a grain size compatible with that of the receiving beach. (Note: material less than 90% sand will require bulk sediment chemistry analyses and additional testing - see Section III.) Material with a grain size smaller than the "compatible grain size" for the beach, but still greater than 75% sand, could be utilized in dune construction, provided that effective erosion controls were utilized until vegetative cover can be established, and the bulk sediment chemistry data does not identify contamination at unacceptable levels.

(4) Testing Requirements: all dredged material proposed for beach nourishment must be characterized by grain size analyses. In addition, grain size analyses of the sand on the proposed receiving beach must also be completed. Sampling guidance for these required analyses will be provided by the Department on a case-by-case basis. Exclusionary criteria for testing requirements are described in Section III-C. Bulk sediment chemistry analyses will be required for dredged material which does not meet the exclusionary criteria. This data will be compared with the NJDEP Residential Direct Contact Soil Clean-up Criteria to evaluate potential impacts to public health. To evaluate potential impacts to estuarine benthic communities, the Department will compare this data with the guidelines values developed by Long et al. (1995) and other literature sources, on a case-by-case basis.

E - Habitat Development

(1) Overview: A wide range of habitat types can be developed (created, restored, or enhanced) using dredged material. The development of upland and wetlands habitats is discussed in this Section of the Technical Manual. These could include areas which would then be developed further, in whole or in part, for parkland/open space or passive/active recreation uses.

The construction of islands using dredged material, on which wetlands as well as upland habitat types could develop, is considered to be a special case. Islands are not addressed in this Technical Manual, but will be considered by the Department on a project-specific basis.

Aquatic habitats (including tidal flats, seagrass meadows, and other benthic habitats) could also be developed as a result of the Open Water Disposal of dredged material (see Section IV-C). Development of aquatic habitat in association with such disposal operations will be evaluated on a case-by-case basis. In general, dredged material used to create such habitats should be placed so as to maximize habitat value; the final cap must also be designed to consider potential contaminant uptake. A special case of aquatic habitat development is the use of dredged rock to create artificial reefs, jetties, etc.

The USACE Engineer Manual EM 1110-2-5026 (30 June 1987), Beneficial Uses of Dredged Material, includes detailed discussions and a listing of references concerning habitat development using dredged material.

(2) Authority: The Department's authority to regulate the use of dredged material for habitat development depends on the location of the project site. The Department may have regulatory authority pursuant to the Flood Hazard Area Control Act, the Waterfront Development Act, the Freshwater Wetlands Protection Act, the Wetlands Act of 1970, the Coastal Zone Management Act. Additional Departmental authority may also be derived from both the federal and State Water Pollution Control Acts. Dredged material could also be used in restoration or mitigation activities required pursuant to permits issued for other projects.

(3) Potential Impacts/Regulatory Objectives:

(a) Upland Habitats. Habitats will develop on upland dredged material disposal sites regardless of human intervention. However, the use of a variety of management techniques can improve the habitat that develops, or foster the development of specific habitat types. Although the level of effort needed to develop upland habitat could essentially be limited to that necessary to provide erosion control, additional effort and long-term management may be needed to create specific and more productive habitats. The objectives (i.e. habitat functions and values) of proposed upland habitat development projects must be identified in advance, and the project designed and managed accordingly.

Some of the potential impacts and regulatory objectives associated with habitat creation at upland Confined Disposal Facilities (CDFs) are discussed in Section IV-D(5).

Dredged material used for upland habitat development must be suitable in terms of physical (particularly grain size) and chemical (salinity, nutrients, contaminants) characteristics. The main concern of the Department is the potential dispersal of contaminants from the dredged material into the terrestrial environment and food webs. For example, Brandon et al. (1996) report on plant uptake of heavy metals (zinc, cadmium, nickel, lead, chromium, copper, and mercury) at levels of potential concern. Uptake of lead and cadmium by animals colonizing the upland habitat area are also of potential concern. Refer to Section IV-D(2) for information concerning the development of habitat as part of the final closure process on upland CDFs. In general, placement of a clean cap at least 2 feet thick will serve to isolate the underlying contaminated dredged material and eliminate many of the concerns with the dispersal of contaminants into the terrestrial ecosystem.

When placed in an upland environment, among other changes it will undergo, dredged material will dry, tend to oxidize, and decrease in pH. Thus, soil amendments (including lime, manure, sand, and limestone gravel) may be needed to provide a suitable medium for the recolonization and growth of plants. In addition, the salt content of material dredged from estuarine areas may inhibit the development of upland habitat. For additional information and guidance, refer to Brandon et al. (1996 and 1992).

Section V-D of this Technical Manual briefly discusses the use of dredged material to create dunes on beaches.

(b) Wetlands. As discussed in this section, the use of dredged material to create wetlands will be considered by the Department only under exceptional conditions.

Development of emergent wetlands habitats is usually accomplished by the placement of dredged material in open water areas to create substrate elevations conducive to the development of such wetlands. The objectives (i.e. habitat functions and values) of proposed wetlands development projects must be identified in advance, and the project designed and managed accordingly.

The Department has three major concerns with the use of dredged material to create (non-open water, emergent) wetland habitats: (1) the loss of other habitats coincident with the creation of wetlands, (2) the potential release of contaminants from the dredged material into surface waters, and (3) the potential uptake of contaminants by biota.

While wetlands are recognized as important and productive components of the aquatic ecosystem, creation of such habitat could result in the loss of important open water and benthic habitat. The Department will consider such wetland creation proposals on a case-by-case basis, consistent with the Rules on Coastal Zone Management. In general, sites proposed for wetland creation should avoid areas of productive open water and benthic habitat.

Dispersal of contaminants from dredged material used for wetland development can occur through two major routes: (1) resuspension of dredged material due to waves and currents, and (2) uptake by plants and animals colonizing or using the created wetland. In order to prevent the physical dispersal of the placed dredged material, low wave/current energy, shallow water sites should be used for wetland creation projects. Temporary (and possibly permanent) protective/retaining structures may be needed to contain the dredged material (see Containment Areas, Section IV-F). Additional design and management factors which must be considered to create a productive wetland, while minimizing the potential for contaminant dispersal, include salinity, tidal range, weir operation, and placement of a cap.

Uptake of contaminants by plants and animals will be minimized by restricting the contaminant levels allowable in dredged material proposed for wetland creation. In addition, capping of contaminated dredged material with clean material may be required. To evaluate potential impacts to benthic communities, the Department will compare bulk sediment chemistry data with the guidelines values developed by Long et al. (1995) and other literature sources.. Additional biological testing as specified in the USACE/USEPA Draft Inland Testing Manual (1993) may also be required.

(4) Permitting Process: The development of wetlands using dredged material is regulated by the Department's Land Use Regulation Program pursuant to the Rules on Coastal Zone Management and other applicable authorities.

Long-term maintenance and monitoring of both upland and wetlands habitat development projects may be required.

(5) Testing Requirements: The use of dredged material to develop wetlands habitats may require project-specific permits with specific conditions. Section III-C of this document identifies those sediments which are excluded from the Department's testing or reporting requirements for the purpose of disposal. These exclusions may not apply to the testing required for an evaluation of potential impacts resulting from the use of the dredged material for habitat development. The testing needed to evaluate the suitability of the dredged material for the proposed habitat development project include considerations of salinity, nutrients, and degree of contamination. This could include bulk sediment analyses, modified elutriate testing, and predictive animal and plant bioassays. The Department will determine the need for such additional testing on a case-by-case basis.

F - Structural & Non-structural Fill

(1) Overview: the Department has previously authorized the use of contaminated soils and other residual materials in construction related activities. Consistent with applicable regulations, contaminated soils have been washed and blended with leaf compost to make a topsoil product. In addition, remediated petroleum contaminated soil is marketable as a fill product. Thus, it appears that the potential exists to utilize dredged material in similar types of applications for both structural and non-structural fill.

Given the various physical/geotechnical requirements for structural or non-structural fill applications, dredged material must be dewatered before it could be used. In addition, if the dredged material contains a high proportion of fine-grained particles and/or contaminants at levels of concern, it would have to be blended with coarser-grained material or otherwise processed/stabilized/amended to form a "product" which would then meet the required engineering and environmental specifications.

The New Jersey Department of Transportation (NJDOT) is investigating potential uses of dredged material in various aspects of its construction projects. The NJDOT must develop a testing protocol to assess the engineering properties of processed/stabilized/amended dredged material to ensure that it is utilized in appropriate applications. In addition, quality control and quality acceptance requirements must be established to ensure that the material placed is of good, uniform quality.

The U.S. Army Corps of Engineers (USACE) has summarized the potential uses of geotextile containers filled with dredged material in a variety of projects (Fowler et al., 1995). These uses include dike construction (including perimeter and subdivision dikes in dredged material disposal areas), underwater stability berms, structural scour protection, and the containment of contaminated dredged material. Fowler et al. (1995) also provide an overview of design and construction considerations when using geotextile containers. Clausner et al. (1996) provide background information on geotextile fabrics and discuss the open water placement of geotextile containers.

The USACE has only limited experience with filling geotextile containers with fine-grained and/or contaminated dredged material. To prevent the dispersal of contaminants, the geotextile fabric must be designed to retain the particle size(s) of the dredged material to be placed within it. Limited testing with permeable and impermeable liners have shown that fine-grained dredged material can be retained within geotextile containers (however, additional research is needed; see Clausner et al., 1996). Colonization of the containers by plants and animals, with the potential for subsequent loss of container integrity and the dispersal of contaminants into the environment, must be considered when designing a project using geotextile containers.

(2) Potential Impacts/Regulatory Objectives: given that the dredged material has been dewatered and/or processed/stabilized/amended to meet the physical and engineering specifications required for a proposed structural or non-structural fill use, the Department's main concerns are (1) potential human exposure to contaminants in the dredged material, and (2) the dispersal of contaminants from the dredged material. In particular, the Department is concerned with the leaching of contaminants from the dredged material due to percolation and stormwater runoff. The Department will evaluate any proposed fill uses on a case-by-case basis consistent with the "Acceptable Use Determination Process" presented in Appendix E.

(3) Testing Requirements: exclusionary criteria for testing requirements are described in Section III-C. However, note that the processing/stabilization/amendment of dredged material through the addition of various substances has the potential to increase the bulk concentration of contaminants in the dredged material "product" compared to the "raw" dredged material. Thus, depending on the types of substances to be added, testing of the "product" may be required irrespective of the dredged material meeting any of the testing exclusions discussed in Section III-C (see Appendix E). Required testing will be determined by the Department on a case-by-case basis, but will usually consist of bulk chemical analysis of the dredged material and any processed/stabilized/amended "product", and an appropriate leaching test.

G - Landfill Cover

(1) Authority/Management Process: in recent years, the Department has received numerous requests for the utilization of residual materials as daily landfill cover throughout the state. Contaminated soils, shredder residue, sludge derived products and other materials have been authorized for daily cover application or in blends with other soil to produce a suitable product. Since landfill operators would otherwise have to purchase soil for cover, the acceptance of residual materials for approved applications has been considered an exempt activity pursuant to N.J.A.C. 7:26-1.1.

The Department's regulations at N.J.A.C. 7:26-2A.8-13 address landfill cover requirements. In general, three different classifications of cover are addressed - daily, intermediate and final cover. All exposed surfaces of solid waste must be covered at the close of each operating day with a minimum of 6 inches of daily cover. Areas outside the immediate landfill working face which will be exposed for any period exceeding 24 hours must contain at least 12 inches of intermediate cover. Finally, the federal government adopted amendments to the Resource Conservation and Recovery Act in 1993 at 40 CFR 258.60 which address landfill closure requirements. Under these rules, an infiltration layer of at least 18 inches of earthen material with a permeability less than or equal to the bottom liner and an erosion layer of at least 6 inches of earthen material capable of sustaining plant growth must be provided as part of a final landfill cover system.

The need for landfill cover across New Jersey is substantial. Currently, 25 landfills remain in operation in New Jersey. Fourteen of these facilities are large county-wide or regional landfills which utilize substantial quantities of daily and intermediate cover. The balance consists of 9 small sole source construction and demolition debris or company landfills, and 2 very small municipal landfills. In addition, the Department has identified a total of 578 sites which may require final closure and remediation.

From the sizable number of operating and closed landfills, and the State and federal regulatory requirements for daily, intermediate and final cover, it is clear that enormous quantities of earthen material will be needed. Dredged material or blends of dredged material and soils or residual materials may be suitable for these applications. However, such applications will have to be carefully evaluated, particularly from a structural perspective.

(2) Testing Requirements: The purpose of a good landfill cover is to (1) impede rodents and vectors from entering the waste fill, (2) control malodorous emissions, (3) provide a firebreak, (4) have limited erosion potential, (5) not be easily windblown, and (6) provide control of windblown litter. Given these purposes, the physical properties of dredged material (which tend to be low cohesion fine-grained material) must be evaluated to ascertain its suitability for use as cover material. For example, excessively fine-grained material is generally prohibited due to its susceptibility to wind blown dust, erosion, and potentially limiting hydraulic conductivity (preventing good drainage capability which consequently can cause leachate seeps on side slopes). The moisture content of the material must also be evaluated to ascertain its workability. If the moisture content is too high, then the material must be dewatered, which will require additional processing. The Department will evaluate the suitability of dredged material proposed for use as landfill cover on a case-by-case basis.

H - Agricultural Use

(1) Overview: an additional area in which dredged material may have potential use applications is for agricultural/horticultural purposes, particularly for non-food crop applications. As an example of this type of a use with a material similar to dredged material, New Jersey potable water treatment plant residuals have been approved by the Department for several uses. These include blending with other materials to create soil products for rehabilitating barren sites and as soil for nursery use as potting and field growing media. In some cases, the residuals also have qualified for use directly as clean fill on review by the Department on a case-by-case basis.

While the chemical and physical qualities of specific dredged material would have to be evaluated, it is likely that cleaner materials would also qualify for many types of similar agricultural/horticultural uses in New Jersey, and other states as well. For example, dredged material can contain high levels of plant nutrients (including nitrogen, phosphorous, and silicon) and thus could be used to amend marginal soils, resulting in increased crop production. However, salinity problems will occur with the use of dredged material from estuarine waters.

(2) Potential Impacts/Regulatory Objectives: the Department's main concerns with the use of dredged material for agricultural purposes are human exposure to, and the dispersal of contaminants from, the dredged material through runoff/leaching and uptake by plants. In addition, the level of contamination in the dredged material will effect its potential use in food and non-food crop applications. In general, dredged material proposed to be used for agricultural purposes will have to meet the Residential Direct Contact Soil Cleanup Criteria, or blended with suitable materials to meet these criteria.

(3) Testing Requirements: any dredged material proposed for use in agricultural operations must be subjected to bulk sediment chemistry analyses; the testing exclusions discussed in Section III-C are not applicable. In addition, if the dredged material is blended with other materials prior to its use, this "product" must also be subject to bulk chemical analysis. In addition, the Department may require an appropriate leaching test of the dredged material.

I - Capping Open Water Disposal Sites

(1) Overview: depending upon its degree of contamination, dredged material proposed for disposal at an Open Water Site (see Section IV-C) may only be acceptable for disposal if management techniques are used to isolate the contaminated dredged material from the surrounding environment. The principal method used to isolate contaminated dredged material placed at an Open Water Disposal Site is to cap it with a layer of clean material. Capping could be required as both an interim and final dredged material management method.

The use of suitable clean dredged material for capping purposes involves a number of engineering and design considerations beyond those associated solely with the open water disposal of dredged material. In addition, capping may be required for the disposal of contaminated dredged material. Thus, the Department considers capping to be a potential use of clean dredged material.

Capping may also be required at Subaqueous Disposal Pits (Section IV-E) and Containment Areas (Section IV-F) in which contaminated dredged material is disposed. The following discussion of Capping Open Water Disposal Sites is also generally applicable to these two dredged material management alternatives.

(2) Authority: capping may be required for contaminated dredged material placed at an Open Water Disposal Site, in a Subaqueous Disposal Pit, or in a Containment Area. The Department's authority to regulate dredged material disposal activities at these areas has been discussed in Sections IV-C, IV-E, and IV-F, respectively.

Disposal of dredged material in ocean waters (and thus any required capping of such material) is regulated by the USACE and USEPA. The State of New Jersey has discretionary authority to review disposal activities at ocean disposal sites pursuant to the Federal Coastal Zone Management Act. The review of proposed ocean disposal (and capping) operations at currently designated ocean disposal sites will be coordinated with the USACE and USEPA.

