Sediment Decontamination Demonstration Project

Final Report

submitted by

Harbor Resource Environmental Group, Inc.

submitted to

State of New Jersey Department of Transportation
Office of Maritime Resources

December 2005

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Executive Summary

This report presents the results of the Sediment Decontamination Demonstration Project conducted by Harbor Resource Environmental Group, Inc. (HREG) under contract with the NJ Department of Transportation, Office of Maritime Resources (NJDOT/OMR), as part of OMR's Sediment Decontamination Demonstration Project Request for Proposals (RFP). This RFP was issued by OMR (then New Jersey Maritime Resources in Department of Commerce) in March 1998, as part of the effort to demonstrate innovative technologies that may be capable of economically transforming large volumes of dredged material from the New York/New Jersey Harbor into beneficial use products.

Initially NUI Environmental Group, Inc., (NUIEG) was among those selected by OMR to demonstrate a new and innovative technology to process dredged material into marketable end products. In 2002, the responsibility for conducting the sediment decontamination demonstration project was transferred from NUIEG to HREG through an acquisition. The pilot study phase of the project—comprising the processing and decontamination of approximately 650 gallons of dredged material from the Stratus Petroleum site in Newark, NJ—was conducted by NUIEG in 2001, the results of which were compiled in a report and submitted to OMR in February 2002. The evaluation of the analytical results from the pilot study confirmed that the HREG Dredged Material Process demonstrated the ability to reduce target contaminant levels in dredged material from the New York/New Jersey Harbor to levels below New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) levels.

The second phase of this project, the larger-scale demonstration project, was conducted by HREG from March 10, 2005 through March 23, 2005 to test the effectiveness of the process using commercial-scale equipment. Included in HREG's team for the demonstration project were:

- Parsons Brinckerhoff – General Engineering Consultant
- Tetra Tech EC, Inc. – Technology Consultant
- LITT Consulting, LLC – Engineering and Business Development Consultant
- Lefco Environmental Services – Facility Operations
- Bayshore Recycling Corporation – Material Handling

- Potomac Environmental, Inc. – Effluent Disposal
- Environmental Testing Laboratories (ETL) – Analytical Testing
- Converse Consultants – Field Services and Geotechnical Testing
- Data/Analysis Technology (DAT) – Independent Data Validation

The dredged material processed in the HREG Demonstration Project came from the Darling International site at 825 Wilson Avenue in Newark, NJ, shown in Figure 4. Darling International's primary business activities include recycling and rendering of animal and food waste products into useful and commercial goods, including tallow, protein meals (Meat and Bone Meal), and yellow grease. The dredging of the material was coordinated by OMR, and was conducted by Great Lakes Dredge and Dock on January 22, 2005. The approximate quantity of dredged material delivered in the scow was 2,400 cubic yards.

The HREG Dredged Material Process

The HREG Dredged Material Process has been developed to convert contaminated dredged material into a beneficial use product. The principal elements of the technology are chemical oxidation for contaminant reduction, moisture removal or dewatering, and beneficial use conditioning through the addition of cement. For the demonstration project, the HREG Dredged Material Process was implemented in a large-scale process with commercial equipment, as shown in the process flow diagram (PFD) presented as Figure 1. The demonstration project utilized three core elements to achieve its goals of contaminant reduction via addition of a chemical oxidant, potassium permanganate ($KMnO_4$) in an aqueous solution, followed by mechanical dewatering (through the use of a belt filter presses in conjunction with a polymer flocculent) and addition of cement for solidification/stabilization.

The following provides a summary of the key processes employed during the HREG Demonstration Project to demonstrate the contaminant reduction, dewatering, and stabilization capabilities of HREG's Dredged Material Process.

Chemical Oxidant Addition - Chemical oxidant addition was achieved during the demonstration project using a solution of $KMnO_4$ in an aqueous solution. The $KMnO_4$ was introduced into the dredged material at a dosage of approximately 10,000 parts per million (ppm) after the sediment had been reduced to a slurry of approximately 15-30% solids by weight. After the $KMnO_4$ was introduced, the sediment slurry was held in

Baker Tanks for a minimum of approximately 6 hours to provide suitable reaction time for oxidation of organic contaminants.

Dredged Material Dewatering - For the demonstration project, HREG utilized a mechanical belt filter press for dewatering. The belt filter press applies mechanical pressure to the slurry by passing the slurry, which is sandwiched between two tension belts, over decreasing diameter rolls. A polymer, which serves as a flocculent, was used in conjunction with the belt filter presses to maximize water removal. The polymer was metered into the sediment depending on sediment flow rate and the percentage and characteristics of solids present in the sediment.

Beneficial Use Conditioning - Cement was employed as a stabilizing agent in the demonstration project to achieve the desired beneficial use characteristics. Pozzolanic additives such as cement have been widely used as stabilizing agents on New York and New Jersey Harbor dredged material and their ability to enhance the physical characteristics of these materials has been established. Cement was added at a dosage rate of approximately 7.6% by weight to the dredged material after the oxidation and dewatering steps using a screw-type ribbon blender.

Demonstration Project Activities

The scow containing material dredged from the Darling International facility on January 22, 2005 for processing under the HREG Demonstration Project arrived at the Bayshore Recycling facility on February 27, 2005 and was moored at the site throughout the duration of the project. Pre-processing (startup and shakedown) activities took place from March 10, 2005 through March 17, 2005, during which limited processing of material was anticipated. The processing phase of the project took place during a five-day period from March 18, 2005 through March 23, 2005, during which dredged material was processed at the maximum achievable rate and sampling and testing was conducted.

Towards the end of the processing phase, HREG determined that it would not be able to process all of the sediment in the scow, and made alternative arrangements for the disposition of the portion of the sediment not processed by HREG. Subsequent to the processing phase of the project, the following activities took place:

- Between the dates of March 24, 2005 and March 30, 2005, a total of 20 truckloads of processed dredged material, containing a total of 332 tons of

material, were delivered to and accepted by EnCap Golf's Rutherford/Lyndhurst facility. Acceptance records from EnCap are provided in Appendix I ;

- HREG submitted a request for an amendment to its AUD, authorizing the transportation of the scow and its remaining contents to DonJon Marine's facility at Berth 36 in Port Newark for processing and delivery to EnCap in accordance with DonJon's AUD. Authorization of this request was granted by the New Jersey Department of Environmental Protection (NJDEP) on April 1, 2005 in the form of a Revised AUD for HREG's project. A copy of the revised AUD is provided in Appendix A;
- Demobilization of the project site, with the exception of the cement "pig" storage tank, was completed by March 31, 2005. The "pig" was taken off-site on May 3, 2005;
- Arrangements were made to have Great Lakes Dredge & Dock Co. transport the scow and its remaining contents to the MOTBY terminal in Bayonne for temporary staging on April 3, 2005; and
- The scow and its remaining contents were transported from the MOTBY terminal to DonJon Marine's facility in Port Newark on April 11, 2005. The material was then processed by DonJon in accordance with the AUD issued for its facility and transported to EnCap for beneficial use.

Demonstration Project Results

Contaminant Reduction

In evaluating results for contaminants with initial concentrations either exceeding the NRDCSCC and Residential Direct Contact Soil Cleanup Criteria (RDCSCC), or within an order of magnitude of the RDCSCC, HREG developed average total feed and product concentrations to assess the Demonstration Project performance (i.e. percent reduction of contaminants on a concentration basis). The percent reductions of contaminants were calculated based on taking the overall average concentration of all of the feed samples and the overall average concentrations of all of the treated samples. Based on a statistical "t-test" analysis of the performance data, it was determined that statistical significance was not achieved. As a result, it is noted that the data summarized in the table below represents the observed trend determined through evaluation of the analytical results from the demonstration project.

Analyte Group	% Reduction Overall Average (Range)
Semi-Volatile Organic Compounds (SVOCs)	12 (-75.9 to 71.2)
Metals	21 (-40.1 to 63.5)[1]
Polychlorinated Biphenyls (PCBs)	10 (-135.4 to 66.5)
Dioxins	* (-183.3 to 25.6)

* Analytical results insufficient to draw any conclusions as relates to reduction of dioxin concentrations

[1] Metals data from Day 1 was excluded from the range of % reduction presented, as Antimony on Day 1 was below method detection limits for the feed, but was detected in the treated product. Since the % reduction was calculated based on the method detection limit as the feed concentration, the overall % reductions for Metals on Day 1 was heavily skewed by the Antimony data, hence the exclusion.

It should be noted that there was one set of data (Day 5 samples) that showed relatively higher concentrations of contaminants in the feed (four of the seven PAHs tracked in the SVOC category exceeded RDCSCC). The treated sediment from this day showed the best results; the concentrations in the treated product were all below RDCSCC. For this sample, the average percent reduction for the SVOCs was over 70%. The average percent reduction for PCBs on the same day was over 65%.

HREG was pleased with the overall results of the Demonstration Project. Overall, the performance data shown in Tables 8 and 9 demonstrated the ability of the chemical oxidant component of the HREG Process to reduce organic chemical contaminant and PCB concentrations based on the specific feed and chemical dosages used in the HREG Demonstration Project. The data for dioxins varied over a wide range making these results less conclusive. It should be recognized that the feed sediment used for this project was very low in contaminant concentrations, thus requiring a chemical oxidant concentration ($KMnO_4$) of only 10,000 ppm on a dry solids basis to achieve an acceptable Beneficial Use Product. Based on the observed data trends from the demonstration project, HREG believes that sediment containing higher concentrations of contaminants can be successful treated through the use of higher concentrations of oxidant.

Air Monitoring

Air monitoring for mercury and particulates was performed in accordance with the NJDEP-approved Air Monitoring Plan for the project. Monitoring was performed at six

(6) locations for mercury and four (4) locations for particulates over a three (3) day period. The results show no elevated readings for mercury at any of the locations for all three days. All readings were at or below 0.005 ppm, which is below the OSHA Permissible Exposure Limit (PEL) for mercury of 0.1 mg/m^3. Results for particulates showed no elevated readings at any of the stockpiles, at the belt filter presses (as compared to National Ambient Air Quality Standards), and at the baghouse (as compared to typical air permit limits for particulates from a baghouse for this type of application). Air monitoring for Carbon Monoxide (CO) also was performed at various locations throughout the facility to ensure worker safety. There were no elevated readings for CO, as they were all less than 0.5 ppm (as compared to the OSHA PEL value of 50 ppm).

Air sampling was performed for VOCs, SVOCs, and PCBs. Summa canisters were used for collecting samples for VOCs and PUF cartridges were used for collecting samples for SVOCs and PCBs. Samples were collected at several locations for a one-hour period on three separate days. The results showed that all compounds analyzed were well below OSHA Short Term Exposure Limits (STELs) and PELs.

Suitability for Beneficial Use

The selected beneficial use for the HREG Demonstration Project was fill material for the EnCap Golf development project in Lyndhurst & Rutherford, NJ. The EnCap Golf project entails the closure and remediation of several landfills, and their subsequent development into golf courses and other complementary amenities.

EnCap has established requirements for both the analytical (chemical) and physical (geotechnical) properties of material to be placed at its sites. Analytical requirements for EnCap's Lyndhurst & Rutherford sites are presented in Table 14. The requirements for physical properties are:

- Minimum compressive strength of 2,000 pounds per square foot;
- Maximum hydraulic conductivity of $1x10^{-5}$ cm/sec; and
- Maximum particle size of 4 inches

During the HREG Demonstration Project, approximately 330 tons of processed dredged material was successfully placed at EnCap Golf's Lyndhurst & Rutherford facility through the application of HREG's process.

HREG utilized cement as a pozzolanic additive in its demonstration project in order to improve the physical properties of the processed dredged material to meet the requirements stated above. The cement was added to the dewatered dredged material using a 10-cubic-yard screw-type Maxon "Maxcrete" ribbon blender. The overall average rate of addition for cement in the demonstration project was approximately 7.6% of the weight of dewatered sediment. The use of pozzolanics in the HREG process serves several purposes including providing improved strength properties; and reducing moisture content through the hydration associated with cement curing. Though not measured in this project, the addition of cement to dredged material has been proven through previous projects and studies to reduce leachability of metals and certain organic compounds through their stabilization in the sediment matrix.

The table below summarizes some of the key properties of the processed dredged material as determined through the sampling and testing program conducted as part of the HREG Demonstration Project.

Sample	**Grain Size Distribution**			**Atterberg Limits**		**UC (psf)**	**HC (cm/sec)**	**Solids Content (wt %)**
	% Sand	**% Silt**	**% Clay**	**LL**	**PL**			
Days 1-5 (A)	16.9	63.2	19.9	110	78	3,400	1.4×10^{-5}	53.6
Days 1-5 (B)	8.6	65.2	26.2	108	74	2,720	2.8×10^{-6}	52.5
Average	**12.8**	**64.2**	**23.0**	**109**	**76**	**3,060**	$\mathbf{8.4 \times 10^{-6}}$	**53.0**

Notes:
LL = Liquid Limit
PL = Plastic Limit
UC = Unconfined Compressive Strength
HC = Hydraulic Conductivity

Economic Evaluation for Commercial – Scale Processing

As part of the development process for a permanent facility, HREG conducted an economic analysis of processing costs for the proposed technology at a commercial scale (500,000 cubic yards per year) based on an anticipated facility life of 30 years. The results of this analysis, originally presented HREG's Pilot Study Report, have been updated to incorporate new information gained through the execution of the

demonstration project, particularly with regard to the variable costs associated with process additives. The updated analysis, presented in Table 15, indicates a net average "tipping fee" for a commercial-scale of approximately **$39.66**, exclusive of costs associated with dredging and delivery of the material to HREG's facility.

HREG anticipates using a variable degree of oxidant in its process, depending on the characteristics of the incoming material, with a dosage range from 4,000 ppm to 12,000 ppm on the weight of dry solids. As such the processing costs are expected to range from approximately $33.95 to $45.40 per cubic yard. These projections compare well with the target of $35 per cubic yard established by OMR, particularly after adjusting for inflation since the issuance of the RFP.

Conclusions

Through the execution of its demonstration project, HREG was able to demonstrate the key components of its process, specifically:

- Contaminant reduction through chemical oxidant addition;
- Dewatering through the use of belt filter presses in conjunction with polymer flocculent; and
- Beneficial use conditioning through the addition of cement to dewatered sediment.

Contaminant reduction was achieved by adding an oxidant ($KMnO_4$) at a dosage of approximately 10,000 parts per million to a dredged material slurry and providing a minimum reaction time of six hours to facilitate oxidation of organic constituents. The following key observations and statistics are worthy of note:

- Site-specific analytical requirements for the beneficial use site (EnCap) were met;
- There were no RDCSCC exceedances for VOCs in the treated product;
- Of the 49 data points for the PAHs tracked in the SVOC category, there were only three (3) RDCSCC exceedances in the treated product, and the overall average treated concentrations showed no RDCSCC exceedances;
- Of the 84 data points of the 13 metals tracked, there was only one RDCSCC exceedance (Antimony) in the treated product; and

- Despite the higher concentrations of Manganese in the treated dredged material, the Mn concentrations were below RDCSCC in all samples; and
- The PCB data points all met NRDCSCC.

Dewatering of the sediment was performed after the oxidation step and was achieved through the use of belt filter presses in combination with a polymer flocculent (OndeoNalco 9908). The operation of the belt filter presses yielded dewatered sediment "cake" that was over 50% solids by weight. It should be noted that the total amount of water removed from the raw sediment was less than expected, primarily due to the sediment feed having a lower moisture content than is typically encountered in the Harbor. As implemented in the demonstration project, the HREG Process first diluted the raw sediment from its natural state to a slurry of approximately 15% solids by weight. Based on the success in the demonstration project in dewatering this slurry to result in a cake of approximately 50% solids by weight, HREG is confident that for sediment feeds with higher moisture contents than that encountered on this project, similar performance of the dewatering step, with solids contents of over 50% by weight, can be achieved.

The addition of cement was the last of three key steps in the HREG Process. Through a cement dosage of approximately 7.6% by weight of sediment, the goal of solidification (improving physical properties of the processed material) was achieved. HREG's processed dredged material met the hydraulic conductivity requirements of EnCap, and exceeded their unconfined compressive strength requirements by roughly 50%. EnCap praised HREG on the quality of its product, noting that the material was very friable and significantly better than most other material that they receive from other processes.

Additional observations with regard to the impact of the cement on leachability of metals and other constituents include:

- The results of the MEP test revealed that out of approximately 114 data points for PAHs and metals, only Lead exceeded groundwater criteria and only in three of the samples;
- Despite the higher concentrations of Manganese in the treated dredged material, the results of the MEP test indicate that Mn was not leachable (below groundwater criteria); and
- All compounds passed TCLP.

Based on the results documented above and throughout this report, HREG is confident that its process can reduce levels of contaminants from dredged sediment and create a Beneficial Use Product that satisfies the requirements of a particular end user. HREG is grateful to the NJ Department of Transportation, Office of Maritime Resources for the opportunity to have participated in this Demonstration Project and will eagerly continue in the development of its process and establishment of a commercial-scale facility.

1.0 Introduction

In an effort to promote the development of new technologies to process contaminated dredged materials into beneficial use products, the Office of Maritime Resources (OMR) in 1998 began a program of funding demonstrations of new technologies, with the goal of having successful technologies establish permanent commercial-scale, cost-effective processing facilities to serve the New York/New Jersey Harbor (the "Harbor"). The overall scope of the OMR-sponsored project involved two principal tasks, a small-scale pilot study and a larger-scale demonstration project.

Initially NUI Environmental Group, Inc., (NUIEG) was among those selected by OMR to demonstrate a new and innovative technology to process dredged material into marketable end products. In 2003, the responsibility for conducting the sediment decontamination demonstration project was transferred from NUIEG to Harbor Resource Environmental Group, Inc. (HREG) as the result of HREG's acquisition of NUIEG.

The initial stage of the project consisted of a pilot study to demonstrate the effectiveness of the HREG Dredged Material Process to convert dredged material into marketable beneficial use products. This was to be accomplished by reducing contaminants in the dredged material to acceptable levels for the proposed end uses and to satisfy requirements set forth by the State of New Jersey.

The second phase of this project, the larger-scale demonstration project, was performed to test the logistical, environmental and economic effectiveness of the process using commercial-scale equipment. This report presents the results of the HREG Demonstration Project and the effectiveness of the process in a commercial-scale operation.

1.1 Project Background

In March of 1998, OMR issued a request for proposals (RFP) for the demonstration of new and innovative technologies for the decontamination of dredged material that would result in an end product that could serve a beneficial use. NUIEG responded to the RFP, and was selected as one of the contractors to perform a pilot study and develop a demonstration-scale facility to evaluate their processing technology under the terms outlined in the RFP.

1.1.1 OMR Program

The OMR Sediment Decontamination Demonstration Project, as described in the RFP dated March 4, 1998, includes two principal tasks, a pilot study and a demonstration project.

1.1.1.1 Pilot Study

The RFP issued by OMR called for a pilot study facility capable of processing a minimum of 200 gallons of dredged material, to be provided to the contractor by OMR. The purpose of the pilot study was to prove the effectiveness of the processing technology on a small-scale before proceeding to the larger-scale demonstration facility.

The pilot study phase of the project—comprising the processing and decontamination of approximately 650 gallons of dredged material from Stratus Petroleum in Newark, NJ—was conducted by NUIEG in 2001, the results of which were compiled in a report and submitted to OMR in February 2002. The evaluation of the analytical results from the pilot study confirmed that the HREG Dredged Material Process was able to reduce target contaminant concentrations in NY/NJ Harbor dredged material to levels below New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

1.1.1.2 Demonstration Project

For the demonstration portion of the project, the RFP stipulated that a larger-scale facility, based on the technology used in the pilot study, be constructed on a waterfront site adjacent to New Jersey waters within the New York/New Jersey Port District. This demonstration-scale facility was expected to process approximately 3,000 cubic yards of sediment, in order to show that the technology could feasibly be utilized in a cost-effective manner at a commercial scale.

1.2 Project Organization

1.2.1 Program Manager – Harbor Resource Environmental Group, Inc.

The pilot study was managed by NUIEG, a subsidiary of NUI Corporation, under the direction of Michael Behan as Project Executive and Daniel Edwards as project manager. Subsequent to the completion of the pilot study, NUIEG was acquired by HREG. Overseeing the Demonstration Project for HREG as Project Executive was Michael J. Behan, President of HREG. Prior to forming HREG, Mr. Behan held management positions at NUI Corporation for nearly 25 years, including the position of president of NUIEG and NUI Ventures.

Mr. Behan was assisted in the management of the project by Joseph Kelly of LITT Consulting, LLC. Mr. Kelly, a chemical and environmental engineer, has over 30 years of industry experience in process engineering, operations, and business planning. Mr. Kelly has served as a consultant to NUIEG/HREG since 1997, assisting in the engineering, environmental and business development arenas.

1.2.2 Engineering Consultant – Parsons Brinckerhoff Quade & Douglas, Inc.

Parsons Brinckerhoff (PB) is a New York City-based engineering firm with over a century of expertise in marine and coastal engineering, including waterfront construction, permitting, and dredging. PB served as the general engineering consultant for both the pilot study and demonstration project, providing engineering and permitting services for the facility, and coordinating project activities and reporting throughout the project. PB's dredging project experience includes feasibility studies, engineering, design and construction supervision of upland and nearshore confined disposal facilities (CDFs), artificial islands, stabilization/solidification processes, and decontamination technology facility developments. A number of PB-designed CDFs were reclaimed and are being beneficially used as wetlands, container terminals, airport storage areas and tunnel portal islands.

1.2.3 Technology Consultant – Tetra Tech EC, Inc.

Tetra Tech EC, Inc., (TTEC) served as the technology consultant for both the pilot study (as Foster Wheeler Environmental Corporation) and the demonstration project, providing assistance in development of the process technology, testing programs, evaluation of the analytical results, preparation of the engineering level material balances, and contributing to the final report.

1.2.4 Testing Laboratories

Converse Consultants and Environmental Testing Laboratory (ETL) performed the geotechnical and environmental testing, respectively, for both the pilot study and demonstration project.

1.2.5 Independent Data Validation – Data/Analysis Technologies, Inc.

Data/Analysis Technologies (DAT) performed independent data validation for the pilot study. Situated in Plain City, Ohio, DAT was founded in 1990. Dr. Ronald K. Mitchum, Ph.D. served as DAT's project director for both the pilot study and the demonstration project.

1.2.6 Facility Operations

Operations of the HREG demonstration facility were conducted by several parties, as follows:

- Bayshore Recycling Corporation – material handling;
- Lefco Environmental, Inc. – processing of dredging material (including dewatering, oxidant addition, and cement addition); and
- Potomac Environmental, Inc. – effluent disposal.

1.3 Project Objectives

1.3.1 Contaminant Reduction

Much of the dredged material from the Harbor has been contaminated to some degree by past municipal and/or industrial discharges to the Harbor's waterways, thereby complicating the issue of disposal of these

sediments. An alternative to disposal is the beneficial use of this material, which requires processing such that it can be reused as a commercial product. For this reuse to be permitted, however, the level of contamination existing in the material often needs to be reduced to meet a regulatory threshold and allay environmental concerns. In New Jersey, the generally applicable thresholds are the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) and the New Jersey Residential Direct Contact Soil Cleanup Criteria (RDCSCC), with the applicability of these thresholds depending on the intended beneficial use for the material. In addition to the NRDCSCC or RDCSCC, most existing beneficial use sites have site-specific acceptance criteria. Contaminant reduction is a core component of the HREG Dredged Material Process. Consequently, the primary objective of HREG's Demonstration Project was to assess the effectiveness of the process using commercial-scale equipment to reduce target contaminants to levels below the applicable thresholds (NRDCSCC, RDCSCC, and/or site-specific criteria) for the proposed beneficial use.

1.3.2 Sediment Dewatering

One of the key challenges in the processing of dredged material for beneficial use is reducing the natural moisture content of the dredged material. Dredged sediments from the New York/New Jersey Harbor typically have a moisture content ranging from 100% to 250%, with moisture content being defined as the ratio of the weight of water to the weight of solids. Sediment of this nature is highly plastic and very difficult to work with, earning it the nickname "black mayonnaise". A reduction in the moisture content of the material results in improved mechanical properties (workability, compaction) of the material, which are critical to the successful beneficial use of the material. Dewatering is a core component of the HREG Dredged Material Process, and one of the key objectives of the HREG Demonstration Project was to assess the effectiveness of the mechanical dewatering process.

1.3.3 Beneficial Use

The NY/NJ Harbor is situated within the naturally shallow Hudson Raritan estuary. Modern shipping has necessitated that creation of over 250 miles of engineered waterways requiring annual maintenance dredging of 4 to 6 million cubic yards. Historical practice relied on ocean disposal of sediments, but recent improvement in environmental analysis and tighter environmental regulation has restricted the use of ocean disposal. Consequently, the States of New Jersey and New York have encouraged beneficial use of dredged material, including sediment decontamination for the continued maintenance of Port infrastructure. In addition to the sustainability benefit of generating a productive use from material that would otherwise be disposed of as waste, beneficial use has the potential to substantially reduce net dredging costs in the Harbor. It is in this context that HREG has established its objective, consistent with the goals of the OMR RFP, for the development of a cost-effective processing technology that can produce a marketable beneficial use product at a commercial scale with a net cost of not more than $35 per cubic yard.

1.3.4 Economic Evaluation

An additional requirement of the RFP and objective of the demonstration project was to use the data collected during the execution of the demonstration project to evaluate the economics of the HREG Dredged Material Process at a commercial scale. This evaluation, presented in Section 5.0, has been based on a full-scale commercial facility with a 30-year operating life and an estimated annual processing capacity of 500,000 cubic yards of material.

2.0 HREG Demonstration Project Process Description

The HREG Dredged Material Process has been developed to convert contaminated dredged material into a beneficial use product. The principal elements of the technology are moisture removal or dewatering, chemical oxidation for contaminant reduction and beneficial use conditioning through the use of a pozzolanic admixture, frequently cement. For the demonstration project, the HREG Dredged Material Process was implemented in a large-scale process with commercial equipment, as

shown in the process flow diagram (PFD) presented as Figure 1. The demonstration project utilized three core elements to achieve its goals of contaminant reduction via addition of a chemical oxidant, potassium permanganate ($KMnO_4$) in an aqueous solution, followed by mechanical dewatering (through the use of belt filter presses in conjunction with a polymer flocculent) and addition of cement for solidification/stabilization.

The following provides a summary of the key processes employed during the HREG Demonstration Project to demonstrate the contaminant reduction, dewatering, and stabilization capabilities of HREG's Dredged Material Process.

2.1 Chemical Oxidant Addition

Chemical oxidant addition was achieved during the demonstration project using a solution of $KMnO_4$ in an aqueous solution. The $KMnO_4$, supplied by the Carus Chemical Company (Peru, IL) with a minimum specified purity level of 97%, was introduced into the dredged material after it had been reduced to a slurry of approximately 15-30% solids by weight and pumped in one of four 19,950-gallon Baker Tanks, each of which was equipped with four two-blade mixers. The target dosage (not to exceed 12,000 part per million [ppm] on a dry solids basis) of $KMnO_4$ was based on the pilot study results and preliminary bench-scale tests conducted by HREG. The bench-scale tests used samples of dredged material from the New York/New Jersey Harbor supplied by OMR. The actual dosage used in the demonstration project was estimated to be about 10,000 ppm by weight of the dry solids content of the raw material, roughly equivalent to 128 pounds of $KMnO_4$ per cubic yard of raw dredged material. After the $KMnO_4$ was introduced, the slurry was held in the Baker Tanks for a minimum of approximately 6 hours to provide suitable reaction time for oxidation of organic contaminants.

2.2 Dredged Material Dewatering

An important aspect of HREG's beneficial use program is the ability to significantly reduce the water content of the dredged material to enhance its physical/mechanical properties. The HREG Dredged Material Process incorporates dewatering as one of the three core elements (discussed above) in the overall process. For the demonstration project HREG utilized two 2.0-meter Ashbrook "Winklepress" mechanical belt filter presses for dewatering. The belt filter press applies mechanical pressure to the slurry by passing the slurry, which is sandwiched between two tension

belts, over decreasing diameter rolls. The belt filter press was equipped with a polymer feed system where Ondeo Nalco dry polymer #9908 was mixed with water and combined with the sediment slurry when it was pumped from the oxidation tanks to the belt filter press. The polymer, which serves as a flocculent to maximize water removal in the belt filter presses, was metered into the sediment depending on sediment flow rate and the percentage and characteristics of solids present in the sediment. The actual dosage used in the demonstration project was estimated to be about 4.6 pounds per ton of dry sediment.

2.3 Beneficial Use Conditioning

In addition to the process elements applied in the pilot study, cement was employed as a stabilizing agent in the demonstration project to achieve the desired beneficial use characteristics. Pozzolanic additives such as cement have been widely used as stabilizing agents on New York and New Jersey Harbor dredged material and their ability to enhance the physical characteristics of these materials has been established. Cement was added to the dredged material after the oxidation and dewatering steps using a 10-cubic-yard screw-type Maxon “Maxcrete” ribbon blender. Cement addition was controlled through the use of load cells to facilitate achieving the target cement dosage of 10% by weight. A further discussion of beneficial use conditioning is presented in Section .4.6.2.

3.0 Demonstration Project Activities

3.1 Project Planning

3.1.1 Project Plans and Documents

The demonstration project was conducted from March 10, 2005 to March 24, 2005 in general accordance with the OMR- and NJDEP-approved Demonstration Project Work Plan (Work Plan), submitted to OMR in February 2003, including an addendum (Sampling and Analysis Plan) submitted in April 2003. The Work Plan included a description of the process, project site and costs; an analytical and physical sampling and analysis plan; and a health and safety plan.

3.1.2 Site Selection

The HREG Demonstration Project required a site that offered waterfront access with sufficient draft and berth suitable to accommodate scows containing dredged material. Additionally, due to the demonstrative nature of the project, it was desirable that the site require minimal permitting (i.e. a site with an existing waterfront development permit). Finally, the economic constraints of the project dictated the costs associated with the use of the site needed to be reasonable.

The Construction & Marine (C&M) site on South Front Street in Elizabeth, NJ was initially selected for use as the unloading site for the demonstration project. Due to on-going remediation on site, and corresponding liability associated with conducting the entire project on an active remediation site, it was decided to locate the processing component of the project at a vacant parking lot on Butler Street owned by NUI Corporation and located in Elizabeth within a mile of the C&M site.