(3) Potential Impacts/Regulatory Objectives: the primary purpose of capping an Open Water Disposal Site is to isolate contaminated dredged material placed at the site from the surrounding environment. This will serve to minimize potential adverse impacts to the benthic and pelagic communities as a result of exposure to the contaminants.

It must be emphasized that the use of capping must be considered throughout the siting, development and implementation of the open water dredged material disposal alternative. This begins with the process used to select the disposal site. The USACE Waterways Experiment Station Dredging Research Technical Notes DRP-5-03 (Palermo, 1991a) and DRP-5-04 (Palermo, 1991b) provide discussions of design, engineering, and construction considerations for the capping of dredged material disposal sites. The USACE emphasizes that a capping project must be considered as an engineered structure, with specific design and construction requirements that must be implemented, monitored, and maintained.

Any cap placed on contaminated dredged material must be of a thickness to ensure the long-term isolation of the contaminants from the surrounding environment. The required thickness will be dependent on the following factors:

(a) the physical and chemical properties of the contaminated dredged material and the clean material to be used for capping;

(b) the potential for bioturbation by recolonizing benthic organisms to disturb the cap and expose the underlying contaminated dredged material;

(c) the potential for consolidation and erosion of the cap material, including consideration of hydrodynamic conditions at the site.

In general, a required final cap will be 3 to 4 feet thick, plus allowances for consolidation and erosion.

Interim capping, between disposal operations at Open Water Disposal Sites or in Subaqueous Pits, may also be required. The need for and thickness of an interim cap will be determined on a case-by-case basis. Factors that will be considered in making such a determination include the grain size of the last-placed dredged material, its degree of contamination, the anticipated schedule of future disposal operations at the site, and the physical conditions (particularly currents) at the disposal site.

Only clean material of suitable grain size, which would otherwise be acceptable for unrestricted open water disposal, can be used for capping purposes. Both fine grain and sandy material may be suitable for capping. However, in order to avoid mixing or displacing the contaminated dredged material during capping operations, the cap material should be applied in a manner that does not displace the underlying contaminated dredged material. In addition, the cap material should be of a grain size which will be resistant to erosion and thus stable over the long-term. The USACE Waterways Experiment Station Dredging Research Technical Note DRP-5-05 (Palermo, 1991c) discusses a variety of techniques which can be used to construct a cap.

When selecting material to be used for capping purposes, its suitability (particularly grain size) for recolonization by benthic organisms must be considered. The cap must be thick enough to ensure that recolonizing organisms cannot penetrate down to the underlying contaminated dredged material and that bioturbation will not expose the contaminated material. However, the cap may also serve to mitigate the original loss of habitat resulting from the disposal of the contaminated dredged material.

(4) Management Process: short- and long-term monitoring of capped Open Water Disposal Sites will be required to ensure that contaminated dredged material is isolated from the environment. Refer to the USACE Waterway Experiment Station Dredging Research Technical Note DRP-5-07 (Palermo et al., 1992) for general guidance on designing an appropriate monitoring program.

A precision bathymetric survey (accuracy to 6 inches or better) of the disposal site will be required prior to any interim or final capping operation. Immediately after the capping operation is completed, additional monitoring will be required to verify that a cap of the required thickness has been placed as intended. This would include a precision bathymetric survey and the collection of core samples. The placement of additional cap material will be required if the specified cap design parameters have not been met.

Long-term monitoring of the Open Water Disposal Site and its cap will be required to ensure that (1) the stability and required thickness of the cap is maintained, and (2) the cap is effective in isolating the contaminated dredged material. This will consist of precision bathymetric surveys, the collection of core samples and the chemical analysis of sediment and body burden analyses of benthic organisms in the disposal area. Appropriate management actions will be required to ensure that the contaminated dredged material is isolated from the environment. This will usually involve the placement of additional suitable cap material.

(5) Testing Requirements: only clean dredged material which will ensure the long-term isolation of the underlying contaminated dredged material is suitable for use in capping Open Water Disposal Sites. This involves a consideration of the physical and chemical characteristics of the capping material in relation to both the disposal site and the underlying contaminated dredged material. Such considerations must be evaluated as part of the process of selecting/siting the Open Water Disposal Site. Grain size analyses will be required to evaluate the potential long-term stability of the cap when subjected to the current and other erosive forces in the disposal area. The grain size data will also be used to ensure that the contaminated dredged material is not dispersed as a result of the capping operation. In addition, this information will be considered as part of the evaluation of the potential recolonization of the cap by benthic organisms.

Chemical analyses of the proposed capping material will also be required to ensure it is acceptable for unrestricted open water disposal. Refer to Section IV-C-(3)(d) for applicable testing requirements (note: any dredged material that meets the Testing Exclusion criteria listed in Section III-C does not need to undergo bulk sediment chemistry testing). This information, together with the chemical data for the underlying contaminated dredged material, will be used in the development of a monitoring program for the Open Water Disposal Site and its cap.

Given the interdependent and complex evaluations needed, the suitability of any material for use in the capping of an Open Water Disposal Site will be made on a case-by-case basis.

Dredged material proposed for capping at an ocean disposal site must be tested per the Green Book (USEPA and USACE, 1991) and regional implementation (USACE and USEPA, 1992) testing manuals, unless it meets the exclusionary criteria of the USEPA Ocean Dumping Regulations.

Chapter VI - References

Brandon, D.L., C.R. Lee, and J.W. Simmers 1996. "Update: Evaluating Ecosystem Development at Contaminated Dredged Material Placement Sites," Environmental Effects of Dredging Information Exchange Bulletin D-96-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, June 1996.

Brandon, D.L., C.R. Lee, and J.W. Simmers 1992. "Long-term Evaluation of Plants and Animals Colonizing Contaminated Estuarine Dredged Material Placed in Upland and Wetland Environments," Environmental Effects of Dredging Information Exchange Bulletin D-92-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, September 1992.

Brannon, J.M., T.E. Meyers, and B.A. Tardy 1994. "Leachate Testing and Evaluation of Freshwater Sediments," Miscellaneous Paper D-94-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, April 1994.

Clausner, J. M. Palermo, D. Banks, and J. Palmerton 1996. "Potential Application of Geosynthetic Fabric Containers for Open-water Placement of Contaminated Dredged Material", Environmental Effects of Dredging Technical Note EEDP-01-39, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS, March 1996.

Department of the Army - U.S. Army Corps of Engineers 1987. Beneficial Uses of Dredged Material, Engineer Manual EM 1110-2-5026, 30 June 1987.

Department of the Army - U.S. Army Corps of Engineers 1987. Confined Disposal of Dredged Material, Engineer Manual EM 1110-2-5027, September 1987.

Folk, R.L. 1980. Petrology of Sedimentary Rocks, Hemphall Publishing Co., Austin, Texas.

Fowler, J., C.J. Sprague, and D. Toups 1995. "Dredged Material-Filled Geotextile Containers", Environmental Effects of Dredging Technical Note EEDP-05-01, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS, May 1995.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder 1995. "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments," Environmental Management 19(1):81-97.

Myers, T.E. J.M. Brannon, B.A. Tardy, and D.M. Townsend 1996. "Leachate Testing and Evaluation for Estuarine Sediments", Technical Report D-96-1, U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS.

New Jersey Department of Environmental Protection and Energy 1992. "Field Sampling Procedures Manual".

Olin, T.J. and D.W. Bowman 1996. "Soil Washing Potential at Confined Disposal Facilities", Environmental Effects of Dredging Information Exchange Bulletin D-96-3, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, September 1996.

Palermo, M.R. 1985. "Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas - Test Procedures," Environmental Effects of Dredging Technical Note EEDP-04-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, June 1985.

Palermo, M.R. 1991a. "Design Requirements for Capping", Dredging Research Technical Note DRP-5-03, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, February 1991.

Palermo, M.R. 1991b. "Site Selection Considerations for Capping," Dredging Research Technical Note DRP-5-04, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, November 1991.

Palermo, M.R. 1991c. "Equipment and Placement Techniques for Capping," Dredging Research Technical Note DRP-5-05, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, November 1991.

Palermo, M.R., T. Fredette, and R.E. Randall 1992. "Monitoring Considerations for Capping," Dredging Research Technical Note DRP-5-07, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, June 1992.

Raymond, G.J. 1983. "Sediment Resuspension During Clamshell Dredging", Dredged Material Research D-83-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS, January 1983.

Schaefer, T.E. and P.R. Schroeder 1988. "Confined Disposal Guidance for Small Hydraulic Maintenance Dredging Projects - Design Procedures," Environmental Effects of Dredging Technical Note EEDP-02-8, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, December 1988.

U.S. Army Corps of Engineers 1994. Engineer Manual for Hydrographic Surveying, EM 1110-2-1003, 31 October 1994.

U.S. Army Corps of Engineers - New York District and Environmental Protection Agency - Region II 1992. Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal," Draft - 18 December 1992.

U.S. Army Corps of Engineers - Seattle District, U.S. Environmental Protection Agency - Region 10, Washington Department of Natural Resources, and Washington Department of Ecology 1997. Dredged Material Evaluation and Disposal Procedures: A Users Manual for the Puget Sound Dredged Disposal Analysis (PSSDA) Program, July 1, 1997.

U.S. Environmental Protection Agency. "Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring," OWRS QA-1, Office of Water Regulations and Standards.

U.S. Environmental Protection Agency. "Handbook - Stream Sampling for Waste Load Allocation Applications.

U.S. Environmental Protection Agency and Department of the Army - U.S. Army Corps of Engineers 1993. Evaluation of Dredged Material Proposed for Discharge in Inland and Near Coastal Waters Testing Manual (Draft), May 1993.

U.S. Environmental Protection Agency and Department of the Army - U.S. Army Corps of Engineers 1991. Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual, EPA-503/8-91/0001, February 1991.

Chapter VII - Glossary

ambient conditions: those physical, chemical, and biological conditions present in the immediate vicinity of the project site.

anadromous fish: marine or estuarine species of finfish that spawn in freshwater (CZM Rules Glossary); fish that migrate from oceanic to coastal waters, or from salt water to fresh water.

benthic: occurring or living on or in the bottom of a water body (CZM Rules Glossary); the bottom of a water body, with particular reference to sediments.

benthos: see **benthic**; the organisms living on the bottom of a water body.

best management practices (BMPs): methods and measures (or the prohibition of practices) employed to reduce the adverse environmental impacts resulting from a dredging or dredged material management/disposal activity.

bioaccumulation: the accumulation of contaminants in the tissues of organisms through any route, including respiration, ingestion, or direct contact with sediment or water; indicates the biological availability of contaminants.

bioassay (test): acute or sublethal/chronic toxicity or bioaccumulation tests using organisms representative of the water column, benthic, and terrestrial environment(s) at the dredging or dredged material disposal site.

borrow pit: a deep hole in a bay or near-shore area remaining after borrow material has been removed.

bulk (sediment) chemical analysis: the determination of the concentration of **target analytes** present in the whole sediments to be dredged.

clamshell dredge: a dredging bucket comprised of two hinged jaws; a boat or barge equipped with such a machine.

containment area: any site used for the permanent disposal or temporary confinement of dredged material, and which may or may not have a permanent retaining structure, located in an open water or wetland area directly adjacent to an upland area.

dewatering: the practice of actively or passively removing water from dredged material, usually occurring in a barge or upland confined disposal facility.

dioxin: commonly refers to polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), in particular 2,3,7,8-TCDD (tetrachlorodibenzo-p-dioxin).

dredged material: the sediments under a body of water removed during a dredging operation and displaced or removed to a disposal location.

dredging:

maintenance dredging: the removal of accumulated sediment from previously authorized navigation and access channels, marinas, lagoons, canals, or boat moorings, for the purpose of maintaining an authorized water depth and width for safe navigation (CZM Rules N.J.A.C. 7:7E-4.11[f]).

new dredging: the removal of sediment from the bottom of a water body that has not been previously dredged, for the purpose of increasing water depth, or the widening or deepening of navigable channels to a newly authorized depth or width (CZM Rules N.J.A.C. 7:7E-4.ll[g]).

effluent: a discharge of pollutants into the environment, whether untreated, partially treated, or completely treated (CZM Rules Glossary); particular reference to the quality of water coming over a weir from a dredged material upland confined disposal facility during and after a disposal operation.

elutriate (test): involves mixing dredged material with dredging-site water and allowing the mixture to settle - the potential release of dissolved chemical constituents from the dredged material is determined by chemical analysis of the supernatant (elutriate) remaining after undisturbed settling.

flocculents: substances which, when added to dredged material, result in the aggregation of finer particles into larger particles, thus enhancing the settling properties of the suspended particles and lowering the **Total Suspended Solids** in the dewatering effluent.

furans: see **dioxin**.

geotextile bag/container: tubes, bags, and other containers constructed of woven and non-woven water permeable synthetic fabrics which can be filled with dredged material.

heavy metals: metals which have proven to be hazardous to living organisms ingesting them in sufficient quantities; generally, cadmium, nickel, lead, zinc, copper, mercury, and chromium.

hopper dredge: self-propelled seagoing ships equipped with sediment containers (hoppers), dredge pumps, and other special equipment. Dredged material is raised by dredge pumps through drag arms in contact with the bay/ocean bottom and discharged into hoppers built in the vessel.

hydraulic conductivity: ratio of the velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium.

hydraulic dredging: use of suction equipment to remove a sediment/water slurry from the bay/ocean bottom.

hydrogeology: the study of those factors that deal with subsurface waters and related geologic aspects of subsurface waters.

impervious: impassable, applies to strata such as clays, shales, etc., which will not permit the penetration of water, petroleum, or natural gas.

leachate: a solution obtained by leaching, as in the downward penetration of water through soil or solid waste, and containing soluble substances.

lysimeter: a structure containing a mass of soil and so designed as to permit the measurement of water drainage through the soil.

mitigation: a measure or system of measures taken to lessen the adverse impacts of development (CZM Rules Glossary); the replacement or substitution of a habitat in repayment for habitat that has been degraded or destroyed.

modified elutriate test: used to predict the quality of dewatering effluent discharged from upland confined disposal facilities and similar operations; see **elutriate (test)**.

New Jersey Coastal Zone: the Coastal Area under the jurisdiction of the Coastal Area Facility Review Act (N.J.S.A. 13:19-4), all other areas now or formerly flowed by the tide, shorelands subject to the Waterfront Development Law, regulated wetlands listed at N.J.A.C. 7:7-2.2, and the Hackensack Meadowlands Development Commission District as defined by N.J.S.A. 13:17-4 (CZM Rules N.J.A.C. 7:7E-1.1[b]).

ocean: those waters of the open seas lying seaward of the baseline from which the territorial sea is measured.

ocean disposal: the practice of dredged material disposal via oceangoing barge into a designated disposal site in deep, open water, often miles from shore.

open water disposal: the practice of dredged material disposal anywhere into open water, exclusive of disposal into a subaqueous disposal pit or containment area.

permit(s): an authorization, license, or equivalent control document issued by the U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, or approved State agency to implement the requirements of an environmental regulation.

physiography: the physical geography of the general region/area in the vicinity of a project site; the study of the genesis and evolution of land forms.

pollutants: any gaseous, chemical, or organic waste (natural or man-made) that contaminates air, soil, sediment, or water, and has the potential for harm to human health, to any aspect of human or natural ecosystems, or to environmental aesthetics or vitality.

polychlorinated biphenyls (PCBs): nonflammable liquids formerly used in heat exchangers, electrical condensers, hydraulic and lubricating fluids, etc. with demonstrated chronic toxicity effects.

polynuclear aromatic hydrocarbons (PAHs): although present in some natural products (eg. crude oil), they are generally associated with the incomplete combustion of organic materials; some have demonstrated carcinogenic effects.

reprofiling: the levelling of sediments within a berth or reach, essentially removing small mounds on the bay bottom, by redistributing the sediments within the boundaries of the berth or reach.

sample compositing: mixing distinct samples, or sediment layers from distinct samples, (see **stratification**) collected in a berth or reach proposed to be dredged.

sample homogenizing: mixing an entire sediment core sample which is not stratified (see **stratification**).

sand: loose, granular particles of worn or disintegrated rock, finer than gravel, and coarser than dust; the fraction of dredged material whose grain size distribution is greater than 0.0625 mm, and less than 2.00 mm.

sidecasting: the pumping of dredged material and the discharge of the material to the side of the dredge, out of the channel or berth area.

stratification (of sediments): the formation of distinct layers of sediments having the same general composition (grain size, quality), arranged one on top of another.

target analyte/compound: a hazardous substance, hazardous waste, or pollutant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively (N.J.A.C. 7:26E-1.8).

terrestrial ecosystem: of, pertaining to, or composed of land as distinct from air or water.

total suspended solids (TSS): the mass per unit volume (usually expressed in units of milligrams per liter - mg/L) of solid material obtained by filtering a known volume of liquid.

toxic/toxicity: a condition or substance that is harmful, destructive, poisonous, or deadly; the limit of intolerance of organisms to survive lethal chronic or short-term (acute) subjection to certain chemical and contaminating substances, or physical and environmental conditions.

upland confined disposal facility: a disposal site/structure located above the mean high tide level built to hold dredged material in a confined condition. Upland CDFs are usually built to permanently hold contaminated sediments, but this term also refers to those facilities which will only contain dredged material for dewatering purposes prior to some future beneficial use or decontamination management alternative.