The Bayshore Recycling Corporation site in Keasbey, NJ was made available to HREG by OMR in November 2004, after the C&M/Butler Street sites had been selected and permit applications were prepared. Like the C&M site, the Bayshore site had adequate waterfront access for scows and an existing Waterfront Development Permit covering the handling of dredged material. In addition, material handling costs at the Bayshore Recycling site were expected to be lower than at C&M/Butler since the material would be off-loaded and processed at the same site, a feature that also eliminated the undesirable aspect of transporting raw dredged material over public roadways. Existing partially-enclosed buildings at the Bayshore site were an available and suitable location for HREG's processing facilities that allowed for execution of the project during the winter months, accelerating the project schedule. Locating the processing equipment inside one of the buildings would allow for some refuge from the weather, and would help prevent equipment failures due to freezing temperatures. Bayshore's location in an industrial area and existing operations (processing of aggregate, C&D material, etc.) also were consistent with the operations for the demonstration project.

In mid-December 2004, it was decided to relocate the project to the Bayshore Recycling Corporation site. As a result of this change, HREG quickly commenced with the revision and resubmittal of environmental permit

documents to address the new site location. A location plan and facility plan for the Bayshore Recycling site is provided in Figures 2 and 3, respectively.

3.1.3 Permits

As noted in Section 3.1.2, the proposed demonstration project site location was changed to the Bayshore Recycling Corporation site in December 2004. Permitting requirements at the Bayshore site were similar to those for the C&M/Butler site which only required an AUD and Air Monitoring Permit. Consequently, permitting activities for this site comprised the preparation of requests for amendments to the AUD application and Air Monitoring Permit applications submitted for the C&M/Butler Street site to reflect the change in project location. These requests were submitted on January 21, 2005 and January 24, 2005, respectively.

The AUD for the project was issued on February 14, 2005 and the Air Permit was issued on February 16, 2005. Copies of the AUD and Air Permit (including the approved Air Monitoring Plan) are provided in Appendix A.

Dredging of the sediment processed during the HREG Demonstration Project was conducted at the Darling International facility on January 22, 2005 under existing permits for that facility issued by the US Army Corps of Engineers (permit #1999-13370) and NJDEP (permit #0714-91-0002.20).

3.2 Site Preparation

The HREG Demonstration Project utilized a portion of an existing masonry industrial building on the Bayshore site. The building was in deteriorated condition, with several broken windows and missing sections of walls. The building's floor is concrete. Site preparation requirements were minimal and included enclosing areas with missing walls with plastic and creating several small holes in an exterior wall to accommodate hoses to be run between the cement silo (pig) and the ribbon blender. During the demonstration, portable air heaters were utilized as necessary to maintain the ambient air temperatures near the equipment above freezing. All equipment was located inside the building except for the cement silo, oxidant ($KMnO_4$) storage containers and feed system, effluent storage tank, and roll-offs containing the raw dredged material. A mobile field office trailer was rented for the demonstration project and located outside of the building.

3.3 Dredging and Transportation

3.3.1 Source Material Selection and Dredging

The dredged material used in the HREG Pilot Project came from Stratus Petroleum, located in Newark, New Jersey. Due to changing priorities at the terminals participating in the OMR program, Darling International was selected to provide the material for the demonstration project. The Darling International facility is located at 825 Wilson Avenue in Newark, NJ (Figure 4), adjacent to Stratus Petroleum. Darling International's primary business activities include recycling and rendering of animal and food waste products into useful and commercial goods, including tallow, protein meals (Meat and Bone Meal), and yellow grease. Additionally Darling International collects cooking oils from restaurants. The dredging of the material was coordinated by OMR, and was conducted by Great Lakes Dredge and Dock on January 22, 2005. The approximate quantity of dredged material delivered in the scow was 2,400 cubic yards.

3.3.2 Dredged Material Transportation and Storage

Due to permit limitations on dredging, it was necessary to dredge the sediment at Darling International before HREG's facility was established. The sediment was loaded into an uncovered scow, transported by a tug to the MOTBY terminal in Bayonne, NJ, and held there until it was transported by tug to the Bayshore site on February 27, 2005. No attempts were made to reduce rainfall into or volatilization out of the material during storage. However, all evaluations of treatment efficiency were made based on composite samples taken at the head of the treatment works, not from the scow itself.

3.4 Demonstration Facility Equipment

Table 1 comprises the primary process equipment utilized in the HREG Demonstration Project, as shown on the process flow diagram in Figure 1. Brief descriptions of the major process components are provided below. Photographs of the equipment used in the demonstration project are provided in Appendix B.

Mechanical Excavator – A Komatsu 400 mechanical excavator was used to transfer raw sediment from the scow to truck-mounted roll-off containers for transport to the head end of the processing train.

Roll-off Containers – two 30-cubic-yard capacity roll-off containers mounted on delivery trucks (equipment ID X-101 in process flow diagram) were utilized during the project to deliver raw sediment to the head end of the processing train.

Pumps – pumps were used in several locations within the processing train to move material through the system. The first pump was required to transfer material from the roll-off containers through the bar screen and into the surge tank. Some difficulties were encountered in pumping material out of the roll-off containers (as further described in Section 3.6), resulting in the use of several different pumps during the initial stages of the project. The most effective pump, used to transfer the majority of material processed, was a Schwing (St. Paul, MN) BLP 1000 concrete pump with a capacity of approximately 68 cubic yards per hour (P-101). In addition to this pump, several electrical centrifugal pumps, typically with a capacity of 350 gallons per minute, were utilized to move material through the system, including a Slurry Transfer Pump (P-102), Belt Filter Press Feed Pump (P-103), and Recycle Water Pump (P-104), each of which had an operating capacity of 350 gallons per minute (gpm).

Screening Devices – screening devices were used at two locations to prevent oversize (+1/4") material from entering the processing equipment, including:

- 3" bar screen and surge chamber (X-102) mounted on the Schwing concrete pump; and
- Brandt (Houston, TX) double ¼" vibrating screen mounted above a two-compartment, 800-gallon surge tank (X-103).

Oversize Material Roll-Off Container – a five-cubic-yard capacity roll-off container (X-105) was utilized to store oversize material excluded from the process train.

Oxidant Feed System – a Carus Chemical (Peru, IL) feed system with weigh scale and feed pump (PK-101) was used to deliver potassium permanganate ($KMnO_4$) to the oxidant tanks.

Oxidation Tanks – four 19,950-gallon Baker (Seal Beach, CA) "Short Tanks" (T-101A/B/C/D), each with four double blade agitators, were used to store the dredged material slurry during the oxidation process.

Polymer Flocculent Feed System – a 5,000 gallon mix tank and 60 gallon-per-minute recirculation/mix pump and feed pump (PK-102) was used to deliver Ondeo Nalco (Naperville, IL) dry polymer #9908 to the belt filter presses.

Belt Filter Presses – two 2.0-meter Ashbrook (Houston, TX) "Winklepress" belt filter presses (X-104A/B) were utilized to dewater the dredged material slurry after the oxidation step.

Filtrate Water Surge Tanks – two 19,950-gallon Baker "Short Tanks" (T-102A/B), each with four double blade agitators, were used for intermediate storage of the effluent water generated through the dewatering process.

Sand Filter System – a Baker three-bed sand filter system with a 567-gallon-per-minute pump (F-101) was used to polish effluent water prior to its transfer to the effluent storage tank.

Effluent Storage Tank – a 10,000-gallon calibrated Baker Tank (T-103) was used to store polished effluent prior to its transfer to tank trucks for off-site disposal at a licensed permitted facility.

Skid-Steer Loader – a Caterpillar (Peoria, IL) 248B skid-steer loader (X-106) was used to transfer dewatered sediment from the discharge of the belt filter presses to the ribbon blender, and processed material from the discharge of the ribbon blender to the product stockpile.

Cement Feed System – a Fruehauf cement "pig" tanker (75-ton capacity) with a pneumatic feed system and baghouse (PK-103) was used to store cement and transfer it to the ribbon blender for mixing with dewatered dredged material.

Ribbon Blender – a Maxon (Milwaukee, WI) 10-cubic-yard ribbon blender with weigh scale (M-101) was used to mix cement into the dewatered dredged material to create beneficial use product.

Front-end Loader – a front-end loader (X-107) was used to load processed dredged material into over-the-road trucks for transport to the beneficial use site.

3.5 Material Processing

3.5.1 Offloading, Screening and Contaminant Reduction

Sediment was delivered from the barge scow in 30-cubic-yard (cy) truck-mounted roll-off containers (X-101) to the processing site where recycle water was added into the roll-off and the mixture of water and sediment was manually sluiced over a 3" static grizzly with hopper (X-102) that fed the raw sediment transfer pump (P-101). The undersize slurry material, less than 3" in size, was pumped over a vibrating ¼" screen (X-103) and the +3" debris was collected in a roll-off container and disposed of by Bayshore Recycling's solid waste vendor (not part of the HREG processing scope). The – 3" + ¼" oversize from the vibrating screen was collected in a roll-off container (X-105) and periodically sent to the ribbon blender (M-101) to be mixed with filter cake and cement and incorporated into the beneficial use product (M8). The -¼" undersize slurry dropped into an agitated sump and was pumped by P-102 into the Oxidation Tanks (T-101 A/B/C/D). The slurry in T-101 A/B/C/D was adjusted to between 15% and 30% solids and then the oxidant, KMnO4, was added at a controlled addition rate via a weigh scale from the Carus Chemical Feed System (PK-101) for contaminant reduction by oxidizing the organic contaminants. The T-101 A/B/C/D Oxidation Tanks provided a minimum residence time of six (6) hours for the oxidation step and these tanks included agitators to ensure thorough mixing.

3.5.2 Sediment Dewatering

After the residence/reaction time in the Oxidant Tanks, the treated sediment slurry was further diluted to between 12% and 15% solids and pumped by the Belt Press Feed Pump (P-103) from the Oxidant Tanks to the two (2) Belt Filter Presses (X-104 A/B). The two belt filter presses were equipped with a Polymer Feed System (PK-102) where polymer powder was mixed with water and combined with the sediment slurry as it was pumped from T-101 A/B/C/D to the belt filter presses. The polymer, which serves as a flocculent to maximize water removal in the belt filter presses, was metered into the sediment depending on sediment flow rate and the percentage and characteristics of solids present in the sediment.

3.5.3 Recovery and Use of Filtrate and Treatment of Water Effluent

As the sediment was dewatered in the belt filter press, filtrate water was produced. This filtrate was pumped to the Filtrate Water Surge Unit (T-102 A/B) for use as recycle water and residual solids recovery. These tanks were equipped with mixers, which were used when solids in these tanks needed to be placed in suspension and periodically returned to the dewatering operation.

The filtrate water (M6) was returned to the sediment feed roll-off (X-101) to aid in producing a pumpable slurry as discussed in 3.6.1 above. Additional filtrate water was used to dilute the solid slurry for the dewatering operation while the balance of the filtrate water was disposed at an off-site licensed/permitted wastewater treatment facility (Lehigh County Wastewater Treatment Plant). Prior to disposal, this effluent was passed through a sand filter unit (F-101) to reduce suspended solids and then sent to an effluent water tank (T-103) to await disposal.

Filter cake (M4), produced during the mechanical dewatering operation, exited the belt filter press through a chute that dropped the cake onto an intermediate storage pile. A skid-steer loader (X-106) then delivered cake as necessary to the Ribbon Blender (M-101), for mixing with cement to produce a beneficial use product.

3.5.4 Cement Addition

In order to meet beneficial use specifications, cement was added to the dewatered/treated sediment for solidification and stabilization. This cement was stored on site in a cement “pig” tanker (PK-103). The Ribbon Blender (M-101) was equipped with a weighscale to monitor the weights of both filter cake and cement being fed. The cement addition was pneumatically metered to the blender on a weight basis derived from the ribbon blender’s load cell readings. The dewatered sediment was processed at a peak rate of approximately 10 cubic yards per hour during the demonstration project, as compared to the maximum throughput for the Ribbon Blender of approximately 30 cubic yards per hour.

Once loaded with dredged material and cement, the ribbon blender, which utilizes a screw mechanism to mix the materials, was run through a mixing cycle. At the completion of the mixing cycle, the ribbon blender was tipped up via hydraulic cylinders, its discharge gate opened, and the process dredged material was released into a stockpile. This stockpile of processed material was then transported by the skid-steer loader to the processed dredged material stockpile.

The beneficial use product was then loaded by a front-end loader (X-107) into tandem-axle dump trucks for shipment to the end user location. Bayshore's truck weigh scale was used to record the weight of beneficial use product shipped off-site.

3.6 Summary of Demonstration Project Activities

The scow containing dredged material to be processed under the HREG Demonstration Project arrived at the Bayshore Recycling facility on February 27, 2005 and was moored at the site throughout the duration of the project. Pre-processing (startup and shakedown) activities took place from March 10, 2005 through March 17, 2005, during which limited processing of material was performed.

The processing phase of the project took place during a five-day period from March 18, 2005 through March 23, 2005, during which dredged material was processed at the maximum achievable rate and sampling and testing was conducted. Brief descriptions of the activities from each day of the startup and processing phases of the project are provided below.

<u>March 10, 2005</u>

Initial processing of dredged material commenced on March 10, 2005 with the delivery of the first roll-off container of dredged material from the scow to the head end of the processing train. Difficulties were encountered in pumping the material from the roll-off; consequently, a new 5 hp submersible pump was ordered and delivered later the same day. Using the new pump to circulate the dredged material with water being added to improve pumpability, some success in pumping the material was achieved, although the pump would periodically become clogged or the material cavitated. By the end of the day, the majority of the material from the first roll-off had been pumped into the process train.

March 11, 2005

On March 11, 2005, more progress was made pumping material into the system; at day's end a total of three roll-offs had been pumped into the system and circulated into the oxidation tanks. When approximately 1½ oxidation tanks had been filled, the $KMnO_4$ feed system was turned on and the first dose of $KMnO_4$ was input into the full oxidation tank. Due to continued slow progress in pumping material out of the roll-offs, a larger (15 hp) submersible pump was ordered and delivered to the site just prior to closing.

March 12, 2005

After unsuccessfully attempting to use the new 15-hp pump, processing personnel reverted to the 5-hp submersible pump and were able to pump the contents of three full roll-offs into the system over the course of the day. The first of the two belt filter presses was turned on and production of dewatered "cake" commenced in the afternoon. Preparatory work on the ribbon blender also was performed. Immediately prior to closing, $KMnO_4$ was injected into the oxidation tanks containing the material pumped into the system during the day.

March 14, 2005

The pump supplier was called to the site on the morning of March 14th to evaluate the difficulties encountered in pumping material out of the roll-offs. The supplier recommended that a 6-inch hydraulic concrete pump be utilized; this pump was delivered later that day. Additional pumps, required to pump the flocculent solution into both belt filter presses (to support simultaneous operation of the presses) were ordered, with delivery scheduled for the morning of March 15th. The hydraulic pump was delivered in the afternoon and, though it initially appeared to work, it too became clogged and was rendered unusable. Production of dewatered cake from one belt filter press continued throughout the day, and after preparatory work on the ribbon blender (including connecting the cement "pig" and calibrating the blender's load cells) was completed, the first batch of dewatered cake was loaded into the ribbon blender for cement addition. Due to operational constraints inherent in loading the blender with a skid-steer loader, it was determined that only about 3 cubic yards of dewatered cake could be loaded into the ribbon blender per batch.

March 15, 2005

An alternative approach to pumping material out of the roll-offs (use of a concrete pump) was proposed on March 15th. A pump was ordered for delivery on March 16th, and arrangements for necessary modifications to the roll-off containers to support the use of a concrete pump with a hopper were made; delivery of the pump was scheduled for Thursday, March 17th. The pumps for the flocculent system were picked up and installed; as a result, both belt filter presses were operable and produced dewatered cake. Field measurements indicated that the dewatered cake was approximately 50% solids by weight at the discharge of the belt filter presses, and the processed dredged material was approximately 56% solids by weight one day after cement addition.

March 16, 2005

Scaffolding was erected on March 16th to facilitate personnel access to the truck-mounted roll-offs to improve the pace at which material could be pumped into the system. A water hose fitted on the pump also helped somewhat with the pumping operation. Modifications to the roll-off containers (comprising the welding of a gate to the back end of the container) to support the use of the concrete pump were underway. The contents of one roll-off were pumped into the system in the morning.

March 17, 2005

The concrete pump was delivered and set up the morning of March 17th. A mound was created from several loads of dirt provided by Bayshore Recycling to raise the elevation of the truck several feet as necessary to accommodate the concrete pump and hopper. No new material was pumped into the system, but the material from the previous day was dewatered through the belt filter presses and converted to beneficial use product through the addition of cement in the ribbon blender. It was noted that the material in the barge (and consequently in the roll-offs) appeared to be getting noticeably drier over time.

March 18, 2005

March 18th was established as “Day 1” of the processing phase of the demonstration project, and arrangements had been made for personnel from Converse Consultants and ETL to be on-site toward the end of the day to collect the first set of samples for analysis. The new gate on the roll-off container

worked fairly well, as did the concrete pump, but the screen to the initial surge tank became clogged, requiring the processing to be stopped periodically to clean the screen. Due to the creation of the mound to raise the elevation of the truck, an extension to the scaffolding was installed to raise its elevation as well. Processing of material through the system continued, and the contents of 2½ roll-offs were pumped into the system over the course of the day. It was noted that the material in the roll-offs appeared to be getting drier and it was becoming more difficult to add water to create a pumpable slurry in the container. Air monitoring tests were scheduled for March 19, 2005. Converse Consultants and ETL personnel arrived at approximately 4:00pm and collected "Day 1" samples for each process stream. Due to the slow pace of processing, it was realized that HREG would not be able to process all of the contents of the scow through the demonstration process train, and contingency planning commenced for disposition of the portion of the scow's contents that could not be processed by HREG. Arrangements were made with EnCap to commence shipment of product on March 23, 2005.

March 19, 2005

Processing of material through the system continued, and the contents from 1½ roll-offs were pumped into the system over the course of the day. A stockpile of processed material (approximately 100 cubic yards) was created immediately outside the processing building under a canopy. Converse Consultants and ETL personnel arrived at approximately 3:00pm and collected "Day 2" samples for each process stream.

March 21, 2005

Based on a review of financial status of the project, the decision to reduce the duration of the processing phase from 12 days to five days was made on March 21st. The sampling program was revised to reflect a five-day program, while maintaining the number of samples to be analyzed. March 23, 2005 was established as the final day of the processing phase. Processing of material through the system continued with both belt filter presses in operation, with a peak rate of slightly over 25 cubic yards per hour achieved. The screen over the initial surge tank continued to bottleneck the operation of the concrete pump. Converse Consultants personnel arrived at approximately 3:00pm and collected "Day 3" samples for each process stream.

March 22, 2005

Processing of material through the system continued over the course of the day. One belt filter press and one oxidation tank was taken off-line to begin clean up. Converse Consultants personnel arrived at approximately 3:00pm and collected "Day 4" samples for each process stream. HREG commenced discussions with DonJon Marine regarding the potential to transport the scow with its remaining material to their facility in Port Newark for processing and delivery to EnCap.

March 23, 2005

Processing of material through the system was completed, and all finished product was stored in stockpiles for shipment to EnCap. HREG contacted EnCap to arrange for the bills of lading to be issued so that delivery of processed material could commence on March 24th. Break down and clean up of the facility continued. Converse Consultants and ETL personnel arrived at approximately 3:00pm and collected "Day 4" samples for each process stream. Discussions with DonJon Marine and OMR regarding disposition of the scow and remaining unprocessed material were held.

Post-Processing Operations

Subsequent to the processing phase of the project, the following activities took place:

- Between the dates of March 24, 2005 and March 30, 2005, a total of 20 truckloads of processed dredged material, containing a total of 332 tons of material, were delivered to and accepted by EnCap. Acceptance records from EnCap are provided in Appendix I;
- HREG submitted a request for an amendment to its AUD, authorizing the transportation of the scow and its remaining contents to DonJon Marine's facility at Berth 36 in Port Newark for processing and delivery to EnCap in accordance with DonJon's AUD. Authorization of this request was granted by NJDEP on April 1, 2005 in the form of a Revised AUD for HREG's project. A copy of the revised AUD is provided in Appendix A;
- Demobilization of the project site, with the exception of the cement "pig" storage tank, was completed by March 31, 2005. The "pig" was taken off-site on May 3, 2005;

- Arrangements were made to have Great Lakes Dredge & Dock Co. transport the scow and its remaining contents to the MOTBY terminal in Bayonne for temporary staging on April 3, 2005; and
- The scow and its remaining contents were transported from the MOTBY terminal to DonJon Marine's facility in Port Newark for processing on April 11, 2005.

3.7 Sample Management

Field samples were collected according to the NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E, and the NJDEPE Field Sampling Procedures Manual dated May 1992. The standard sample analyses were conducted by a New Jersey certified laboratory in accordance with NJDEP protocols. The laboratory data reports conformed to the "Reduced Laboratory Deliverables Format".

3.7.1 Sample Identification

Each sample taken during the demonstration project was assigned a unique identifier in order to allow the sample to be tracked through the sampling and analysis process. The system used to identify samples consisted of a three-part identifier, which included the following components:

- Sample stream number (e.g. sediment feed samples were given the primary identifier "S1");
- Primary or duplicate sample (primary sample is "A", duplicate sample is "B"; and
- Day number (i.e. a sample taken on day 1 would be "D1").

S1A-D1 = [Sample Stream S1] [Primary Sample] – [Day #1]

S3B-D4 = [Sample Stream S3] [Duplicate Sample] – [Day #4]

Composite samples followed the same methodology, except the label "COMP" preceded the three-part identifier.

COMP S4A–D3+D4+D5 = Composite sample for Sample Stream S4 for Days 3, 4, and 5.

For the MS/MSD (Matrix Spike / Matrix Spike Duplicate) samples, the identifier consisted of a two-part identifier as follows:

- Sample stream number (as described above);
- MS/MSD tag

S1-MS/MSD = [Sample Stream S1][MS/MSD Sample]

3.7.2 Sample Collection

Daily composites were collected by HREG over the course of the operating day in accordance with the Sampling and Analysis Plan. For sediment samples, plastic scoops were used to collect material from each stream (S1 through S3) into five-gallon pails. Different scoops were used for different streams to eliminate the potential for cross-contamination. The daily composite for the effluent stream (S4) was collected by opening a valve on the effluent storage tank and allowing the effluent to flow into the five-gallon pail.

Samples for analysis were collected from the five-gallon pails containing daily composites by Converse Consultants' field personnel. Wearing nitrile gloves, Converse personnel would hand-scoop material from each of the sediment sample streams (S1 through S3) into its respective container. Material that came in direct contact with the gloves was not included in the sample to minimize potential contamination. For the effluent (S4) stream, personnel wearing nitrile gloves collected the sample by immersing the sample container in the five-gallon pail. For all streams, a new set of gloves was donned for each sample collected.

3.7.3 Sample Packaging and Shipment

Samples were packaged in accordance with the NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E, and the NJDEPE Field Sampling Procedures Manual dated May 1992.

Accompanying each sample shipped was a chain-of-custody (COC) form, completed by Converse Consultants personnel, which included:

- Sample identification;

- Date and time that sample(s) was/were taken;
- Sampling method;
- Description of number and type of container(s) containing sample(s); and
- Identification of analyses to be performed on sample(s).

After being packaged, samples to be subjected to analytical testing were either transferred to ETL custody on-site (on days when ETL was present during sampling) or transported off-site and stored in coolers in Converse Consultants' custody until they were retrieved by personnel from ETL. Geotechnical samples were documented and identified in a similar fashion, but were retained by Converse Consultants for testing in their laboratory. Copies of the completed Chain of Custody documents for analytical and geotechnical samples are provided in Appendix C.

3.8 Testing Procedures

3.8.1 Startup

Prior to commencing the demonstration project, dredged material was used to test and troubleshoot all the process equipment and to set the operating parameters in line with the design criteria. These tests and checks included testing the operating speeds of the equipment, establishing the required concentrations of $KMnO_4$, polymer, and cement, coordinating movement of sediment between process unit operations, and stockpiling product for shipment to EnCap.

3.8.2 During Operations

The primary objective of the Sampling and Analysis Plan (SAP) for the HREG Demonstration Project was to provide an approach to collecting representative samples of sediment to determine:

a) physical and chemical properties of the sediment before and after processing,

b) the effectiveness of the NUI Dredged Material Process, and

c) that the final product is suitable for the intended beneficial use market.

Two types of testing were conducted during the demonstration project — analytical and geotechnical. Analytical tests were conducted to determine the levels of target contaminants in the process feed sediment (input dredged material) and the levels after processing. This information was used to evaluate the process effectiveness at reducing contaminant levels. ETL performed all analytical testing except for dioxins/furans, which were analyzed by ETL's testing partner for this project, Paradigm Analytical Laboratories, Inc.

Geotechnical testing was performed on some samples to determine the physical properties of the processed dredged material for use in evaluating potential beneficial uses for the processed material. All geotechnical testing was performed by Converse Consultants.

Samples were collected on each day of processing phase operations during the course of the HREG Demonstration Project, including two samples (original and duplicate) taken at each of the four (4) sampling points in the process, including:

- Stream S1 (Raw Sediment) was collected from the roll-off containers delivering sediment feed to the head-end of the process train;
- Stream S2 (Dewatered Sediment) was collected from the discharge point of the belt filter presses;
- Stream S3 (Beneficial Use Product) was collected from the discharge point of the ribbon blender; and
- Stream S4 (Effluent Water) was collected from the effluent storage tank.

The sampling points were selected such that raw and processed material were sampled and analyzed at key points in the process in order to provide sufficient data to develop engineering-level material balances and to evaluate the process's contaminant reduction efficiency. To aid in the material balance, one (1) sample of each process additive was analyzed as well, including:

- Stream S6 – Potassium Permanganate ($KMnO_4$)
- Stream S7 – Polymer Flocculent (OndeoNalco 9908)
- Stream S8 - Cement

3.8.2.1 Analytical Sampling & Testing Requirements

HREG's sampling program for process performance evaluation was performed over a 5-day period of operations, during which approximately 325 cubic yards of material was processed. HREG collected four (4) one gallon grab samples per 12-hour day (for samples S1, S2, S3, and S4 as described below), i.e. one every three (3) hours, and mixed these into one daily composite sample. Daily composite samples collected using this procedure for 5 consecutive operating days were then submitted to the laboratories noted above for analysis in accordance with the analytical flowchart below.

Sampling Procedure (S1, S2, S3, and S4)	**Number of Samples**
Day 1 composite	1
Days 1 – 2 composite of daily composites	1
Days 3 – 5 composite of daily composites	1
Day 5 composite	1
Days 1 – 5 composite of daily composites	1 + duplicate
Samples Submitted for Analysis (per stream)	**6**

The *NJDEP Field Sampling Procedures Manual* was consulted to determine the number of duplicate sample analyses required for each stream. As stated in the referenced manual, one (1) duplicate is required every 20 samples. Consequently, one (1) duplicate of each sample stream was submitted for analysis during the sampling and testing program. In this regard, HREG selected the Days 1 – 5 composite as the sample for which duplicates were analyzed.

A summary of the samples and tests performed on each sample is presented in Tables 2 and 3.

For the purposes of laboratory quality control (QC), matrix spike/matrix spike duplicate (MS/MSD) and trip blank samples also were analyzed. MS/MSD analyses were performed on Day 1 for Streams S1 and S3. A trip blank sample for Day 3 was analyzed.

3.8.2.2 Geotechnical Sampling & Testing Requirements

A geotechnical testing program was implemented for the demonstration project to determine the physical properties of the raw and processed dredged material and the suitability of the treated dredged material for the prescribed end use. The geotechnical tests were performed in accordance with the American Society of Testing Materials (ASTM) standards and included:

- Atterberg Limits – ASTM D4318
- pH – ASTM D4972 or D3987
- Organic Content – ASTM D2974
- Moisture Content (water content) - ASTM D2216
- Grain Size with Hydrometer - ASTM D422
- Chemical Testing
  - Chloride Content (CL) – ASTM D512
  - Sulfate Content (SO_3) – ASTM D516
  - Resistivity - ASTM G57 (Soil Box)
- Specific Gravity - ASTM D854
- Solids Content - ASTM D2216, D854, and Volume Determination
- Permeability – ASTM D5084
- Standard Compaction – ASTM D698
- Unconfined Compressive Strength – ASTM D2166

Samples were collected for analysis, at the same points in the process as the environmental samples were taken. The specific geotechnical tests performed on samples from each process stream are listed in Table 2.

3.9 QA/QC Procedures

3.9.1 Laboratory QA/QC Procedures

Samples received by the analytical testing laboratory (ETL) were classified as QA/QC Level 3, an internal designation that indicates that full data package results of the analyses performed were to be reviewed by the analyst (lab technician), the lab supervisor, and ETL's QA/QC department. Upon receiving the samples, ETL completed a chain of custody (COC) document, indicating the number and type of containers received for each sample as well as trip blanks, the temperature of the samples upon receipt, and the analyses to be performed on each sample. Once the analyses were completed and the results tables generated, the data packages underwent QA/QC review as described in ETL's Laboratory Work Quality Assurance Plan, attached as Appendix F. Items verified during the QA/QC review included:

- Numerical accuracy of reported results;
- Holding time requirements were met;
- Calibrations were performed as required;
- Tune specifications met QC criteria;
- Method blank results;
- Surrogate recoveries met QC criteria; and
- Internal standards were met.

3.9.2 Uses of Data

The demonstration project's analytical data (results) generated by ETL and Paradigm are intended for use primarily in evaluating the effectiveness of the HREG Process in reducing contaminant levels in the dredged material processing during the study. These results also are

used, in conjunction with the results from geotechnical testing performed by Converse Consultants, to assess the suitability of the processed dredged material from the HREG Demonstration Project for various potential end users.

3.10 Process Residuals Management

3.10.1 Oversized Material

Oversize material (rocks, debris, etc.) was collected in a roll-off container and disposed of by Montecalvo Disposal at the Middlesex County Utility Authority landfill.

3.10.2 Effluent Disposal

Effluent collected throughout the project was periodically pumped from storage tanks to tanker trucks operated by S.J. Transportation Company, Inc. and Earthcare. The effluent was transported to the Lehigh County Wastewater Treatment Plant in Foglesville, Pennsylvania, where it was accepted for disposal. In total, nine truckloads were transported to the treatment facility, totaling 46,972 gallons. The effluent was classified as non-RCRA and non-DOT regulated; as a result, no permits or approvals were required for its disposal other than acceptance by the receiving facility.

3.10.3 Raw and Processed Dredged Material

Dredged material processed by HREG, totaling approximately 332 tons in 20 truckloads, was delivered to and accepted by EnCap between the dates of March 24, 2005 and March 30, 2005. Acceptance records from EnCap are provided in Appendix I.

The scow and its remaining contents, totaling approximately 2,085 cubic yards of dredged material, were transported to DonJon Marine's facility in Port Newark for processing on April 11, 2005. The material was then processed by DonJon in accordance with the AUD issued for its facility and transported to EnCap for beneficial use.

3.10.4 Other Solid Waste

Other solid waste, such as personal protective equipment (nitrile gloves, etc.) and common waste (garbage) were placed in a roll-off container and disposed of by Montecalvo Disposal.

4.0 Discussion of Results

4.1 Dredged Material Characterization

4.1.1 Physical Characterization

In order to determine the physical properties of the dredged material, both before and after processing, a number of samples were taken at different points along the process (see Figure 1) and sent to the soils laboratory at Converse Consultants for analysis.

The physical properties of the samples, with the exception of natural moisture content of the raw sediment samples, were representative of typical sediments found throughout New York/New Jersey Harbor. Variations between samples of the same stream (such as varying grain size distribution) can be attributed to the heterogeneous nature of the material and the randomness of the sampling process. Natural moisture content for the sediment feed samples was on the low end of the range of values encountered in the Harbor, which range approximately from 100% to 250%.

The fine-grained sediments processed during the HREG Demonstration Project were classified as dark grey elastic silt (MH) in accordance with the Unified Soil Classification System. Overall, physical properties for the samples, summarized in Table 4, can be generalized by:

<u>Raw Dredge Material (S1):</u>

- 75% silt; 15% clay; and 10% sand;
- Natural water content of 101.8%;
- pH of 6.99;
- Total Organic Content (TOC) of 6.5%;

- Chloride content of 4,170 ppm (0.41%);
- Sulfate content of 1,200 ppm (0.12%);
- Resistivity of 96 ohm-cm.

Dewatered Material, before Cement Addition (S2):

- Natural water content of 104.0%; and
- Specific gravity of 2.61.

Beneficial Use Product (S3):

- 64% silt; 23% clay; and 13% sand;
- Specific gravity of 2.53;
- pH of 7.35;
- Total Organic Content (TOC) of 7.4%;
- Chloride content of 2,920 ppm (0.29%);
- Sulfate content of 1,085 ppm (0.11%);
- Hydraulic Conductivity 8.4×10^{-6} cm/second at 20 degrees Celsius;
- Unconfined compressive strength of 3,060 pounds per square foot;
- Maximum dry density of 68.6 pounds per cubic foot; and
- Optimum moisture content of 40%.

Appendix E presents a complete set of geotechnical laboratory test results from Converse Consultants. Discussion of these test results in the context of suitability for beneficial use is provided in Section 4.6.

4.1.2 Analytical Characterization

HREG's approach in evaluating data from the Demonstration Project was to track those target contaminants whose concentrations in the feed sediment were within one order of magnitude of the New Jersey Residential Direct Contact Soil Clean-up Criteria (RDCSCC), as shown in Table 5. Of these analytes selected for evaluation, only the following contaminants were

present in the material at concentrations exceeding the RDCSCC in at least one of the feed samples:

- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(a)pyrene
- Arsenic
- Lead
- Total PCBs (combined Aroclors)

Benzo(a)pyrene and Arsenic were the only contaminants that also exceeded New Jersey Non-Residential Direct Contact Soil Clean-up Criteria (NRDCSCC).

4.2 Summary of Demonstration Project Testing Results

In evaluating results for contaminants with initial concentrations either exceeding the NRDCSCC and RDCSCC, or within an order of magnitude of the RDCSCC, HREG developed average total feed and product concentrations to assess the Demonstration Project performance (i.e. percent reduction of contaminants on a concentration basis). The percent reductions of contaminants were calculated by comparing the overall average concentration of the feed to the overall average concentration of the treated product. Section 4.2.1 describes the six (6) feed (S1) samples taken during the Demonstration Project. The six treated (S3) samples were also taken in this manner.

Full laboratory reports for all analytical samples are provided in Appendix F.

4.2.1 Sediment Feed (S1) Contaminant Analyses

Tables 5 and 6 present the sediment feed contaminant analyses for the six feed samples, which comprised the following:

- Day 1 composite
- Composite of Days 1 + 2 daily composites
- Composite of Days 3 + 4 + 5 daily composites

- Day 5 composite
- Composite of Days 1 + 2 + 3 + 4 + 5 daily composites
- Composite of Days 1 + 2 + 3 + 4 + 5 daily duplicate composites

A discussion of these analyses by contaminant group follows. Note that in many cases, the method detection limits for a particular compound are different for different samples. The reason for this is that the method detection limit is a statistical value that cannot be viewed as an expected quantification level. Actual method detection limits are sample dependent and vary as the sample matrix varies.

4.2.1.1 Volatiles

All VOCs, with the exception of acetone, were below the Method Detection Limit (MDL). Acetone is a common laboratory contaminant; therefore tracking its percent reduction during the demonstration project was not justified. No percent reductions for any individual VOCs were tracked for these reasons.

4.2.1.2 Semivolatiles

In the raw dredged material there were 22 semi-volatile constituents with concentrations above the MDL, shown in bold face numbers in Table 5. However, only seven of these contaminants were at concentrations within one order of magnitude of the RDCSCC. These contaminant values were highlighted in Table 5 and were used to track the component mass balances and process performance data presented in Table 7 and Table 8, respectively. The remaining semi-volatiles were orders of magnitude below the RDCSCC and therefore tracking the process performance on these contaminants was not justified. The seven tracked contaminants are listed below:

- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene

- Benzo(a)pyrene
- Bis(2-Ethylhexyl)phthalate
- Chrysene
- Indeno(1,2,3-cd)pyrene

4.2.1.3 PCBs/Pesticides

PCBs and pesticides are presented in Table 5, (total PCB Aroclors present above MDL). The concentrations of total PCBs exceeded RDCSCC in four (4) of the samples, and were within one order of magnitude of the RDCSCC for the remaining two (2) samples. Individual PCB Aroclors were not tracked because there was no set of consistent individual Aroclor analyses common to all six samples.

4.2.1.4 Dioxins

The concentration of 2,3,7,8-TCDD as well as total dioxins, expressed as Total Equivalent Factor (TEF), are presented in Table 5. Because NJDEP has not published values for Dioxins in either the RDCSCC or the NRDCSCC, the demonstration project results have been evaluated against the current landfill standard of 1 part per billion (ppb) presently used by NJDEP.

4.2.1.5 Metals

The concentration profiles and mass balances are presented in Table 5 for twelve (12) target metals listed below:

- Antimony
- Arsenic
- Barium
- Cadmium
- Copper
- Lead

- Manganese
- Mercury
- Nickel
- Silver
- Vanadium
- Zinc

The sediment feed concentrations for these metals were below RDCSCC levels except for one (1) Arsenic sample and one (1) Lead sample. In fact, most were orders of magnitude lower than the NRDCSCC as well.

A mass balance has been developed for mercury and is presented in Table 7. HREG understood that OMR and NJDEP had a concern for the fate of mercury from the OMR-funded pilot test programs performed in 2001, particularly with regard to air emissions. The pilot test programs concluded there was no loss of mercury from any of the runs from the pilot study. For the Demonstration Project, HREG used real-time monitoring equipment, Arizona Instruments' Model 431-X Jerome Analyzers (Tempe, AZ), to monitor for mercury emissions. The detection limit for these instruments is 0.003 mg/m^3. No mercury emissions were observed above the OSHA Permissible Exposure Limit (PEL) of 0.1 mg/m^3. These results are further discussed in Section 4.3.1.

4.2.1.6 Cyanide

There were no concentrations of cyanide in the sediment feed above the method detection limit of 10 parts per billion.

4.2.2 Contaminant Reduction Performance in Beneficial Use Products (S3) Samples

Review and evaluation of the Demonstration Project results indicate that the HREG Dredged Material Process has the ability to reduce the concentration of target organic chemical contaminants in materials dredged from the New York/New Jersey Harbor. The overall average

percent reduction for the target organic chemicals, metals, PCBs and dioxins are presented in the table below. While there is a consistent downward trend in concentration observed overall, variability in the data resulted in the trend being determined to be statistically insignificant.

Analyte Group	% Reduction Overall Average (Range)
Semi-Volatile Organic Compounds (SVOCs)	12 (-75.9 to 71.2)
Metals	21 (-40.1 to 63.5)[1]
Polychlorinated Biphenyls (PCBs)	10 (-135.4 to 66.5)
Dioxins	* (-183.3 to 25.6)

* Analytical results insufficient to draw any conclusions as relates to reduction of dioxin concentrations

[1] Metals data from Day 1 was excluded from the range of % reduction presented, as Antimony on Day 1 was below method detection limits for the feed, but was detected in the treated product. Since the % reduction was calculated based on the method detection limit as the feed concentration, the overall % reductions for Metals on Day 1 was heavily skewed by the Antimony data, hence the exclusion.

HREG was pleased with the overall results of the Demonstration Project. Overall, the performance data shown in Tables 8 and 9 displays a trend that we believe demonstrates the ability of the chemical oxidant component of the HREG Process to reduce organic chemical contaminant concentrations given the specific feed and chemical dosages used for this sediment. In addition, the dosage of cement was effective not only in reducing the concentrations from the MEP test to below groundwater criteria, but also in producing a desirable Beneficial Use Product. While the variability observed in both pre- and post-treatment samples makes it difficult to prove statistical significance of the treatment, we firmly believe that full scale operations with navigational dredged sediments will be able to consistently achieve the target concentrations for beneficial use. Also, at full scale, bench scale pretests will enable HREG to design and prove treatability prior to receipt of dredged material.

It should be recognized that the feed sediment used for this project was very low in contaminant concentrations, thus requiring a chemical oxidant

concentration ($KMnO_4$) of only 10,000 ppm on a dry solids basis to achieve an acceptable Beneficial Use Product. The results looked very encouraging, as summarized below:

- There were no Residential Direct Contact Soil Cleanup Criteria (RDCSCC) exceedances for VOCs in the treated product.
- Of the 49 data points for the PAHs tracked in the SVOC category, there were only three (3) discrete samples that exceeded RDCSCC in the treated product, and on average the treated sediment was below RDCSCC.
- Of the 84 data points of the 13 metals tracked, there was only one discrete sample where RDCSCC were exceeded.
- The treatment successfully reduced total PCBs to below the NRDCSCC, but only one sample met the RDCSCC.
- In general, the levels of contaminants in the feed were so low that in many cases the concentrations were at or near Method Detection Limits (MDL). This made it difficult to evaluate treatment efficiency. However, there was one set of data (Day 5 samples) that showed relatively higher concentrations of contaminants in the feed (four of the seven tracked PAHs exceeded RDCSCC). For this sample, the average percent reduction for the SVOCs was over 70%. The overall average percent reduction for PCBs was over 65%, although the final concentration of PCBs in this sample remained above RDCSCC.
- The MEP results were encouraging. Of all the contaminants evaluated, only Lead showed leachability above the NJDEP criteria for three samples (6.5 ppb on Day 1 + Day 2 composite, 8.7 ppb on Day 3 + Day 4 + Day 5 composite, and 25 ppb on Day 1 – Day 5 composite; note MEP standard for lead is 5 ppb). Of particular note, despite the higher concentrations of Manganese in the Beneficial Use Product, the Manganese results were below groundwater impact criteria. It is not possible to determine if this is a result of the HREG process or if this would have been achieved using only cement stabilization.

- All compounds passed TCLP.
- Due to the fact that this test was conducted on sediment from only one location, it is not possible to predict the amount of oxidant required for more highly contaminated (non-navigational) sediments. However, it is logical to predict that the dosages of oxidant would need to be higher for higher levels of contamination. Higher doses of oxidant would also result in higher processing costs. This potential was not evaluated in this study, but could easily be determined through bench scale studies on a case-by-case basis.
- During the Demonstration Project, EnCap Golf received the final treated material from the HREG Process. EnCap was extremely pleased with the product that they were provided by the HREG Process. They stated that the material was very friable and significantly better than most other material that they receive from other processes. HREG attributes the dewatering and cement addition components of its process. Because the material had a relatively low moisture content when the cement was added, it was most likely closer to optimum moisture content than might otherwise be expected, resulting in a more workable end product.
- Based on these results, we feel confident that the HREG process can reduce levels of contaminants from dredged sediment and create a Beneficial Use Product from navigational dredged material that satisfies the requirements of a particular end user at a competitive cost.

4.2.3 Supplementary Performance Data for Beneficial Use Products

Tables 10 and 11 present supplementary performance data on Multiple Extraction Procedure (MEP) and Toxicity Characteristics Leaching Procedure (TCLP) analyses, Flash Point and Reactivity. The full laboratory reports for the seven-day MEP analyses and the TCLP analyses are presented in Appendix F.

4.2.3.1 MEP Analyses

Results of the MEP analyses for targeted analytes are presented in Table 10 for all six samples analyzed.

Volatiles

All of the MEP analyses were either below MDLs or below the Groundwater Criteria (IGWC).

SVOCs

The seven target SVOCs shown in Table 5, and the balance of the SVOCs shown in the reports in Appendix C, all had MEP analyses that were either below the MDL or below the groundwater criteria (IGWC).

PCBs

All of the MEP analyses for PCBs were below the MDLs.

Pesticides

All of the MEP analyses for pesticides were below the MDLs.

Metals

Metals evaluated in the MEP analysis included Aluminum (Al), Antimony (Sb), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Calcium (Ca), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Magnesium (Mg), Manganese (Mn), Mercury (Hg), Nickel (Ni), Potassium (K), Selenium (Se), Silver (Ag), Sodium (Na), Thallium (Th), Vanadium (Va), and Zinc (Zn). With the exception of Lead, all of the MEP analyses were either below the MDLs or below the GWC for these metals. MEP results for Lead exceeded GWC for three (3) samples. Table 10 presents the MEP data for Sb, As, Ba, Cd, Cu, Pb, Mn, Hg, Ni, Ag, Va and Zn. Results for the balance of the metals are found in Appendix F.

4.2.3.2 TCLP Analyses

TCLP is used to determine whether processed dredged material is classified under the Resource Conservation and Recovery Act (RCRA). Material that falls below TCLP thresholds and characteristics generally can be beneficially used provided further regulatory requirements (i.e. MEP) also are met. TCLP results for the Demonstration Project are presented in Table 11. All of the TCLP analyses for the following groups of contaminants were either below MDL or well below the allowable TCLP criteria:

- Semi-volatiles
- Herbicides
- Pesticides
- Metals

These results indicate that the HREG processed dredged material met TCLP criteria. The TCLP and analytical results indicate that the treated material is appropriate for upland beneficial use in regulated municipal solid waste landfills.

4.2.3.3 Flash Point

As shown in Table 11, the treated sediments for all samples were determined to be non-flammable.

4.2.3.4 Reactivity

As shown in Table 11, the treated sediment for all samples had a negative cyanide and H_2S reactivity.

4.3 Air Quality Monitoring and Testing Results

Air monitoring was performed at the demonstration project facility in accordance with the NJDEP-approved air monitoring program, as attached in Appendix A. A summary of the air monitoring program is presented below:

Compound Monitored	Monitoring Method
VOCs	SUMMA Canister
SVOCs	PUF Cartridge
PCBs	PUF Cartridge
Particulates	DataRAM
Mercury	Jerome Analyzer
CO	VRAE

4.3.1 Air Monitoring

Air monitoring for mercury was performed at six (6) locations:

- Vibrating Screen
- Oxidant Tank
- Belt Press
- Intermediate Stock Pile
- Final Stock Pile (Beneficial Use Product)
- Baghouse

The air monitoring was performed at each of these locations on three (3) separate days. The results show no elevated readings for mercury at any of these locations for all three days. All readings were at or below 0.005 ppm, which is below the OSHA PEL for mercury of 0.1 mg/m^3.

Air monitoring for particulates was performed at four (4) locations:

- Belt Press
- Intermediate Stock Pile
- Final Stock Pile (Beneficial Use Product)
- Baghouse

The results showed no elevated readings at any of the stock piles and belt press (as compared to National Ambient Air Quality Standards) and at the baghouse (as compared to typical air permit limits for particulates from a baghouse for this type of application). The National Ambient Air

Quality Standard for particulates is 150 ug/m^3, and all readings at the stock piles and belt press were at or below 25 ug/m^3. Typical air permit particulate limits for baghouses are approximately 0.01 – 0.02 grains / standard cubic ft (scf). The particulates from the baghouse measured during the Demonstration Project was approximately 0.0062 grains / scf. For the full-scale unit, the cement loading system will be a totally enclosed unit to minimize dust emissions.

Air monitoring for Carbon Monoxide (CO) was performed at various locations throughout the facility to ensure worker safety. There were no elevated readings for CO, as they were all less than 0.5 ppm (as compared to the OSHA Permissible Exposure Limit [PEL] value of 50 ppm).

4.3.2 PUF Testing

Air sampling was performed for VOCs, SVOCs, and PCBs. Summa canisters were used for collecting samples for VOCs and PUF cartridges were used for collecting samples for SVOCs and PCBs. The sampling locations for these were as follows:

<u>VOCs</u>

- Oxidant Tank

<u>SVOCs & PCBs</u>

- Oxidant Tank
- Intermediate Stock Pile
- Final Stock Pile (Beneficial Use Product)

Samples were collected at each of these locations for a one hour period on three separate days. The results were compared to OSHA Short Term Exposure Limits (STELs) and Permissible Exposure Limits (PELs) for individual compounds to determine if there are any potential hazards for workers. The results presented in Table 12 show all compounds are well below both STELs and PELs.

4.4 Engineering Material Balance

From a global perspective, the entire Demonstration Project (from startup through demobilization), was a net producer of water, as can be seen by the fact that approximately 47,000 gallons of effluent water were shipped off-site at the completion of the project. This water came from startup city water, demobilization city water and excess water present in the dredged sediment. The HREG process was successful in diluting the material as necessary to move the material through the process train, and then dewater the material to meet beneficial use requirements. An engineering material balance for the project is presented in Table 13.

4.5 Process Validation

4.5.1 Data Validation Summary

Data validations for the HREG Demonstration Project were performed by Data/Analysis Technologies, Inc. on all analytical packages generated for the project in accordance with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (October 1999), "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (February 1994), and the quality control parameters found in Method 8290 for dioxins/furans. Full Data Validation Reports, including worksheets, are attached in Appendix H.

4.5.1.1 Volatiles

The data for volatile organic compound (VOC) analyses were reviewed for usability based on quality control parameters. All data was determined to be usable as qualified with the exception of acetone in some samples [Samples COMP S4A-D1+D2, COMP S4A-D3+D4+D5, S6-D1 ($KMnO_4$), and S7-D1 (polymer)]. Data for these analytes were rejected due to initial calibration relative response factors (RRFs) less than 0.05. The cause for the rejections stems from an incompatibility between the requirements for the testing laboratory and the data validator.

Volatile analyses for the project were performed in accordance with USEPA SW-846 Method 8260, which requires a minimum response factor for the least responsive target compound of 0.01. The USEPA National Functional Guidelines for data validation, however, indicate "The criteria employed for technical data review purposes are different than those used in the method. The laboratory must meet a minimum RRF criterion of 0.01, however, for data review purposes, the 'greater than or equal to 0.05' criterion is applied for all volatile compounds." The Guidelines further note that acetone is among the volatile target compounds that typically exhibit poor response. Therefore, while the testing laboratory met the requirements of the test method, the data was rejected by the validator due only to the above-noted inconsistency.

4.5.1.2 Semivolatiles

The data for SVOC analyses were reviewed for usability based on quality control parameters. With the exception of the data rejections noted below, all data was determined to be usable:

- Because the associated blank spike recoveries were below QC limits, the results were rejected for the noted constituents in the MEP analyses for the following samples:
    - COMP S3A-D1+D2+D3+D4+D5 Day 7 MEP Analysis (4-nitrophenol and pentachlorophenol)
    - COMP S3A-D3+D4+D5 Day 7 MEP Analysis (4-nitrophenol and pentachlorophenol)
    - COMP S3A-D1+D2 Day 7 MEP Analysis (4-nitrophenol and pentachlorophenol)
    - COMP S3A-D1+D2 Day 5 MEP Analysis (pentachlorophenol)
    - COMP S3B-D1+D2+D3+D4+D5 Day 6 MEP Analysis (4-nitrophenol and pentachlorophenol)

- COMP S3B-D1+D2+D3+D4+D5 Day 7 MEP Analysis (pentachlorophenol)
- S3A-D1 Day 1 MEP Analysis (4-nitrophenol)

- Due to laboratory control spike recovery problems, pentachlorophenol results in the following samples and 4-nitrophenol results in one sample were rejected:
  - COMP S1A-D1+D2
  - COMP S1A-D3+D4+D5
  - COMP S3A-D3+D4+D5
  - COMP S1A-D1+D2+D3+D4+D5
  - COMP S3A-D1+D2+D3+D4+D5
  - COMP S1B-D1+D2+D3+D4+D5
  - COMP S3B-D1+D2+D3+D4+D5

  4-nitrophenol results in Sample COMP S3A-D1+D2 was rejected for the same reason.
- Due to surrogate recovery problems, all acid fraction compounds in the TCLP analysis of Samples COMP S3A-D1+D2+D3+D4+D5 and COMP S3B-D1+D2+D3+D4+D5 were qualified as rejected.

4.5.1.3 PCBs/Pesticides

The data for pesticide and polychlorinated biphenyl (PCB) analyses were reviewed for usability based on quality control parameters. All data was determined to be usable.

4.5.1.4 Dioxins

The data for dioxin/furan analyses were reviewed for usability based on quality control parameters. All data was determined to be usable with the following exceptions:

- Positive 2378-TCDF results in the following samples were rejected since no second column confirmation was performed:
  - S3A-D1 MS Day 1 MEP Analysis
  - S3A-D1 MSD Day 1 MEP Analysis

  The second column confirmation for TCDF is used to stop false positive detection of the 2378-TCDF analyte. The primary column cannot separate 2378-TCDF from other isomers within the tetra group. Since the value could be a false positive and since the 2378-TCDF isomer will contribute to the TEF more than non 2,3,7,8- isomers, it was deemed prudent by the validator to reject the result.
- Due to results exceeding the calibration range, OCDD results in the following samples were rejected:
  - S1-MSD
  - S3A-D1
  - S3A-D1 MS
  - S3A-D1 MSD
  - S1A-D5
  - S3A-D5

4.5.1.5 Metals

The data for metals analyses were reviewed for usability based on quality control parameters. With the exception of the data rejections noted below, all data was determined to be usable as qualified:

- Due to severe matrix spike and post-digestion spike recovery problems, non-detected silver results in Day 1 and Days 3 through 7 MEP analyses for sample COMP S3A-D1+D2+D3+D4+D5 were rejected;
- Sodium results for all MEP analyses for Sample S3A-D5 were rejected due to extremely low blank spike recoveries;

- Due to severe calibration problems, potassium results for all MEP analyses for Sample S3A-D1 were rejected;
- Due to severe matrix spike recovery problems, copper results were rejected in the following water (S4) samples:
  - COMP S4A-D1+D2
  - COMP S4A-D3+D4+D5
  - COMP S4A-D1+D2+D3+D4+D5
  - COMP S4B-D1+D2+D3+D4+D5

4.5.1.6 Cyanides and Others

The data for cyanide analyses, as well as waste characterizations (reactivity, ignitability, corrosivity) were reviewed for usability based on quality control parameters. All data was determined to be usable.

4.6 Beneficial Use Evaluation

4.6.1 Beneficial Use

The selected beneficial use for the HREG Demonstration Project was fill material for the EnCap Golf development project in Lyndhurst & Rutherford, NJ. The EnCap Golf project entails the closure and remediation of several landfills, and their subsequent development into golf courses and other complementary amenities.

EnCap has established requirements for both the analytical (chemical) and physical (geotechnical) properties of material to be placed at its sites. Analytical requirements for EnCap's Lyndhurst & Rutherford sites are presented in Table 14. The requirements for physical properties are summarized below:

- Minimum compressive strength of 2,000 pounds per square foot;
- Maximum hydraulic conductivity of $1x10^{-5}$ cm/sec; and
- Maximum particle size of 4 inches

4.6.2 Suitability Determination

Prior to the performance of the demonstration project, HREG provided EnCap and its consultants with data for the sediment to be processed as well as data from HREG's pilot study (performed on sediment from the Stratus Petroleum site, nearby the Darling International site). In addition, at the request of EnCap's consultant, HREG engaged ETL to perform an analysis on sediment from Darling International to determine the concentration of hexavalent chromium (Cr+6) in the material, as previous data for this analyte did not exist for the Darling International sediment. By demonstrating that the "raw" feed sediment to be processed during the HREG Demonstration Project would meet the analytical placement criteria for EnCap's site, HREG was able to obtain a suitability determination from EnCap prior to commencing its demonstration project operations.

During the HREG Demonstration Project, approximately 330 tons of processed dredged material was successfully placed at EnCap Golf's Lyndhurst & Rutherford facility through the application of HREG's process.

HREG utilized cement as a pozzolanic additive in its demonstration project in order to improve the physical properties of the processed dredged material to meet the requirements stated above. The overall average rate of addition for cement in the demonstration project was approximately 7.6% of the weight of dewatered sediment. The use of pozzolanics in the HREG process serves several purposes including providing improved strength properties; reducing moisture content through the hydration associated with cement curing; and the reduction of leachability of metals and certain organic compounds through their stabilization in the sediment matrix.

At the completion of the project, HREG received praise from EnCap, indicating their satisfaction with the quality of the processed dredged material generated through HREG's demonstration project.

The table below summarizes some of the key properties of the processed dredged material as determined through the sampling and testing program conducted as part of the HREG Demonstration Project.

Sample	**Grain Size Distribution**			**Atterberg Limits**		**UC (psf)**	**HC (cm/sec)**	**Solids Content (wt %)**
	% Sand	**% Silt**	**% Clay**	**LL**	**PL**			
Days 1-5 (A)	16.9	63.2	19.9	110	78	3,400	1.4×10^{-5}	53.6
Days 1-5 (B)	8.6	65.2	26.2	108	74	2,720	2.8×10^{-6}	52.5
Average	**12.8**	**64.2**	**23.0**	**109**	**76**	**3,060**	$\mathbf{8.4 \times 10^{-6}}$	**53.0**

Notes:
LL = Liquid Limit
PL = Plastic Limit
UC = Unconfined Compressive Strength
HC = Hydraulic Conductivity

Appendix I contains copies of EnCap's acceptance criteria, communications between HREG and EnCap, and the acceptance records (truck tickets) documenting that the PDM from the demonstration project was placed at EnCap's site.

5.0 Economic Evaluation

5.1 Demonstration Project Costs

The project budget for the HREG Demonstration Project was established as $2,000,000, divided among the following categories:

- Project Management and Engineering ($1,071,180);
- Analytical and Data Analysis ($328,020); and
- Operations ($600,800).

The breakdown of total project costs among these categories were adjusted by a letter amendment to the contract in 2005, and will be revisited at project completion to reflect changes in the project resulting in its relocation from the Construction & Marine/Butler Street sites to the Bayshore Recycling Corporation site.

5.2 Commercial-Scale Processing Cost Evaluation

Based on the results presented in Section 4 of this report, HREG has demonstrated that its technology has the ability to reduce targeted contaminant levels in dredged material from the New York/New Jersey Harbor to levels acceptable for beneficial use. As part of the development process for a permanent facility, HREG conducted an economic analysis of processing costs for the proposed technology at a commercial scale (500,000 cubic yards per year) based on an anticipated facility life of 30 years. The results of this analysis, originally presented HREG's Pilot Study Report, have been updated to incorporate new information gained through the execution of the demonstration project, particularly with regard to the variable costs associated with process additives. The updated analysis, presented in Table 15, indicates a net average "tipping fee" for a commercial-scale of approximately $39.66, exclusive of costs associated with dredging and delivery of the material to HREG's facility. This cost includes HREG's profit and contains all facility processing components, including:

- Debris removal;
- Dredged material transfer;
- Contaminant reduction;
- Sediment dewatering;
- Production of beneficial use material; and
- Recovery and reuse of filtrate within the HREG Process and treatment and discharge of water effluent.

HREG anticipates using a variable degree of oxidant in its process, depending on the characteristics of the incoming material, with a dosage range from 4,000 ppm to 12,000 ppm on the weight of dry solids. As such the processing costs are expected to range from approximately $33.95 to $45.40 per cubic yard, which is within the current range for upland management of dredged material from navigational projects in the NY/NJ Harbor.

6.0 Proposed Process Improvements for Commercial-Scale Operations

Implementation of the HREG process at a commercial-scale facility would entail several process improvements, resulting both from "lessons learned" through the execution of the demonstration project, as well as the relaxation of certain constraints that precluded their implementation during the demonstration project.

Because the material processed during the demonstration project was of a considerably lower moisture content (averaging approximately 104% for feed samples) than was expected and than that which would be expected for typical dredged sediments in the NY/NJ Harbor, difficulties in pumping the material from roll-off containers into the head-end of the processing train were encountered. After trying several types of pumps, a concrete pump with a hopper proved to be the most effective means by which to pump the material into the system. In a commercial-scale operation, the interim step of pumping from a scow to roll-off containers would be eliminated, likely resulting in some improvements in the pumpability of material. Nonetheless, as a result of the lessons learned during the demonstration, a pump of a nature similar to that of the concrete pump used in the demonstration would be considered for a commercial-scale operation. Alternatively, a pump with a slurry nozzle at its head to facilitate mixing of recycle water with the sediment in the barge would also be considered.

Once the pumping difficulties had been overcome, a further challenge associated with the screening of material manifested itself, hampering the process of feeding sediment into the processing train. Oversize material would periodically clog the screens mounted atop the initial surge tank, requiring processing to halt periodically for cleaning of the screens. It was originally intended to include a pre-screening operation in the demonstration (as discussed in Section 3.6), and the clogging of the screens encountered served to underscore the need for this process. As a result, in a commercial-scale operation, the use of an exclusion device (bar screen, cage, or similar) mounted to the pump head would be considered to maintain oversize material in the scow, and prevent it from impacting downstream operations.

In addition to potential improvements at the head-end of the process, improvements to other material handling components of the HREG process would most likely be made in a commercial-scale operation:

- Use of conveyors to transport dewatered sediment from the belt filter press discharge to the inlet of the cement addition unit. By replacing the batch style operation of a skid-steer loader with conveyors sized to match production from the belt filter presses, a greater system throughput will be achieved;

- Use of pugmills for the addition of cement to dewatered sediment. Pugmills were originally considered for the demonstration project, but suitable units were not available for the short-duration lease required. Replacement of the batch-type ribbon blender with a continuous pugmill operation also would improve system throughput; and

- Providing the ability to discharge processed dredged material either directly into a truck (via a conveyor/surge hopper combination or similar equipment) or into a stockpile (via a radial stacker or similar equipment) would provide greater flexibility in moving processed material off-site.