APPENDIX A - SAMPLING METHODOLOGY AND SAMPLING REQUIREMENTS

I. Sampling Methodology:

The sampling methodology described below has been drawn from Section 8.2.6 of the "Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual," February 1991, U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (USACE)(EPA-503/8-91/001); the USEPA and the USACE "QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations," (EPA 823-B-95-001, April 1995); and the "Field Sampling Procedures Manual," New Jersey Department of Environmental Protection and Energy, May 1992.

The data reports submitted to the Department for testing and analysis of material proposed for dredging must include descriptions of the procedures used for sample handling, preservation, and storage. These procedures must conform to the following guidance:

(a) Sediment sampling:

The recommended storage and preservation procedures for sediment samples are summarized in Attachment 1 of this appendix. The specified holding times must be adhered to or the proposed alterations to the specified holding time approved by the Department prior to analysis.

Sediment samples are subject to chemical, biological, and physical changes as soon as they are collected. Therefore, the handling, preservation, and storage techniques should minimize any changes in sample composition by retarding chemical and/or biological activity and by avoiding extraneous contamination.

A coring device should be used for sediment sample collection, in conjunction with inert plastic liners which are not to be reused. The barrel of the coring device must be rinsed between each coring; the use of site water for rinsing is acceptable. Cross-contamination of collected sediment and water samples via personnel must also be avoided.

Generally, samples to be analyzed for metals should not come into contact with metal sampling equipment, and samples to be analyzed for organic compounds should not come into contact with plastics. All sample containers should be appropriately cleaned: acid-rinsed (10% nitric acid) for metal analysis, and solvent-rinsed (acetone is preferred; however, other approved solvents such as methanol and hexane can be used as well) for organic analysis. When equipment will be used to take samples for both metal and organic compound analysis, the acid rinse must be conducted first, and the solvent rinse second.

Samples should completely fill the storage container, leaving no head space, except for expansion volume needed for potential freezing. Since the first few hours after collection are the most critical for potential changes to the sediment, preservation should begin immediately after collection onboard the collecting vessel. This would include refrigeration or freezing with dry ice. The elapsed time between sample collection and analysis must be as short as possible, and not exceed the recommended holding times listed in Attachment 1.

(b) Water sampling:

The recommended storage and preservation procedures for water samples are summarized in Attachment 1. The specified holding times by analyte group for water samples must be adhered to, or any proposed alteration of the specified holding time approved by the Department prior to analysis.

Water samples are subject to chemical, biological, and physical changes as soon as they are collected. Therefore, the handling, preservation, and storage techniques should minimize any changes in sample composition by retarding chemical and/or biological activity and by avoiding extraneous contamination.

Water samples should be collected with either a non-contaminating pump (peristaltic or magnetically coupled impeller design pump) or a discrete water sampler. The pump system should be flushed with 10 times the volume of the collection tubing using site water. The discrete water sampler should be made of stainless steel or acrylic plastic and be of the closed /opened/closed type. Seals should be Teflon-coated. All water sampling devices should be acid-rinsed (10% nitric acid) for metal analysis, and solvent-rinsed (acetone is preferred; however, other approved solvents such as methanol and hexane can be used as well) for organic analysis. When equipment will be used to take samples for both metal and organic compound analysis, the acid rinse must be conducted first, and the solvent rinse second.

II. Sampling Requirements:

Attachment 1 of APPENDIX B lists the inorganic and organic compounds for which sampling may be required under normal circumstances. See APPENDIX B for further details on the origins of this list.

Attachment 2 contains the applicable Ground Water Criteria, Direct Contact Soil Cleanup Criteria, and Surface Water Criteria.

The Direct Contact Soil Cleanup Criteria (DCSCC) consists of two subsets of values. One set is the Unrestricted or Residential DCSCC while the other is the Restricted or Non-Residential DCSCC. The Unrestricted or Residential DCSCC is intended to reflect a residential exposure scenario and also determines the concentration at which the Department requires a Declaration of Environmental Restriction (DER). The Restricted or Non-residential DCSCC reflects an industrial or occupational exposure scenario. It is also the concentration where institutional controls such as a DER are supplemented with engineering controls in order to be protective.

Note that the presented table of New Jersey surface water criteria apply to all New Jersey waters, except the Delaware River. For the Delaware River, the Delaware River Basin Commission surface water criteria must considered as well as the New Jersey and federal criteria. The most stringent of those three sets of values applies to the main stem of the Delaware River.

All the criteria are current as of August 1997; however, these criteria are subject to modification and the user is cautioned to verify that the criteria values shown in Attachment 2 are applicable at the time of the proposed work.

Attachment 1

SUMMARY OF RECOMMENDED PROCEDURES FOR SAMPLE COLLECTION, PRESERVATION, AND STORAGE

Analyses	Collection Method[a]	Sample Volume[b]	Container[c]	Preservation Technique	Storage Conditions	Holding Times[d]
Sediment						
Chemical/Physical Analyses						
Metals	Grab/corer	100 g	Precleaned polyethylene jar[e]	Dry ice[e] or freezer storage for extended storages; otherwise refrigerate	≤ 4°C	Hg - 28 days Others - 6 months[f]
Organic compounds (e.g., PCBs, pesticides, polycyclic aromatic hydrocarbons)	Grab/corer	250 g	Solvent-rinsed glass jar with Teflon® lid[e]	Dry ice[e] or freezer storage for extended storage; otherwise refrigerate	≤ 4°C[e]/dark[f]	14 days[g]
Particle size	Grab/corer	100 g	Whirl-pac bag[e]	Refrigerate	< 4°C	Undetermined
Total organic carbon	Grab/corer	50 g	Heat treated glass vial with Teflon®-lined lid[e]	Dry ice[e] or freezer storage for extended storages; otherwise refrigerate	≤ 4°C[e]	14 days
Total solids/specific gravity	Grab/corer	50 g	Whirl-pac bag	Refrigerate	< 4°C	Undetermined
Miscellaneous	Grab/corer	≥ 50 g	Whirl-pac bag	Refrigerate	< 4°C	Undetermined
Sediment from which elutriate is prepared	Grab/corer	Depends on tests being performed	Glass with Teflon®-lined lid	Completely fill and refrigerate	4°C/dark/airtight	14 days
Biological Tests						
Dredged material	Grab/corer	12–15 L per sample	Plastic bag or container[h]	Completely fill and refrigerate; sieve	4°C/dark/airtight	14 days[i]
Reference sediment	Grab/corer	45–50 L per test	Plastic bag or container[h]	Completely fill and refrigerate; sieve	4°C/dark/airtight	14 days[i]
Control sediment	Grab/corer	21–25 L per test	Plastic bag or container[h]	Completely fill and refrigerate; sieve	4°C/dark/airtight	14 days[i]

Analyses	Collection Method[a]	Sample Volume[b]	Container[c]	Preservation Technique	Storage Conditions	Holding Times[d]
Water and Elutriate						
Chemical/Physical Analyses						
Particulate analysis	Discrete sampler or pump	500–2,000 mL	Plastic or glass	Lugols solution and refrigerate	4°C	Undetermined
Metals	Discrete sampler or pump	1 L	Acid-rinsed polyethylene or glass jar[j]	pH < 2 with HNO_3; refrigerate[j]	4°C 2°C[j]	Hg - 14 days Others - 6 months[k]
Total Kjeldahl nitrogen	Discrete sampler or pump	100–200 mL	Plastic or glass[k]	H_2SO_4 to pH < 2; refrigerate	4°C[k]	24 h[k]
Chemical oxygen demand	Discrete sampler or pump	200 mL	Plastic or glass[k]	H_2SO_4 to pH < 2; refrigerate	4°C[k]	7 days[k]
Total organic carbon	Discrete sampler or pump	100 mL	Plastic or glass[k]	H_2SO_4 to pH < 2; refrigerate	4°C[k]	<48 hours[k]
Total inorganic carbon	Discrete sampler or pump	100 mL	Plastic or glass[k]	Airtight seal; refrigerate[k]	4°C[k]	6 months[k]
Phenolic compounds	Discrete sampler or pump	1 L	Glass[k]	0.1–1.0 g $CuSO_4$; H_2SO_4 to pH < 2; refrigerate	4°C[k]	24 hours[k]
Soluble reactive phosphates	Discrete sampler or pump	--	Plastic or glass[k]	Filter; refrigerate[k]	4°C[k]	24 hours[k]
Extractable organic compounds (e.g., semivolatile compounds)	Discrete sampler or pump	4 L	Amber glass bottle[j]	pH < 2, 6N HCl; airtight seal; refrigerate	4°C[j]	7 days for extraction; 40 days for sample extract analyses[j]
Volatile organic compounds	Discrete sampler or pump	80 mL	Glass vial[j]	pH < 2 with 1:1 HCL; refrigerate in airtight, completely filled container[j]	4°C[j]	14 days for sample analysis, if preserved[j]
Total phosphorus	Discrete sampler or pump	--	Plastic or glass[h]	H_2SO_4 to pH < 2; refrigerate	4°C[k]	7 days[k]

Analyses	Collection Method[a]	Sample Volume[b]	Container[c]	Preservation Technique	Storage Conditions	Holding Times[d]
Total solids	Discrete sampler or pump	200 mL	Plastic or glass[k]	Refrigerate	4°C[k]	7 days[k]
Volatile solids	Discrete sampler or pump	200 mL	Plastic or glass[k]	Refrigerate	4°C[k]	7 days[k]
Sulfides	Discrete sampler or pump	--	Plastic or glass[k]	pH > 9 NaOH (ZnAc); refrigerate[k]	4°C[k]	24 hours[k]
Biological Tests						
Site water	Grab	Depends on tests being performed	Plastic carboy	Refrigerate	< 4°C	14 days
Dilution water	Grab or makeup	Depends on tests being performed	Plastic carboy	Refrigerate	< 4°C	14 days
Tissue						
Metals	Trawl/Teflon®-coated grab	5–10 g	Double Ziploc®[e]	Handle with non-metallic forceps; plastic gloves; dry ice[e]	≤ –20°C[e] or freezer storage	Hg - 28 days Others - 6 months[m]
PCBs and chlorinated pesticides	Trawl/Teflon®-coated grab	10–25 g	Hexane-rinsed double aluminum foil and double Ziploc®[e]	Handle with hexane-rinsed stainless steel forceps; dry ice[e]	≤ –20°C[e] or freezer storage	14 days[g]
Volatile organic compounds	Trawl/Teflon®-coated grab	10–25 g	Heat-cleaned aluminum foil and watertight plastic bag[l]	Covered ice chest[f]	≤ –20°C[m] or freezer storage	14 days[m]
Semivolatile organic compounds	Trawl/Teflon®-coated grab	10–25 g	Hexane-rinsed double aluminum foil and double Ziploc®[e]	Handle with hexane-rinsed stainless steel forceps; dry ice[e]	≤ –20°C[e] or freezer storage	14 days[g]
Lipids	Trawl/Teflon®-coated grab	Part of organic analyses	Hexane-rinsed aluminum foil	Handle with hexane-rinsed stainless steel forceps; quick freeze	≤ –20°C or freezer storage	14 days[g]

Note: This table contains only a summary of collection, preservation, and storage procedures for samples. The cited references should be consulted for a more detailed description of these procedures.

PCB - polychlorinated biphenyl

[a] Collection method should include appropriate liners.

[b] Amount of sample required by the laboratory to perform the analysis (wet weight or volume provided, as appropriate). Miscellaneous sample size for sediment should be increased if auxiliary analytes that cannot be included as part of the organic or metal analyses are added to the list. The amounts shown are not intended as firm values; more or less tissue may be required depending on the analytes, matrices, detection limits, and particular analytical laboratory.

[c] All containers should be certified as clean according to U.S. EPA (1990c).

[d] These holding times are for sediment, water, and tissue based on guidance that is sometimes administrative rather than technical in nature. There are no promulgated, scientifically based holding time criteria for sediments, tissues, or elutriates. References should be consulted if holding times for sample extracts are desired. Holding times are from the time of sample collection.

[e] NOAA (1989).

[f] Tetra Tech (1986a).

[g] Sample may be held for up to 1 year if ≤ −20°C.

[h] Polypropylene should be used if phthalate bioaccumulation is of concern.

[i] Two weeks is recommended; sediments must not be held for longer than 8 weeks prior to biological testing.

[j] U.S. EPA (1987a); 40 CFR Part 136, Table III.

[k] Plumb (1981).

[l] If samples are not preserved to pH < 2, then aromatic compounds must be analyzed within 7 days.

[m] Tetra Tech (1986b).

Excerpted from pp. 54-57 of the USEPA "QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations", Office of Water (EPA 823-B-95-0001, April 1995).

Attachment 2:

A. Ground Water Criteria or Standards

B. Soil Cleanup Criteria

C. Surface Water Criteria for all areas except the Delaware River

TARGET ANALYTE LIST				
APPLICABLE STANDARDS				
Compound	Criteria	Criteria	Criteria	
Volatiles		Residential	non-Residential	
	GWQS (ug/L)	SCC(mg/Kg)	SCC(mg/Kg)	
Chloromethane	30	520	1000	
Bromomethane	10	79	1000	
Vinyl Chloride	5	2	7	
Chloroethane	NA	NA	NA	
Methylene Chloride	3	49	210	
Acetone	700	1000	1000	
Carbon Disulfide	NA	NA	NA	
1,1-Dichloroethene	2	8	150	
1,1-Dichloroethane	50	570	1000	
1,2-Dichloroethene (total)--->				
cis-1,2-Dichloroethene	70	79	1000	
trans-1,2-Dichloroethene	100	1000	1000	
Chloroform	6	19	28	
1,2-Dichloroethane	2	6	24	
2-Butanone(MEK)	300	1000	1000	
1,1,1-Trichloroethane	30	210	1000	
Carbon Tetrachloride	2	2	4	
Bromodichloromethane	1	11	46	
1,2-Dichloropropane	1	10	43	
cis-1,3-Dichloropropene	*	**	***	
Trichloroethene	1	23	54	
Dibromochloromethane	10	110	1000	
1,1,2-Trichloroethane	3	22	420	
Benzene	1	3	13	
trans-1,3-Dichloropropene	*	**	***	
Bromoform	4	86	370	
4-Methyl-2-pentanone(MIBK)	400	1000	1000	
2-Hexanone	NA	NA	NA	
Tetrachloroethene	1	4	6	
1,1,2,2-Tetrachloroethane	1	34	70	
Toluene	1000	1000	1000	
Chlorobenzene	50	37	680	
Ethylbenzene	700	1000	1000	
Styrene	100	23	97	
Xylenes(total)	1000	410	1000	
	* = combined 1,3-Dichloropropenes = 0.2			
	** = combined 1,3-Dichloropropene = 4.0			
		*** = combined 1,3-Dichloropropenes = 5.0		
Semivolatiles				
Phenol	4000	10,000	10,000	
bis-(2-Chloroethyl)ether	10	0.66	3	
2-Chlorophenol	40	280	5200	
1,3-Dichlorobenzene	600	5100	10,000	
1,4-Dichlorobenzene	75	570	10,000	

Compound	Criteria	Criteria	Criteria	
Semivolatiles (continued)		Residential	non-Residential	
	GWQS (ug/L)	SCC(mg/Kg)	SCC(mg/Kg)	
1,2-Dichlorobenzene	600	5100	10,000	
2-Methylphenol	NA	2800	10,000	
2,2'-oxybis(1-Chloropropane)	300	2300	10,000	
4-Methylphenol	NA	2800	10,000	
N-Nitroso-di-n-propylamine	20	0.66	0.66	
Hexachloroethane	10	6	100	
Nitrobenzene	10	28	520	
Isophorone	100	1100	10,000	
2-Nitrophenol	NA	NA	NA	
2,4-Dimethylphenol	100	1100	10,000	
bis(2-Chloroethoxy)methane	NA	NA	NA	
2,4-Dichlorophenol	20	170	3100	
1,2,4-Trichlorobenzene	9	68	1200	
Naphthalene	300	230	4200	
4-Chloroaniline	NA	230	4200	
Hexachlorobutadiene	1	1	21	
4-Chloro-3-methylphenol	NA	10,000	10,000	
2-Methylnaphthalene	NA	NA	NA	
Hexachlorocylcopentadiene	50	400	7300	
2,4,6-Trichlorophenol	20	62	270	
2,4,5-Trichlorophenol	700	5600	10,000	
2-Chloronaphthalene	NA	NA	NA	
2-Nitroaniline	NA	NA	NA	
Dimethylphthalate	NA	10,000	10,000	
Acenaphthylene	NA	NA	NA	
2,6-Dinitrotoluene	10	*	**	
3-Nitroaniline	NA	NA	NA	
Acenaphthene	400	3400	10,000	
2,4-Dinitrophenol	40	110	2100	
4-Nitrophenol	NA	NA	NA	
Dibenzofuran	NA	NA	NA	
2,4-Dinitrotoluene	10	*	**	
Diethylphthalate	5000	10,000	10,000	
4-Chlorophenyl-phenyl ether	NA	NA	NA	
Fluorene	300	2300	10,000	
4-Nitroaniline	NA	NA	NA	
4,6-Dinitro-2-methylphenol	NA	NA	NA	
N-Nitroso-diphenylamine	20	140	600	
4-Bromophenyl-phenylether	NA	NA	NA	
Hexachlorobenzene	10	0.66	2	
Pentachlorophenol	1	6	24	
Phenanthrene	NA	NA	NA	
Anthracene	2000	10,000	10,000	
Carbazole	NA	NA	NA	
Di-n-butylphthalate	900	5700	10,000	
Fluoranthene	300	2300	10,000	
Pyrene	200	1700	10,000	
Butylbenzylphthalate	100	1100	10,000	

Compound	Criteria	Criteria	Criteria	
Semivolatiles (continued)		Residential	non-Residential	
	GWQS (ug/L)	SCC(mg/Kg)	SCC(mg/Kg)	
3,3'-Dichlorobenzidine	60	2	6	
Benzo(a)anthracene	NA	0.9	4	
Chrysene	NA	9	40	
bis(2-Ethylhexyl)phthalate	30	49	210	
Di-n-octlyphthalate	100	1100	10,000	
Benzo(b)fluoranthene	NA	0.9	4	
Benzo(k)fluoranthene	NA	0.9	4	
Benzo(a)pyrene	NA	0.66	0.66	
Indeno(1,2,3-cd)pyrene	NA	0.9	4	
Dibenzo(a,h)anthracene	NA	0.66	0.66	
Benzo(g,h,i)perylene	NA	NA	NA	
	* = combined Dinitrotoluene = 1.0			
	** = combined Dinitrotroluene = 4.0			
Pesticides/Aroclors				
alpha-BHC	0.02	NA	NA	
beta-BHC	0.2	NA	NA	
delta-BHC	NA	NA	NA	
gamma-BHC (Lindane)	0.2	0.52	2.2	
Heptachlor	0.4	0.15	0.65	
Aldrin	0.04	0.04	0.17	
Heptachlor epoxide	0.2	NA	NA	
Endosulfan I	0.4	***	*****	
Dieldrin	0.03	0.042	0.18	
4,4'-DDE	0.1	2	9	
Endrin	2	17	310	
Endosulfan II	0.4	***	*****	
4,4'-DDD	0.1	3	12	
Endosulfan sulfate	0.4	NA	NA	
4,4'-DDT	0.1	2	9	
Methoxychlor	40	280	5200	
Endrin ketone	NA	NA	NA	
Endrin aldehyde	NA	NA	NA	
alpha-Chlordane	*	NA	NA	
gamma-Chlordane	*	NA	NA	
Toxaphene	3	0.1	0.2	
Aroclor-1016	**	****	******	
Aroclor-1221	**	****	******	
Aroclor-1232	**	****	******	
Aroclor-1242	**	****	******	

Compound	Criteria	Criteria	Criteria	
Pesticides/Aroclors (continued)		Residential	non-Residential	
	GWQS (ug/L)	SCC(mg/Kg)	SCC(mg/Kg)	
Aroclor-1248	**	****	******	
Aroclor-1254	**	****	******	
Aroclor-1260	**	****	******	
	* = combined Chlordanes = 0.5			
	** = combined Aroclors = 0.5			
	*** = combined Endosulfans = 340			
	**** = combined Aroclors = 0.49			
		***** = combined Endosulfans = 6200		
		****** = combined Aroclors = 2.0		
Inorganics				
Aluminum	200	NA	NA	
Antimony	20	14	340	
Arsenic	8	20	20	
Barium	2000	700	47,000	
Beryllium	20	1	1	
Cadmium	4	1	100	
Calcium	NA	NA	NA	
Chromium	100	NA	NA	
Cobalt	NA	NA	NA	
Copper	1000	600	600	
Iron	300	NA	NA	
Lead	10	400	600	
Magnesium	NA	NA	NA	
Manganese	50	NA	NA	
Mercury	2	14	270	
Nickel	100	250	2400	
Potassium	NA	NA	NA	
Selenium	50	63	3100	
Silver	NA	110	4100	
Sodium	50,000	NA	NA	
Thallium	10	2	2	
Vanadium	NA	370	7100	
Zinc	5000	1500	1500	
Cyanide	200	1100	21,000	

State of New Jersey
Department of Environmental Protection
Office of Environmental Planning
CN418, Trenton, NJ 08625

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

TO: Distribution List

FROM: Shing-Fu Hsueh, Ph.D., P.E., P.P., Chief
Standards, Assessment & Modelling Unit
Office of Environmental Planning

SUBJECT: Surface Water Quality Standards
Criteria Currently Applicable to New Jersey Surface Waters

DATE: January 30, 1997

Attached is a table, Surface Water Quality Criteria Applicable To New Jersey, which lists criteria currently applicable to New Jersey surface waters for toxic pollutants. The criteria reflect the more stringent of the New Jersey adopted criteria (25 N.J.R. 5569, December 6, 1993 and 28 N.J.R. 3782, August 5, 1996) and the USEPA adopted criteria (Fed. Reg. Vol. 57, No. 246-60848, December 22, 1992, Fed. Reg. Vol. 60, No. 86-22228, May 4, 1995, and Fed. Reg. Vol. 60, No. 164-44120, August 24, 1995). The Office of Environmental Planning is providing this revised table of applicable criteria to reflect the adoption of aquatic copper criteria for New York/New Jersey Harbor Complex. Revised tables will be issued as needed to reflect future criteria adoptions either by the USEPA or the DEP.

For criteria for pollutants other than toxics please refer to N.J.A.C. 7:9B or you may contact the Surface Water Quality Standards program within the Standards, Assessment and Modelling Unit, Office of Environmental Planning, at the number referenced below.

If you have any other questions regarding SWQS or need copies of SWQS, please call (609) 633-7020.

Attachment

SURFACE WATER QUALITY CRITERIA APPLICABLE TO NEW JERSEY

(µg/L unless otherwise noted)

Toxic Substance	Freshwater Criteria			Saltwater Criteria		
	Aquatic		Human Health	Aquatic		Human Health
	Acute	Chronic		Acute	Chronic	
Acrolein			320(h)$_{NJ}$			780(h)$_{NJ}$
Acrylonitrile			0.059(hc)$_{EPA}$			0.66(hc)$_{EPA}$
Aldrin	3.0$_{NJ}$		0.00013(hc)$_{EPA}$	1.3$_{NJ}$		0.00014(hc)$_{EPA}$
Ammonia, un-ionized (24-hr. average)		20♦$_{NJ}$ 50♦♦$_{NJ}$			0.1 (LC_{50} or EC_{50})$_{NJ}$	
Anthracene			9,570(h)$_{NJ}$			108,000(h)$_{NJ}$
Antimony			12.2(h)$_{4NJ}$			4,300(h)$_{4NJ}$
Arsenic	360(d)$_{OEPA}$	190(d)$_{OEPA}$	0.0170(hc)$_{4NJ}$	69(d)$_{OEPA}$	36(d)$_{OEPA}$	0.136(hc)$_{4NJ}$
Asbestos			7 million fibers/L(h)$_{NJ}$			
Barium			2,000(h)$_{4NJ}$			
Benz(a)anthracene			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
Benzene			0.150(hc)$_{NJ}$			71(hc)$_{NJ}$
Benzidine			0.000118(hc)$_{NJ}$			0.000535(hc)$_{NJ}$
3,4-Benzofluoranthene (Benzo(b)fluoranthene)			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
Benzo(a)pyrene (BaP)			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
Benzo(k)fluoranthene			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
alpha-BHC (alpha-HCH)			0.0039(hc)$_{EPA}$			0.013(hc)$_{EPA}$
beta-BHC (beta-HCH)			0.137(hc)$_{NJ}$			0.460(hc)$_{NJ}$
gamma-BHC (gamma-HCH/Lindane)	2.0$_{NJ}$	0.080$_{NJ}$	0.19(hc)$_{EPA}$	0.16$_{NJ}$		0.63(hc)$_{EPA}$
Bis(2-chloroethyl) ether			0.031(hc)$_{EPA}$			1.4(hc)$_{NJ}$
Bis(2-chloroisopropyl) ether			1,250(h)$_{NJ}$			170,000(h)$_{NJ}$
Bis(2-ethylhexyl) phthalate			1.76(hc)$_{NJ}$			5.92(hc)$_{NJ}$
Bromodichloromethane (Dichlorobromomethane)			0.266(hc)$_{NJ}$			22(hc)$_{NJ}$
Bromoform			4.3(hc)$_{EPA}$			360(hc)$_{NJ}$
Butyl benzyl phthalate			239(h)$_{NJ}$			416(h)$_{NJ}$
Cadmium	3.7(a)$_{OEPA}$	1.0(a)$_{OEPA}$	10(h)$_{4NJ}$	42(d)$_{OEPA}$	9.3(d)$_{OEPA}$	
Carbon tetrachloride			0.25(hc)$_{EPA}$			4.4(hc)$_{EPA}$
Chlordane	2.4$_{NJ}$	0.0043$_{NJ}$	0.000277(hc)$_{NJ}$	0.09$_{NJ}$	0.0040$_{NJ}$	0.000283(hc)$_{NJ}$
Chloride	860,000$_{NJ}$	230,000$_{NJ}$	250,000(ol)$_{NJ}$			
Chlorine Produced Oxidants	19$_{NJ}$	11$_{NJ}$		13$_{NJ}$	7.5$_{NJ}$	

SURFACE WATER QUALITY CRITERIA APPLICABLE TO NEW JERSEY

(µg/L unless otherwise noted)

Toxic Substance	Freshwater Criteria			Saltwater Criteria		
	Aquatic		Human Health	Aquatic		Human Health
	Acute	Chronic		Acute	Chronic	
Chlorobenzene			22.0(h)$_{NJ}$			21,000(h)$_{NJ}$
Chloroform			5.67(hc)$_{NJ}$			470(hc)$_{NJ}$
2-Chlorophenol			122(h)$_{NJ}$			402(h)$_{NJ}$
Chlorpyrifos	0.083$_{NJ}$	0.041$_{NJ}$		0.011$_{NJ}$	0.0056$_{NJ}$	
Chromium			160(h)$_{4-NJ}$			3,230(h)$_{4-NJ}$
Chromium^{+3}	550(a)$_{EPA}$	180(a)$_{EPA}$				
Chromium^{+6}	15(d)$_{EPA}$	10(d)$_{EPA}$		1,100(d)$_{EPA}$	50(d)$_{EPA}$	
Chrysene			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
Copper	17(a)$_{EPA}$	11(a)$_{EPA}$		2.4(d)$_{EPA}$ 7.9$_{\blacktriangledown NJ}$	2.4(d)$_{EPA}$ 5.6$_{\blacktriangledown NJ}$	
Cyanide	22$_{NJ}$	5.2$_{NJ}$	700(h)$_{EPA}$	1.0$_{NJ}$	1.0$_{NJ}$	220,000(h)$_{NJ}$
4,4'-DDD (p,p'-TDE)			0.00083(hc)$_{EPA}$			0.000837(hc)$_{NJ}$
4,4'-DDE			0.000588(hc)$_{NJ}$			0.00059(hc)$_{EPA}$
4,4'-DDT	1.1$_{NJ}$	0.0010$_{NJ}$	0.000588(hc)$_{NJ}$	0.13$_{NJ}$	0.0010$_{NJ}$	0.00059(hc)$_{EPA}$
Demeton		0.1$_{NJ}$			0.1$_{NJ}$	
Dibenz(a,h)anthracene			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
Dibromochloromethane (Chlorodibromomethane)			72.6(h)$_{NJ}$ 4.1(hc)$_{EPA}$			340(hc)$_{EPA}$
Di-n-butyl phthalate			2,700(h)$_{EPA}$			12,000(h)$_{EPA}$
1,2-Dichlorobenzene			2,520(h)$_{NJ}$			16,500(h)$_{NJ}$
1,3-Dichlorobenzene			400(h)$_{EPA}$			2,600(h)$_{EPA}$
1,4-Dichlorobenzene			343(h)$_{NJ}$			2,600(h)$_{EPA}$
3,3'-Dichlorobenzidine			0.0386(hc)$_{NJ}$			0.0767(hc)$_{NJ}$
1,2-Dichloroethane			0.291(hc)$_{NJ}$			99(hc)$_{NJ}$
1,1-Dichloroethylene			4.81(h)$_{NJ}$ 0.57(hc)$_{EPA}$			32(hc)$_{EPA}$
trans-1,2-Dichloroethylene			592(h)$_{NJ}$			
2,4-Dichlorophenol			92.7(h)$_{NJ}$			790(h)$_{EPA}$
1,3-Dichloropropene (cis and trans)			0.193(hc)$_{NJ}$ 10(h)$_{EPA}$			1,700(h)$_{NJ}$
Dieldrin	2.5$_{NJ}$	0.0019$_{NJ}$	0.000135(hc)$_{NJ}$	0.71$_{NJ}$	0.0019$_{NJ}$	0.00014(hc)$_{EPA}$
Diethyl phthalate			21,200(h)$_{NJ}$			111,000(h)$_{NJ}$
Dimethyl phthalate			313,000(h)$_{NJ}$			2,900,000(h)$_{NJ}$

SURFACE WATER QUALITY CRITERIA APPLICABLE TO NEW JERSEY

(µg/L unless otherwise noted)

Toxic Substance	Freshwater Criteria			Saltwater Criteria		
	Aquatic		Human Health	Aquatic		Human Health
	Acute	Chronic		Acute	Chronic	
4,6-Dinitro-o-cresol			13.4(h)$_{NJ}$			765(h)$_{NJ}$
2,4-Dinitrophenol			69.7(h)$_{NJ}$			14,000(h)$_{NJ}$
2,4-Dinitrotoluene			0.11(hc)$_{NJ}$			9.1(hc)$_{NJ}$
1,2-Diphenylhydrazine			0.040(hc)$_{EPA}$			0.54(hc)$_{EPA}$
Endosulfans (alpha and beta)	0.22$_{NJ}$	0.056$_{NJ}$	0.932(h)$_{NJ}$	0.034$_{NJ}$	0.0087$_{NJ}$	1.99(h)$_{NJ}$
alpha-Endosulfan			0.93(h)$_{EPA}$			
beta-Endosulfan			0.93(h)$_{EPA}$			
Endosulfan sulfate			0.93(h)$_{NJ}$			2.0(h)$_{NJ}$
Endrin	0.18$_{NJ}$	0.0023$_{NJ}$	0.629(h)$_{NJ}$	0.037$_{NJ}$	0.0023$_{NJ}$	0.678(h)$_{NJ}$
Endrin aldehyde			0.76(h)$_{NJ}$			0.81(h)$_{NJ}$
Ethylbenzene			3,030(h)$_{NJ}$			27,900(h)$_{NJ}$
Fluoranthene			300(h)$_{EPA}$			370(h)$_{EPA}$
Fluorene			1,300(h)$_{EPA}$			14,000(h)$_{EPA}$
Guthion		0.01$_{NJ}$			0.01$_{NJ}$	
Heptachlor	0.52$_{NJ}$	0.0038$_{NJ}$	0.000208(hc)$_{NJ}$	0.053$_{NJ}$	0.0036$_{NJ}$	0.00021(hc)$_{EPA}$
Heptachlor epoxide	0.52$_{NJ}$	0.0038$_{NJ}$	0.00010(hc)$_{EPA}$	0.053$_{NJ}$	0.0036$_{NJ}$	0.000106(hc)$_{NJ}$
Hexachlorobenzene			0.000748(hc)$_{NJ}$			0.00077(hc)$_{EPA}$
Hexachlorobutadiene			6.94(h)$_{NJ}$ 4.4(hc)$_{EPA}$			500(hc)$_{EPA}$
Hexachlorocyclopentadiene			240(h)$_{EPA}$			17,000(h)$_{NJ}$
Hexachloroethane			2.73(h)$_{NJ}$ 19(hc)$_{EPA}$			12.4(h)$_{NJ}$ 89(hc)$_{EPA}$
Indeno(1,2,3-cd)pyrene			0.0028(hc)$_{NJ}$			0.031(hc)$_{NJ}$
Isophorone			552(h)$_{NJ}$ 84(hc)$_{EPA}$			6,000(hc)$_{EPA}$
Lead	65(a)O_{EPA}	2.5(a)O_{EPA}	5.0(h)$_{\Phi NJ}$	210(d)O_{EPA}	8.1(d)O_{EPA}	
Malathion		0.1$_{NJ}$			0.1$_{NJ}$	
Manganese						100(h)$_{\Phi NJ}$
Mercury	2.1(d)O_{EPA}	0.012(c)$_{\Phi EPA}$	0.14(h)$_{\Phi EPA}$	1.8(d)O_{EPA}	0.025(c)$_{\Phi EPA}$	0.146(h)$_{\Phi NJ}$
Methoxychlor		0.03$_{NJ}$	40(h)$_{NJ}$		0.03$_{NJ}$	
Methyl bromide (bromomethane)			48(h)$_{EPA}$			4,000(h)$_{NJ}$
Methylene chloride			2.49(hc)$_{NJ}$			1,600(hc)$_{NJ}$