7.0 Conclusions

Through the execution of its demonstration project, HREG was able to demonstrate the key components of its process, specifically:

- Contaminant reduction through chemical oxidant addition;
- Dewatering through the use of belt filter presses in conjunction with polymer flocculent; and
- Beneficial use conditioning through the addition of cement to dewatered sediment.

Contaminant reduction was achieved by adding an oxidant ($KMnO_4$) at a dosage of approximately 10,000 parts per million to a dredged material slurry and providing a minimum reaction time of six hours to facilitate oxidation of organic constituents. In evaluating the data, it is worth noting that the levels of contaminants in the feed sediment in general were sufficiently low that in many cases the concentrations were at or near Method Detection Limits (MDL). These low concentrations created difficulties in being able to accurately determine the percent reduction in contaminants. Based on a statistical “t-test” analysis of the performance data, it was determined that statistical significance was not achieved. As a result, it is noted that the overall contaminant reduction performance data summarized in the table below represents the

observed trend determined through evaluation of the analytical results from the demonstration project.

Analyte Group	% Reduction Overall Average (Range)
Semi-Volatile Organic Compounds (SVOCs)	12 (-75.9 to 71.2)
Metals	21 (-40.1 to 63.5)[1]
Polychlorinated Biphenyls (PCBs)	10 (-135.4 to 66.5)
Dioxins	* (-183.3 to 25.6)

* Analytical results insufficient to draw any conclusions as relates to reduction of dioxin concentrations

[1] Metals data from Day 1 was excluded from the range of % reduction presented, as Antimony on Day 1 was below method detection limits for the feed, but was detected in the treated product. Since the % reduction was calculated based on the method detection limit as the feed concentration, the overall % reductions for Metals on Day 1 was heavily skewed by the Antimony data, hence the exclusion.

It should be noted that there was one set of data (Day 5 samples) that showed relatively higher concentrations of contaminants in the feed (four of the seven PAHs tracked in the SVOC category exceeded RDCSCC). The treated sediment from this day showed the best results; the concentrations in the treated product were all below RDCSCC. For this sample, the average percent reduction for the SVOCs was over 70%. The average percent reduction for PCBs was over 65%.

HREG was pleased with the overall results of the Demonstration Project. Overall, the performance data demonstrated the ability of the chemical oxidant component of the HREG Process to reduce organic chemical contaminant and PCB concentrations based on the specific feed and chemical dosages used in the HREG Demonstration Project. In addition, the following key observations and statistics are worthy of note:

- Site-specific analytical requirements for the beneficial use site (EnCap) were met;
- There were no Residential Direct Contact Soil Cleanup Criteria (RDCSCC) exceedances for VOCs in the treated product;
- For the PAHs that were tracked, only three (3) discrete samples exceeded the RDCSCC in the treated product, however there were no exceedances of RDCSCC in the overall composite samples;

- For the metals that were tracked, only one (1) discrete sample exceeded the RDCSCC in the treated product (for Antimony), however there were no exceedances of RCDSCC in the overall composite samples;
- For the MEP analyses, leachability of all tracked analytes with the exception of Lead in three (3) samples, was below NJDEP groundwater criteria; and
- The PCB data points all met Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

Dewatering of the sediment was performed after the oxidation step and was achieved through the use of belt filter presses in combination with a polymer flocculent (OndeoNalco 9908). The operation of the belt filter presses yielded a dewatered sediment "cake" that was approximately 50% solids by weight. It should be noted that the total amount of water removed from the raw sediment was less than the expected value, primarily due to the lower than anticipated moisture content of the sediment feed. As implemented in the demonstration project, the HREG Process first diluted the raw sediment from its natural state to a slurry of approximately 15% solids by weight. Based on the success in the demonstration project in dewatering this slurry to result in a cake of approximately 50% solids by weight, HREG is confident that for sediment feeds with higher moisture contents than that encountered on this project, similar performance of the dewatering step, with solids contents of over 50% by weight, can be achieved.

The addition of cement was the last of three key steps in the HREG Process. Through a cement dosage of approximately 7.6% by weight of sediment, the dual goals of solidification (improving physical properties of the processed material) and stabilization (reducing leachability of metals and other constituents) were achieved. HREG's processed dredged material met the hydraulic conductivity requirements of EnCap, and exceeded their unconfined compressive strength requirements by roughly 50%. EnCap praised HREG on the quality of its product, noting that the material was very friable and significantly better than most other material that they receive from other processes.

Additional observations with regard to the impact of the cement on leachability of metals and other constituents include:

- Of the targeted PAHs and metals (approximately 114 data points), only one contaminant (Lead) exceeded ground water criteria from the MEP test for three

of the samples. In addition, despite the higher concentrations of Manganese in the processed dredged material, the manganese results from the MEP test were below groundwater criteria; and

- All compounds passed TCLP.

Based on the results documented above and throughout this report, HREG is confident that its process can reduce levels of contaminants from dredged sediment and create a Beneficial Use Product that satisfies the requirements of a particular end user. HREG is grateful to the New Jersey Dept. of Transportation, Office of Maritime Resources for the opportunity to have participated in this Demonstration Project and will eagerly continue in the development of its process and establishment of a commercial-scale facility.

Figures

X-101
30 CU. YD. SEDIMENT DELIVERY TRUCKS

X-102
3" BAR SCREEN

P-101
RAW SEDIMENT TRANSFER PUMP

X-103
8' X 8' X 1/4" VIBRATING SCREEN

P-102
350 GPM SLURRY TRANSFER PUMP

T-101 A/B/C/D
19,950 GAL BAKER SHORT OXIDATION TANKS WITH 4 - 10HP AGITATORS

P-103
BELT PRESS FEED PUMP

PK-101
KMnO4 FEED SYSTEM

PK-102
POLYMER FEED SYSTEM WITH 5,000 GAL MIX AND 60 GPM RECIRC / MIX PUMP

X-104 A/B
2.0 METER BELT PRESS

P-104
RECYCLE WATER PUMP

X-105
OVERSIZE ROLLOFF

T-102 A/B
19,950 GAL BAKER SHORT FILTRATE WATER SURGE TANKS

X-106
SKID-STEER LOADER

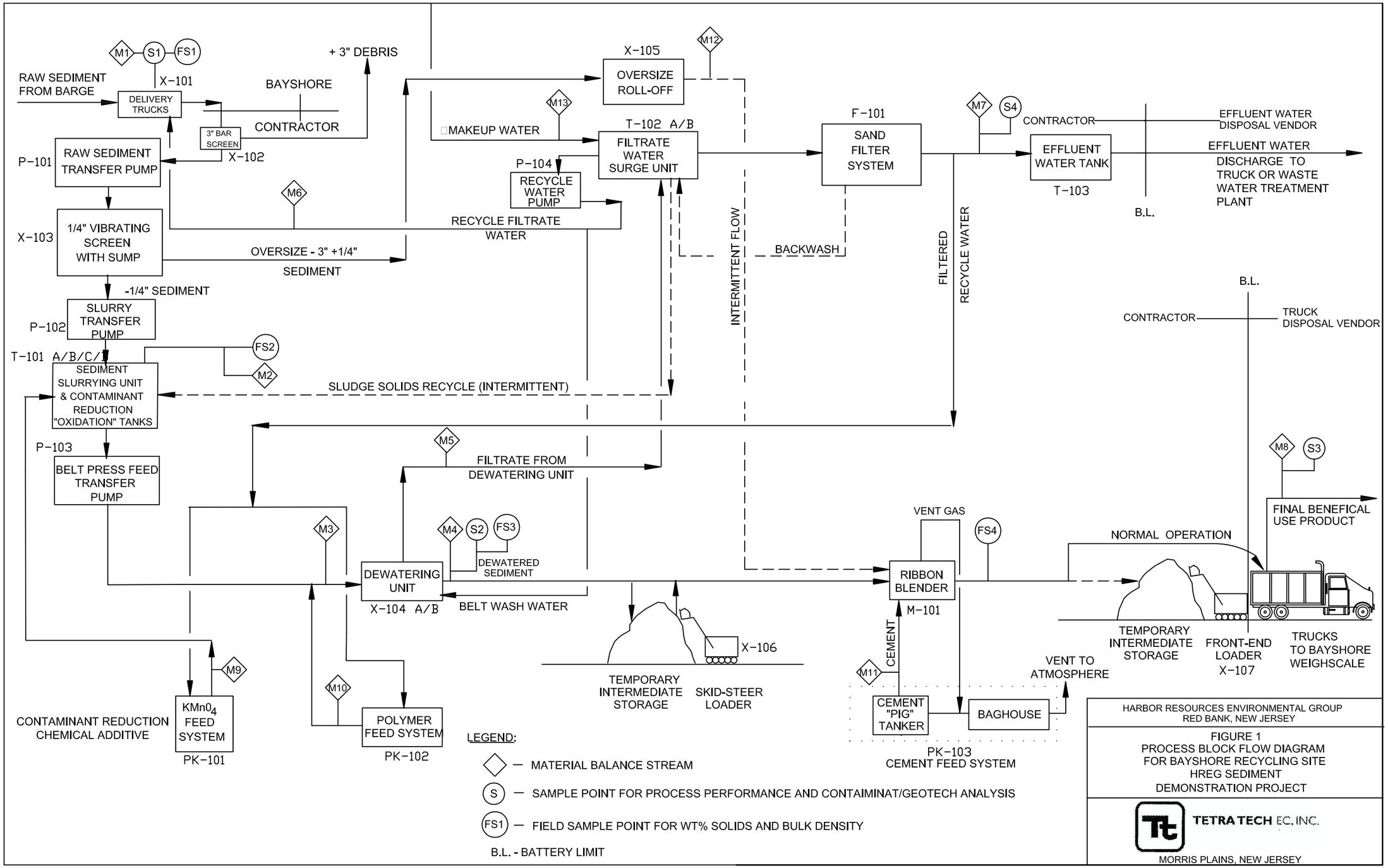
X-107
1.5 CU. YD. FRONT END LOADER

F-101
3 BED SAND FILTER 35-80 PSI; 567 GPM MAX

M-101
10 CU. YD. RIBBON BLENDER 3-6 RPM AGITATE 16-24 RPM MIX SPEED

T-103
10,000 GAL BAKER EFFLUENT WATER TANK

PK-103
CEMENT FEED SYSTEM 150,000 LB "PIG" TANKER WITH BAGHOUSE



HARBOR RESOURCES ENVIRONMENTAL GROUP
RED BANK, NEW JERSEY

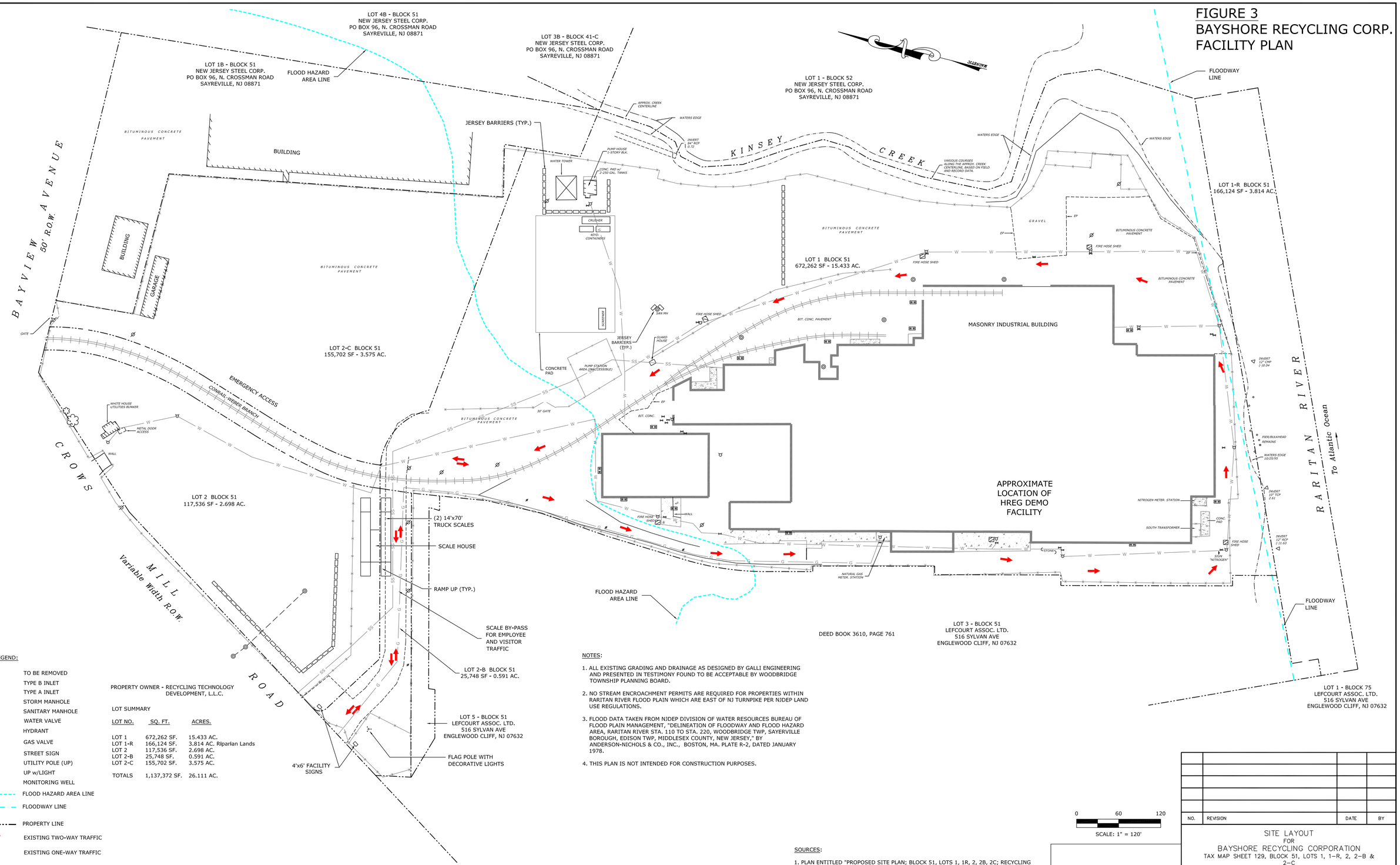
FIGURE 1
PROCESS BLOCK FLOW DIAGRAM
FOR BAYSHORE RECYCLING SITE
HREG SEDIMENT
DEMONSTRATION PROJECT

TETRA TECH EC, INC.
MORRIS PLAINS, NEW JERSEY

CAD FILE NAME: FINAL BAYSHORE PFD.DWG
PLOT SCALE: 1=1
DATE: 7/29/05
TIME: 9:13 AM

HARBOR RESOURCE ENVIRONMENTAL GROUP	**FIGURE 2**
	LOCATION PLAN
SEDIMENT DECONTAMINATION DEMONSTRATION PROJECT	**BAYSHORE RECYLING CORP. 75 CROWS MILL ROAD**
DECEMBER 2005	**KEASBEY, NJ**

FIGURE 3
BAYSHORE RECYCLING CORP.
FACILITY PLAN



LEGEND:

(TBR)	TO BE REMOVED
	TYPE B INLET
	TYPE A INLET
	STORM MANHOLE
	SANITARY MANHOLE
	WATER VALVE
	HYDRANT
	GAS VALVE
	STREET SIGN
	UTILITY POLE (UP)
	UP w/LIGHT
	MONITORING WELL
	FLOOD HAZARD AREA LINE
	FLOODWAY LINE
	PROPERTY LINE
	EXISTING TWO-WAY TRAFFIC
	EXISTING ONE-WAY TRAFFIC

PROPERTY OWNER - RECYCLING TECHNOLOGY DEVELOPMENT, L.L.C.

LOT SUMMARY

LOT NO.	SQ. FT.	ACRES.
LOT 1	672,262 SF.	15.433 AC.
LOT 1-R	166,124 SF.	3.814 AC. Riparian Lands
LOT 2	117,536 SF.	2.698 AC.
LOT 2-B	25,748 SF.	0.591 AC.
LOT 2-C	155,702 SF.	3.575 AC.
TOTALS	1,137,372 SF.	26.111 AC.

NOTES:

1. ALL EXISTING GRADING AND DRAINAGE AS DESIGNED BY GALLI ENGINEERING AND PRESENTED IN TESTIMONY FOUND TO BE ACCEPTABLE BY WOODBRIDGE TOWNSHIP PLANNING BOARD.

2. NO STREAM ENCROACHMENT PERMITS ARE REQUIRED FOR PROPERTIES WITHIN RARITAN RIVER FLOOD PLAIN WHICH ARE EAST OF NJ TURNPIKE PER NJDEP LAND USE REGULATIONS.

3. FLOOD DATA TAKEN FROM NJDEP DIVISION OF WATER RESOURCES BUREAU OF FLOOD PLAIN MANAGEMENT, "DELINEATION OF FLOODWAY AND FLOOD HAZARD AREA, RARITAN RIVER STA. 110 TO STA. 220, WOODBRIDGE TWP, SAYERVILLE BOROUGH, EDISON TWP, MIDDLESEX COUNTY, NEW JERSEY," BY ANDERSON-NICHOLS & CO., INC., BOSTON, MA. PLATE R-2, DATED JANUARY 1978.

4. THIS PLAN IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

SOURCES:

1. PLAN ENTITLED "PROPOSED SITE PLAN; BLOCK 51, LOTS 1, 1R, 2, 2B, 2C; RECYCLING TECHNOLOGY DEVELOPMENT, L.L.C.;" MIDDLESEX COUNTY; TOWNSHIP OF WOODBRIDGE; NEW JERSEY, PREPARED BY LOUIS L. ZUEGNER, IV, P.E., (LICENSE NO. GE 42265) CONSISTING OF 4 SHEETS, DATED SEPTEMBER 5, 2001, LAST REVISED DECEMBER 10, 2001.

2. PLAN ENTITLED "FACILITY SITE PLAN," PREPARED BY RICHARD D. GALLI, P.E. (LICENSE NO. 31994), CONSISTING OF FOUR SHEETS, DATED SEPTEMBER 22, 2000, REVISED MAY 3, 2001.

3. SURVEY ENTITLED CARBORUNDOM FACILITY; PLAN OF SURVEY; LOTS 1, 1R, 2, 2B & 2C - BLOCK 51," PREPARED BY JAMES V. DE MURO, P.E. & P.L.S. (LICENSE NO. 21866), DATED DECEMBER 18, 1995.

0 60 120
SCALE: 1" = 120'

DRAFT

NO.	REVISION	DATE	BY

SITE LAYOUT
FOR
BAYSHORE RECYCLING CORPORATION
TAX MAP SHEET 129, BLOCK 51, LOTS 1, 1-R, 2, 2-B & 2-C
75 CROWS MILL ROAD
WOODBRIDGE TOWNSHIP, MIDDLESEX COUNTY, NEW JERSEY

DATE:	11/08/04
DRAWN BY:	XXX
CHECKED BY:	XXX
SCALE:	1" = 60'
FILENAME:	203097_BAYSHORE_120204
LAYOUT:	BAYSHORE

Princeton Planning & Engineering
A Division of Environmental Liability Management, Inc.
218 Wall Street, Research Park
Princeton, New Jersey 08540-1512
Tel./Fax: (609) 683-4848/0129
E-mail: n@princetonpe.com
CERTIFICATE OF AUTHORIZATION NO. 24GA28044100

DRAWING NO.: 1 OF 1

HARBOR RESOURCE ENVIRONMENTAL GROUP	**FIGURE 4**
	LOCATION PLAN
SEDIMENT DECONTAMINATION DEMONSTRATION PROJECT	**DARLING INTERNATIONAL 825 WILSON AVENUE**
DECEMBER 2005	**NEWARK, NJ**

Tables

HARBOR RESOURCE DEMONSTRATION PROJECT
EQUIPMENT LIST
TABLE 1

EQUIP ID	DESCRIPTION	QUANTITY	SPECIFICATIONS
P-101	Raw Sediment Transfer Pump	1	Schwing BLP 1000 pump (68 cu.yd./hr)
P-102	Slurry Transfer Pump	1	350 gpm
P-103	Belt Press Feed Pump	1	350 gpm
P-104	Recycle Water Pump	1	350 gpm
T-101 A/B/C/D	Oxidation Tanks	4	19,950-gal Baker Short Tanks (11' - 10" ht) with 4 - 10hp double blade agitators
T-102 A/B	Filtrate Water Surge Tanks	2	19,950-gal Baker Short Tanks (11' - 10" ht) with 4 - 10hp double blade agitators
T-103	Effluent Water Tank	1	10,000-gal calibrated Baker Tank
M-101	Ribbon Blender	1	Maxcrete - Waste Mixer; 10 cu.yd. 3 - 6 RPM agitate 16-24 RPM mix speed with weigh scale
F-101	Sand Filter System	1	Baker - 3 bed sand filter system & pump 35-80 psi; 567 gpm max
X-101	Delivery Trucks		30 cu.yd. Truck unit
X-102	Bar Screen	1	3" bar screen and surge chamber on Schwing Pump
X-103	Vibrating Screen	1	8' x 8' x 1/4" screen with 2 surge compartments (approx 400 gal capacity each); 1 agitated surge unit (5 hp)
X-104 A/B	Belt Press	2	Ashbrook 2.0 meter Winklepress
X-105	Oversize roll-off	1	5 cu.yd.
X-106	Skid-Steer Loader	1	Caterpillar 248B
X-107	Front-end Loader	1	
PK-101	KMnO4 Feed System	1	Carus Chemical feed system with weigh scale & feed pump
PK-102	Polymer Feed System	1	Ondeo Nalco dry polymer # 9908 with 5,000 gal mix tank and 60 gpm recirculation / mix pump & feed pump
PK-103	Cement Feed System	1	MCS Cement "Pig" Tanker (150,000 lb) with pneumatic feed system and bag house

HARBOR RESOURCE DEMONSTRATION PROJECT
SAMPLING AND TESTING SUMMARY TABLE
TABLE 2

Process Performance Evaluation Testing			
Sample	**Test**	**Total Samples**	**Duplicates**
S1	➢ Contaminants (Bulk chemistry, see Table 3) ➢ pH, Organic Carbon Content, Moisture Content ➢ Grain size distribution with hydrometer ➢ Chemical Testing (CL, SO_3, Resistivity)	5	1
S2	➢ Solids wt %	5	1
S3	➢ Contaminants (Bulk chemistry, see Table 3) ➢ MEP/TCLP (see Table 3) ➢ Atterberg Limits, pH, Organic Carbon Content, Moisture Content ➢ Permeability ➢ Specific Gravity ➢ Grain size distribution with hydrometer ➢ Chemical Testing (CL, SO_3, Resistivity) ➢ Standard Compaction ➢ Unconfined Compressive Strength	5	1
S4	➢ Contaminants (Bulk chemistry, see Table 3)	5	1
$KMnO_4$	➢ Contaminants (Bulk chemistry, see Table 3)	1	-
Polymer	➢ Contaminants (Bulk chemistry, see Table 3)	1	-
Cement	➢ Contaminants (Bulk chemistry, see Table 3)	1	-

HARBOR RESOURCE DEMONSTRATION PROJECT
ANALYTICAL TESTING REQUIREMENTS AND METHODS
TABLE 3

Analysis Method	Description
SW-846 8260	➢ NJDEP Appendix VOC TCL+10
SW-846 8270C	➢ TCL Semi-volatile Organics by GC/MS +20
SW-846 8290	➢ Dioxins/Furans by HRGC/HRMS
SW-846 6010	➢ TAL Metals by ICP
SW-846 9012A	➢ Total Cyanide
SW-846 7471A	➢ Mercury by CVAA
SW-846 8081A	➢ TCL Pesticides by GC
SW-846 8082	➢ TCL PCB Aroclors by GC
SW-846 1311	➢ TCLP Leachate Preparation
SW-846 1320M	➢ Multiple Extraction Procedure – NJ 10/97 Mod
SW-846 8260	➢ TCLP VOC by GCMS
SW-846 8151	➢ TCLP Herbicides by GC
SW-846 6010/7470	➢ TCLP Metals
SW-846 8081A	➢ TCLP Pesticides by GC
SW-846 8270C	➢ TCLP Semivolatiles by GC/MS+20 TICs
SW 846 Chap 6	➢ Reactivity: Sulfide and Cyanide
SW-846 1030	➢ Ignitability
SW-846 9045C	➢ Corrosivity (pH)
SW-846 8260	➢ NJDEP Appendix VOC TCL+10
SW-846 8270C	➢ TCL Semivolatile Organics by GC/MS+20
SW-846 8290	➢ Dioxins/Furans by HRGC/HRMS
SW-846 6010	➢ TAL Metals by ICP
SW-846 9012A	➢ Total Cyanide
SW-846 7470	➢ Mercury by CVAA
SW-846 8081A	➢ TCL Pesticides by GC
SW-846 8082	➢ TCL PCB Aroclors by GC

HARBOR RESOURCE DEMONSTRATION PROJECT
SUMMARY OF GEOTECHNICAL TESTING
TABLE 4

SAMPLE NUMBER	CLASSIFICATION	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		PLASTICITY INDEX	SPECIFIC GRAVITY	ORGANIC CONTENT (%)	RESISTIVITY (OHM-CM)	SOLID CONTENT (BY WT %)	BULK DENSITY (PCF)	pH	CHLORIDES (PPM)	SULFATES (PPM)
			LIQUID LIMIT	PLASTIC LIMIT									
S1A-D1	Dark Grey Elastic Silt (MH)	102.4	-	-	-	-	5.9	80	-	-	7.00	4,372	1,300
S1A-D5	Dark Grey Elastic Silt (MH)	108.7	-	-	-	-	7.7	70	-	-	7.00	4,705	1,460
S1A-D1-D2	Dark Grey Elastic Silt (MH)	109.3	-	-	-	-	6.6	110	-	-	6.95	3,204	1,060
S1A-D3-D5	Dark Grey Elastic Silt (MH)	101.4	-	-	-	-	7.5	85	-	-	6.80	3,721	1,150
S1A-D1-D5	Dark Grey Elastic Silt (MH)	102.4	-	-	-	-	5.9	100	-	-	6.98	4,038	1,350
S1B-D1-D5	Dark Grey Elastic Silt (MH)	101.2	-	-	-	-	7.1	91	-	-	7.00	4,305	1,050
S2A-D1	Dark Grey Elastic Silt (MH)	98.8	-	-	-	2.61	-	-	50.3	66.0	-	-	-
S2A-D5	Dark Grey Elastic Silt (MH)	116.7	-	-	-	2.60	-	-	46.1	73.0	-	-	-
S2A-D1-D2	Dark Grey Elastic Silt (MH)	104.4	-	-	-	2.59	-	-	48.9	66.8	-	-	-
S2A-D3-D5	Dark Grey Elastic Silt (MH)	105.0	-	-	-	2.61	-	-	48.8	69.7	-	-	-
S2A-D1-D5	Drak Grey Elastic Silt (MH)	104.7	-	-	-	2.61	-	-	48.8	68.6	-	-	-
S2B-D1-D5	Drak Grey Elastic Silt (MH)	103.5	-	-	-	2.61	-	-	49.1	70.9	-	-	-
S3A-D1	Dark Grey Sandy Elastic Silt (MH)	79.4	-	-	-	-	-	280	55.7	-	7.40	1,018	880
S3A-D2	Dark Grey Sandy Elastic Silt (MH)	80.1	98	69	29	2.58	-	135	55.5	74.3	7.62	2,334	660
S3A-D5	Drak Grey Elastic Silt with Sand(MH)	86.5	111	65	46	2.56	6.7	170	53.6	77.1	7.80	1,101	960
S3A-D1-D5	**Drak Grey Elastic Silt with Sand(MH)**	**86.5**	**110**	**78**	**32**	**2.54**	**7.2**	**170**	**53.6**	**72.0**	**7.40**	**2,836**	**1,170**
S3B-D1-D5	**Drak Grey Elastic Silt (MH)**	**90.6**	**108**	**74**	**34**	**2.52**	**7.6**	**160**	**52.5**	**71.3**	**7.30**	**3,003**	**1,000**

Notes:
1. **Bolded** fields are samples representative of final processed material.
2. Due to insufficient sample quantity, some tests scheduled to be run on sample S3A-D1 were run on sample S3A-D2.