SURFACE WATER QUALITY CRITERIA APPLICABLE TO NEW JERSEY

(µg/L unless otherwise noted)

Toxic Substance	Freshwater Criteria			Saltwater Criteria		
	Aquatic		Human Health	Aquatic		Human Health
	Acute	Chronic		Acute	Chronic	
Mirex		0.001$_{NJ}$			0.001$_{NJ}$	
Nickel	1,400(a)O$_{EPA}$	160(a)O$_{EPA}$	516(h)$_{\&NJ}$	74(d)O$_{EPA}$	8.2(d)O$_{EPA}$	3,900(h)$_{\&NJ}$
Nitrate (as N)			10,000(h)$_{NJ}$			
Nitrobenzene			16.0(h)$_{NJ}$			1,900(h)$_{NJ}$
N-Nitrosodi-n-butylamine			0.00641(hc)$_{NJ}$			
N-Nitrosodiethylamine			0.000233(hc)$_{NJ}$			
N-Nitrosodimethylamine			0.000686(hc)$_{NJ}$			8.1(hc)$_{NJ}$
N-Nitrosodiphenylamine			4.95(hc)$_{NJ}$			16(hc)$_{EPA}$
N-Nitrosopyrrolidine			0.0167(hc)$_{NJ}$			
Parathion	0.065$_{NJ}$	0.013$_{NJ}$				
Pentachlorobenzene			3.67(h)$_{NJ}$			4.21(h)$_{NJ}$
Pentachlorophenol	20(b)$_{NJ}$	13(b)$_{NJ}$	0.28(hc)$_{EPA}$	13$_{NJ}$	7.9$_{NJ}$	8.2(hc)$_{NJ}$
Phenol			20,900(h)$_{NJ}$			4,600,000(h)$_{NJ}$
Phosphorous (yellow)					0.1$_{NJ}$	
Polychlorinated biphenyls (PCBs)		0.014$_{NJ}$	0.000244(hc)$_{NJ}$		0.030$_{NJ}$	0.000247(hc)$_{NJ}$
PCB-1242			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
PCB-1254			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
PCB-1221			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
PCB-1232			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
PCB-1248			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
PCB-1260			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
PCB-1016			0.000044(hc)$_{EPA}$			0.000045(hc)$_{EPA}$
Pyrene			797(h)$_{NJ}$			8,970(h)$_{NJ}$
Selenium	20$_{\&EPA}$	5.0$_{\&EPA}$	10(h)$_{\&NJ}$	290(d)O$_{EPA}$	71(d)O$_{EPA}$	
Silver	3.4(a)O$_{EPA}$		164(h)$_{\&NJ}$	1.9(d)O$_{EPA}$		
Sulfide-hydrogen sulfide (undissociated)		2$_{NJ}$			2$_{NJ}$	
1,2,4,5-Tetrachlorobenzene			2.56(h)$_{NJ}$			3.25(h)$_{NJ}$
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)			0.000000013(hc)$_{NJ}$			0.000000014(hc)$_{NJ}$
1,1,2,2-Tetrachloroethane			1.7(hc)$_{EPA}$			110(hc)$_{EPA}$
Tetrachloroethylene			0.388(hc)$_{NJ}$			4.29(hc)$_{NJ}$

SURFACE WATER QUALITY CRITERIA APPLICABLE TO NEW JERSEY

(µg/L unless otherwise noted)

Toxic Substance	Freshwater Criteria			Saltwater Criteria		
	Aquatic		Human Health	Aquatic		Human Health
	Acute	Chronic		Acute	Chronic	
Thallium			1.70(h)$_{4NJ}$			6.22(h)$_{4NJ}$
Toluene			6,800(h)$_{EPA}$			200,000(h)$_{NJ}$
Toxaphene	0.73$_{NJ}$	0.0002$_{NJ}$	0.000730(hc)$_{NJ}$	0.21$_{NJ}$	0.0002$_{NJ}$	0.000747(hc)$_{NJ}$
1,2,4-Trichlorobenzene			30.6(h)$_{NJ}$			113(h)$_{NJ}$
1,1,1-Trichloroethane			127(h)$_{NJ}$			
1,1,2-Trichloroethane			13.5(h)$_{NJ}$ 6.0(hc)$_{EPA}$			420(hc)$_{EPA}$
Trichloroethylene			1.09(hc)$_{NJ}$			81(hc)$_{NJ}$
2,4,5-Trichlorophenol			2,580(h)$_{NJ}$			9,790(h)$_{NJ}$
2,4,6-Trichlorophenol			2.1(hc)$_{EPA}$			6.5(hc)$_{EPA}$
Vinyl chloride			0.0830(hc)$_{NJ}$			525(hc)$_{NJ}$
Zinc	110(a)$_{EPA}$	100(a)$_{EPA}$		90(d)$_{EPA}$	81(d)$_{EPA}$	

a Criteria for these metals are expressed by equations which follow. Criteria in the table are at total hardness of 100 mg/L of $CaCO_3$. Criteria can be calculated for any hardness using the following equations. Criteria listed above are multiplied by appropriate conversion factors (CF) and by the default water effect ratio (WER) of 1.0.

$$\text{Acute criterion} = WER \times e^{(m_A\{\ln(\text{hardness})\}+b_A)} \times \text{acute CF}$$

$$\text{Chronic criterion} = WER \times e^{(m_C\{\ln(\text{hardness})\}+b_C)} \times \text{chronic CF}$$

Factors for use in the formulae are:

	m_A	b_A	m_C	b_C	Acute CF	Chronic CF
Cadmium	1.128	-3.828	0.7852	-3.490	0.944@	0.909@
Copper	0.9422	-1.464	0.8545	-1.465	0.960	0.960
Chromium^{+3}	0.8190	3.688	0.8190	1.561	0.316	0.860
Lead	1.273	-1.460	1.273	-4.705	0.791@	0.791@
Nickel	0.8460	3.3612	0.8460	1.1645	0.998	0.997
Silver	1.72	-6.52	-	-	0.85	-
Zinc	0.8473	0.8604	0.8473	0.7614	0.978	0.986

@ The freshwater CF for cadmium and lead are hardness dependent. Conversion factors listed above for cadmium and lead are at total hardness of 100 mg/L of $CaCO_3$. Conversion factors for cadmium and lead can be calculated for any hardness using the following equations:

Cadmium

Acute: CF = 1.1366-[(ln hardness)(0.0418)]

Chronic: CF = 1.1016-[(ln hardness)(0.0418)]

Lead

Acute & Chronic: CF = 1.4620-[(ln hardness)(0.1457)]

b Criteria are expressed by the equations which follow. Criteria in the table are at pH of 7.8.

Acute criterion = $e^{(1.005\{pH\}-4.830)}$

Chronic criterion = $e^{(1.005\{pH\}-5.290)}$

c If the chronic criterion for total mercury exceeds 0.012 µg/L, the edible portion of aquatic species of concern must be analyzed to determine whether additional actions are required.

d Criteria for these metals are expressed as a function of the WER

h Noncarcinogenic effect-based human health criteria

hc Human carcinogenic effect-based human health criteria

ol Organoleptic effect-based criteria expressed as maximum concentrations

♦ Criteria for FW2-TP & FW2-TM waters

♦♦ Criteria for FW2-NT waters

o Criteria expressed as dissolved

♣ Criteria expressed as total recoverable

♥ Criterion applicable to waters which include Newark Bay, the New Jersey portions of Raritan Bay, Upper New York Bay, Arthur Kill, Kill Van Kull, saline portions of the Passaic, Hackensack, and Hudson Rivers and saline portions of tributaries to all of these waters.

APPENDIX B - ANALYTICAL PROCEDURES AND ASSOCIATED QUALITY ASSURANCE/QUALITY CONTROL MEASURES

I. Required Target Analyte Lists and Methodologies:

(a) Target analytes:

Required bulk sediment chemistry, modified elutriate, and leaching tests must include analysis for all target analytes listed in Attachment 1, excepting the volatile organic compounds list, which will be required on a case by case basis. Typically, volatile organic compound testing will be instituted where known or suspected discharges of such compounds have occurred. Dioxin/furan analysis is required for all projects in Region 1.

The list of target analytes in Attachment 1 represents the constituents common to both the USEPA Contract Laboratory Program (CLP) analytes and the much larger list of compounds evaluated under the USEPA SW-846 testing program (SW-846). This latter program specifically employs the Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Publication SW-846. While the SW-846 methods are distinct from the CLP methods, they are considered to be equivalent. Attachment 1 also details the required quantitation limit for each target analyte. The estimated quantitation limit (EQL) specified is the higher of the quantitation limits associated with the CLP and SW-846 programs. There is no requirement to use either the CLP or SW-846 analytical methodologies; however, the method employed must achieve the required EQL and must be from a standard method from a recognized agency. Alternatively, a method with prior approval by the Department may be employed. The analysis must be done by a Department certified laboratory.

(b) Polychlorinated Biphenyls:

Polychlorinated biphenyls (PCBs) are required by the USEPA to be reported on an individual congener basis as well as a total PCB value. However, the Department anticipates that upland disposal of dredged material will be the primary type of proposal evaluated. This will increase the potential need to assess human health impacts due to PCBs.

The Department evaluates potential human health impacts of upland management and disposal activities using a Total Aroclor criterion. Therefore, it is acceptable to provide data to the Department using Aroclor based analysis methods (SW-846 Method 8081 or its equivalent) where aquatic species impacts are not anticipated. Where aquatic species impacts are a concern, the Department will require congener specific based analysis for PCBs using the Sloan method, NOAA Technical Memorandum NOS ORCA-71 or its equivalent. This is the same methodology that the USEPA employs. In order to be further consistent with the USEPA and to avoid duplicative analytical costs, the Department will also accept congener specific results if required by the USEPA or if already available. These congener specific results will be converted to a total PCB value by multiplying the sum of the 22 individual congeners by a factor of 2 as per the T. O'Connor, National Ocean Service, National Oceanic and Atmospheric Administration, July 20, 1994 memorandum to S. Ausubel, USEPA Region II (O'Connor 1994) and as per Contaminant Levels in Muscle and Hepatic Tissue of Lobster from the New York Bight Apex (National Marine Fisheries Service 1996). That computed result will then be compared against the

Total Aroclor based human health criteria. The recommended MDLs for all individual PCB congeners are 1 ug/kg dry weight (sediment) and 0.0005 ug/l (water).

(c) Polychlorinated Dibenzo-p-Dioxin and Dibenzofurans

When required, analysis will be conducted for all seventeen (17) 2,3,7,8 substituted polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofurans using EPA Method 1613 Revision B. While not preferred, SW-846 Method 8290 is also acceptable. The required congeners and related isotopes used for analysis are shown in Attachment 2. The analytical sensitivity should be within 5 times that which is cited in the method for each matrix type. Testing for these analytes will be required by the Department on a case by case basis in Region 1 waters.

All polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran congener results, in both sediment and water matrices, must be reported in both individual congener concentrations and summarized as 2,3,7,8-tetrachlorodibenzo(p)dioxin toxic equivalents using the Toxic Equivalent Factors, International 1988 Method in Attachment 3. For those values reported as Estimated Maximum Possible Concentrations (EMPCs), the full EMPC value should be used.

(d) Grain size analysis:

The grain size analysis must be conducted according to the methods described by Folk 1980.

Results must be reported as percentages within the general size classes:

Sand: equal to or greater than 0.0625 mm diameter

Silt: less than 0.0625 mm diameter and equal to or greater than 0.0039 mm diameter

Clay: less than 0.0039 mm diameter

(e) Total Organic Carbon

Total organic carbon analysis must be conducted according to the USEPA 1986 method, excerpted from the December 1992 regional manual for USEPA Region II and the New York District Corps of Engineers, entitled, "Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal" (Attachment 4).

(f) Multiple Extraction Procedure

Testing of sediments which have been modified prior to final placement may be required to undergo testing to evaluate their potential for contaminant leaching. One procedure used to accomplish this task is the Multiple Leaching Procedure (EPA Method 1320).

II. Quality Assurance/Quality Control Guidance and Reporting Requirements

The guidance described below has been drawn from the December 1992 regional manual for USEPA Region II and the New York District Corps of Engineers, entitled, "Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal"; the EPA and the USACE "QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations," (EPA 823-B-95-001, April 1995); and the "Field Sampling Procedures Manual," New Jersey Department of Environmental Protection and Energy, May 1992.

The following quality control samples or procedures will be required for chemical analysis of both sediment and water matrices:

1. Field blanks: One with every batch of 1-20 samples
2. Method blanks: One with every batch of 1-20 samples or every 12 hours, whichever is less
3. Matrix spike and matrix spike duplicate: One set with every batch of 1-20 samples
4. Surrogate spike recovery: Each sample, organic compounds only
5. Minimum detection limit verification within last 2 years for marine sediments and salt water matrices to be submitted to the Department upon request (procedure or citation at 40 CFR 136 [1994] Appendix B, Revision 1.11).
6. Duplicate analyses to be conducted as per method requirements

All bulk sediment chemistry results must be reported on a dry weight basis. All raw data should be presented along with the appropriate criterion. Exceedances of the criterion must be highlighted in an acceptable fashion.

The need to supply either full or reduced data deliverables will be determined by the Department on a case by case basis. The need for the applicant to obtain the services of a data validation contractor will concurrently be determined by the Department at the pre-application stage.

The data reports submitted to the Department for testing and analysis of material proposed for dredging must include a description of all methods and procedures used in the field and in the laboratory, referencing established protocols or guidance, for the following:

1. Sample collection
2. Sample preparation (including homogenizing and compositing)
3. Sample preservation methods and holding times (before and after extraction)
4. Chain of custody tracking documents
5. Sample transport, storage, and disposal
6. Sample analysis
7. Data entry and data reduction
8. Deviations from standard methods or prescribed procedures
9. QA/QC summary and data
10. Narrative of analytical problems, corrective action taken, effects on data interpretation

III. References for APPENDICES A AND B

Folk, R. 1980. Petrology of Sedimentary Rocks. Hemphill Publishing Co., Texas. 181 p.

National Marine Fisheries Service. 1996. Contaminant Levels in Muscle and Hepatic Tissue of Lobster from the New York Bight Apex.

N.J. Department of Environmental Protection and Energy. 1992. Field Sampling Procedures Manual. 363 p.

O'Connor, T. 1994. Personal communication on July 20, 1994 to S. Ausubel, U.S. Environmental Protection Agency, Region II.

Sloan, N.; G. Adams; R. Pearce; D. Brown; and S-L Chan. 1993. Sampling and Analytical Methods of the National Status and Trends Program, National Benthic Surveillance and Mussel Watch Projects 1984 - 1992, Volume IV Comprehensive Descriptions of Trace Organic Analytical Methods. NOAA Technical Memorandum NOS ORCA 71. 97 p.