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5a: Volatiles

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody #			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
		S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5			
VOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Chloromethane	ppb	3.61	3.61	U	3.63	3.63	U	3.44	3.44	U	4.23	4.23	U	3.27	3.27	U	3.35	3.35	U	520,000
Bromomethane	ppb	1.35	1.35	U	1.35	1.35	U	1.29	1.29	U	1.58	1.58	U	1.22	1.22	U	1.25	1.25	U	79,000
Vinyl Chloride	ppb	2.13	2.13	U	2.14	2.14	U	2.03	2.03	U	2.5	2.5	U	1.93	1.93	U	1.98	1.98	U	2,000
Chloroethane	ppb	2.00	2.00	U	2.01	2.01	U	1.91	1.91	U	2.35	2.35	U	1.81	1.81	U	1.86	1.86	U	NR
Methylene Chloride	ppb	2.26	**9.24**	Y	2.27	2.27	U	2.16	2.16	U	2.65	2.65	U	2.05	2.05	U	2.10	2.10	U	49,000
Acetone	ppb	23.7	**195**		23.8	**309**		22.6	**388**		27.8	27.8	U	21.5	**226**		22.0	**281**		1,000,000
Carbon disulfide	ppb	1.70	**5.42**	Y	1.70	1.70	U	1.62	1.62	U	1.99	1.99	U	1.54	1.54	U	1.58	1.58	U	**NR**
1,1-Dichloroethene	ppb	2.52	2.52	U	2.53	2.53	U	2.41	2.41	U	2.96	2.96	U	2.29	2.29	U	2.34	2.34	U	8,000
1,1-Dichloroethane	ppb	1.78	1.78	U	1.79	1.79	U	1.7	1.70	U	2.09	2.09	U	1.62	1.62	U	1.66	1.66	U	570,000
t-1,2-Dichloroethene	ppb	2.22	2.22	U	2.23	2.23	U	2.12	2.12	U	2.6	2.6	U	2.01	2.01	U	2.06	2.06	U	1,000,000
c-1,2-Dichloroethene	ppb	2.35	2.35	U	2.36	2.36	U	2.24	2.24	U	2.75	2.75	U	2.13	2.13	U	2.18	2.18	U	79,000
Chloroform	ppb	1.57	1.57	U	1.57	1.57	U	1.49	1.49	U	1.84	1.84	U	1.42	1.42	U	1.45	1.45	U	19,000
1,2-Dichloroethane	ppb	1.96	1.96	U	1.97	1.97	U	1.87	1.87	U	2.3	2.3	U	1.77	1.77	U	1.82	1.82	U	6,000
2-Butanone	ppb	20.7	20.7	U	20.8	20.8	U	19.8	19.8	U	24.3	24.3	U	18.8	18.8	U	19.3	**56.0**	Y	1,000,000
1,1,1-Trichloroethane	ppb	2.09	2.09	U	2.10	2.10	U	1.99	1.99	U	2.45	2.45	U	1.89	1.89	U	1.94	1.94	U	210,000
Carbon Tetrachloride	ppb	2.39	2.39	U	2.40	2.40	U	2.28	2.28	U	2.81	2.81	U	2.17	2.17	U	2.22	2.22	U	2,000
Bromodichloromethane	ppb	1.78	1.78	U	1.79	1.79	U	1.7	1.70	U	2.09	2.09	U	1.62	1.62	U	1.66	1.66	U	11,000
1,2-Dichloropropane	ppb	1.70	1.70	U	1.70	1.70	U	1.62	1.62	U	1.99	1.99	U	1.54	1.54	U	1.58	1.58	U	10,000
cis-1,3-Dichloropropene	ppb	1.91	1.91	U	1.92	1.92	U	1.83	1.83	U	2.24	2.24	U	1.73	1.73	U	1.78	1.78	U	4,000
Trichloroethene	ppb	2.04	2.04	U	2.05	2.05	U	1.95	1.95	U	2.4	2.4	U	1.85	1.85	U	1.90	1.90	U	23,000
Dibromochloromethane	ppb	2.31	2.31	U	2.32	2.32	U	2.2	2.20	U	2.7	2.7	U	20.9	20.9	U	2.14	2.14	U	110,000
1,1,2-Trichloroethane	ppb	1.87	1.87	U	1.88	1.88	U	1.78	1.78	U	2.19	2.19	U	1.69	1.69	U	1.74	1.74	U	22,000
Benzene	ppb	2.13	2.13	U	2.14	2.14	U	2.03	2.03	U	2.5	2.5	U	1.93	1.93	U	1.98	1.98	U	3,000
trans-1,3-Dichloropropene	ppb	1.83	1.83	U	1.84	1.84	U	1.74	1.74	U	2.14	2.14	U	1.65	1.65	U	1.70	1.70	U	4,000
Bromoform	ppb	3.00	3.00	U	3.02	3.02	U	2.86	2.86	U	3.52	3.52	U	2.72	2.72	U	2.79	2.79	U	86,000
4-Methyl-2-pentanone	ppb	20.1	20.1	U	20.2	20.2	U	19.2	19.2	U	23.6	23.6	U	18.2	18.2	U	18.7	18.7	U	1,000,000
2-Hexanone	ppb	19.4	19.4	U	19.5	19.5	U	18.5	18.5	U	22.7	22.7	U	17.6	17.6	U	18.0	18.0	U	NR
Tetrachloroethene	ppb	3.87	3.87	U	3.89	3.89	U	3.69	3.69	U	4.54	4.54	U	3.51	3.51	U	3.60	3.60	U	4,000
Toluene	ppb	2.04	2.04	U	2.05	2.05	U	1.95	1.95	U	2.4	2.4	U	1.85	1.85	U	1.90	1.90	U	1,000,000
1,1,2,2-Tetrachloroethane	ppb	2.70	2.70	U	2.71	2.71	U	2.57	2.57	U	3.16	3.16	U	2.44	2.44	U	2.50	2.50	U	34,000
Chlorobenzene	ppb	1.83	1.83	U	1.84	1.84	U	1.74	1.74	U	2.14	2.14	U	1.60	1.60	U	1.70	1.70	U	37,000
Ethylbenzene	ppb	1.04	1.04	U	1.05	1.05	U	1	1.00	U	1.22	1.22	U	0.95	0.95	U	0.97	0.97	U	1,000,000
Styrene	ppb	1.87	1.87	U	1.88	1.88	U	1.78	1.78	U	2.19	2.19	U	1.69	1.69	U	1.74	1.74	U	23,000
m,p-xylene	ppb	3.61	3.61	U	3.63	3.63	U	3.44	**3.34**	J	4.23	4.23	U	3.27	3.27	U	3.35	**2.49**	J	**410,000**
o-xylene	ppb	1.83	1.83	U	1.84	1.84	U	2.67	2.67	U	2.14	2.14	U	1.65	1.65	U	1.70	1.70	U	410,000

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, Y, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppb is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5b: Semi-Volatiles

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody #			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
			S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5		
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Phenol	ppb	840	840	U	988	988	U	938	938	U	1160	1160	U	892	892	U	915	915	U	10,000,000
bis(2-Chloroethyl)ether	ppb	174	174	U	181	181	U	172	172	U	212	212	U	164	164	U	168	168	U	660
2-Chlorophenol	ppb	167	167	U	170	170	U	161	161	U	199	199	U	154	154	U	158	158	U	**280,000**
1,3-Dichlorobenzene	ppb	158	158	U	172	172	U	164	164	U	201	**54.9**	J	156	156	U	160	160	U	5,100,000
1,4-Dichlorobenzene	ppb	161	161	U	172	**65.4**	J	164	**97.8**	J	201	**223**	Y	156	**111**	J	160	**95.2**	J	**570,000**
1,2-Dichlorobenzene	ppb	145	145	U	203	203	U	193	193	U	237	237	U	183	183	U	188	188	U	5,100,000
2-Methylphenol	ppb	213	213	U	227	227	U	215	215	U	265	265	U	205	205	U	210	210	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	145	145	U	207	207	U	197	197	U	242	242	U	187	187	U	192	192	U	2,300,000
3+4-Methylphenol	ppb	169	169	U	264	264	U	250	**66.1**	J	309	**164**	J	238	**75.4**	J	244	**72.4**	J	2,800,000
N-Nitrosodi-n-propylamine	ppb	124	124	U	174	174	U	166	166	U	204	204	U	158	158	U	162	162	U	660
Hexachloroethane	ppb	132	132	U	203	203	U	193	193	U	237	237	U	183	183	U	188	188	U	6,000
Nitrobenzene	ppb	191	191	U	144	144	U	137	137	U	168	168	U	130	130	U	133	133	U	28,000
Isophorone	ppb	158	158	U	192	192	U	182	182	U	224	224	U	173	173	U	178	178	U	1,100,000
2-Nitrophenol	ppb	104	104	U	71.9	71.9	U	68.3	68.3	U	84.2	84.2	U	65	65	U	66.7	66.7	U	NR
2,4-Dimethylphenol	ppb	150	150	U	183	183	U	174	174	U	214	214	U	165	165	U	170	170	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	156	156	U	190	190	U	180	180	U	222	222	U	171	171	U	176	176	U	NR
2,4-Dichlorophenol	ppb	152	152	U	168	168	U	159	159	U	196	196	U	152	152	U	156	156	U	170,000
1,2,4-Trichlorobenzene	ppb	165	165	U	192	192	U	182	182	U	224	**56.8**	J	173	173	U	178	178	U	**68,000**
Naphthalene	ppb	178	**135**	J	185	**136**	J	176	**196**	Y	217	**426**	Y	167	**228**	Y	172	**201**	Y	**230,000**
4-Chloroaniline	ppb	176	176	U	198	198	U	188	188	U	232	232	U	179	179	U	184	184	U	230,000
Hexachlorobutadiene	ppb	165	165	U	159	159	U	151	151	U	186	186	U	144	144	U	147	147	U	1,000
4-Chloro-3-methylphenol	ppb	158	158	U	157	157	U	149	149	U	184	184	U	142	142	U	145	145	U	10,000,000
2-Methylnaphthalene	ppb	187	187	U	251	**48.2**	J	238	**76.7**	J	293	**199**	J	227	**91.4**	J	232	**77.6**	J	**NR**
Hexachlorocyclopentadiene	ppb	1030	1030	U	74.1	74.1	U	70.4	70.4	U	86.7	86.7	U	67.0	67.0	U	68.7	68.7	U	400,000
2,4,6-Trichlorophenol	ppb	156	156	U	148	148	U	141	141	U	173	173	U	134	134	U	137	137	U	62,000
2,4,5-Trichlorophenol	ppb	206	206	U	185	185	U	176	176	U	217	217	U	167	167	U	172	172	U	5,600,000
2-Chloronaphthalene	ppb	180	180	U	161	161	U	153	153	U	189	189	U	146	146	U	149	149	U	NR
2-Nitroaniline	ppb	200	200	U	216	216	U	205	205	U	252	252	U	195	195	U	200	200	U	NR
Dimethylphthalate	ppb	182	182	U	172	172	U	164	164	U	201	201	U	156	156	U	160	160	U	10,000,000
Acenaphthylene	ppb	176	**128**	J	185	**145**	J	176	**189**	Y	217	**309**	Y	167	167	U	172	**160**	J	**NR**
2,6-Dinitrotoluene	ppb	135	135	U	196	196	U	186	186	U	230	230	U	177	177	U	182	182	U	1,000
3-Nitroaniline	ppb	200	200	U	201	201	U	190	190	U	235	235	U	181	181	U	186	186	U	NR
Acenaphthene	ppb	182	182	U	198	**70.7**	J	188	**97.5**	J	232	**256**	Y	179	**124**	J	184	**107**	J	**3,400,000**
2,4-Dinitrophenol	ppb	7250	7250	U	4050	4050	U	3850	3850	U	4740	4740	U	3660	3660	U	3760	3760	U	110,000
4-Nitrophenol	ppb	1270	1270	U	1920	1920	U	1820	1820	U	2240	2240	U	1730	1730	U	1780	1780	U	NR
Dibenzofuran	ppb	171	171	U	279	279	U	265	265	U	326	**98.7**	J	252	**47.6**	J	259	259	U	NR
2,4-Dinitrotoluene	ppb	135	135	U	155	155	U	147	147	U	181	181	U	140	140	U	143	143	U	1,000
Diethylphthalate	ppb	**282**	**592**	BY	338	**789**	BY	321	**713**	BY	395	**1060**	YB	305	**697**	BY	313	**1460**	BY	**10,000,000**
4-Chlorophenyl phenyl ether	ppb	184	184	U	201	201	U	190	190	U	235	235	U	181	181	U	186	186	U	NR
Fluorene	ppb	**184**	**74.4**	J	190	**78.1**	J	180	**95.5**	J	222	**310**	Y	171	**132**	J	174	**142**	J	**2,300,000**
4-Nitroaniline	ppb	178	178	U	246	246	U	234	234	U	288	288	U	223	223	U	228	228	U	NR

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5b: Semi-Volatiles

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody #			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
			S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5		
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
4,6-Dinitro-2-methylphenol	ppb	6660	6660	U	2050	2050	U	1950	1950	U	2400	2400	U	1850	1850	U	1900	1900	U	NR
N-Nitrosodiphenylamine	ppb	171	171	U	218	218	U	207	207	U	255	255	U	197	197	U	202	202	U	140,000
4-Bromophenyl phenyl ether	ppb	187	187	U	185	185	U	176	176	U	217	217	U	167	167	U	172	172	U	NR
Hexachlorobenzene	ppb	187	187	U	207	207	U	197	197	U	242	242	U	187	187	U	192	192	U	660
Pentachlorophenol	ppb	3150	3150	U	1040	1040	U	987	987	U	1220	1220	U	940	940	U	964	964	U	6,000
Phenanthrene	ppb	**195**	**470**	J	198	**428**	Y	188	**604**	Y	232	**1380**	Y	179	**645**	Y	184	**609**	Y	**NR**
Anthracene	ppb	**189**	**291**	J	209	**259**	Y	199	**341**	Y	245	**655**	Y	189	**343**	Y	194	**319**	Y	**10,000,000**
Carbazole	ppb	158	158	U	240	**72.3**	J	228	**86.5**	J	280	280	U	217	**102**	J	222	**83.1**	J	NR
Di-n-butylphthalate	ppb	**195**	**112**	J	216	**87**	J	205	**128**	J	252	**219**	J	195	**177**	J	200	**101**	J	**5,700,000**
Fluoranthene	ppb	**189**	**1360**	Y	225	**928**	Y	213	**1050**	Y	263	**1890**	Y	203	**875**	Y	208	**758**	Y	**2,300,000**
Pyrene	ppb	**180**	**1250**	Y	201	**1130**	Y	190	**1370**	Y	235	**2530**	Y	181	**1310**	Y	186	**1220**	Y	**1,700,000**
Butylbenzylphthalate	ppb	**189**	**71.3**	J	172	**81.6**	J	164	164	U	201	201	U	156	**63.7**	J	160	160	U	**1,100,000**
3,3'-Dichlorobenzidine	ppb	820	820	U	1070	1070	U	1020	1020	U	1260	1260	U	971	971	U	996	996	U	2,000
Benzo(a)anthracene	ppb	**169**	**746**	Y	205	**527**	Y	195	**699**	Y	240	**1250**	Y	185	**643**	Y	190	**534**	Y	**900**
Chrysene	ppb	**193**	**980**	Y	198	**644**	Y	188	**832**	Y	232	**1390**	Y	179	**1080**	Y	184	**702**	Y	**9,000**
bis(2-Ethylhexyl)phthalate	ppb	**200**	**8490**		225	**8370**		213	**14400**		1180	**38200**		203	**17300**		208	**15900**		**49,000**
Di-n-octylphthalate	ppb	150	150	U	125	201	U	190	190	U	235	**734**	Y	181	181	U	186	186	U	**NR**
Benzo(b)fluoranthene	ppb	**193**	**688**	Y	179	**457**	Y	170	**600**	Y	209	**1080**	Y	162	**584**	Y	166	**582**	Y	**900**
Benzo(k)fluoranthene	ppb	**165**	**613**	Y	238	**593**	Y	226	**736**	Y	278	**1280**	Y	215	**625**	Y	220	**513**	Y	**900**
Benzo(a)pyrene	ppb	**104**	**712**	Y	183	**529**	Y	174	**679**	Y	214	**1240**	Y	165	**620**	Y	170	**560**	Y	**660**
Indeno(1,2,3-cd)pyrene	ppb	**714**	**337**	J	185	**316**	Y	176	**356**	Y	217	**660**	Y	167	**290**	Y	172	**291**	Y	**900**
Dibenz(a,h)anthracene	ppb	753	753	U	174	**96.1**	J	166	**140**	J	204	**216**	Y	158	**136**	J	162	**102**	J	**660**
Benzo(g,h,i)perylene	ppb	**757**	**368**	J	187	**321**	Y	178	**361**	Y	219	**672**	Y	169	**326**	Y	174	**283**	Y	**NR**

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, Y, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppb is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5c: PCBs

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
		S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5			
PCB (Aroclor)	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
PCB 1016	ppb	4.43	**429**		4.45	4.45	U	4.23	4.23	U	5.20	5.20	U	4.02	4.02	U	4.12	4.12	U	
PCB 1221	ppb	20.9	20.9	U	21.0	21.0	U	19.9	19.9	U	24.5	24.5	U	18.9	18.9	U	19.4	19.4	U	
PCB 1232	ppb	4.63	4.63	U	4.65	4.65	U	4.42	4.42	U	5.43	5.43	U	4.19	4.79	U	4.3	4.3	U	
PCB 1242	ppb	3.48	3.48	U	3.49	**186**		3.32	**290**		4.08	**914**		3.15	**425**		3.23	**309**		
PCB 1248	ppb	7.83	7.83	U	7.86	7.86	U	7.47	7.47	U	9.18	9.18	U	7.09	7.09	U	7.27	7.27	U	
PCB 1254	ppb	11.8	**424**		11.9	**150**		11.3	**219**		13.9	**604**		10.7	**286**		11.0	**226**		
PCB 1260	ppb	13.6	13.6	U	13.7	13.7	U	13.0	13.0	U	16.00	16.0	U	12.3	12.3	U	12.6	12.6	U	
PCB Total	ppb	NA	**853**		NA	**336**		N/A	509		N/A	1518		NA	**711**		NA	**535**		**490**

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppb is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5d: Pesticides

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody #			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
		S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5			
Pesticides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
alpha-BHC	ppb	1.54	1.54	U	1.55	1.55	U	1.47	1.47	U	1.81	1.81	U	1.40	1.40	U	1.43	1.43	U	NR
beta-BHC	ppb	1.67	1.67	U	1.68	1.68	U	1.6	1.6	U	1.96	1.96	U	1.52	1.52	U	1.56	1.56	U	NR
delta-BHC	ppb	2.98	2.98	U	2.99	2.99	U	2.84	2.84	U	3.49	3.49	U	2.70	2.70	U	2.77	2.77	U	NR
gamma-BHC (Lindane)	ppb	3.02	3.02	U	3.03	3.03	U	2.88	2.88	U	3.55	3.55	U	2.74	2.74	U	2.81	2.81	U	520
Heptachlor	ppb	1.37	1.37	U	1.38	1.38	U	1.31	1.31	U	1.61	1.61	U	1.24	1.24	U	1.27	1.27	U	150
Aldrin	ppb	2.13	2.13	U	2.14	2.14	U	2.03	2.03	U	2.50	2.50	U	1.93	1.93	U	1.98	1.98	U	40
Heptachlor epoxide	ppb	2.22	2.22	U	2.23	2.23	U	2.12	2.12	U	2.60	2.60	U	2.01	2.01	U	2.06	2.06	U	NR
Endosulfan I	ppb	2.33	2.33	U	2.34	2.34	U	2.22	2.22	U	2.73	2.73	U	2.11	2.11	U	2.16	2.16	U	340,000
Dieldrin	ppb	3.41	3.41	U	3.43	3.43	U	3.26	3.26	U	4.01	4.01	U	3.09	3.09	U	3.17	3.17	U	42
4,4'-DDE	ppb	3.59	**11.7**		3.60	**28.3**		**3.42**	**24.4**		4.21	**31.7**		3.25	**18.0**		3.33	**17.5**		**2,000**
Endrin	ppb	2.59	2.59	U	2.60	2.60	U	2.47	2.47	U	3.04	3.04	U	2.34	2.34	U	2.40	2.40	U	17,000
Endosulfan II	ppb	1.57	1.57	U	1.57	1.57	U	1.49	1.49	U	1.84	1.84	U	1.42	1.42	U	1.45	1.45	U	340,000
4,4'-DDD	ppb	2.98	**9.58**	Y	2.99	**16.0**		**2.84**	**15.3**		3.49	**18.2**		2.70	**14.1**		2.77	**8.56**	Y	**3,000**
Endosulfan sulfate	ppb	1.74	1.74	U	1.75	1.75	U	1.66	1.66	U	2.04	2.04	U	1.57	1.57	U	1.62	1.62	U	NR
4,4'-DDT	ppb	1.11	1.11	U	1.11	**7.39**	Y	**1.06**	**10.2**	Y	1.30	**43.0**		1.00	**17.4**		1.03	**8.20**	Y	2,000
Methoxychlor	ppb	3.37	3.37	U	338	3.38	U	3.22	3.22	U	3.95	3.95	U	3.05	3.05	U	3.13	3.13	U	280,000
Endrin ketone	ppb	5.02	5.02	U	5.04	5.04	U	4.79	4.79	U	5.89	5.89	U	4.55	4.55	U	4.67	4.67	U	NR
Endrin aldehyde	ppb	3.96	3.96	U	3.97	3.97	U	3.78	3.78	U	4.64	4.64	U	3.58	3.58	U	3.68	3.68	U	NR
alpha-Chlordane	ppb	2.59	**3.06**	Y	2.60	**4.69**	Y	**2.47**	**5.46**	Y	3.04	3.04	U	2.34	**3.69**	Y	2.40	**3.14**	Y	NR
gamma-Chlordane	ppb	4.28	4.28	U	4.30	**4.79**	U	**4.09**	**4.36**	Y	5.03	5.03	U	3.88	**4.81**	Y	3.98	**3.69**	J	NR
Toxaphene	ppb	47.8	47.8	U	48.0	48.0	U	45.6	45.6	U	56.1	56.1	U	43.3	43.3	U	44.4	44.4	U	100

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
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3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppb is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5e: Metals

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody #			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
		S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5			
Metals	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Aluminum	ppm	2.69	**12000**		45.1	45.1	U	51.3	**8440**		3.24	**16000**	E	48.6	**12500**	U	49.0	**13500**		**NR**
Antimony *	ppm	0.43	0.43		7.16	7.16	U	8.14	8.14	U	1.66	1.66	U	7.72	7.72	U	7.77	7.77	U	**14**
Arsenic *	ppm	0.72	**29.5**	U	12.2	12.2	U	13.8	13.8	U	2.47	2.47	U	13.1	13.1	U	13.2	13.2	U	**20**
Barium *	ppm	0.085	**105**		1.43	1.43	U	1.63	**96.4**		0.15	**245**		1.54	**121**	U	1.55	**120**		**700**
Beryllium	ppm	0.043	**0.35**		0.72	0.72	U	0.81	0.81	U	0.051	0.051	U	0.77	0.77	U	0.78	0.78	U	1
Cadmium *	ppm	0.064	**4.88**		1.07	1.07	U	1.22	**9.76**		0.18	**31.5**		1.16	**6.95**	U	1.17	**5.83**		**39**
Calcium	ppm	5.52	**5090**		92.7	92.7	U	105	**6350**		6.68	**6850**		100	**8640**	U	101	**6110**		**NR**
Chromium	ppm	0.34	**112**		5.72	5.72	U	6.51	**85.4**		0.26	**410**		6.18	**141**	U	6.22	**145**		**NR**
Cobalt	ppm	0.085	**10.4**		2.50	**2.50**		1.63	**13.80**		0.15	**18.50**		1.54	**12.7**		1.55	**14.4**		**NR**
Copper *	ppm	0.62	**143**		37.9	**37.9**		11.8	**178**		0.79	**452**		11.2	**198**		11.3	**207**		**600**
Iron	ppm	3.84	**25900**		64.4	64.4	U	73.2	**22300**		91.8	**37400**		69.5	**34200**	U	69.9	**37100**		**NR**
Lead *	ppm	0.36	**156**		6.08	6.08	U	6.92	**111**		0.61	**593**		6.56	**175**	U	6.60	**221**		**400**
Magnesium	ppm	5.67	**6650**		95.2	95.2	U	108	**4880**		1.40	**8020**		103	**7500**	U	103	**8000**		**NR**
Manganese	ppm	0.17	**502**		6.08	**6.08**		3.25	**408**		0.15	**611**		3.09	**1050**		3.11	**617**		**NR**
Mercury *	ppm	0.012	**2.44**		0.012	**2.91**		0.011	**3.04**		0.013	**6.57**		0.011	**3.04**		0.011	**3.73**		**14**
Nickel *	ppm	0.11	**32.6**		1.79	1.79	U	2.03	**26.4**		0.43	**95.6**		1.93	**37.8**	U	1.94	**40.0**		**250**
Potassium	ppm	11.1	**1890**		187	187	U	213	**1090**		267	**3440**		202	**1760**	U	203	**1690**		NR
Selenium	ppm	0.92	0.92	U	15.4	15.4	U	17.5	17.5	U	0.87	0.87	U	16.6	16.6	U	16.7	16.7	U	63
Silver *	ppm	0.21	0.21	U	3.58	3.58	U	4.07	4.07	U	0.077	0.077	U	3.86	3.86	U	3.89	3.89	U	**110**
Sodium	ppm	4.62	**5290**		77.6	77.6	U	88.3	**3030**		111	**7580**		83.8	**4370**	U	84.3	**4430**		**NR**
Thallium	ppm	0.43	**11.8**		18.6	**18.6**		8.14	8.14	U	1.12	1.12	U	7.72	7.72		7.77	7.77	U	2
Vanadium *	ppm	0.11	**34.4**		1.79	1.79	U	2.03	**27.7**		0.10	**57.4**		1.93	**36.3**	U	1.94	**38.1**		**370**
Zinc *	ppm	0.94	**309**		15.7	15.7	U	17.9	**228**		1.48	**989**	E	17.0	**363**	U	17.1	**378**		**1,500**

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, E, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5f: Dioxins

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
		S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5			
Dioxins	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
2,3,7,8-TCDF	pg/g	0.55	**9.96**		0.30	**9.76**		0.31	**10.4**		0.98	**19.9**	Q	0.24	**9.21**		0.31	**17.3**		
Total TCDF	pg/g	0.55	**409**		0.30	**282**	Q	0.31	**356**	Q	0.98	**674**		0.30	**312**	Q	0.46	**567**	Q	
2,3,7,8-TCDD	pg/g	0.37	**140**		0.30	**97.5**		0.34	**133**		0.63	**241**	Q	0.27	**122**		0.40	**195**		
Total TCDD	pg/g	0.64	**206**		0.63	**150**	Q	0.34	**194**	Q	0.63	**347**		0.65	**178**	Q	0.40	**292**	Q	
1,2,3,7,8-PeCDF	pg/g	0.56	**7.83**	Q	0.96	**6.51**	QA	0.93	**8.18**	QA	0.71	**14.5**	Q	0.86	**6.09**	QA	0.98	**11.3**	Q	
2,3,4,7,8-PeCDF	pg/g	0.52	**22.4**		0.96	**16.3**		0.93	**25.1**		0.67	**38.7**	Q	0.86	**18.8**		0.98	**34.1**	Q	
Total PeCDF	pg/g	0.62	**317**		0.96	**230**	Q	0.93	**347**	Q	0.71	**541**		0.86	**270**	Q	0.98	**515**	Q	
1,2,3,7,8-PeCDD	pg/g	0.47	**4.15**	A	0.96	**3.49**	A	0.93	**4.46**	A	1.01	**7.59**		0.86	**3.75**	A	0.98	**6.32**	QA	
Total PeCDD	pg/g	0.47	**50.2**		0.96	**40.3**	Q	0.93	**49.9**	Q	1.01	**86.4**		0.86	**41.9**	Q	0.98	**58.1**	Q	
1,2,3,4,7,8-HxCDF	pg/g	1.69	**93.2**		1.59	**68.9**		0.93	**130**		0.82	**161**		0.86	**78.7**		1.02	**109**		
1,2,3,6,7,8-HxCDF	pg/g	1.56	**24.5**		1.47	**16.1**		0.93	**27.5**		0.76	**40.5**		0.86	**18.0**		0.98	**28.5**		
2,3,4,6,7,8-HxCDF	pg/g	1.69	**12.9**		1.60	**11.1**		0.93	**15.5**		0.83	**27.1**		0.86	**11.1**		1.02	**18.6**		
1,2,3,7,8,9-HxCDF	pg/g	1.93	**3.64**	A	1.82	**3.03**	A	0.93	**5.05**	A	0.94	**7.51**		0.86	**3.56**	A	1.16	**5.38**	A	
Total HxCDF	pg/g	1.93	**330**		1.82	**244**		0.93	**408**		0.94	**599**		0.86	**269**		1.16	**426**	Q	
1,2,3,4,7,8-HxCDD	pg/g	0.94	**3.63**	A	0.96	**2.92**	A	0.93	**4.09**	A	1.69	**8.25**		0.86	**2.62**	A	0.98	**5.74**	A	
1,2,3,6,7,8-HxCDD	pg/g	0.92	**16.3**		0.96	**13.5**		0.93	**17.9**		1.64	**33.8**		0.86	**16.1**		0.98	**27.8**		
1,2,3,7,8,9-HxCDD	pg/g	0.94	**9.44**		0.96	**7.99**	A	0.93	**10.1**		1.67	**19.5**		0.86	**8.28**	A	0.98	**14.5**		
Total HxCDD	pg/g	0.94	**156**		0.96	**127**		0.93	**164**		1.69	**277**		0.86	**136**		0.98	**250**	Q	
1,2,3,4,6,7,8-HpCDF	pg/g	0.47	**351**		0.96	**277**		0.93	**464**		0.71	**640**		0.86	**287**		0.98	**424**		
1,2,3,4,7,8,9-HpCDF	pg/g	0.57	**10.7**		0.98	**12.9**		0.93	**14.4**		0.89	**22.3**		0.86	**9.44**		0.98	**14.3**		
Total HpCDF	pg/g	0.57	**494**		0.98	**388**		0.93	**608**		0.89	**922**		0.86	**401**		0.98	**630**		
1,2,3,4,6,7,8-HpCDD	pg/g	0.88	**257**		0.96	**207**		0.93	**247**		1.00	**536**		0.91	**203**		0.99	**376**		
Total HpCDD	pg/g	0.88	**610**		0.96	**483**		0.93	**546**		1.00	**1180**		0.91	**545**		0.99	**858**		
OCDF	pg/g	0.95	**545**		1.92	**457**		1.87	**698**		1.21	**1400**		1.72	**483**		1.96	**776**		
OCDD	pg/g	1.11	**2930**		1.92	**2210**		1.87	**2830**		1.50	**6070**	E	1.72	**2450**		1.96	**4300**		
TEF (Total)	pg/g	NA	**180**		NA	**128**		NA	**181**		NA	**313**		NA	**155**		NA	**251**		**NR**

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
2. Bold face numbers identify analytical data above Q or A. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppt is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
SEDIMENT FEED CONTAMINANT ANALYSIS
Table 5g: Cyanide

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain			0503407			0503550			0503550			0503492			0503550			0503550		
Date Received:			3/18/2005			3/26/2005			3/26/2005			3/24/2005			3/26/2005			3/26/2005		
		S1A-D1			S1A-D1+D2			S1A-D3+D4+D5			S1A-D5			S1A-D1-D5			S1B-D1-D5			
Cyanide	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Cyanide	ppm	0.42	0.42	U	0.74	0.74	U	0.69	0.69	U	0.82	0.82	U	0.62	0.62	U	0.65	0.65	U	1100

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboritories, Inc. analytical results report for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FEED CONCENTRATIONS OF TARGETED COMPOUNDS
TABLE 6

	D1	D1+D2	D3+D4+D5	D5	D1-D5	D1-D5 - DUP	AVG D1-D5	OVERALL AVG
	Feed (ppb)	Feed (ppb)	Feed (ppb)	Feed (ppb)	Feed (ppb)	Feed (ppb)	Feed (ppb)	Feed (ppb)
VOCs								
Benzene	2.13	2.14	2.03	2.5	1.93	1.98	1.96	***AS ALL READINGS FOR ALL TREATED SAMPLES WERE BELOW THE METHOD DETECTION LIMITS , NO AVERAGE CAN BE CALCULATED***
Carbon Tetrachloride	2.39	2.40	2.28	2.81	2.17	2.22	2.20	
Chlorobenzene	1.83	1.84	1.74	2.14	1.65	1.70	1.68	
Chloroform	1.57	1.57	1.49	1.84	1.42	1.45	1.44	
1,2-Dichloroethane	1.96	1.97	1.87	2.3	1.77	1.82	1.80	
1,1-Dichloroethene	2.52	2.53	2.41	2.96	2.29	2.34	2.32	
Tetrachloroethene	3.87	3.89	3.69	4.54	3.51	3.60	3.56	
Trichloroethene	2.04	2.05	1.95	2.4	1.85	1.90	1.88	
Vinyl Chloride	2.13	2.14	2.03	2.5	1.93	1.98	1.96	
SVOCs								
Benzo(a)anthracene	746.0	527.0	699.0	1250.0	643.0	534.0	588.5	733.2
Benzo(b)fluoranthene	688.0	457.0	600.0	1080.0	584.0	582.0	583.0	665.2
Benzo(k)fluoranthene	613.0	593.0	736.0	1280.0	625.0	513.0	569.0	726.7
Benzo(a)pyrene	712.0	529.0	679.0	1240.0	620.0	560.0	590.0	723.3
bis(2-Ethylhexyl)phthalate	8490.0	8370.0	14400.0	38200.0	17300.0	15900.0	16600.0	17110.0
Chrysene	980.0	644.0	832.0	1390.0	1080.0	702.0	891.0	938.0
Indeno(1,2,3-cd)pyrene	337.0	316.0	356.0	660.0	290.0	291.0	290.5	375.0
Metals	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Antimony	***0.43***	***8.56***	***8.14***	***1.66***	***7.72***	***7.77***	7.7	5.7
Arsenic	29.5	***14.6***	***13.8***	***2.47***	***13.1***	***13.2***	13.2	14.4
Barium	105.0	302.0	96.4	245.0	121.0	120.0	120.5	164.9
Cadmium	4.9	9.4	9.8	31.5	7.0	5.83	6.4	11.4
Copper	143.0	377.0	178.0	452.0	198.0	207.0	202.5	259.2
Lead	156.0	390.0	111.0	593.0	175.0	221.0	198.0	274.3
Mercury	2.44	2.91	2.95	6.57	3.04	3.73	3.39	3.61
Nickel	32.6	96.8	26.4	95.6	37.8	40.0	38.9	54.9
Silver	***0.21***	***4.28***	***4.07***	***0.077***	***3.86***	***3.89***	3.9	2.7
Vanadium	34.4	87.8	27.7	57.4	36.3	38.1	37.2	47.0
Zinc	309.0	725.0	228.0	989.0	363.0	378.0	370.5	498.7
PCBs, Total (ppbw)	853.0	336.0	509.0	1518.0	388.1	535.0	461.6	689.9
Dioxins	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt
2,3,7,8-TCDD	140.0	97.5	133.0	241.0	122.0	195.0	158.5	154.8
TEF (Total)	180.0	128.0	181.0	313.0	155.0	251.0	203.0	201.3

Notes:

(1) Shaded areas indicate concentration above Residential Direct Contact Soil Cleanup Criteria

(2) Bold + Italics concentrations were below method detection limits.