U.S. Army Corps of Engineers, New York District and the U.S. Environmental Protection Agency, Region II. 1992. Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal (Draft).

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1991. Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual. EPA-503/8-91/001.

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1995. QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations. EPA 823-B-95-001.

TARGET ANALYTE LIST		
Analyte	Limits of Detection	
Volatiles	Water (ug/L)	Soil (ug/Kg)
Chloromethane	10	10
Bromomethane	10	10
Vinyl Chloride	10	10
Chloroethane	10	10
Methylene Chloride	10	10
Acetone	10	10
Carbon Disulfide	10	10
1,1-Dichloroethene	10	10
1,1-Dichloroethane	10	10
1,2-Dichloroethene (total)	10	10
Chloroform	10	10
1,2-Dichloroethane	10	10
2-Butanone(MEK)	10	10
1,1,1-Trichloroethane	10	10
Carbon Tetrachloride	10	10
Bromodichloromethane	10	10
1,2-Dichloropropane	10	10
cis-1,3-Dichloropropene	10	10
trichloroethene	10	10
Dibromochloromethane	10	10
1,1,2-Trichloroethane	10	10
Benzene	10	10
trans-1,3-Dichloropropene	10	10
Bromoform	10	10
4-Methyl-2-pentanone(MIBK)	10	10
2-Hexanone	10	10
Tetrachloroethene	10	10
1,1,2,2-Tetrachloroethane	10	10
Toluene	10	10
Chlorobenzene	10	10
Ethylbenzene	10	10
Styrene	10	10
Xylenes(total)	10	10
Semivolatiles		
Phenol	10	660
bis-(2-Chloroethyl)ether	10	660
2-Chlorophenol	10	660
1,3-Dichlorobenzene	10	660
1,4-Dichlorobenzene	10	660
1,2-Dichlorobenzene	10	660
2-Methylphenol	10	660
2,2'-oxybis(1-Chloropropane)	10	660
4-Methylphenol	10	660
N-Nitroso-di-n-propylamine	10	660

	Limits of Detection	
Semivoilatiles (continued)	Water (ug/L)	Soil (ug/Kg)
Hexachloroethane	10	660
Nitrobenzene	10	660
Isophorone	10	660
2-Nitrophenol	10	660
2,4-Dimethylphenol	10	660
bis(2-Chloroethoxy)methane	10	660
2,4-Dichlorophenol	10	660
1,2,4-Trichlorobenzene	10	660
Naphthalene	10	660
4-Chloroaniline	20	1300
Hexachlorobutadiene	10	660
4-Chloro-3-methylphenol	20	1300
2-Methylnaphthalene	10	660
Hexachlorocylcopentadiene	10	660
2,4,6-Trichlorophenol	10	660
2,4,5-Trichlorophenol	10	660
2-Chloronaphthalene	10	660
2-Nitroaniline	50	3300
Dimethylphthalate	10	660
Acenaphthylene	10	660
2,6-Dinitrotoluene	10	660
3-Nitroaniline	50	3300
Acenaphthene	10	660
2,4-Dinitrophenol	50	3300
4-Nitrophenol	50	3300
Dibenzofuran	10	660
2,4-Dinitrotoluene	10	660
Diethylphthalate	10	660
4-Chlorophenyl-phenyl ether	10	660
Fluorene	10	660
4-Nitroaniline	20	830
4,6-Dinitro-2-methylphenol	50	3300
N-Nitroso-diphenylamine	10	660
4-Bromophenyl-phenylether	10	660
Hexachlorobenzene	10	660
Pentachlorophenol	50	3300
Phenanthrene	10	660
Anthracene	10	660
Carbazole	10	330
Di-n-butylphthalate	10	330
Fluoranthene	10	660
Pyrene	10	660
Butylbenzylphthalate	10	660
3,3'-Dichlorobenzidine	20	1300
Benzo(a)anthracene	10	660
Chrysene	10	660
bis(2-Ethylhexyl)phthalate	10	660
Di-n-octlyphthalate	10	660
Benzo(b)fluoranthene	10	660

	Limits of Detection	
Semivolatiles (continued)	Water (ug/L)	Soil (ug/Kg)
Benzo(k)fluoranthene	10	660
Benzo(a)pyrene	10	660
Indeno(1,2,3-cd)pyrene	10	660
Dibenzo(a,h)anthracene	10	660
Benzo(g,h,i)perylene	10	660
Pesticides/Aroclors		
alpha-BHC	0.05	1.9
beta-BHC	0.05	3.3
delta-BHC	0.05	1.7
gamma-BHC (Lindane)	0.05	2
Heptachlor	0.05	2.1
Aldrin	0.05	2
Heptachlor epoxide	0.05	2.1
Endosulfan I	0.05	2.1
Dieldrin	0.10	3.3
4,4'-DDE	0.10	4.2
Endrin	0.10	3.6
Endosulfan II	0.10	3.3
4,4'-DDD	0.10	4.2
Endosulfan sulfate	0.10	3.6
4,4'-DDT	0.10	3.6
Methoxychlor	0.50	17
Endrin ketone	0.10	3.3
Endrin aldehyde	0.10	3.3
alpha-Chlordane	0.05	1.7
gamma-Chlordane	0.05	1.7
Toxaphene	5.0	170
Aroclor-1016	1.0	33
Aroclor-1221	2.0	67
Aroclor-1232	1.0	33
Aroclor-1242	1.0	33
Aroclor-1248	1.0	33
Aroclor-1254	1.0	33
Aroclor-1260	1.0	33
Inorganics	ug/L	mg/Kg
Aluminum	200	40
Antimony	60	12
Arsenic	10	2
Barium	200	40
Beryllium	5	1
Cadmium	5	1
Calcium	5000	1000
Chromium	10	2

	Limits of Detection	
Inorganics (continued)	Water (ug/L)	Soil (mg/Kg)
Cobalt	50	10
Copper	25	5
Iron	100	20
Lead	3	0.6
Magnesium	5000	1000
Manganese	15	3
Mercury	0.2	0.1
Nickel	40	8
Potassium	5000	1000
Selenium	5	1
Silver	10	2
Sodium	5000	1000
Thallium	10	2
Vanadium	50	10
Zinc	20	4
Cyanide	10	0.5

Attachment 2

Retention Time References, Quantitation References, Relative Retention Times, and Minimum Levels for CDDs and CDFs

Compound	Retention Time and Quantitation Reference	Relative Retention Time	Minimum Level[1] Water (pg/L; ppq)	Solid (ng/kg; ppt)	Extract (pg/µL; ppb)
Compounds using $^{13}C_{12}$-1,2,3,4-TCDD as the injection internal standard					
2,3,7,8-TCDF	$^{13}C_{12}$-2,3,7,8-TCDF	0.999–1.003	10	1	0.5
2,3,7,8-TCDD	$^{13}C_{12}$-2,3,7,8-TCDD	0.999–1.002	10	1	0.5
1,2,3,7,8-PeCDF	$^{13}C_{12}$-1,2,3,7,8-PeCDF	0.999–1.002	50	5	2.5
2,3,4,7,8-PeCDF	$^{13}C_{12}$-2,3,4,7,8-PeCDF	0.999–1.002	50	5	2.5
1,2,3,7,8-PeCDD	$^{13}C_{12}$-1,2,3,7,8-PeCDD	0.999–1.002	50	5	2.5
Compounds using $^{13}C_{12}$-1,2,3,7,8,9-HxCDD as the injection internal standard					
1,2,3,4,7,8-HxCDF	$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	0.999–1.001	50	5	2.5
1,2,3,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	0.997–1.005	50	5	2.5
1,2,3,7,8,9-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	0.999–1.001	50	5	2.5
2,3,4,6,7,8-HxCDF	$^{13}C_{12}$-2,3,4,6,7,8,-HxCDF	0.999–1.001	50	5	2.5
1,2,3,4,7,8-HxCDD	$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	0.999–1.001	50	5	2.5
1,2,3,6,7,8-HxCDD	$^{13}C_{12}$-1,2,3,6,7,8,-HxCDD	0.998–1.004	50	5	2.5
1,2,3,7,8,9-HxCDD	–[2]	1.000–1.019	50	5	2.5
1,2,3,4,6,7,8-HpCDF	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	0.999–1.001	50	5	2.5
1,2,3,4,7,8,9-HpCDF	$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	0.999–1.001	50	5	2.5
1,2,3,4,6,7,8-HpCDD	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	0.999–1.001	50	5	2.5
OCDF	$^{13}C_{12}$-OCDD	0.999–1.008	100	10	5.0
OCDD	$^{13}C_{12}$-OCDD	0.999–1.001	100	10	5.0

1. The Minimum Level (ML) for each analyte is defined as the level at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed.
2. The retention time reference for 1,2 3,7,8,9-HxCDD is $^{13}C_{12}$-1,2,3,6,7,8-HxCDD, and 1,2,3,7,8,9-HxCDD is quantified using the averaged responses for $^{13}C_{12}$-1,2,3,4,7,8-HxCDD and $^{13}C_{12}$-1,2,3,6,7,8-HxCDD.

Attachment 3: This is the toxicity equivalent factor guidance. Note that CDD and CDF are acronyms for chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans. T, Pe, Hx, Hp, and O stand for tetra, penta, hexa, hepta, and octa, respectively.

Compound	Toxicity Equivalency Factor (TEF)
2,3,7,8-TCDD	1.000
1,2,3,7,8-PeCDD	0.500
1,2,3,4,7,8-HxCDD	0.100
1,2,3,6,7,8-HxCDD	0.100
1,2,3,7,8,9-HxCDD	0.100
1,2,3,4,6,7,8-HpCDD	0.010
1,2,3,4,6,7,8,9-OCDD	0.001
2,3,7,8-TCDF	0.100
1,2,3,7,8-PeCDF	0.050
2,3,4,7,8-PeCDF	0.500
1,2,3,6,7,8-HxCDF	0.100
1,2,3,7,8,9-HxCDF	0.100
1,2,3,4,7,8-HxCDF	0.100
2,3,4,6,7,8-HxCDF	0.100
1,2,3,4,6,7,8-HpCDF	0.010
1,2,3,4,7,8,9-HpCDF	0.010
1,2,3,4,6,7,8,9-OCDF	0.001

All other CDD and CDF have a TEF of zero.

DETERMINATION OF TOTAL ORGANIC CARBON

1.0 APPLICATION AND SCOPE

This method, developed by the U.S. Environmental Protection Agency, Region II, Environmental Services Division laboratory in Edison, New Jersey, describes protocols for the determination of organic carbon in ocean sediments. Although the detection limit may vary with procedure or instrument, a minimum reporting value of 100 mg/kg will be required for the ocean dumping/dredging program. Several types of determinations, which are considered equivalent, are presented in this procedure. However, wet combustion methods are not considered to be equivalent to the pyrolytic methods described.

In this method, inorganic carbon from carbonates and bicarbonates is removed by acid treatment. The organic compounds are decomposed by pyrolysis in the presence of oxygen or air. The carbon dioxide that is formed is determined by direct nondispersive infrared detection, flame ionization gas chromatography after catalytic conversion of the carbon dioxide to methane; thermal conductivity gas chromatography, differential thermal conductivity detection by sequential removal of water and carbon dioxide; or thermal conductivity detection following removal of vater with magnesium perchlorate.

Water content is determined on a separate portion of sediment and data are reported in mg/kg on a dry weight basis.

2.0 DEFINITIONS

The following terms and acronyms are associated with this procedure:

LRB	Laboratory record book
TOC	Total organic carbon

3.0 PROCEDURE

3.1 Sample collection

Collect sediments in glass jars with lids lined with Teflon or aluminum foil. Cool samples and maintain at 4°C. Analyze samples within 14 days. If unrepresentative material is to be removed from the sample, it should be removed in the field under the supervision of the chief scientist and noted in the LRB on the field log sheet.

3.2 Apparatus and Reagents

- Drying oven maintained at 103° to 105°C.
- Analytical instrument. No specific TOC analyzer is recommended as superior. The following listing is for information on instrument options only, and is not intended to restrict the use of other unlisted instruments capable of analyzing TOC. The instrument to be used must meet the following specifications:
  - A combustion boat that is heated in a stream of oxygen or air in a resistance or induction-type furnace to completely convert organic substances to CO_2 and water.
  - A means to physically or by measurement technique to separate water and other interferants from CO_2.
  - A means to quantitatively determine CO_2 with adequate sensitivity (100 mg/kg), and precision (25% at the 95% confidence level as demonstrated by repetitive measurements of a well-mixed ocean sediment sample).
  - A strip chart or other permanent recording device to document the analysis.

(1.) Perkin Elmer Model 240C Elemental Analyzer or equivalent. In this instrument, the sample from Section 3.5 is pyrolyzed under pure oxygen, vater is removed by magnesium perchlorate and the carbon dioxide is removed by ascarite. The decrease in signal obtained by differential thermal conductivity detectors placed between the combustion gas stream before and after the ascarite tube is a measure of the organic carbon content.

(2.) Carlo Erba Model 1106 CHN Analyzer, or equivalent. In this apparatus, the sample is pyrolyzed in an induction-type furnace, and the resultant carbon dioxide is chromatographically separated and analyzed by a differential thermal conductivity

detector.

(3.) LECO Models WR12, WR112, or CR-12 carbon determinators, or Models 600 or 800 CHN analyzers. In the LECO WR-12, the sample is burned in high frequency induction furnace, and the carbon dioxide is selectively absorbed at room temperature in a molecular sieve. It is subsequently released by heating and is measured by a thermal conductivity detector. The WR-112 is an upgraded WR-12 employing microprocessor electronics and a printer to replace the electronic digital voltmeter.

In the LECO CR-12 carbon determinator, the sample is combusted in oxygen, moisture and dust are removed by appropriate traps, and the carbon dioxide is measured by a selective, solid state, infrared detector. The signal from the detector is then processed by a microprocessor and the carbon content is displayed on a digital readout and recorded on an integral printer.

In the LECO CHN-600 and CHN-800 elemental analyzers, the sample is burned under oxygen in a resistance furnace and the carbon dioxide is measured by a selective infrared detector.

(4.) Dohrman Model DC85 Digital High Temperature TOC Analyzer. In this instrument, the sample is burned in resistance furnace under oxygen, the interfering gases are removed by a sparger/scrubber system, and the carbon dioxide is measured by a non-dispersive infrared detector and shown on a digital display in concentration units.

- Reagents

(1.) Distilled water used in preparation of standards and for dilution of samples should be ultrapure to reduce the carbon concentration of the blank.

(2.) Potassium hydrogen phthalate, stock solution, 1000 mg carbon/L: Dissolve 0.2128 g of potassium hydrogen phthalate (Primary Standard Grade) in distilled water and dilute to 100.0 mL.

NOTE: Sodium oxalate and acetic acid are not recommended as stock solutions.

(3.) Potassium hydrogen phthalate, standard solutions: Prepare standard solutions from the stock solution by dilution with distilled water.

(4.) Phosphoric acid solution, 1:1 by volume.

3.3 Interferences

3.3.1 Volatile organics in the sediments may be lost in the decarbonation step resulting in a low bias.

3.3.2 Bacterial decomposition and volatilization of the organic compounds are minimized by maintaining the sample at 4 °C, analyzing within the specified holding time, and analyzing the wet sample.

3.4 Sample Preparation

3.4.1 Allow frozen samples to warm to room temperature. Homogenize each sample mechanically, incorporating any overlying water.

3.4.2 Weigh the well-mixed sample (up to 500 mg) into the combustion boat or cup. Add 1:1 phosphoric acid dropwise until effervescence stops. Heat to 75°C.

NOTE: This procedure will convert inorganic carbonates and bicarbonates to carbon dioxide and eliminate it from the sample.

3.5 Sample Analysis

Analyze the residue according to the instrument manufacturer's instructions.

3.6 Percent Residue Determination

Determine percent residue on a separate sample aliquot as follows:

3.6.1 Heat a clean 25-mL beaker at 103° to 105°C for 1 h. Cool in a desiccator, weigh to

the nearest mg, and store in desiccator until use.

3.6.2 Add 1 g, weighed to the nearest mg, of an aliquot of the well-mixed sample .

3.6.3 Dry and heat in the 103° to 105°C oven for 1 h. Cool in a desiccator. Weigh to the nearest mg.

3.7 Calibration

Follow instrument manufacturer's instructions for calibration. Prepare a calibration curve by plotting mg carbon vs. instrument response using four standards and a blank, covering the analytical range of interest.