HARBOR RESOURCE DEMONSTRATION PROJECT
OVERALL AVERAGE MASS FLOW RATES FOR TARGETED SVOCs, METALS, PCBs, DIOXINS
TABLE 7

	OVERALL AVG FLOW RATE IN		OVERALL AVG FLOW RATE OUT	
Sediment Flow (lb/hr)	**4358**		**5032**	
	Conc (ppb)	**Mass Flow (g/hr)**	**Conc (ppb)**	**Mass Flow (g/hr)**
SVOCS				
Benzo(a)anthracene	733.2	1.45	647.3	1.48
Benzo(b)fluoranthene	665.2	1.31	606.2	1.38
Benzo(k)fluoranthene	726.7	1.44	635.0	1.45
Benzo(a)pyrene	723.3	1.43	645.7	1.47
bis(2-Ethylhexyl)phthalate	17160	33.92	17643	40.27
Chrysene	938.0	1.85	760.5	1.74
Indeno(1,2,3-cd)pyene	375.0	0.74	292.2	0.67
METALS (ppm)				
Antimony	8.00	15.81	7.40	16.89
Arsenic	13.70	27.08	12.60	28.76
Barium	164.9	326.0	134	305.9
Beryllium	0.58	1.15	0.67	1.53
Cadmium	7.40	14.63	7.80	17.80
Copper	220.6	436.1	199.2	454.7
Lead	210.6	416.3	190.2	434.1
Manganese (Note 1)	534.5	1056.6	4360.0	9951.8
Mercury	3.00	5.93	3.40	7.76
Nickel	46.70	92.3	45.90	104.77
Silver	4.00	7.91	3.70	8.45
Thallium	9.19	18.17	8.49	19.38
Vanadium	49.50	97.85	40.10	91.53
Zinc	400.6	791.9	369.8	844.1
PCBs				
PCBs, Total	689.9	1.36	622.2	1.42
DIOXINS (ppt)				
Dioxins	201.0	0.0004	322.3	0.0007

Note 1 - Concentration in treated sediment higher than feed concentration due to the fact that $KMnO_4$ was added as oxidant. However MEP results show that the concentrations are well below the 50 ppb threshold for NJ Groundwater Quality Criteria.

HARBOR RESOURCE DEMONSTRATION PROJECT
TREATED CONCENTRATIONS OF TARGETED COMPOUNDS
TABLE 8

	D1	D1+D2	D3+D4+D5	D5	D1-D5	D1-D5 - DUP	AVG D1-D5	OVERALL AVG		
	Treated (ppb)	Treated (ppb)	Treated (ppb)	Treated (ppb)	Treated (ppb)	Treated (ppb)	Treated (ppb)	Treated (ppb)	Residential Direct Contact Soil Cleanup Criteria (ppb)	Non-Residential Direct Contact Soil Cleanup Criteria (ppb)
VOCs										
Benzene	1.74	1.79	1.90	1.23	1.87	1.93	1.90	***AS ALL READINGS FOR ALL TREATED SAMPLES WERE BELOW THE METHOD DETECTION LIMITS , NO AVERAGE CAN BE CALCULATED***	3,000	13,000
Carbon Tetrachloride	1.95	2.01	2.13	1.39	2.10	2.16	2.13		2,000	4,000
Chlorobenzene	1.49	1.53	1.63	1.06	1.60	1.65	1.63		37,000	680,000
Chloroform	1.28	1.31	1.39	0.91	1.38	1.41	1.40		19,000	28,000
1,2-Dichloroethane	1.60	1.64	1.74	1.29	1.72	1.77	1.75		6,000	24,000
1,1-Dichloroethene	2.06	2.12	2.24	1.46	2.22	2.28	2.25		8,000	150,000
Tetrachloroethene	3.16	3.25	3.44	2.24	3.40	3.50	3.45		4,000	6,000
Trichloroethene	1.67	1.72	1.82	1.18	1.80	1.85	1.83		23,000	54,000
Vinyl Chloride	1.74	1.79	1.90	1.23	1.87	1.93	1.90		2,000	7,000
SVOCs										
Benzo(a)anthracene	703.0	851.0	665.0	387.0	517.0	761.0	639.0	647.3	900	4,000
Benzo(b)fluoranthene	632.0	886.0	567.0	295.0	513.0	744.0	628.5	606.2	900	4,000
Benzo(k)fluoranthene	752.0	741.0	694.0	390.0	548.0	685.0	616.5	635.0	900	4,000
Benzo(a)pyrene	756.0	878.0	624.0	371.0	519.0	726.0	622.5	645.7	660	660
bis(2-Ethylhexyl)phthalate	17700.0	25500.0	17500.0	9060.0	15700.0	20400.0	18050.0	17643.3	49,000	210,000
Chrysene	868.0	1060.0	758.0	398.0	598.0	881.0	739.5	760.5	9,000	40,000
Indeno(1,2,3-cd)pyrene	317.0	365.0	321.0	203.0	222.0	325.0	273.5	292.2	900	4,000
Metals	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Antimony	22.5	***7.16***	***7.30***	***0.82***	***7.63***	***7.56***	7.6	8.8	14	340
Arsenic	***0.60***	***12.2***	***12.4***	***1.22***	***13.0***	***12.8***	12.9	8.7	20	20
Barium	140.0	***1.43***	149.0	109.0	123.0	149.0	136.0	111.9	700	47,000
Cadmium	5.8	***1.07***	11.7	13.6	6.87	6.80	6.8	7.6	39	100
Copper	174.0	37.9	237.0	138.0	214.0	233.0	223.5	172.3	600	600
Lead	167.0	***6.08***	215.0	161.0	197.0	211.0	204.0	159.5	400	600
Mercury	3.23	3.40	4.00	2.33	3.50	3.55	3.53	3.34	14	270
Nickel	49.7	***6.08***	48.9	39.5	38.5	52.9	45.7	39.3	250	2,400
Silver	***0.18***	***3.58***	***3.65***	***0.038***	***3.82***	***3.78***	3.8	2.5	110	4,100
Vanadium	43.5	***1.79***	43.8	32.4	36.6	44.2	40.4	33.7	370	7,100
Zinc	314.0	***15.7***	438.0	276.0	397.0	424.0	410.5	310.8	1,500	1,500
PCBs, Total (ppb)	311.0	791.0	874.0	509.0	620.0	628.0	624.0	622.2	490	2,000
Dioxins	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt	ppt
2,3,7,8-TCDD	439.0	187.0	302.0	178.0	221.0	206.0	213.5	255.5	NR	NR
TEF (Total)	510.0	250.0	384.0	233.0	297.0	261.0	279.0	322.5	NR	NR

Notes:

(1) Shaded areas indicate concentration above Residential Direct Contact Soil Cleanup Criteria

(2) Bold + Italics concentrations were below method detection limits. For conservatism, concentration presented in table assumed to be method detection limit concentration

(3) Dioxin concentrations presented in parts per **trillion** on a dry weight basis (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
SUMMARY OF PERFORMANCE DATA
TABLE 9

	OVERALL AVG				
	Feed (ppb)	Treated (ppb)	% Contaminant Reduction	Residential Direct Contact Soil Cleanup Criteria (ppb)	Non-Residential Direct Contact Soil Cleanup Criteria (ppb)
VOCs					
Benzene	***AS ALL READINGS FOR ALL FEED AND TREATED SAMPLES WERE BELOW THE METHOD DETECTION LIMITS, NO CONCLUSIONS CAN BE DRAWN REGARDING VOCs***			3,000	13,000
Carbon Tetrachloride				2,000	4,000
Chlorobenzene				37,000	680,000
Chloroform				19,000	28,000
1,2-Dichloroethane				6,000	24,000
1,1-Dichloroethene				8,000	150,000
Tetrachloroethene				4,000	6,000
Trichloroethene				23,000	54,000
Vinyl Chloride				2,000	7,000
Total VOCs					
SVOCs					
Benzo(a)anthracene	733.2	647.3	11.7%	900	4,000
Benzo(b)fluoranthene	665.2	606.2	8.9%	900	4,000
Benzo(k)fluoranthene	726.7	635.0	12.6%	900	4,000
Benzo(a)pyrene	723.3	645.7	10.7%	660	660
bis(2-Ethylhexyl)phthalate	17110.0	17643.3	-3.1%	49,000	210,000
Chrysene	938.0	760.5	18.9%	9,000	40,000
Indeno(1,2,3-cd)pyrene	375.0	292.2	22.1%	900	4,000
Total SVOCs	--	--	11.7%		
Metals	ppm	ppm		ppm	ppm
Antimony	5.7	8.8	-54.4%	14	340
Arsenic	14.4	8.7	39.6%	20	20
Barium	164.9	111.9	32.1%	700	47,000
Cadmium	11.4	7.6	33.3%	39	100
Copper	259.2	172.3	33.5%	600	600
Lead	274.3	159.5	41.9%	400	600
Mercury	3.61	3.34	7.5%	14	270
Nickel	54.9	39.3	28.4%	250	2,400
Silver	2.7	2.5	7.4%	110	4,100
Vanadium	47.0	33.7	28.3%	370	7,100
Zinc	498.7	310.8	37.7%	1,500	1,500
Total Metals	--	--	21.4%		
PCBs, Total (ppb)	689.9	622.2	9.8%	490	2,000
Dioxins	ppt	ppt		ppt	ppt
2,3,7,8-TCDD	154.8	255.5	-65.1%	NR	NR
TEF (Total)	201.3	322.5	-60.2%	NR	NR

Notes:

(1) Shaded areas indicate concentration above Residential Direct Contact Soil Cleanup Criteria

(2) Dioxin concentrations presented in parts per **trillion** on a dry weight basis (ppt)

(3) Concentration in treated sediment higher than feed concentration due to the fact that $KMnO_4$ was added as oxidant. However MEP results show that the concentrations are well below the 50 ppb threshhold for NJ Groundwater Quality Criteria.

NR - Not Regulated by NJ Residential or Non-residential Soil Cleanup Criteria

HARBOR RESOURCE DEMONSTRATION PROJECT
MEP RESULTS FOR TARGET SVOCs, METALS, PCBs, DIOXINS
Table 10a - Sample S3A-D1 (Day 1)

	Units	Day 1	Q[1]	Day 2	Q[1]	Day 3	Q[1]	Day 4	Q[1]	Day 5	Q[1]	Day 6	Q[1]	Day 7	Q[1]
SEMIVOLATILES															
Benzo(a)anthracene	ppb	1.21	U	1.21	U	1.21	U	1.21	U	1.21	U	1.21	U	1.21	U
Chrysene	ppb	1.14	U	1.14	U	1.14	U	1.14	U	1.14	U	1.14	U	1.14	U
bis(2-Ethylhexyl)phthalate	ppb	0.28	JB	0.43	JB	0.55	JB	0.52	JB	0.44	JB	0.39	JB	0.46	JB
Benzo(b)fluoranthene	ppb	1.13	U	1.13	U	1.13	U	1.13	U	1.13	U	1.13	U	1.13	U
Benzo(k)fluoranthene	ppb	1.09	U	1.09	U	1.09	U	1.09	U	1.09	U	1.09	U	1.09	U
Benzo(a)pyrene	ppb	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U
Indeno(1,2,3-cd)pyrene	ppb	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U
PCB (AROCLOR)															
PCB 1016	ppb	0.084	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
PCB 1221	ppb	0.032	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
PCB 1232	ppb	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1242	ppb	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1248	ppb	0.095	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1254	ppb	0.042	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U
PCB 1260	ppb	0.084	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
TOTAL METALS															
Antimony	ppm	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U
Arsenic	ppm	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U
Barium	ppm	0.052		0.033		0.019		0.014		0.014		0.01		0.045	
Cadmium	ppm	0.0046		0.0019		0.0029		0.0011		0.0007		0.0006		0.0006	
Copper	ppm	0.33		0.25		0.16		0.11		0.088		0.068		0.058	
Lead	ppm	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0017	U	0.0028	
Manganese	ppm	0.008	U	0.0013		0.0034		0.0012		0.0015		0.0017		0.0026	
Mercury	ppm	0.000062		0.00013		0.00011		0.00012		0.00011		0.00011		0.00011	
Nickel	ppm	0.056		0.034		0.017		0.01		0.0091		0.0061		0.0058	
Silver	ppm	0.0019		0.053		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Vanadium	ppm	0.0042		0.013		0.023		0.029		0.0.3		0.037		0.038	
Zinc	ppm	0.0055		0.014		0.013		0.011		0.014		0.0086		0.017	
DIOXINS															
2,3,7,8-TCDF	ng/L	ND	U	0.0046	A	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDF	ng/L	ND	U	0.0046		ND	U	ND	U	ND	U	ND	U	ND	U
2,3,7,8-TCDD	ng/L	ND	U	ND	U	0.0052	A	ND	U	ND	U	ND	U	ND	U
Total TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDF	ng/L	0.0068	A	0.013	A	0.0092	A	0.0044	A	ND	U	ND	U	0.0023	A
2,3,4,7,8-PeCDF	ng/L	0.0053	A	0.01	A	0.0068	A	ND	U	ND	U	ND	U	ND	U
Total PeCDF	ng/L	0.012		0.024		0.016		ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDD	ng/L	0.0072	A	0.014	A	0.01	A	0.0036	A	ND	U	ND	U	ND	U
Total PeCDD	ng/L	0.0072		0.014		ND	U	0.0036		ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDF	ng/L	0.0044	A	0.0087	A	0.0073	A	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDF	ng/L	0.0048	A	0.01	A	0.0083	A	ND	U	ND	U	ND	U	ND	U
2,3,4,6,7,8-HxCDF	ng/L	0.0039	A	0.0079	A	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDF	ng/L	0.0056	A	0.009	A	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDF	ng/L	0.0087		0.036		ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDD	ng/L	0.0033	A	0.0076	A	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDD	ng/L	0.0046	A	0.011	A	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDD	ng/L	0.005	A	0.0094	A	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDD	ng/L	0.013		0.018		ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDF	ng/L	0.0024	A	0.0062	A	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8,9-HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDF	ng/L	ND	U	0.0062		ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDD	ng/L	ND	U	0.0065	A	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
OCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.012	A	ND	U
OCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.055	A	ND	U
TEQ	ng/L	0.017		0.03		0.026		0.012		0.0058		0.012		0.0074	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. NR - not regulated
3. Ng/L = parts per trillion (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
MEP RESULTS FOR TARGETED SVOCs, METALS, PCBs, DIOXINS
Table 10b - Sample COMP S3A-D1+D2 (Day 1+2 Composite)

	Units	Day 1	Q[1]	Day 2	Q[1]	Day 3	Q[1]	Day 4	Q[1]	Day 5	Q[1]	Day 6	Q[1]	Day 7	Q[1]
SEMIVOLATILES															
Benzo(a)anthracene	ppb	2.42	U	2.42	U	2.42	U	2.42	U	1.21	U	2.42	U	2.42	U
Chrysene	ppb	2.28	U	2.28	U	2.28	U	2.28	U	1.41	U	2.28	U	2.28	U
bis(2-Ethylhexyl)phthalate	ppb	1.79	JB	1.55	JB	1.62	JB	1.51	JB	0.60	JB	1.42	JB	0.71	JB
Benzo(b)fluoranthene	ppb	2.26	U	2.26	U	2.26	U	2.26	U	1.29	U	2.26	U	2.58	U
Benzo(k)fluoranthene	ppb	2.18	U	2.18	U	2.18	U	2.18	U	0.89	U	2.18	U	1.78	U
Benzo(a)pyrene	ppb	2.30	U	2.30	U	2.30	U	2.30	U	1.03	U	2.30	U	2.06	U
Indeno(1,2,3-cd)pyrene	ppb	2.30	U	2.30	U	2.30	U	2.30	U	0.84	U	2.30	U	1.68	U
PCB (AROCLOR)															
PCB 1016	ppb	0.16	U	0.08	U	0.16	U	0.16	U	0.16	U	0.16	U	0.08	U
PCB 1221	ppb	0.06	U	0.03	U	0.06	U	0.06	U	0.06	U	0.06	U	0.03	U
PCB 1232	ppb	0.22	U	0.11	U	0.22	U	0.22	U	0.22	U	0.22	U	0.11	U
PCB 1242	ppb	0.22	U	0.11	U	0.22	U	0.22	U	0.22	U	0.22	U	0.11	U
PCB 1248	ppb	0.18	U	0.09	U	0.18	U	0.18	U	0.18	U	0.18	U	0.09	U
PCB 1254	ppb	0.08	U	0.04	U	0.08	U	0.08	U	0.08	U	0.08	U	0.04	U
PCB 1260	ppb	0.16	U	0.08	U	0.16	U	0.16	U	0.16	U	0.16	U	0.08	U
TOTAL METALS															
Antimony	ppm	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U
Arsenic	ppm	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U
Barium	ppm	0.053		0.033		0.022		0.018		0.012		0.012		0.011	
Cadmium	ppm	0.0065		0.002		0.0029		0.0013		0.0011		0.001		0.0008	
Copper	ppm	0.42		0.27		0.17		0.12		0.086		0.072		0.052	
Lead	ppm	0.0017	U	0.0017	U	0.0028		0.0017	U	0.0038		0.0034		0.0065	
Manganese	ppm	0.0015		0.0018		0.0022		0.002		0.011		0.001		0.0011	
Mercury	ppm	0.00025		0.00025		0.00024		0.00024		0.00024		0.00024		0.00024	
Nickel	ppm	0.078		0.043		0.023		0.013		0.0087		0.0071		0.0052	
Silver	ppm	0.001	U	0.031		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Vanadium	ppm	0.0082		0.014		0.022		0.03		0.034		0.038		0.04	
Zinc	ppm	0.02		0.018		0.016		0.015		0.012		0.012		0.012	
DIOXINS															
2,3,7,8-TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2,3,7,8-TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDF	ng/L	ND	U	0.0013	A	ND	U	ND	U	ND	U	0.0026	A	ND	U
2,3,4,7,8-PeCDF	ng/L	ND	U	0.0015	A	ND	U	ND	U	ND	U	0.0021	A	ND	U
Total PeCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.0026		ND	U
1,2,3,7,8-PeCDD	ng/L	ND	U	0.0014	A	0.0022	A	ND	U	ND	U	ND	U	ND	U
Total PeCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.0017	A	ND	U
1,2,3,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.0019	A	ND	U
2,3,4,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.0019		ND	U
1,2,3,4,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDF	ng/L	ND	U	0.0017	A	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8,9-HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDD	ng/L	ND	U	0.0024	A	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
OCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
OCDD	ng/L	0.02	A	0.022	A	0.0095	U	ND	U	ND	U	0.0095	A	ND	U
TEQ	ng/L	0.0066		0.0052		0.0057		0.0075		0.0065		0.0067		0.0071	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. NR - not regulated
3. Ng/L = parts per trillion (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
MEP RESULTS FOR TARGETED SVOCs, METALS, PCBs, DIOXINS
Table 10c - Sample COMP-S3A-D3+D4+D5 (Day 3+4+5 Composite)

	Units	Day 1	Q[1]	Day 2	Q[1]	Day 3	Q[1]	Day 4	Q[1]	Day 5	Q[1]	Day 6	Q[1]	Day 7	Q[1]
SEMIVOLATILES															
Benzo(a)anthracene	ppb	1.21	U	2.42	U	2.42	U	2.42	U	2.42	U	2.42	U	2.42	U
Chrysene	ppb	1.14	U	2.82	U	2.82	U	2.28	U	2.28	U	2.28	U	2.82	U
bis(2-Ethylhexyl)phthalate	ppb	0.62	JB	1.02	JB	0.65	JB	0.90	JB	0.80	JB	0.81	JB	2.94	U
Benzo(b)fluoranthene	ppb	1.13	U	2.58	U	2.58	U	2.26	U	2.26	U	2.58	U	2.58	U
Benzo(k)fluoranthene	ppb	1.09	U	1.78	U	1.78	U	2.18	U	2.18	U	1.78	U	1.78	U
Benzo(a)pyrene	ppb	1.15	U	2.06	U	2.06	U	2.30	U	2.30	U	2.06	U	2.06	U
Indeno(1,2,3-cd)pyrene	ppb	1.15	U	1.68	U	1.68	U	2.30	U	2.30	U	1.68	U	1.68	U
PCB (AROCLOR)															
PCB 1016	ppb	0.08	U	0.08	U	0.082	U	0.08	U	0.08	U	0.08	U	0.08	U
PCB 1221	ppb	0.03	U	0.03	U	0.031	U	0.03	U	.0.3	U	0.03	U	0.03	U
PCB 1232	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1242	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1248	ppb	0.09	U	0.09	U	0.092	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1254	ppb	0.04	U	0.04	U	0.041	U	0.04	U	0.04	U	0.04	U	0.04	U
PCB 1260	ppb	0.08	U	0.08	U	0.082	U	0.08	U	0.08	U	0.08	U	0.08	U
TOTAL METALS															
Antimony	ppm	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U
Arsenic	ppm	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U
Barium	ppm	0.0052		0.0066		0.029		0.041		0.012		0.0042		0.002	
Cadmium	ppm	0.0026		0.0009		0.0036		0.001		0.0007		0.0005		0.0004	
Copper	ppm	0.34		0.17		0.11		0.069		0.052		0.039		0.041	
Lead	ppm	0.016		0.0091		0.011		0.011		0.0081		0.0095		0.0087	
Manganese	ppm	0.0037		0.0033		0.015		0.0039		0.0069		0.0029		0.0023	
Mercury	ppm	0.00026		0.00023		0.00032		0.00033		0.00029		0.0003		0.0003	
Nickel	ppm	0.033		0.016		0.0068		0.0039		0.0034		0.0021		0.0014	
Silver	ppm	0.015		0.038		0.027		0.0062		0.0026		0.0015		0.0018	
Vanadium	ppm	0.069		0.048		0.041		0.03		0.026		0.02		0.018	
Zinc	ppm	0.02		0.01		0.025		0.027		0.028		0.013		0.011	
DIOXINS															
2,3,7,8-TCDF	ng/L	0.0042	A	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDF	ng/L	0.0042		ND	U	ND	U	ND	U	ND	U	0.0098		0.0054	
2,3,7,8-TCDD	ng/L	0.0048	A	ND	U	ND		ND	U	ND	U	ND	U	0.0052	A
Total TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDF	ng/L	0.011	A	0.0022	A	0.0023	A	ND	U	ND	U	ND	U	0.0023	A
2,3,4,7,8-PeCDF	ng/L	0.011	A	0.0015	U	0.0014	A	ND	U	ND	U	ND	U	0.0017	A
Total PeCDF	ng/L	0.011		0.0022		0.0014		ND	U	ND	U	ND	U	0.0024	
1,2,3,7,8-PeCDD	ng/L	0.014	A	0.0028	A	0.0022		ND	U	ND	U	ND	U	ND	U
Total PeCDD	ng/L	0.014	U	0.0028		ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDF	ng/L	0.0095	A	0.0017	A	0.0014	A	ND	U	ND	U	ND	U	0.0036	A
1,2,3,6,7,8-HxCDF	ng/L	0.0097	A	0.002	A	0.0013	A	ND	U	ND	U	ND	U	ND	U
2,3,4,6,7,8-HxCDF	ng/L	0.0091	A	0.0011	A	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDF	ng/L	0.009	A	0.0018	A	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDF	ng/L	0.028		0.0035		0.0014		ND	U	ND	U	ND	U	0.0036	
1,2,3,4,7,8-HxCDD	ng/L	0.0086	A	0.0015	A	ND		ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDD	ng/L	0.0095	A	0.0025	A	ND		ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDD	ng/L	0.011	A	0.0021	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDD	ng/L	0.011		0.0036		ND	U	ND	U	ND	U	ND	U	0.0026	
1,2,3,4,6,7,8-HpCDF	ng/L	0.01	A	0.0022	A	0.0046	A	ND	U	0.0062	A	0.0078	A	0.015	A
1,2,3,4,7,8,9-HpCDF	ng/L	0.0063	A	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDF	ng/L	0.0063		ND	U	ND	U	ND	U	0.0062		0.0011		0.015	
1,2,3,4,6,7,8-HpCDD	ng/L	ND	U	0.0042	A	0.0071	A	ND	U	ND	U	0.0076	A	0.018	A
Total HpCDD	ng/L	ND	U	0.0042		0.0071		ND	U	ND	U	0.0076		0.034	
OCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.0081	A	0.026	A
OCDD	ng/L	0.027	A	0.021	A	0.032	A	ND	U	0.41	A	0.06	A	0.16	
TEQ	ng/L	0.032		0.0065		0.0078		0.0072		0.0065		0.0067		0.011	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. NR - not regulated
3. Ng/L = parts per trillion (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
MEP RESULTS FOR TARGETED SVOCs, METALS, PCBs, DIOXINS
Table 10d - Sample S3A-D5 (Day 5)

	Units	Day 1	Q[1]	Day 2	Q[1]	Day 3	Q[1]	Day 4	Q[1]	Day 5	Q[1]	Day 6	Q[1]	Day 7	Q[1]
SEMIVOLATILES															
Benzo(a)anthracene	ppb	1.21	U	1.21	U	1.22	U	1.21	U	1.21	U	2.42	U	2.42	U
Chrysene	ppb	1.41	U	1.41	U	1.42	U	1.41	U	1.14	U	2.82	U	2.82	U
bis(2-Ethylhexyl)phthalate	ppb	0.58	JB	0.36	JB	0.57	J	0.26	J	0.58	JB	1.01	JB	0.71	JB
Benzo(b)fluoranthene	ppb	1.29	U	1.29	U	1.30	U	1.29	U	1.13	U	2.58	U	2.26	U
Benzo(k)fluoranthene	ppb	0.89	U	0.89	U	0.90	U	0.89	U	1.09	U	1.78	U	2.18	U
Benzo(a)pyrene	ppb	1.03	U	1.03	U	1.04	U	1.03	U	1.15	U	2.06	U	2.30	U
Indeno(1,2,3-cd)pyrene	ppb	0.84	U	0.84	U	0.85	U	0.84	U	1.15	U	1.68	U	2.30	U
PCB (AROCLOR)															
PCB 1016	ppb	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
PCB 1221	ppb	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
PCB 1232	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1242	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1248	ppb	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1254	ppb	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U
PCB 1260	ppb	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
TOTAL METALS															
Antimony	ppm	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U
Arsenic	ppm	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U
Barium	ppm	0.0059		0.0045		0.007		0.0044		0.0039		0.0038		0.004	
Cadmium	ppm	0.0034		0.0012		0.0023		0.001		0.0006		0.0005		0.0005	
Copper	ppm	0.28		0.12		0.092		0.06		0.043		0.034		0.03	
Lead	ppm	0.004		0.0041		0.0017		0.003		0.0025		0.0033		0.0019	
Manganese	ppm	0.0032		0.0032		0.0031		0.0056		0.003		0.0028		0.0041	
Mercury	ppm	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U	0.000013	U
Nickel	ppm	0.028		0.0092		0.0058		0.0033		0.0025		0.0019		0.0019	
Silver	ppm	0.0087		0.032		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Vanadium	ppm	0.072		0.059		0.049		0.038		0.026		0.021		0.02	
Zinc	ppm	0.019		0.016		0.016		0.017		0.015		0.012		0.013	
DIOXINS															
2,3,7,8-TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2,3,7,8-TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDF	ng/L	ND	U	0.0023	A	0.0019	A	0.0031	A	ND	U	0.0015	A	ND	U
2,3,4,7,8-PeCDF	ng/L	ND	U	0.0026	A	0.0013	A	0.0025	A	ND	U	0.0011	A	ND	U
Total PeCDF	ng/L	ND	U	0.005		0.0019		ND	U	ND	U	0.0011		ND	U
1,2,3,7,8-PeCDD	ng/L	ND	U	ND	U	0.0019	A	ND	A	ND	U	ND	U	ND	U
Total PeCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	0.0038		ND	U
1,2,3,4,7,8-HxCDF	ng/L	ND	U	ND	U	0.00085	A	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDF	ng/L	ND	U	ND	U	0.00099	A	ND	U	ND	U	ND	U	ND	U
2,3,4,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDF	ng/L	ND	U	0.0063	A	0.0057	A	0.0071	A	ND	U	ND	U	0.0082	A
1,2,3,4,7,8,9-HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDF	ng/L	ND	U	0.011		0.0057		ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDD	ng/L	ND	U	0.011	A	0.0078	A	0.0078	A	ND	U	ND	U	0.0069	A
Total HpCDD	ng/L	ND	U	0.011		0.0063		ND	U	ND	U	ND	U	ND	U
OCDF	ng/L	ND	U	0.013	A	0.016	A	0.013	A	ND	U	ND	U	0.013	A
OCDD	ng/L	ND	U	0.065	A	0.062	A	0.092	A	ND	U	0.0069	A	0.078	A
TEQ	ng/L	0.0061		0.009		0.0068		0.012		0.013		0.0056		0.0091	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. NR - not regulated
3. Ng/L = parts per trillion (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
MEP RESULTS FOR TARGETED SVOCs, METALS, PCBs, DIOXINS
Table 10e - Sample COMP S3A-D1+D2+D3+D4+D5 (Day 1-5 Composite)

	Units	Day 1	Q[1]	Day 2	Q[1]	Day 3	Q[1]	Day 4	Q[1]	Day 5	Q[1]	Day 6	Q[1]	Day 7	Q[1]
SEMIVOLATILES															
Benzo(a)anthracene	ppb	1.21	U	1.21	U	1.21	U	1.21	U	1.21	U	1.21	U	2.42	U
Chrysene	ppb	1.14	U	1.14	U	1.14	U	1.14	U	1.14	U	1.14	U	2.82	U
bis(2-Ethylhexyl)phthalate	ppb	0.34	JB	0.45	JB	0.33	JB	0.45	JB	0.46	JB	0.41	JB	0.50	JB
Benzo(b)fluoranthene	ppb	1.13	U	1.13	U	1.13	U	1.13	U	1.13	U	1.13	U	2.58	U
Benzo(k)fluoranthene	ppb	1.09	U	1.09	U	1.09	U	1.09	U	1.09	U	1.09	U	1.78	U
Benzo(a)pyrene	ppb	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	2.06	U
Indeno(1,2,3-cd)pyrene	ppb	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.15	U	1.68	U
PCB (AROCLOR)															
PCB 1016	ppb	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
PCB 1221	ppb	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
PCB 1232	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1242	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1248	ppb	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1254	ppb	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U
PCB 1260	ppb	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
TOTAL METALS															
Antimony	ppm	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U
Arsenic	ppm	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U
Barium	ppm	0.0032		0.0013		0.0092		0.006		0.0096		0.0066		0.0049	
Cadmium	ppm	0.0003	U	0.0008		0.0006		0.0011		0.0006		0.0004		0.0003	
Copper	ppm	0.025		0.20		0.13		0.069		0.059		0.049		0.032	
Lead	ppm	0.014		0.031		0.028		0.031		0.025		0.025		0.025	
Manganese	ppm	0.0008	U	0.0042		0.0024		0.0031		0.0029		0.0021		0.0016	
Mercury	ppm	0.00021		0.0002		0.0002		0.0002		0.00021		0.00021		0.00022	
Nickel	ppm	0.0061		0.026		0.016		0.0071		0.0057		0.0042		0.0039	
Silver	ppm	0.001	U	0.063		0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Vanadium	ppm	0.002		0.036		0.04		0.042		0.041		0.036		0.034	
Zinc	ppm	0.0044	U	0.021		0.014		0.014		0.013		0.012		0.0096	
DIOXINS															
2,3,7,8-TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2,3,7,8-TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDF	ng/L	ND	U	ND	U	ND	U	ND	U	0.0021	A	ND	U	ND	U
2,3,4,7,8-PeCDF	ng/L	ND	U	0.0012	A	0.0013	A	ND	U	ND	U	ND	U	ND	U
Total PeCDF	ng/L	ND	U	0.0012		0.0013		ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total PeCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	0.0026	A	ND	U	ND	U
2,3,4,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	0.0026		ND	U	ND	U
1,2,3,4,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDF	ng/L	ND	U	ND	U	ND	U	0.0029	A	0.0065	A	ND	U	0.004	A
1,2,3,4,7,8,9-HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDF	ng/L	ND	U	ND	U	ND	U	0.0029		ND	U	ND	U	0.006	
1,2,3,4,6,7,8-HpCDD	ng/L	ND	U	ND	U	ND	U	0.0053	A	0.0064	A	ND	U	ND	U
Total HpCDD	ng/L	ND	U	ND	U	ND	U	0.0031		0.0064		ND	U	ND	U
OCDF	ng/L	ND	U	ND	U	ND	U	0.0063	A	0.012	A	ND	U	ND	U
OCDD	ng/L	ND	U	0.0088	A	ND	U	0.032	A	0.054	A	0.01	A	0.038	A
TEQ	ng/L	0.011		0.0052		0.0078		0.0063		0.0067		0.0063		0.0066	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. NR - not regulated
3. Ng/L = parts per trillion (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
MEP RESULTS FOR TARGETED SVOCs, METALS, PCBs, DIOXINS
Table 10f - Sample S3B-D1+D2+D3+D4+D5 (Day 1-5 Composite Duplicate)

	Units	Day 1	Q[1]	Day 2	Q[1]	Day 3	Q[1]	Day 4	Q[1]	Day 5	Q[1]	Day 6	Q[1]	Day 7	Q[1]
SEMIVOLATILES															
Benzo(a)anthracene	ppb	1.21	U	2.42	U	2.42	U	2.42	U	2.42	U	2.42	U	2.42	U
Chrysene	ppb	1.14	U	2.82	U	2.82	U	2.82	U	2.82	U	2.82	U	2.82	U
bis(2-Ethylhexyl)phthalate	ppb	0.36	JB	1.39	JB	0.58	JB	0.60	JB	0.54	JB	0.55	JB	0.83	JB
Benzo(b)fluoranthene	ppb	1.13	U	2.58	U	2.58	U	2.58	U	2.58	U	2.58	U	2.58	U
Benzo(k)fluoranthene	ppb	1.09	U	1.78	U	1.78	U	1.78	U	1.78	U	1.78	U	1.78	U
Benzo(a)pyrene	ppb	1.15	U	2.06	U	2.06	U	2.06	U	2.06	U	2.06	U	2.06	U
Indeno(1,2,3-cd)pyrene	ppb	1.15	U	1.68	U	1.68	U	1.68	U	1.68	U	1.68	U	1.68	U
PCB (AROCLOR)															
PCB 1016	ppb	0.08	U	0.08	U	0.082	U	0.08	U	0.08	U	0.08	U	0.08	U
PCB 1221	ppb	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
PCB 1232	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1242	ppb	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U	0.11	U
PCB 1248	ppb	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1254	ppb	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U	0.04	U
PCB 1260	ppb	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U	0.08	U
TOTAL METALS															
Antimony	ppm	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U	0.002	U
Arsenic	ppm	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U	0.0034	U
Barium	ppm	0.042		0.015		0.0077		0.0056		0.0048		0.0045		0.0042	
Cadmium	ppm	0.063		0.0003	U	0.0003	U	0.0003	U	0.0012		0.0003	U	0.0003	U
Copper	ppm	0.67		0.17		0.13		0.091		0.08		0.065		0.062	
Lead	ppm	0.096		0.0046		0.012		0.0086		0.008		0.0059		0.0092	
Manganese	ppm	0.076		0.0016		0.0014		0.0012		0.0022		0.0015		0.0016	
Mercury	ppm	0.00023		0.00021		0.00021		0.00021		0.00021		0.00021		0.00021	
Nickel	ppm	0.16		0.023		0.012		0.0062		0.0044		0.0037		0.0033	
Silver	ppm	0.01	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Vanadium	ppm	0.015		0.022		0.036		0.035		0.034		0.032		0.029	
Zinc	ppm	1.31		0.01		0.012		0.01		0.01		0.01		0.011	
DIOXINS															
2,3,7,8-TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2,3,7,8-TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total TCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2,3,4,7,8-PeCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total PeCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8-PeCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total PeCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2,3,4,6,7,8-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,6,7,8-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,7,8,9-HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HxCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	A	ND	U	0.0032	A
1,2,3,4,7,8,9-HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Total HpCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,3,4,6,7,8-HpCDD	ng/L	ND	U	ND	U	ND	U	ND	U	0.0044	A	ND	U	ND	U
Total HpCDD	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
OCDF	ng/L	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
OCDD	ng/L	0.016	A	ND	U	ND	U	0.01	A	0.023	A	ND	U	0.024	A
TEQ	ng/L	0.005		0.0054		0.0064		0.0065		0.0061		0.0067		0.0075	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. NR - not regulated
3. Ng/L = parts per trillion (ppt)

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11a: Semivolatiles TCLP

Summary of Results																			
Project: HREG DEMONSTRATION PROJECT																			
ETL Chain of Custody #:		0503407			0503550			0503550			0503492			0503550			0503550		
Date Analyzed:		3/23/2005			3/31/2005			3/31/2005			4/6/2005			3/31/2005			3/31/2005		
		S3A-D1			S3A-D1+D2			S3A-D3+D4+D5			S3A-D5			S3A-D1-D5			S3A-D1-D5 DUP		
Semivolatiles	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q
o-cresol	ppm	0.0064	0.0064	U	0.0086	0.0086	U	0.0086	0.0086	U	0.0064	0.0064	U	0.0086	0.0086	U	0.0086	0.0086	U
m,p-cresol	ppm	0.0068	0.0068	U	0.0065	0.0065	U	0.0065	0.0065	U	0.0068	0.0068	U	0.0065	0.0065	U	0.0065	0.0065	U
Cresol	ppm	0.013	0.013	U	0.015	0.015	U	0.015	0.015	U	0.013	0.013	U	0.015	0.015	U	0.015	0.015	U
1,4-Dichlorobenzene	ppm	0.0073	0.0073	U	0.0085	0.0085	U	0.0085	0.0085	U	0.0073	0.0073	U	0.0085	0.0085	U	0.0085	0.0085	U
2,4-Dinitrotoluene	ppm	0.0078	0.0078	U	0.0092	0.0092	U	0.0092	0.0092	U	0.0078	0.0078	U	0.0092	0.0092	U	0.0092	0.0092	U
Hexachlorobenzene	ppm	0.0069	0.0069	U	0.0094	0.0094	U	0.0094	0.0094	U	0.0069	0.0069	U	0.0094	0.0094	U	0.0094	0.0094	U
Hexachlorobutadiene	ppm	0.0076	0.0076	U	0.0098	0.0098	U	0.0098	0.0098	U	0.0076	0.0076	U	0.0098	0.0098	U	0.0098	0.0098	U
Hexachloroethane	ppm	0.01	0.01	U	0.0087	0.0087	U	0.0087	0.0087	U	0.01	0.01	U	0.0087	0.0087	U	0.0087	0.0087	U
Nitrobenzene	ppm	0.009	0.009	U	0.0054	0.0054	U	0.0054	0.0054	U	0.009	0.009	U	0.0054	0.0054	U	0.0054	0.0054	U
Pentachlorophenol	ppm	0.056	0.056	U	0.035	0.035	U	0.035	0.035	U	0.056	0.056	U	0.035	0.035	U	0.035	0.035	U
Pyridine	ppm	0.036	0.036	U	0.003	0.003	U	0.003	0.003	U	0.036	0.036	U	0.003	0.003	U	0.003	0.003	U
1,4,5-Trichlorophenol	ppm	0.02	0.02	U	0.016	0.016	U	0.016	0.016	U	0.02	0.02	U	0.016	0.016	U	0.016	0.016	U
2,4,6-Trichlorophenol	ppm	0.016	0.016	U	0.013	0.013	U	0.013	0.013	U	0.016	0.016	U	0.013	0.013	U	0.013	0.013	U

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11b: Herbicides TCLP

Summary of Results																			
Project: HREG DEMONSTRATION PROJECT																			
ETL Chain of Custody #:			0503407			0503550			0503550			0503492			0503550			0503550	
Date Analyzed:			3/29/2005			4/6/2005			4/6/2005			3/29/2005			4/6/2005			4/6/2005	
			S3A-D1			S3A-D1+D2			S3A-D3+D4+D5			S3A-D5			S3A-D1-D5			S3A-D1-D5 DUP	
Herbicides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q
2,4-D	ppm	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U	5.4	5.4	U
2,4,5-TP (Silvex)	ppm	0.082	0.082	U	0.082	0.082	U	0.082	0.082	U	0.082	0.082	U	0.082	0.082	U	0.082	0.082	U

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11c: Pesticdes TCLP

Summary of Results																			
Project: HREG DEMONSTRATION PROJECT																			
ETL Chain of Custody #:			0503407			0503550			0503550			0503492			0503550			0503550	
Date Analyzed:			3/23/2005			4/2/2005			4/2/2005			4/2/2005			4/2/2005			4/2/2005	
			S3A-D1			S3A-D1+D2			S3A-D3+D4+D5			S3A-D5			S3A-D1-D5			S3A-D1-D5 DUP	
Pesticides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q
Chlordane	ppm	0.000059	0.000059	U	0.000059	0.000059	U	0.000059	0.000059	U	0.000059	0.000059	U	0.000059	0.000059	U	0.000059	0.000059	U
Endrin	ppm	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U
Heptachlor	ppm	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U
Heptachlor epoxide	ppm	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U
Lindane	ppm	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U
Methoxychlor	ppm	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U	0.0000010	0.0000010	U
Toxaphene	ppm	0.00092	0.00092	U	0.00092	0.00092	U	0.00092	0.00092	U	0.00092	0.00092	U	0.00092	0.00092	U	0.00092	0.00092	U

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11d: Metals TCLP

Summary of Results																				
Project: HREG DEMONSTRATION PROJECT																				
ETL Chain of Custody #:			0503407			0503550			0503550			0503492			0503550			0503550		
Date Analyzed:			3/23/2005			3/31/2005			3/31/2005			3/28/2005			3/31/2005			3/31/2005		
			S3A-D1			S3A-D1+D2			S3A-D3+D4+D5			S3A-D5			S3A-D1-D5			S3A-D1-D5 DUP		
Metals	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Maximum Concentration of Contaminants for the Toxicitiy
Arsenic	ppm	0.034	0.034	U	0.034	0.034	U	0.034	**0.22**		0.034	0.034	U	0.034	0.034	U	0.034	0.034	U	
Barium	ppm	0.004	**0.095**		0.004	**0.13**		0.004	**0.12**		0.004	**0.17**		0.004	**0.23**		0.004	**0.19**		100
Cadmium	ppm	0.003	**0.006**		0.003	0.003	U	0.003	0.003	U	0.003	**0.014**		0.003	0.003	U	0.003	0.003	U	1
Chromium	ppm	0.016	**0.45**		0.016	**0.260**		0.016	**0.093**		0.016	**0.19**		0.016	**0.060**		0.016	**0.085**		5
Lead	ppm	0.017	**0.57**		0.017	**0.021**		0.017	**0.054**		0.017	**0.37**		0.017	**0.042**		0.017	0.017	U	5
Selenium	ppm	0.043	0.043	U	0.043	0.043	U	0.043	0.043	U	0.043	0.043	U	0.043	0.043	U	0.043	0.043	U	1
Silver	ppm	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11e: Mercury TCLP

Summary of Results																			
Project: HREG DEMONSTRATION PROJECT																			
ETL Chain of Custody #:			0503407			0503550			0503550			0503492			0503550			0503550	
Date Analyzed:			3/23/2005			3/30/2005			3/30/2005			3/25/2005			3/30/2005			3/30/2005	
		S3A-D1			S3A-D1+D2			S3A-D3+D4+D5			S3A-D5			S3A-D1-D5			S3A-D1-D5 DUP		
Mercury	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentrat**	**Q**
Mercury	ppm	0.000030	0.00012		0.000030	0.000140		0.000030	0.000180		0.000030	0.000160		0.000030	0.000150		0.000030	0.000170	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11f: Flash Point

Summary of Results																			
Project: HREG DEMONSTRATION PROJECT																			
ETL Chain of Custody #:			0503407			0503550			0503550			0503492			0503550			0503550	
Date Analyzed:			3/21/2005			3/29/2005			3/29/2005			3/24/2005			3/29/2005			3/29/2005	
			S3A-D1			S3A-D1+D2			S3A-D3+D4+D5			S3A-D5			S3A-D1-D5			S3A-D1-D5 DUP	
Flash Point	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**
Flash Point	deg C	1.00	>100		1.00	>100		1.00	>100		1.00	>100		1.00	>100		1.00	>100	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 11g: Reactivity

Summary of Results																			
Project: HREG DEMONSTRATION PROJECT																			
ETL Chain of Custody #:			**0503407**			**0503550**			**0503550**			**0503492**			**0503550**			**0503550**	
Date Analyzed:			**3/22/2005**			**3/30/2005**			**3/30/2005**			**3/30/2005**			**3/30/2005**			**3/30/2005**	
		S3A-D1			**S3A-D1+D2**			**S3A-D3+D4+D5**			**S3A-D5**			**S3A-D1-D5**			**S3A-D1-D5 DUP**		
Reactivity	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**
Releasable Cyanide	ppm	0.10	0.10	U	0.10	0.10	U	0.10	0.10	U	0.10	0.10	U	0.10	0.10	U	0.10	0.10	U
Releasable H2 Sulfide	ppm	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U	0.010	0.010	U
Reactivity		NA	negative		NA	negative		NA	negative		NA	negative		NA	negative		NA	negative	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix F for definition of abbreviations.
2. Bold face numbers identify analytical data above U, J, or B. Note that many of these analyses are so far below the Residential Direct Conctact Soil Cleanup Criteria that they do not justify tracking as described in (4) below
3. NR - not regulated
4. Highlighted compounds are those which are at sufficiently high concentration (or considered key contaminants) to justify being tracked in the performance tables (Tables 17 and 18).
5. ppm is on dry weight basis

HARBOR RESOURCE DEMONSTRATION PROJECT
AIR SAMPLING RESULTS FOR VOCs, SVOCs, AND PCBs
TABLE 12

	3/19/2005			3/21/2005			3/22/2005				
	Tank (ug/m^3)	Intermediate Stock Pile (ug/m^3)	Final Stock Pile (ug/m^3)	Tank (ug/m^3)	Intermediate Stock Pile (ug/m^3)	Final Stock Pile (ug/m^3)	Tank (ug/m^3)	Intermediate Stock Pile (ug/m^3)	Final Stock Pile (ug/m^3)	STEL (ppm)	PEL (ppm)
VOCs											
Acetone	120	-	-	40	-	-	160	-	-	-	1000
alpha-Chlorobenzene	ND	-	-	ND	-	-	ND	-	-	-	1
Benzene	16	-	-	5.3	-	-	3.2	-	-	-	10
Bromoform	ND	-	-	ND	-	-	ND	-	-	-	0.5
Bromomethane	ND	-	-	ND	-	-	ND	-	-	-	200
1,3-Butadiene	ND	-	-	ND	-	-	ND	-	-	1	-
2-Butanone (Methyl Ethyl Ketone)	29	-	-	4.7	-	-	4.6	-	-	-	200
Carbon Disulfide (Note 1)	40	-	-	32	-	-	33	-	-	-	2
Carbon Tetrachloride (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
Chlorobenzene	5.8	-	-	ND	-	-	ND	-	-	-	75
Chloroethane	ND	-	-	ND	-	-	ND	-	-	-	1000
Chloroform	ND	-	-	ND	-	-	ND	-	-	50	-
Chloromethane (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
cis-1,2-Dichloroethene	ND	-	-	ND	-	-	ND	-	-	-	200
cis-1,3-Dichloropropene	ND	-	-	ND	-	-	ND	-	-	-	75
Cumene	15	-	-	ND	-	-	ND	-	-	-	50
Cyclohexane	5.2	-	-	ND	-	-	ND	-	-	-	3000
1,2-Dichlorobenzene	ND	-	-	ND	-	-	ND	-	-	50	-
1,4-Dichlorobenzene	ND	-	-	ND	-	-	ND	-	-	-	75
1,1-Dichloroethane	ND	-	-	ND	-	-	ND	-	-	-	100
1,2-Dibromoethane (EDB) (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
1,2-Dichloroethane (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
1,2-Dichloroethane-d4 (Note 1)	107	-	-	ND	-	-	ND	-	-	-	2
1,2-Dichloropropane (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	75
1,4-Dioxane	ND	-	-	ND	-	-	ND	-	-	-	100
Ethanol	ND	-	-	ND	-	-	ND	-	-	-	1000
Ethyl Benzene	4.4	-	-	ND	-	-	ND	-	-	-	100
Freon 11	ND	-	-	ND	-	-	ND	-	-	-	1000
Freon 12	ND	-	-	ND	-	-	ND	-	-	-	1000
Freon 113	ND	-	-	ND	-	-	ND	-	-	-	1000
Freon 114	ND	-	-	ND	-	-	ND	-	-	-	1000
Heptane	5.4	-	-	ND	-	-	ND	-	-	-	500
Hexachlorobutadiene	ND	-	-	ND	-	-	ND	-	-	-	0.02
Hexane	6.0	-	-	ND	-	-	ND	-	-	-	500
2-Hexanone	ND	-	-	ND	-	-	ND	-	-	-	100
Methylene Chloride (Note 1)	2.9	-	-	ND	-	-	7.4	-	-	-	2
2-Propanol	ND	-	-	ND	-	-	ND	-	-	-	200
Styrene (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
Tetrachloroethene (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
Tetrahydrofuran	440	-	-	90	-	-	340	-	-	-	200
Toluene (Note 1)	8.8	-	-	3.3	-	-	14	-	-	-	2
Toluene-d8 (Note 1)	102	-	-	ND	-	-	ND	-	-	-	2

HARBOR RESOURCE DEMONSTRATION PROJECT
AIR SAMPLING RESULTS FOR VOCs, SVOCs, AND PCBs
TABLE 12

	3/19/2005			3/21/2005			3/22/2005				
	Tank (ug/m^3)	Intermediate Stock Pile (ug/m^3)	Final Stock Pile (ug/m^3)	Tank (ug/m^3)	Intermediate Stock Pile (ug/m^3)	Final Stock Pile (ug/m^3)	Tank (ug/m^3)	Intermediate Stock Pile (ug/m^3)	Final Stock Pile (ug/m^3)	STEL (ppm)	PEL (ppm)
trans-1,2-Dichloroethene	ND	-	-	ND	-	-	ND	-	-	-	200
trans-1,3-Dichloropropene	ND	-	-	ND	-	-	ND	-	-	-	75
1,1,1-Trichloroethane	ND	-	-	ND	-	-	ND	-	-	-	350
1,1,2,2-Tetrachloroethane	ND	-	-	ND	-	-	ND	-	-	-	5
1,1,2-Trichloroethane	ND	-	-	ND	-	-	ND	-	-	-	10
Trichloroethene (Note 1)	ND	-	-	ND	-	-	ND	-	-	-	2
Vinyl Chloride	ND	-	-	ND	-	-	ND	-	-	5	-
m,p-Xylene	23	-	-	3.8	-	-	5.1	-	-	-	100
o-Xylene	17	-	-	ND	-	-	ND	-	-	-	100
SVOCs											**mg/m3**
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Dibenz(a,h)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Indeno(1,2,3-c,d)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Naphthalene	7.5	ND	ND	20	ND	ND	11	ND	ND	-	10
Phenanthrene	ND	ND	ND	ND	ND	ND	2.1	ND	ND	-	0.2
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
Pyrene-d10	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.2
PCBs											**mg/m3**
PCBs (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.5

HARBOR RESOURCE DEMONSTRATION PROJECT
ENGINEERING MATERIAL BALANCE
TABLE 13

Stream No.	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
Description	Raw Barge Sediment delivered to Bayshore Recycling Site (Note 1)	Diluted/ Pumpable Sediment	Slurry Feed to Dewatering Unit	Dewatered Sediment Cake	Filtrate from Dewatering Unit	Recycle Filtrate Water	Effluent Water Discharge	Beneficial Use Product	Chemical Oxidant ($KMnO_4$) (Note 5)	Dewatering Polymer (coagulant) (Note 3)	Beneficial Use Additive (Cement) (Note 4)	Oversize (Note 2)	Makeup Water (city water)
Dry Sediment, lb/hr	4,358	4,358	4,358	4,358	Trace	Trace	0	5,032	-	-	-	0	-
Water, lb/hr	4,324	15,012	19,447	4,536	14,964	10,475	0	4,536	-	4,000	-	-	213
Decon. Chemical Additives:													-
Oxidant, lb/hr	-	-	44	-	-	-	-		44	-	-	-	-
Water, lb/hr	-	-		-	-	-	-		435	-	-	-	-
Dewatering Polymer, lb/hr	-	-	10	-	-	-	-		-	10	-	-	-
Beneficial Use Additives:													-
Cement, lb/hr	-	-	-	-	-	-	-		-	-	674	-	-
Total, lbs/hr	8,682	19,370	23,859	8,894	14,964	10,475	0	9,568	479	4,010	674	0	213
Bulk Density, lb/cf	95.1	71.2	57.9	70.9	64.0	64.0		71.3					62.4
Volume Flow													
GPM	11.4	33.9	51.4	-	29.2	20.4		-			-	-	0.4
cubic yards/hr	3.4	10.1	15.3	4.6	8.7	6.1		5.0					-
Wt% Solids	50.2	22.5	18.3	49.0				52.6		0.25			
Wt% Water	49.8	77.5	81.7	51.0	100.0	100.0		47.4		99.75	-	-	
Wt% Water As % Dry Solids	99.2	NA	446.4	104.1	NA	NA		90.1					NA
Water Removed:													

Notes:

1. Raw sediment from Darling International's dredge site.
2. Oversize material appeared to be a very small % of M1 and was intermittently sent to Blender and reported in final Beneficial Use Product but not reported directly.
3. Polymer dosage was 4.6 lbs/ton dry solids.
4. Cement dosage was 7.6 wt% on wet M4 cake.
5. $KMnO_4$ dosage was 9,983 ppm on dry solids.

HARBOR RESOURCE DEMONSTRATION PROJECT
SUMMARY OF BENEFICIAL USE - ANALYTICAL CRITERIA
ENCAP GOLF LYNDHURST RUTHERFORD SITE
TABLE 14

Contaminant	Non-Residential Direct Soil Cleanup Criteria (mg/kg)	Category	Total PRG (mg/kg)	Basis for PRG	Acceptance Criteria (mg/kg)
Antimony	340	M	40880	Non-carginogenic	680
Arsenic	20	M	409	Carcinogenic	100
Benzo(a)pyrene	0.66	S	98	Carcinogenic	Note 2
Benzo(k)fluoranthene	4	S	9800	Carcinogenic	Note 2
3,4 Benzofluoranthene	4	S	Note 1	Not Applicable	Note 2
Benzo(a)anthracene	4	S	Note1	Not Applicable	Note 2
Beryllium	1	M	166	Carcinogenic	10
Bis(2-chloroethyl) ether	3	S	641	Carcinogenic	30
Cadmium	100	M	51100	Non-carginogenic	200
Chrysene	40	S	97999	Carcinogenic	Note 2
Copper	600	M	64160	Non-carginogenic	4000
Dibenz(a,h)anthracene	0.66	S	98	Carcinogenic	Note 2
3,3-Dichlorobenzidene	6	S	1590	Carcinogenic	30
Dinitrotoluene (2,4-2/6 mixture)	4	S	1052	Carcinogenic	20
Heptachlor	0.65	S	159	Carcinogenic	6.5
Hexachlorobenzene	2	S	447	Carcinogenic	20
Hexachlorobutadiene	21	S	447	Carcinogenic	105
Indeno (1,2,3-cd) pyrene	4	S	980	Carcinogenic	40
Lead	600	M		Carcinogenic	1200
N-Nitrosodi-n-propylamine	0.66	S	102	Carcinogenic	6.6
Pentachlorophenol	24	S	5962	Carcinogenic	110
Thallium	2	M	8176	Non-carginogenic	10
Zinc	1500	M	30660000	Non-carginogenic	3000

For Exposure Frequency (EF) = 5 days/year and Exposure Duration (ED) = 10 years

M = Metal, P=Pesticide or PCB, S=semivolatile, V=volatile

NOTES:

1. Not yet calculated.
2. The sum of these PAHs may not exceed 200 ppm and the concentration of any individual PAH may not be 15 times greater than the NRDCSCC. Additionally, these concentrations shall not exceed the impact to groundwater cleanup criteria
3. For contaminants not listed above, acceptance criteria reverts to NRDCSCC.

HARBOR RESOURCE DEMONSTRATION PROJECT
ECONOMIC ANALYSIS FOR COMMERCIAL-SCALE (500,000 cy/yr) FACILITY
TABLE 15A - SUMMARY

General Assumptions

1. Operating life of facility (per RFP Addendum 1, Q40, p. 13 of 36) of 30 years.
2. Annual throughput of facility (per RFP) of 500,000 cubic yards.
3. Inflation costs are recoverable through price increase (net zero inflation effect).
4. Revenue from beneficial use product offsets cost to transport material to end user.
5. Suitable waterfront site for facility within NY/NJ Harbor is available for purchase.