3.8 Data Recording

Record all data and sample information in LRBs or on project-specific data forms.

All transfers of data to forms and data reductions (e.g., concentration calculations, means, standard deviations) should be checked by the analyst and approved by a lab manager, project manager, or principal investigator. Hard copies of sample data and spreadsheet reports should be kept in the testing laboratory's central files.

3.9 QA/QC Procedures

3.9.1 Precision and Accuracy The precision and accuracy will differ with the various instruments and matrices, and must be determined by the laboratories reporting data. A representative sample of well-mixed, meshed, sediment should be analyzed in quadruplicate for 4 days to determine the analytical precision.

3.9.2 It is critical that each sample be thoroughly homogenized in the laboratory before a subsample is taken for analysis. Laboratory homogenization should be conducted even if samples were homogenized in the field.

3.9.3 Dried samples should be cooled in a desiccator and held there until they are weighed. If a desiccator is not used, the sediment will accumulate ambient moisture and the sample weight will be overestimated. A color-indicating desiccant is recommended so that spent desiccant can be detected easily. Also, the seal on the desiccator should be checked periodically and, if necessary, the ground glass rims should be greased or the "O" rings replaced.

4.0 DATA REDUCTION, DOCUMENTATION, AND REPORTING

4.1 Data Reduction

Data analysis and calculations will be performed whenever possible on computers using commercial spreadsheet software such as Lotus 1-2-3, Quattro Pro, or Microsoft Excel.

4.2 Documentation

Keep all laboratory records, test results, measurements, other and supporting documentation for each sediment test in a LRB or project file dedicated to that purpose.

4.3 Reporting

A report should be prepared including, but not limited to, the following information:

- Sources of samples
- Description of methods
- Summary of sample analysis results
- Summary of any deviations from the project test plan
- Copies raw data, observations, or data forms

Total organic carbon should be reported as a percentage of the dry weight of the unacidified sample to the nearest 0.1 unit. The laboratory should report the results of all samples (including QC replicates, method blanks, and standard reference measurements) and should note any problems that may have influenced sample quality. The laboratory should also provide a summary of the calibration procedure and results (e.g., range covered, regression equation, coefficient of determination).

Source: U.S. Army Corps of Engineers - New York District and Environmental Protection Agency -Region II, 1992, "Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal," Draft-18 Dec 1992.

APPENDIX C

Dredged Material Data Form (DMDF-997)

State of New Jersey
Department of Environmental Protection
Dredge Material Data Form (DMDF-997)

DREDGING ACTIVITY

1. Project Applicant _____

2. Permit Application Number or other pending permits _____

3. Dredging Location: Water body _____

   State Plane Coordinates of Dredging Site:

   X_____

   Y_____

   - attach USGS quadrangle or county map with project location highlighted

4. Water Environment, Fresh___, Saline___, and salinity if known _____ppt

   Depth of water within project area at Mean Low Water
   Existing_____
   Proposed_____

   Maintenance____ or New Dredging_____

5. Volume of Material to be removed_____ cubic yards

6. Method of Dredging:
   - hydraulic____
   - clamshell____
   - closed clamshell____
   - hopper____
   - bucket____
   - other (specify)_____

MANAGEMENT/DISPOSAL OF DREDGED MATERIAL

7. What is proposed method of disposal or long term use of the dredged material?

   _____

   _____

8. Method of Transport to Management/Disposal Site:

-truck_____
-barge_____
-pipeline_____
-other (specify)_____

9. State Plane Coordinates of Disposal/Management Site Location:
Specify all interim and final locations

X_____

Y_____

-attach USGS or county map with disposal/management location highlighted

Municipality_____, County_____

Lot_____, Block_____

Disposal/Management site owner

_____

If disposal/management site is not owned by applicant, attach proof that property owner has authorized the placement of dredge material on the property.

SAMPLING AND TESTING REQUIREMENTS

THE FOLLOWING TESTING EXCLUSIONS ARE AVAILABLE AS SPECIFIED IN CHAPTER III, SECTION C OF THE TECHNICAL MANUAL, PROVIDED THE DATA IS COLLECTED IN ACCORDANCE WITH A DEPARTMENT APPROVED SAMPLING PLAN.

10. Testing Exclusions

- Does the project meet any of the Testing Exclusion Cases as specified in Chapter III, Section C of the Department's Technical Manual? yes___, no___

If yes, specify and attach proofs of which exclusions are met. Provide the following as appropriate:

CASE 1 (Sand)
-Grain size analysis demonstrating that the material to be dredged is greater than 90% sand

CASE 2 (Subaqueous Disposal Pit)
-less than 1000 cubic yards
-permission to use subaqueous disposal pit

CASE 3 (Residential Property in Region 2)
-project is located between Sandy Hook and Cape May
-less than 500 cubic yards
-disposal site is a residential upland area adjacent to the dredging site
-the dredging site contains 4 or less boat slips
-the disposal /management area is owned by the same person as the area to be dredged
-the dredged material is proposed to be capped with 6 inches of clean fill

CASE 4 (Small Projects in Region 2)
-less than 1000 cubic yards
-project is located between Sandy Hook and Cape May
-demonstration that the disposal area is not located in a residential/recreational area

CASE 5 (Small marinas, channels and other projects in Region 2)
-less than 5000 cubic yards
-project is between Sandy Hook and Cape May
-site has not been occupied with a marina of 25 or more boats and does not have a current or historic industrial use on the adjacent upland
-demonstration that the disposal site is not located in a residential/recreational area

11. If no, proceed with the remainder of this form

ALL SAMPLING PLANS MUST BE REVIEWED AND APPROVED BY THE LAND USE REGULATION PROGRAM PRIOR TO THE COLLECTION OF SAMPLES.

Sampling plan approved? yes___, no___. Date of approval_____

Location and number of sampling points. Attach copy of approved sampling plan.

Depth cores taken to:_____ft at Mean Low Water

List and describe any cores greater than 6 feet in length.
-attach appropriate narrative.

Describe and attach narrative of similarities and differences between sediment cores
-Enclose core logs with dredging application

Was stratification present within any cores greater than 6 feet in length? yes___, no___

If yes, provide depth and description of stratification_____

_____.

Describe how each core was homogenized._____

_____

Detail what homogenized cores and/or strata were combined to form composite samples.

TESTING REQUIREMENTS

12. Check those tests for which data is being submitted

Physical, grain size_____, Total Organic Carbon_____, % moisture_____
Bulk Sediment Chemistry_____
Elutriate_____
Modified Elutriate_____
Leaching Test
-Sequential Batch Leaching Test____
-Column Leach Test_____
- Other_____
Bioaccumulation_____
Bioassay_____

APPENDIX D - BRIEF DESCRIPTION OF APPLICABLE LAWS, STATUTES, REGULATIONS AND PERMITS

(1) Waterfront Development Law (N.J.S.A. 12:5-3)

This statute encompasses all development at or below the mean high water line in tidal waters of the state. It also stipulates that most developments up to 500 feet from the mean high water line in the Coastal Zone but outside the CAFRA area be subject to a permit. Waterfront development activities include, but are not limited to, the construction or addition of docks, wharves, piers, bridges, pipelines, pilings, dolphins, permanent buildings, and removal or deposition of subaqueous materials (dredging or filling).

(2) New Jersey Water Pollution Control Act of 1977 (N.J.S.A. 58:10A-1 *et seq.*)

Those persons who presently discharge or plan to discharge to surface waters of the state are required to obtain a New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water (DSW) permit. Point source discharges are prohibited without a NJPDES-DSW permit. Any persons who presently discharge or propose to discharge pollutants to or via conveyances which will or may result in the introduction of pollutants into the ground waters of the state are required to obtain a NJPDES Discharge to Ground Water (DGW) permit. The DGW permit is required to monitor the actual or potential discharge of pollutants through monitoring of the discharge, monitoring of the groundwater, or both.

(3) Coastal Area Facility Review Act (CAFRA; N.J.S.A. 13:19-1 *et seq.*)

CAFRA regulates all development on beaches and dunes, and the first house or other development within 150 feet of the waterline, beach or dune. Beyond the 150-foot area but still within the CAFRA zone, all industrial and public developments will be subject to permit review. The CAFRA region extends from the confluence of the Cheesequake Creek and Raritan Bay in Middlesex County, along the Atlantic Ocean coastline and Delaware Bay, northwest along the Delaware River to Pennsville, Salem county.

(4) Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et *seq.*)

This act empowered the NJDEP to develop land use regulations to control development in the flood hazard areas in order to minimize potential on and offsite damage to public or private property, to protect and enhance the public's health and welfare by minimizing the degradation of water quality from point and non-point pollution sources, and to protect wildlife and fisheries. A Stream Encroachment Permit is required for the construction, installation or alteration of any structure or permanent fill along, in or across, the channel or flood plain of any watercourse.

(5) Wetlands Act of 1970 (N.J.S.A. 13:9A-1 *et seq.*)

Coastal wetlands extend from the head of tide at Trenton on the Delaware River south along Delaware Bay, up the east coast to the mouth of the Raritan River. A permit is required for development or excavation in mapped tidal wetlands, including the construction of catwalks, piers, docks, the construction of boat channels and mooring basins, the construction of impoundments, the installation of utilities, the diversion or appropriate use of pesticides, driving or causing to pass over or upon wetlands with any mechanical conveyance which may alter or impair the natural contour of the wetlands or natural vegetation, and filling, excavation, or construction of any structure. Maps of the regulated wetlands are filed with each of the following counties -- Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean, and Salem.

(6) Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 *et seq.*)

A Freshwater Wetlands Permit is needed prior to engaging in a regulated activity in and around freshwater wetlands and associated transition areas. Regulated activities include: (1) the removal, excavation, disturbance or dredging of soil, sand, gravel or aggregate material of any kind; (2) the drainage or disturbance of the water level or water table; (3) the dumping discharging or filling with any materials; (4) the driving of pilings; (5) the placing of obstructions; and (6) the destruction of plant life which would alter the character of a freshwater wetland or transition area. In addition, the placement of dredged or fill material into state open waters will require an open water fill permit.

(7) Soil Erosion and Sediment Control Act (N.J.S.A. 4:24-1 *et seq.*)

Municipalities and all other public agencies are required to condition development project approvals on the Soil Erosion and Sediment Control Certification approval from the local soil conservation district for projects that disturb more than 5,000 square feet of surface area of land. Certification is also required for demolition of structures, construction of parking lots, construction of public facilities, operation of mining or quarrying activities and for clearing or grading of land for other than agricultural or horticultural purposes. Best management practices must be installed to control soil erosion, sedimentation, and nonpoint source pollution, and for stormwater management during construction and other land disturbance activities.

(8) Tidelands Conveyances (Riparian Grants, Leases and/or Licenses)

Tidelands grants, leases and/or licenses are required for the use of state-owned riparian lands. These conveyances are granted by the Tidelands Resource Council. The council is guided by the NJDEP Coastal Resources and Development Policies (essentially the core of New Jersey's Coastal Management Program) and by its own interpretation of protecting the public interest.

(9) Solid Waste Management Act (N.J.S.A. 13:1E-1 *et seq.*)

This act establishes a statutory framework for solid waste collection, disposal and utilization activities. The statute designates each county and the Hackensack Meadowlands Development Commission as Solid Waste Management Districts and empowers those districts to develop and implement comprehensive solid waste management plans. The Act grants the Department of Environmental Protection the power to regulate and supervise all solid waste collection and disposal facilities, and support and undertake experimental programs of research and development to determine the most efficient, sanitary, and economical ways of collecting, disposing of, and utilizing solid wastes.

(10) Federal Water Pollution Control Act (Clean Water Act Amendments of 1977; 33 U.S.C 1251)

All projects requiring Federal permits (Section 404) for the discharge of dredged or fill material into State waters or wetlands also require a State Water Quality Certification pursuant to Section 401. The purpose of this certification is to ensure that all such activities are consistent with the applicable New Jersey Water Quality Standards and management policies.

Pursuant to section 404 of the act, the U.S. Army Corps of Engineers (USACE) has authority to control the discharge of fill into lakes, ponds, rivers and streams and their associated wetlands. The USACE regulates those waters which are used to transport interstate or foreign commerce shoreward of their ordinary high water mark. The USACE has retained regulatory authority over those wetlands that are partially or entirely located within 1,000 feet of the ordinary high water mark or mean tide of all water bodies which are subject to tidal flow.

(11) Federal Coastal Zone Management Act (16 U.S.C. 1451 *et seq.*)

Section 307 of the Act requires that all Federal projects, or non-Federal projects which require a federal permit, receive a determination of consistency with the State Coastal Zone Management Program. In New Jersey, these consistency determinations are evaluated pursuant to the Rules on Coastal Zone Management (N.J.A.C. 7:7E-1.1 *et seq.*) and are usually incorporated into the Waterfront Development or CAFRA permit(s) issued for a project.

Note: the above brief descriptions are not intended to be inclusive of all activities which may require permits from the Department. For additional information on the permits required for proposed projects refer to the NJDEP publication "Permits, Licenses, Approvals & Certificates" (June 1995), consult the regulations for each regulatory program, and contact the Department's Office of Pollution Prevention and Permit Coordination (Phone: 609-984-0857) or the Land Use Regulation Program (Phone: 609-292-0600).

APPENDIX E - DREDGED MATERIAL ACCEPTABLE USE DETERMINATION PROCESS

All persons producing structural or nonstructural fill, manufactured soil or using (refer to Chapter 5 of the Technical Manual), processing or transferring dredged materials in New Jersey must obtain an Acceptable Use Determination (AUD) from the New Jersey Department of Environmental Protection as outlined below prior to any use, processing or transfer of the dredged material or products containing dredged material. The process for obtaining an AUD for dredged material from the tidal waters of the State of New Jersey and adjacent interstate waters is as follows:

I. GLOSSARY of TERMS

The following terms as defined herein are applicable to this Appendix E of the Technical Manual.

A. "Acceptable Use" means the use that is determined by the Department as appropriate for the dredged material, admixture or product that will be protective of human health and the environment and is consistent with the requirements of Section II.C below.

B. "Acceptable Use Site" means the site at which the dredged material, admixture or product is used directly as a replacement for a generally-accepted and similarly-manufactured product, or as raw material to make such a product.

C. "Acceptable Use Project" means the acceptable use site of dredged material, admixture or product, or a dredged material processing facility, as authorized pursuant to an AUD.

D. "Admixture" means the materials that are blended with dredged material to produce a product.

E. "Dredged Material Processing Facility" means the site at which dredged material is directly transferred, or is blended with admixtures and then transferred, to another facility or site for direct use or further processing.

F. "Owner/operator" means the individual, trust, firm, joint stock company, Federal agency, corporation (including a government corporation), corporate official, partnership, association, State, municipality, commission, political subdivision of a state, or any interstate body to which an AUD is issued.

G. "Person" means an individual, trust, firm, joint stock company, Federal agency, corporation (including a government corporation), corporate official, partnership, association, State, municipality, commission, political subdivision of a state, or any interstate body.

H. "Product" means the manufactured soil, structural or nonstructural fill or other material, produced by the processing of dredged material with admixtures, that meets the specifications and standards for generally-accepted and similarly-manufactured products or raw materials used in the economic mainstream, for which the product is used as a replacement.

I. "Technical Manual" means the document known as, The Management and Regulation of Dredging Activities and Dredged Material in New Jersey Tidal Waters. This reference shall serve as notice that the AUD process is incorporated in the Technical Manual as an appendix.

II. AUTHORITY and CONSTRUCTION

A. The Department of Environmental Protection (Department or DEP) will issue an AUD for dredged material in conjunction with the Waterfront Development Permit for a specific dredging project or dredged material processing facility provided the acceptable use project is designed and managed in a manner consistent with all of the environmental statutes applicable to the project including, but not limited to, the Water Pollution Control Act (N.J.S.A. 58:10A-1 *et seq.*), the Waterfront Development Act (N.J.S.A. 12:5-3 *et seq.*), the Spill Compensation and Control Act (N.J.S.A. 58:10-23.11), the Solid Waste Management Act (N.J.S.A. 13:1E-1 *et seq.*), any other applicable statutes, the rules and regulations adopted thereunder, and any permits or orders issued pursuant thereto. Each AUD proposal will be evaluated on a case-by-case basis.

B. An AUD shall only be issued for acceptable use projects that use:

1. Dredged material from the tidal waters of the State of New Jersey, which shall include adjacent interstate waters.

2. Materials that are not hazardous wastes pursuant to the New Jersey Hazardous Waste Regulations at N.J.A.C. 7:26G *et seq.*

3. Materials that do not contain polychlorinated biphenyls (PCB) regulated pursuant to the Toxic Substances Control Act, 15 USC 2601 *et seq.*

C. The dredged material will be considered for an AUD provided the dredged material, and each admixture used at the acceptable use project, are used directly as a substitute for a product or as a substitute for an admixture that is incorporated into a product. The dredged material-based products and admixtures must meet the specifications and standards for a generally-accepted and similarly-manufactured product or raw material.

D. Any waste, residual material, by-product, or any material contaminated above the Department's most restrictive contaminant classification criteria, that is delivered to an acceptable use project either for incorporation into product or that is not incorporated into the product but is used in some manner at the project, must be authorized in advance for such use pursuant to the regulations for beneficial use of solid wastes at N.J.A.C. 7:26-1.7(g), or must be fully managed in transit to and at the project as solid waste pursuant to the Solid Waste Management Act, N.J.S.A. 13:1E-1 *et seq.*

III. APPLICATION PROCESS

A. The applicant for an AUD shall submit the following information with the Waterfront Development Permit application, or the application for modification of said permit:

1. A description of all admixtures to be combined with the dredged material at the acceptable use project, and any products produced, including:

   (a) The specific location of the site of origin of each admixture;

   (b) The quantity of each admixture used, and the specific ratios of admixtures used to dredged material. The quantities of admixtures, dredged material and products used or produced on a daily basis shall be included. Ranges of ratios and variability in production levels shall also be included;

   (c) Evidence that the dredged material, and each admixture used for the acceptable use project, are used directly as a product or as a substitute for raw material that is incorporated into a product that meets the specifications and standards for a generally-accepted and similarly-manufactured product or raw material, which shall include a thorough description of the purpose for use of any materials other than dredged material;

   (d) A general description of each admixture, including its current and historical uses, the reason for generating the admixture, the date of generation and the specific process by which the admixture was generated;

   (e) A contaminant profile and an evaluation of the general quality of all dredged material, admixtures, and all products produced in accordance with the AUD including, but not limited to, the following as are necessary as determined by the Department on a case-by-case basis:

      i. A contaminant profile in relation to current Department Soil Cleanup Criteria (SCC) guidance levels and other evaluation requirements, such as those procedures specified at Appendices A & B in the Technical Manual and as specified by the Department as dependent on the proposed acceptable use on a case-by-case basis;

      ii. Physical characteristics including grain size;

      iii. Total organic carbon (TOC) and total petroleum hydrocarbon (TPH);

      iv. All sampling and analyses shall be conducted in accordance with a Department-approved sampling and testing plan, quality assurance, analytical and other technical requirements of Appendices A & B of the Technical Manual, and as otherwise specified by the Department;

      v. A narrative description of the characteristics of the admixtures and all sampling conducted in relation to the admixtures. Material Safety Data Sheets (MSDS), all studies or analytical characterizations performed by any person on the admixture, results of all testing (screening, post-excavation and bulk material) collected during investigation of the area of excavation, or other generation, of the admixture, all historical analyses and any other material specification information shall be included;

vi. The concentration limits for contaminants in the product for the proposed acceptable use, and if different at any stages of intermediate storage or processing, and the rationale for those limits, and a description of the testing and quality assurance procedures that will be used to monitor the product produced in the future;

vii. A scaled site map depicting the site of origin of all admixtures and all sample locations of admixtures and products, as applicable;

viii. A determination of the waste classification of the admixtures and the rationale used for the classifications; and

ix. A full laboratory deliverable package (chain of custody, sampling methods, QA/QC data) used to evaluate the dredged material and admixtures.

(f) A description of any past or ongoing regulatory activity undertaken by the Department or any other agency at the site of origin for each admixture;

(g) A description of any treatment or processing of the dredged material, admixtures and product undertaken prior to shipment to the acceptable use project;

(h) A description of the measures to be taken during all stages of the acceptable use project including handling, storage, transportation, management and application of the dredged material, admixtures and product to minimize or eliminate environmental and human health impacts;

(i) A description of the design capacity of the acceptable use project, setting forth the number and types of all vehicles containing admixtures, product or other materials arriving at and leaving the project on a daily basis, stating the maximum number of vehicles per hour that will arrive at and leave the project site(s);

(j) A narrative describing the acceptable use project's operations from the receipt of dredged material and admixtures describing how those materials are contained, through processing, management and/or transfer to the material's destination at each stage of the project. The narrative must clearly demonstrate how containers of dredged materials, admixtures and product will be managed and that the employees, the public or the environment will not be exposed to dredged materials, admixtures and product except as allowed in accordance with the AUD; and

(k) The hours of operation of the acceptable use project.

2. A description of the acceptable use project including:

(a) Photocopies of documents as evidence of all authorizations and permits for siting, construction and operation of the acceptable use project, and evidence of conformance with, or applications for authorizations from, all local, regional, State or Federal requirements of any governmental agency, or other body with jurisdiction over any aspect of the proposed project. If all such evidence of authorizations and

permits has not been obtained then evidence of applicable correspondence and records of preapplication meetings and other such evidence as shall document the securing of the necessary permits and authorizations shall be submitted;

(b) A description of the geographical location of the acceptable use project, identifying the name of the municipality in which the acceptable use project is located and the street address of the project;

(c) A copy of the tax map showing the lot and block numbers of the acceptable use project site(s) and of all adjoining properties;

(d) A description of the current use of the acceptable use project site(s) and of all adjoining properties;

(e) Three copies of a site plan where the dredged material, admixtures and product are managed or used, plotted on a USGS topographic map. The site plan map shall be prepared, signed, and sealed by a licensed New Jersey professional engineer or surveyor. The site plan must:

i. Identify the placement of all equipment, buildings, activities and areas related to the receipt, loading, unloading, temporary storage and use of all dredged material, admixtures and products;

ii. Be drawn to a scale no greater than one inch equals 100 feet;

iii. Indicate the routing of vehicles between the dredging project or source of admixtures and the acceptable use project and all nearby roadways serving the site, as well as the traffic flow within the project site. Such routing must ensure safe and efficient vehicular and pedestrian circulation, parking, and loading and unloading of containers;

iv. Delineate floodplains as defined at N.J.A.C. 7:13-1.2;

v. Indicate the location of regulated wetlands, New Jersey Pinelands and any other environmentally sensitive areas;

vi. Identify the direction of water runoff both on site and off site and the screening and landscaping on the site;

vii. Indicate topographic contours, drawn at two-foot intervals;

viii. Indicate all site access controls to be employed at the project; and

ix. Contain an original current 7.5 minute USGS Quadrangle map with the boundary of the acceptable use project plotted thereon. The map shall delineate any public access roads to the site and any streams, ponds or other potential sensitive receptors such as, but not limited to, hospitals, schools, shopping centers and other areas of public or private use within a

one-half-mile radius of the site.

(f) A description of the type(s) and number of any containers that will be used for the project and the type and means of storage and staging of the containers;

(g) A description of any treatment or processing of the dredged material, admixtures and product at the acceptable use project;

(h) A copy of the deed of record establishing ownership of the acceptable use project property or, if the applicant is a person other than the landowner, a legal agreement (for example, a lease) to use the real property for the purpose of operating the acceptable use project; and

(i) A description of any past or ongoing regulatory activity at the acceptable use project.

3. The schedule for initiation and completion of the acceptable use project.

4. A thorough description of the destination of all admixtures, products or wastes that will be moved from the site of use, the purpose for such disposition, and copies of any State or other authorizations, or applications for those authorizations, required for receipt or use of such materials at the disposition site.

5. The Department may specify and require additional information from the applicant in order to ensure that the proposed acceptable use and all activities related to that use will meet the requirements of the AUD.

IV. OPERATING CONDITIONS

A. The AUD shall include, but not be limited to, the following provisions and conditions.

1. Any control provisions, including institutional controls such as, but not limited to, a Declaration of Environmental Restriction (DER), and engineering controls as necessary to protect human health and the environment.

2. Specific operational requirements including; hours of operation, truck routing, dust control provisions, noise limitations.

3. Production criteria including admixture quality determination procedures, admixture quality limitations and blending ratios, and quality control procedures and criteria.

4. Product application criteria such as depth of application, application conditions, maintenance, soil erosion and sediment control requirements, and site condition monitoring provisions.

5. Any other requirements and limitations for use of admixtures, products or other materials, and operation of the acceptable use project as shall be determined by the Department on a case-by-case basis.

B. The owner/operator of an acceptable use project shall submit on an annual basis, but not more than 13 months from the issuance of an AUD by the Department and any 13-month anniversary of such issuance, during the operation of the acceptable use project and for the year following the last activity at the project, a report to the Department detailing the amount of all materials used, the date(s) of such use, the location(s) of the use, the information at B.2 below and any other information as specified by the Department in the AUD, to the address specified at B.1.ii below.

1. The dredged material processing facility owner/operator shall maintain the following records at the facility site at all times and shall file reports as follows:

   (a) Daily records shall be maintained that shall note the vehicle plate number, material quantity, source, destination facility name and quantity, by vehicle, of all dredged material, admixtures and product received, transferred and shipped at the facility. The records shall specify the source for every shipment of dredged material and admixture received and the destination of every shipment of any material and/or product out of the facility. Quantities of dredged material, admixtures and product shall be listed in tons and cubic yards as appropriate; and

   (b) The daily records shall be compiled into standard quarterly reports, which shall be submitted to the address below within 20 days of the end of each calendar quarter

   Land Use Regulation Program
   New Jersey Department of Environmental Protection
   P.O. Box 401
   Trenton, New Jersey 08625.

2. Records that document all violations of any local, State or Federal requirements including violations of the AUD issued by the Department.

C. The owner/operator shall be responsible for ensuring that its agents, including all successors and assigns involved in the use of dredged material or products produced at the acceptable use project, including but not limited to, all brokers, transporters, end users and owners and operators of use and management sites, are aware of, and properly manage the respective materials in strict compliance with, any conditions of specified in the AUD.

D. Access to any acceptable use project shall be restricted to project operators, vehicle operators and authorized visitors only. Effective security procedures shall be implemented to control entry and exit at all times.

E. Dredged materials, admixtures and products in any type of container at an acceptable use project shall not emit odors that are detectable at the project or beyond the perimeter of the project.

F. All dredged material, admixture and product containers staged or stored at the acceptable use project shall be secured at all times in a manner that prevents unauthorized access to the containers and their contents.

G. The Department's designated representatives and inspectors shall have the right to enter and inspect any building or any other portion of any acceptable use project at any time. This right to enter and inspect includes, but is not limited to:

(a) Observing and sampling any materials on site;

(b) Photographing any portion of the project, vehicles, containers, and container contents;

(c) Investigating an actual or suspected source of pollution of the environment;

(d) Ascertaining compliance or noncompliance with the statutes, rules, regulations, or policies of the Department, including conditions of the project's AUD or any other permit or certificate issued by the Department; and

(e) Reviewing and copying all applicable records described in this section, which shall be maintained at the project at all times and shall be made available on request to Department representatives and inspectors at all reasonable times for review and inspection.

H. All acceptable use projects shall comply with the requirements of the Federal Occupational Safety and Health Administration and all other applicable standards of any agency for the operation of the project and the maintenance of the health and safety of the employees or other persons.

I. Routine housekeeping and maintenance procedures shall be implemented at the acceptable use project to prevent the accumulation of dust, debris and to maintain general cleanliness throughout the site and in the working environment.

J. Any release or discharge of any material at the acceptable use project, except for such releases as are allowed pursuant to the AUD, must be immediately reported by the project operator or its designee to the DEP Emergency Response 24-hour Hotline at (609)292-7172. The report must specify the type of substance discharged in estimated quantity, the nature of the discharge, the location of the discharge, any action being taken or proposed to be taken in order to mitigate the discharge, and any other information concerning the incident the Department may request at the time of notification.

K. The acceptable use project owner/operator shall designate an on-site emergency coordinator who shall be available during all hours of operation for the purpose of handling emergency situations, such as, but not limited to, spills, discharges or releases of materials at the project.

L. The acceptable use project owner/operator shall develop and maintain at the site an Operations and Maintenance (O&M) Manual that shall describe all operating conditions and procedures of the site operation. The O&M Manual shall be made available to all employees and personnel at the site. The O&M Manual shall be prepared in accordance with the standards applied at N.J.A.C. 7:26-2.10(b)9.

M. All dredged material processing facilities shall operate in accordance with the additional standards that follow:

1. Dredged material and admixtures shall not remain at any dredged material processing facility for more than 30 days or as otherwise specified by the Department in the AUD.

2. The Department will specify the quantities of dredged material and admixtures allowed at any dredged material processing facility in the AUD.

3. Dredged materials or admixtures received, stored, processed and transferred at any dredged material processing facility shall be held at all times in containers that do not leak any liquids or material.

4. Dredged material products stored at a dredged material processing facility must be in compliance with the provisions of Sections IV.M.1,2 and IV.N of this appendix and other requirements as specified by the Department in the AUD. Storage locations must include adequate mechanisms to manage storm water, control dust generation and odors, limit access to the storage areas and prevent the dispersal of product into the environment.

5. Dredged material, admixtures, products, wastes or other materials leaving dredged material processing facilities, that are destined for an acceptable use site or any site out of State, must be authorized in advance for that use pursuant to the requirements and any limitations stipulated in the AUD for the dredged material processing facility.

N. Dredged material, admixtures, products or any other materials at an acceptable use project shall be managed at all times to prevent migration in stormwater runoff, control odors and dust generation per conditions as specified by the Department in the AUD.

O. Dredged material, admixtures, products or any other materials that cannot be used at the acceptable use project in accordance with the AUD are solid wastes, and those wastes as well as any other specific wastes produced at the project site shall be managed as solid waste pursuant to the Solid Waste Management Act, N.J.S.A. 13:1E-1 *et seq.* Use of these wastes at the acceptable use site or off site must be approved in advance by the Department pursuant to the Department's beneficial use regulations at N.J.A.C. 7:26-1.7(g).

V. LIMITATIONS and COMPLIANCE

A. The Department shall suspend all operations at an acceptable use project if it determines that termination is necessary to protect human health and the environment pursuant to the Coastal Permit Program regulations at N.J.A.C. 7:7, other criteria as specified by the Department in the AUD, and other environmental standards pursuant to State law.

B. The Department may revoke the AUD if the owner/operator fails to operate in strict compliance with the requirements of its AUD at all times, or any law or regulation in any way related to the AUD, or the Department determines there is sufficient cause for revocation in order to protect human health, safety and the environment.

C. Any person that conducts any of the activities as specified herein as requiring the authorization of the Department through issuance of an AUD, or that accepts unauthorized dredged material for any purpose as shall be determined by the Department, shall be deemed

to be in violation of the requirement to obtain an AUD for such activity, and shall be subject to all applicable penalties pursuant to law.

D. An AUD shall not be construed as granting permission to fill, disturb or conduct a regulated activity in: flood-plain areas, tidelands, freshwater wetlands, flood hazard areas or coastal saltwater wetlands, tidal areas or surface water runoff conditions. Any such activity must be conducted in accordance with all necessary advance site-specific authorizations and permits from, and as determined by, the Department and other relevant agencies.

E. An AUD shall not constitute an endorsement of, or recommendation for, the use of dredged material or any product containing dredged material. No uses of dredged material or products produced at acceptable use projects are authorized by the AUD unless expressly stated therein.

F. Dredged material, admixtures and products that are not managed and used in strict accordance with all of the conditions and requirements of the AUD are solid waste and shall be subject to the requirements of N.J.S.A. 13:1E-1 *et seq.*, known as the Solid Waste Management Act, which shall include the assessments of penalties for violations thereof.

G. An AUD is not transferable to any person.

H. Any deviation in the information provided to the Department on which an AUD is based may void the AUD, at the discretion of the Department, which would require a reevaluation and may make any person subject to enforcement action pursuant to applicable laws and regulations.

I. The Department reserves the right to require or conduct testing at any time to monitor or enforce the provisions of the AUD.

J. An AUD shall be granted without prejudice and shall not affect any existing or future enforcement action the Department or any other agency may take against any person.

K. If the Department determines that dredged material, admixtures or products are used in any manner, by any person, that violates or exceeds the scope of the conditions granted in the AUD the owner/operator shall be first responsible for the site's proper remediation, as well as for the remediation of all other media affected, and second, any other person or persons responsible in any way for the use of the material as shall be determined by the Department. Specifically, the DEP may take action, and may require the owner/operator to take action, at any time if more stringent standards or other criteria are adopted, or standards or criteria were improperly applied to a use application by any person.