Capital Costs			
Item #	**Description**	**Annual Cost**	**Unit Cost**
C-1	Site Purchase	$ 292,000	$ 0.58
C-2	Final Engineering/Design of Facility	$ 76,500	$ 0.15
C-3	Permitting (incl. permit applications)	$ 41,800	$ 0.08
C-4	Site Preparation	$ 260,500	$ 0.52
C-5	Equipment Procurement	$ 1,557,800	$ 3.12
C-6	Equipment Installation/Testing	$ 431,200	$ 0.86

Total Capital Cost Per Cubic Yard of Sediment $ 5.32

Operating Costs			
Item #	**Description**	**Annual Cost**	**Unit Cost**
O-1	Facility Management	$ 450,800	$ 0.90
O-2	Operating Personnel	$ 2,086,600	$ 4.17
O-3	Operation/Maintenance of Equipment	$ 1,205,200	$ 2.41
O-4	Additives	$ 9,454,800	$ 18.91
O-5	Laboratory Testing/Reporting Costs	$ 819,400	$ 1.64
O-6	Debris Disposal (solid waste)	$ 869,400	$ 1.74
O-7	Utilities	$ 483,000	$ 0.97

Total Operating Cost Per Cubic Yard of Sediment $ 30.74

Total Unit Cost $ 36.06

HREG Profit (@10%) $ 3.61

Average Net Cost (Tipping Fee)[1] $ 39.66

NOTE:

1. The average net cost presented above is based on an oxidant dosage of 8,000 ppm. HREG anticipates using a variable degree of oxidant in its process, depending on the characteristics of the incomoing material, with a dosage range of 4,000 ppm to 12,000 ppm. The resulting range in processing costs is presented below:

Minimum Net Cost (Tipping Fee) $33.95
Maximum Net Cost (Tipping Fee) $45.40

HARBOR RESOURCE DEMONSTRATION PROJECT
ECONOMIC ANALYSIS FOR COMMERCIAL-SCALE (500,000 cy/yr) FACILITY
TABLE 15B - CAPITAL COSTS

Assumptions

1. Assumed interest rate for capital items within facility: 7%

C -1 Site Purchase					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-1-1	Site acquisition	6	Acres	$ 500,000	$ 3,000,000
C-1-2	Legal fees (5% of total)	1	Lump Sum	$ 150,000	$ 150,000
					$ 3,150,000
1. Site purchase covered by 30-year loan				**Incl. contingency (@15%)**	**$ 3,622,500**
				Annual Cost	**$ 291,924**

C-2 Final Engineering/Design of Facility					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-2-1	Civil - site engineering	1	Lump Sum	$ 100,000	$ 100,000
C-2-2	Marine facilities	1	Lump Sum	$ 150,000	$ 150,000
C-2-3	Geotechnical (borings, foundation design, etc.)	1	Lump Sum	$ 75,000	$ 75,000
C-2-4	Structural (supports, etc.)	1	Lump Sum	$ 150,000	$ 150,000
C-2-5	Equipment specification & procurement	1	Lump Sum	$ 200,000	$ 200,000
C-2-6	Electrical	1	Lump Sum	$ 100,000	$ 100,000
C-2-7	Mechanical	1	Lump Sum	$ 50,000	$ 50,000
					$ 825,000
1. Engineering amortized over 30-yr life of facility				**Incl. contingency (@15%)**	**$ 948,750**
				Annual Cost	**$ 76,456**

C-3 Permitting					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-3-1	USACE Permits (marine facility improvements)	1	Lump Sum	$ 100,000	$ 100,000
C-3-2	NJDEP Permits (air, water, & solid waste)	1	Lump Sum	$ 250,000	$ 250,000
C-3-3	Miscellaneous Other Permits (construction, etc.)	1	Lump Sum	$ 75,000	$ 75,000
C-3-4	Permit application fees	1	Lump Sum	$ 25,000	$ 25,000
					$ 450,000
1. Permitting amortized over 30-yr life of facility				**Incl. contingency (@15%)**	**$ 517,500**
				Annual Cost	**$ 41,703**

C-4 Site Preparation					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-4-1	Bulkhead rehabilitation/upgrade	520	Linear Foot	$ 2,000	$ 1,040,000
C-4-2	Site clearing	6	Acre	$ 4,045	$ 24,270
C-4-3	Site grading	9,680	Cubic Yards	$ 28	$ 271,040
C-4-4	Liner installation (50% of site)	130,680	Square foot	$ 1.75	$ 228,690
C-4-5	Gravel fill (9" layer over liner)	14,520	Cubic Yards	$ 16.00	$ 232,320
C-4-6	Drainage (4" plastic pipe)	2,700	Linear Foot	$ 20	$ 54,000
C-4-7	Foundations	1	Lump Sum	$ 130,000	$ 130,000
C-4-8	Berms/dikes	1	Lump Sum	$ 50,000	$ 50,000
C-4-9	Storm water	1	Lump Sum	$ 60,000	$ 60,000
C-4-10	Paving (50% of site)	130,680	Square foot	$ 2.15	$ 280,962
C-4-11	Rail Facilities	1,530	Linear Foot	$ 120	$ 183,600

HARBOR RESOURCE DEMONSTRATION PROJECT
ECONOMIC ANALYSIS FOR COMMERCIAL-SCALE (500,000 cy/yr) FACILITY
TABLE 15B - CAPITAL COSTS

C-4 Site Preparation (cont.)					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-4-12	Lighting (Exterior, pole-mounted)	15	Each	$ 5,750	$ 86,250
C-4-13	Utilities (gas, water)	1	Lump Sum	$ 39,000	$ 39,000
C-4-14	Electric service	1	Lump Sum	$ 130,000	$ 130,000
					$ 2,810,132
1. Site preparation amortized over 30-yr life of facility				**Incl. contingency (@15%)**	**$ 3,231,652**
				Annual Cost	**$ 260,427**

C-5 Equipment Procurement					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-5-1	Long-stick excavators (w/ pump & rake)	2	Each	$ 881,000	$ 1,762,000
C-5-2	8x6 Pumps	5	Each	$ 16,800	$ 84,000
C-5-3	Shaker Screening Equipment	2	Each	$ 43,900	$ 87,800
C-5-4	Mixing Tanks	8	Each	$ 70,800	$ 566,400
C-5-5	Lot Hose & Piping (incl. Installation)	1	Lump Sum	$ 110,000	$ 110,000
C-5-6	Belt Filter Presses	10	Each	$ 200,000	$ 2,000,000
C-5-7	Effluent Surge Tank System (incl. Installation)	1	Lump Sum	$ 125,000	$ 125,000
C-5-8	Water Treatment (incl. Installation)	1	Lump Sum	$ 210,000	$ 210,000
C-5-9	Conveyors	6	Each	$ 21,600	$ 129,600
C-5-10	Cement Silos w/ Pneumatic Feed	2	Each	$ 153,000	$ 306,000
C-5-11	Pugmill Mixers	2	Each	$ 390,000	$ 780,000
C-5-12	Radial Stackers	2	Each	$ 66,000	$ 132,000
C-5-13	Front End Loaders (CAT 980 & IT28 CAT)	1	Lump Sum	$ 506,000	$ 506,000
C-5-14	Forklift	1	Each	$ 46,500	$ 46,500
C-5-15	Site Vehicles	3	Each	$ 20,000	$ 60,000
C-5-16	Unheated Enclosure Structure	1	Lump Sum	$ 395,000	$ 395,000
					$ 7,300,300
1. Equipment costs amortized over 7-yr term				**Incl. contingency (@15%)**	**$ 8,395,345**
				Annual Cost	**$ 1,557,783**

C-6 Equipment Installation and Testing					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-6-1	8x6 Pump Installation	1	Lump Sum	$ 24,860	$ 24,860
C-6-2	Shaker Screening Equipment Installation	1	Lump Sum	$ 10,240	$ 10,240
C-6-3	Mixing Tank Installation	1	Lump Sum	$ 107,000	$ 107,000
C-6-4	Belt Filter Press Installation	1	Lump Sum	$ 283,000	$ 283,000
C-6-5	Conveyor Installation	1	Lump Sum	$ 49,200	$ 49,200
C-6-6	Cement Silo Installation	1	Lump Sum	$ 382,000	$ 382,000
C-6-7	Pugmill Installation	1	Lump Sum	$ 1,000,000	$ 1,000,000
C-6-8	Radial Stacker Installation	1	Lump Sum	$ 164,000	$ 164,000
					$ 2,020,300
1. Installation costs amortized over 7-yr term				**Incl. contingency (@15%)**	**$ 2,323,345**
				Annual Cost	**$ 431,104**

HARBOR RESOURCE DEMONSTRATION PROJECT
ECONOMIC ANALYSIS FOR COMMERCIAL-SCALE (500,000 cy/yr) FACILITY
TABLE 15C - OPERATING COSTS

Notes & Assumptions
1. Operating costs are based on the facility operating 200 days per year
2. Average daily throughput of 2,500 cubic yards
3. FTE = full-time equivalent

O-1 Facility Management					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-1-1	Facility Manager	2,400	Manhours	$ 75.00	$ 180,000
O-1-2	Assistant Manager	2,400	Manhours	$ 65.00	$ 156,000
O-1-3	Administrative Personnel (1 FTE @ 8 hour days)	1,600	Manhours	$ 35.00	$ 56,000
					$ 392,000
				Incl. contingency (@15%)	**$ 450,800**

O-2 Operating Personnel					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-2-1	Union Labor (12 FTEs @ 12 hour days)	28,800	Manhours	$ 60.00	$ 1,728,000
O-2-2	Labor, Union Vacation (15 8-hour days per FTE)	1,440	Manhours	$ 60.00	$ 86,400
					$ 1,814,400
				Incl. contingency (@15%)	**$ 2,086,560**

O-3 Operations/Maintenance of Equipment					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-3-1	Fuel	200	Days	$ 950	$ 190,000
O-3-2	Maintenance (8% of capital equipment costs)	1	Lump Sum	$ 858,000	$ 858,000
					$ 1,048,000
				Incl. contingency (@15%)	**$ 1,205,200**

O-4 Additives					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-4-1	Potassium permanganate	1,512	Tons	$ 3,000	$ 4,536,000
O-4-2	Polymer flocculent	270	Tons	$ 6,000	$ 1,620,000
O-4-3	Fly ash	40,500	Tons	$ 15.00	$ 607,500
O-4-4	Cement	16,200	Tons	$ 90.00	$ 1,458,000
					$ 8,221,500
				Incl. contingency (@15%)	**$ 9,454,725**

O-5 Laboratory Testing					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-5-1	Bulk chemistry (contaminants per NJNRDCSCC)	50	Sample	$ 3,000.00	$ 150,000
O-5-2	MEP	50	Sample	$ 10,500.00	$ 525,000
O-5-2	Physical testing (for beneficial use requirements)	50	Sample	$ 750.00	$ 37,500
					$ 712,500
				Incl. contingency (@15%)	**$ 819,375**

HARBOR RESOURCE DEMONSTRATION PROJECT
ECONOMIC ANALYSIS FOR COMMERCIAL-SCALE (500,000 cy/yr) FACILITY
TABLE 15C - OPERATING COSTS

O-6 Waste Disposal					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-6-1	Debris and oversize material (solid waste)	10,800	Ton	$ 70.00	$ 756,000
					$ 756,000
				Incl. contingency (@15%)	**$ 869,400**

O-7 Utilities					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-7-1	Electricity	200	Days	$ 2,100	$ 420,000
					$ 420,000
				Incl. contingency (@15%)	**$ 483,000**

Analytical Qualifiers

ORGANIC METHOD QUALIFIERS

Q – Qualifier – specified entries and their meanings are as follows:

U – The analytical result is not detected above the Method Detection Limit (MDL). All MDLs are lower than the lowest calibration standard concentration.

J – Indicates an estimated value. The concentration reported was detected below the MDL.

Y – The concentration reported was detected below the lowest calibration standard concentration.

B – The analyte was found in the associated method blank as well as the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

E – The concentration of the analyte exceeded the calibration range of the instrument.

D – This flag identifies all compounds identified in an analysis at a secondary dilution.

INORGANIC METHOD QUALIFIERS

C – (Concentration) qualifiers are as follows:

B – Entered if the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).

U – Entered when the analyte was analyzed for, but not detected above the MDL, which is lower than the lowest calibration standard concentration.

Q – Qualifier – specified entries and their meanings are as follows:

E – Reported value is estimated because of the presence of interferences.

M – (Method) qualifiers are as follows:

A – Flame AA

AS – Semi-automated Spectrophotometric

AV – Automated Cold Vapor AA

C – Manual Spectrophotometric

F – Furnace AA

P – ICP

Appendix A

Permits

Demonstration Project Air Permit

New Jersey Department of Environmental Protection

Emission Unit: U1 Sediment Slurry Unit (Oxidant Contact/Retention Tanks)

Operating Scenario: OS Summary

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Hours of Operation <= 435 hours. The operation of the Environmental Improvement Pilot Test (EIPT) shall consist of no more than four hundred thirty five (435) hours (Total) for the entire test. This shall include the operation of all equipment and control devices included in the Dredge Sediment Processing facility, except for the two (2) diesel fuel electrical power generators and concrete diesel pump, as specified in Ref. No. 8 under U1, OS Summary of the conditions of this permit. An hour of test run time shall be any hour, or part of an hour, during which the EIPT is conducted. [N.J.A.C. 7:27- 8.13(a)]	Hours of Operation: Monitored by hour/time monitor daily, based on one calendar day. The permittee shall monitor the daily operating hours of the EIPT. [N.J.A.C. 7:27-8.13(d)]	Hours of Operation: Recordkeeping by manual logging of parameter daily during operation. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8.13(d)]	
2	All conditions and restrictions specified in this Air Pollution Control (APC) Permit Approval shall apply and are enforceable. After the Environmental Improvement Pilot Test (EIPT) has been completed, the permittee shall refrain from performing any site operations or activities without prior approval from the Department. [N.J.A.C. 7:27- 8]			
3	There shall be no more than 4,350 cubic yards (wet basis) of "raw" dredge sediment processed at the facility for the entire EIPT. [N.J.A.C. 7:27- 8]	Monitored by material feed/flow monitoring once per batch during operation, based on an instantaneous determination. The permittee shall monitor the total amount of screened "raw" dredge sediment once per batch, during operation. A batch shall correspond to "one" barge load of feed sediment. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per batch during operation. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	The period for which the Environmental Improvement Pilot Test (EIPT) may be performed is from February 28, 2005 until May 27, 2005. During this period of time, the permittee shall conduct the EIPT in compliance with the conditions described in this permit. [N.J.A.C. 7:27- 8.13(a)]	Monitored by hour/time monitor once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. The permittee shall keep track of the startup and shutdown dates of the EIPT. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by manual logging of parameter once initially and per change of material during operation [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8.13(d)3]	
5	Total "Raw" Dredge Sediment Processed Hourly <= 25 cubic yards (yd3). [N.J.A.C. 7:27- 8.13(a)]	Monitored by material feed/flow monitoring once per batch during operation, based on an instantaneous determination. During the Environmental Improvement Pilot Test (EIPT), Harbor Resources Environmental Group (HREG) shall monitor and record the volume and density of "raw" dredge sediment processed hourly based on the amount of dredge sediment processed per batch. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by manual logging of parameter once per batch during operation. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8.13(d)3]	
6	Total Cement Processed Hourly <= 3,000 pounds. The total Portland Cement processed for the entire EIPT shall not exceed 400 tons. During the EIPT, HREG shall monitor and record the amount of cement processed hourly through the Dredge Sediment Processing Facility. [N.J.A.C. 7:27- 8.13(a)]	Monitored by material feed/flow monitoring each hour during operation, based on an instantaneous determination. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by manual logging of parameter each hour during operation. The total amount of Portland cement used during the EIPT shall be recorded. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8.13(d)3]	
7	Total "Raw" Dredge Sediment Processed per Day <= 300 cubic yards (yd3). [N.J.A.C. 7:27- 8.13(a)]	Monitored by material feed/flow monitoring daily, based on an instantaneous determination. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by manual logging of parameter daily during operation. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8.13(d)3]	
8	Use of the two (2) diesel-fired Power Generators (combined), and of the diesel-fired concrete pump, shall be limited up to four hundred (400) hours of operation per calendar year. The operating hours and fuel consumption of each piece of diesel powered equipment used during the EIPT, shall be monitored and recorded. [N.J.A.C. 7:27- 8]	Monitored by hour/time monitor once per shift during operation, based on an instantaneous determination or upon each occurrence. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per shift during operation or upon each occurrence. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	During the EIPT, HREG shall confirm that the dredge sediment is moist enough not to result in visible emissions being emitted, and that there are no visible emissions from the chemical oxidation and cement processing and mixing operations, at any time. The permittee shall use a tarp as a first step to mitigate any sudden rise in visible emissions, and thereafter use water sprays and/or chemical wetting agents as a second step if visible emissions are sustained after continuing or resuming the processing of dredge sediment, in a manner to prevent and avoid visible emissions, as necessary (See Ref. No. 22 under U1 of OS Summary of the conditions of this permit). [N.J.A.C. 7:27- 8]	Monitored by visual determination once per batch during operation, based on an instantaneous determination. All employees shall be trained to notify the on-site supervisor, if they see any visible emissions. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per batch during operation. The permittee shall record the date, time and duration when visible emissions occur, and corrective measures taken to prevent and avoid visible emissions. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
10	Cement Silo Baghouse: The Baghouse (CD1) shall be installed as an integrated part of the Cement Silo, and shall be used at all times including during the loading and unloading of the Silo. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of Baghouse (CD1) specifications, operation, maintenance and monitoring manual (OM&M), engineering drawings and operator's logbook. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
11	Mixer Baghouse: The Mixer (E15) shall be tied in to the Cement Silo Baghouse (CD1). The loading/unloading of the Cement Silo should not occur simultaneously with the loading/unloading of the Mixer. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of Mixer (E15) construction drawings and operator's logbook. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

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Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
12	Only "raw" dredge sediment from the Darling International area of Newark Bay, New Jersey shall be processed in the HREG Dredge Sediment Processing Facility. The permittee shall obtain written approval from the Department for processing dredge sediment other than from the Darling International site. [N.J.A.C. 7:27- 8]	Monitored by visual determination once initially and per change of material, based on an instantaneous determination during operation [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. The permittee shall monitor the source and amount of dredge sediment processed in the HREG Dredge Sediment Processing Facility, once initially and upon change of material. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. The permittee shall record the source, amount and site location designation of the dredge sediment processed in the HREG Dredge Sediment Processing Facility, once initially and upon change of material. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
13	The Mixer (E15) shall process a maximum operating load of 20 cubic yard of dredge sediment per hour, including up to 12% by weight of Portland Cement of total reclaimed wet dredge sediment. The reclaimed (wet) dredge sediment consisting of dewatered sediment that has been conditioned with KMnO4 or H2O2 (See Ref. No. 19 and 21 under U1, OS Summary of the conditions of this permit) must be fed first into the Mixer (E15) prior to introducing the cement (See Ref. No. 16 of U1 OS Summary of the conditions of this permit). [N.J.A.C. 7:27- 8]	Monitored by material feed/flow monitoring once per batch during operation, based on an instantaneous determination. During the EIPT, HREG shall monitor the amount and maximum percent of cement processed hourly in the Mixer (E15), once per batch. In addition to material feed/flow monitoring system, the permittee shall have documentation of construction consisting of Mixer maximum operating and design loading capacities, and operation & maintenance manual (O&M), and cement feeding system maximum loading. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per batch during operation. The permittee shall record the amount and maximum percent of cement used hourly in the Mixer (E15) once per batch. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
14	The Mixer (E15) shall have no openings or vents, except one (1) point of discharge or outlet at the bottom. The Mixer lids shall be screwed onto its base and gasketed with neoprene material. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of, but not limited to, Mixer cross-sectional and plan view engineering drawings. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

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Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
15	The Mixer (E15) and the Cement Feeder shall be totally enclosed and sealed with the Baghouse installed as an integrated part of the Mixer. The cement shall be charged through a flanged enclosed dust leakproof chute straight into the Mixer from a silo installed on top of the Mixer. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of, but not limited to, Mixer and Cement Silo cross-sectional and plan views engineering drawings. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
16	Sufficient dredge sediment shall be added to the Mixer (E15) prior to cement being charged into the Mixer to allow for better mixing of the dredge sediment and to minimize the possibilities that large voids are present where cement is added. [N.J.A.C. 7:27- 8]	Monitored by visual determination once per batch during operation, based on an instantaneous determination. The permittee shall monitor the loading of dredge sediment and cement into the Mixer (E15) upon each occurrence, and the mixing of dredge sediment and cement, once per batch. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per batch during operation. The permittee shall record the amount of dredge sediment charged into the Mixer prior to the addition of cement upon each occurrence. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
17	Cement shall be mixed with reclaimed and conditioned dredge sediment in the Mixer (E15) at ambient temperatures, with no external heat applied. [N.J.A.C. 7:27- 8]	Monitored by temperature instrument once per shift during operation, based on an instantaneous determination. The permittee shall monitor the temperature of the reclaimed and conditioned dredge sediment, as well as of the dredge sediment-cement mix, so it does not exceed ambient temperature, by no more than five (5) degrees Fahrenheit, at all times, during operation. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter upon occurrence of event. The permittee shall record the date and time when the temperature of reclaimed and conditioned dredge sediment, and/or of dredge sediment-cement mix increases above ambient temperature by more than five (5) degrees Fahrenheit. All records shall be kept as specified in Ref. No. 24 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
18	Chemical Oxidant Feeding System: Either Potassium Permanganate (KMnO4) or Hydrogen Peroxide (H2O2) shall be separately injected in the Sediment Slurrying Units (E1 through E6), or in the Mixer (E15), during operation. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of, but not limited to, operator's logbook with notes specifying amount and type of chemical oxidant used, and point of injection, and O&M manual. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	Potassium Permanganate (KMnO4) [solid form] <= 47 tons. The total amount of KMnO4 to be used for the entire EIPT shall not exceed 47 tons (dry basis). KMnO4 shall be introduced into Slurrying Units E1 through E6, and/or into the Mixer (E15), at a maximum rate of 312 lbs/hr (dry basis) corresponding to a maximum dosage rate of 12,000 ppm of dry dredge sediment. The preparation and injection of Potassium Permanganate solution shall be accomplished in completely enclosed and sealed dust-proof equipment or containers. [N.J.A.C. 7:27- 8]	Monitored by material feed/flow monitoring once per batch during operation, based on an instantaneous determination. The permittee shall monitor the amount of KMnO4 (dry basis) and the maximum feed rate of KMnO4 solution into the Slurry Units (E1 through E6) and/or Mixer (E15), once per batch during operation. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per batch during operation. The permittee shall record the amount of KMnO4 (dry basis) and maximum hourly feedrate of KMnO4 solution including percent KMnO4, corresponding KMnO4 dosage rate, and number of batches processed per hour, in a separate operator's logbook or electronic (i.e. computer) filing/storage system. All records shall be kept as specified in Ref. No. 25 of U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
20	The Potassium Permanganate (KMnO4) or Hydrogen Peroxide (H2O2) shall be used with dewatered sediment in the Mixer (E15). The material from the Mixer (E15) will then be placed in a stockpile for a period of approximately 12 hours for the oxidation to be completed. It will then be reclaimed by a front-end loader and fed back into the Mixer (E15), where Portland cement will be added. The final product will then be placed into a separate stockpile for a period of a few days to allow for proper curing time of the cement. This operation shall cover a batch size of approximately 10 cubic yards, corresponding to a mixing time-period of 30 to 35 minutes, for both the KMnO4 and the cement mix. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of, but not limited to, operator's logbook with notes specifying size of batch, duration of a batch, amount of cement, and type and amount of chemical oxidant used. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
21	Hydrogen Peroxide (H2O2) [liquid form] <= 39 tons (50% solution). The total amount of H2O2 to be used for the entire EIPT shall not exceed 39 tons (wet basis corresponding to a 50% solution). H2O2 shall be introduced into Slurrying Units E1 through E6, and/or into the Mixer (E15), at a maximum rate of 520 lb/hr (dry basis) corresponding to a maximum dosage rate of 20,000 ppm of dry dredge sediment. H2O2 shall be used at a maximum of 75 hours of the entire EIPT. The preparation and injection of Hydrogen Peroxide solution shall be accomplished in completely enclosed and sealed dust-proof equipment or containers. [N.J.A.C. 7:27- 8]	Monitored by material feed/flow monitoring once per batch during operation, based on an instantaneous determination. The permittee shall monitor the amount of H2O2 (dry basis) and the maximum feed rate of H2O2 solution into the Slurry Units (E1 through E6) and/or Mixer (E15), once per batch during operation. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once per batch during operation. The permittee shall record the amount of H2O2 (dry basis) and maximum hourly feedrate of H2O2 solution including percent H2O2, corresponding H2O2 dosage rate, and number of batches processed per hour, in a separate operator's logbook or in an electronic filing/storage system (i.e. computer). All records shall be kept as specified in Ref. No. 25 of U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
22	There shall be no visible or fugitive emissions from any of the stacks, and from any equipment and control devices, as specified in the conditions of this APC Permit Approval. [N.J.A.C. 7:27- 8]	Monitored by visual determination once per shift during operation, based on an instantaneous determination. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter upon occurrence of event. The permittee shall record the date, time and duration including the location of any visible or fugitive emissions from the site. Records of visible emissions shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	
23	There shall be water and/or chemical wetting agents available on-site to be immediately used on the stockpiles or on any material spill nearby the Mixer (E15) or the Dewatering Unit (E10 through E12), as a corrective measure when visible emissions are observed. [N.J.A.C. 7:27- 8]	Monitored by visual determination daily, based on an instantaneous determination. The permittee shall confirmthat there is enough water sprays and/or chemical wetting agents available on-site to be used for mitigating or preventing visible emissions, once per day. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter daily. All records shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
24	Air Quality Monitoring: During the EIPT, HREG is required to monitor for the following parameters: 1. Mercury (Hg) 2. Particulates, i.e., TSP and PM-10 3. Semi-Volatile Organic Compounds (SVOCs) 4. Polychlorinated Biphenyls (PCBs) 5. Volatile Organic Compounds (VOC) 6. Hydrogen Sulfide (H2S). The sample locations and air monitoring of above parameters, including the air emission controls on Cement Silo, Dry Polymer and Oxidant Additive Systems, shall be performed in accordance with Attachment 2 of the Radius Air Pollution Control (APC) Environmental Improvement Pilot Test (EIPT) Permit Application, submitted by Tetratech FW, Inc. dated January 24, 2005. [N.J.A.C. 7:27- 8]	Monitored by documentation of construction once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. Documentation of construction shall consist of, but not limited to, a copy of the APC EIPT Permit Application including most recent air contaminants emissions calculations, operator's logbook, air monitoring data sheets and air sampling locations. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of process material, equipment specifications and/or operating conditions]. All records, including analytical laboratory air sampling and testing results, and periodic (portable) emissions monitoring data (where applicable), shall be kept as specified in Ref. No. 25 under U1, OS Summary of the conditions of this permit. [N.J.A.C. 7:27- 8]	

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
25	The following records shall be maintained on-site or at the permittee's offices for a minimum of five (5) years after collection, readily made available to the Department, upon request: 1. Amount of screened "raw" dredge sediment processed at the Dengel Site, and 2. Any additional record-items listed in the APC Permit No. EIP030002 under NJID# 42110, where applicable. 3. The start and end dates of the Environmental Improvement Pilot Test (EIPT), per Reference No. 4 under U1, OS Summary of the conditions of this permit. 4. Any air monitoring, and sampling and analytical test results obtained during the EIPT, as per Reference No. 24 under U1, OS Summary of the conditions of this permit. 5. Any operating restrictions or contingencies, and corrective measures (if any) which were implemented during the EIPT. 6. Dredge sediment and filtrate water flow rates, dredge sediment/cement mixture ratios and other process flow parameters that were determined during the EIPT, as per Reference Nos. 5, 6, 7 and 13 of U1 OS Summary of the conditions of this permit. 7. Relevant emissions calculations and emission factors determined during the EIPT 8. Operating hours and fuel consumption of each piece of diesel powered electrical generator used in the EIPT, as per Reference No. 8 of U1 OS Summary of the conditions of this permit. 9. Specifications of any portable air monitoring equipment, instrumentation or device used during the EIPT. [N.J.A.C. 7:27- 8.13(a)]		Recordkeeping by manual logging of parameter upon occurrence of event. The permittee shall keep all records in a separate bound logbook, or in an electronic storage filing system, i.e. computer, on-site or at the permittee's offices, for at least five (5) years, readily made available to the Department upon request. [N.J.A.C. 7:27- 8.13(d)3]	Submit a report: Upon occurrence of event. This information shall be summarized in a report which shall be submitted to the Chief, NJDEP, Bureau of Preconstruction Permits, P.O. Box 027, Trenton, NJ 08625-0027, upon request by the Department. [N.J.A.C. 7:27- 8.13(d)3]

New Jersey Department of Environmental Protection

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
26	The permittee shall notify the Department and the NJDEP Central Regional Office at least five (5) days prior to the startup, and after the completion of the EIPT. [N.J.A.C. 7:27- 8]			Submit notification: As per the approved schedule. The permittee shall notify the Department five (5) days prior to the startup, and after the completion of the EIPT. [N.J.A.C. 7:27- 8]
27	The permittee shall not cause or use the equipment specified in this permit in a manner that will result in the emission of any air contaminant not listed in the Conditions of Approval as set forth in the "Facility Specific Requirements", except for those specified in the conditions of this permit, corresponding to all operating conditions, at a rate equal to or higher than the applicable reporting threshold as set forth in N.J.A.C. 7:27-8 Appendix I, Table A or B. [N.J.A.C. 7:27- 8.4(k)1]	Monitored by calculations once initially and per change of material, based on an instantaneous determination [change of material herein refers to change in source of dredge material, equipment specifications and/or dredge processing rate]. Calculations shall consist of, but not limited to, emissions calculations of criteria air pollutants, including, but not limited to,VOC (total), TSP, PM-10 as well as HAPs (Total) and any applicable Toxic Substances, as listed in N.J.A.C. 7:27-8, Appendix 1, Table A and Table B, based on most recent emissions monitoring data. [N.J.A.C. 7:27- 8]	Recordkeeping by manual logging of parameter once initially and per change of material [change of material herein refers to change in source of dredge material, equipment specifications and/or dredge processing rate]. The permittee shall keep all documentation on-site or at the permittee's offices, for at least five (5) years, readily made available to the department upon request. [N.J.A.C. 7:27- 8]	Submit notification: Upon occurrence of event. The permittee shall comply with all air contaminant emissions limits as specified in the conditions of this permit at all times during operation. The NJDEP Central Regional Air Enforcement Office must be notified no later than seven (7) calendar days following the completion of air emissions calculations or monitoring, if any of the air contaminants listed in this permit, are determined to be above applicable permit requirements, or if any of the air contaminants not listed in this permit would be emitted at a rate equal to or higher than the applicable reporting threshold levels as set forth in N.J.A.C. 7:27-8 Appendix I, Table A or B. [N.J.A.C. 7:27- 8.4(k)1]

Demonstration Project

Acceptable Use Determination

State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection
Office of Dredging and Sediment Technology
Site Remediation Program
P.O. Box 028
Trenton, NJ 08625
(609) 292-1250
FAX (609) 777-1914

Bradley M. Campbell
Commissioner

February 14, 2005

RECEIVED
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PARSONS BRINCKERHOFF
GLASTONBURY, CT

Mr. Jeffrey Schechtman
Parsons Brinkerhoff Quade & Douglas, Inc.
148 Eastern Blvd. Suite 200
Glastonbury, Ct. 06033

RE: Acceptable Use Determination (AUD)
Applicant: Harbor Resource Environmental Group (HREG)
Project: Dredged Sediment Decontamination Demonstration Project
Crows Mill Road, Keasbey, Middlesex County New Jersey

Dear Mr. Schechtman:

The above referenced AUD dated August 13, 2004 was received by the New Jersey Department of Environmental Protection's (NJDEP or the Department) Office of Dredging and Sediment Technology (OD&ST or the Office) on August 16, 2004. The AUD was modified in a letter dated January 21, 2005 which requested approval from the Department to change the processing facility location from the Butler Street address to a facility located in Keasbey, NJ.

Your application requests an approval to utilize approximately 4,000 yd^3 of dredged material (DM) from Darling International's Wilson Avenue (Newark) facility located along Newark Bay. The HREG proposed Demonstration Project includes: a sediment dewatering unit, the addition of oxidizing agents, and a solidification/stabilization process. It is HREG's intention that these components, both individually and together, will create a beneficial use material that will meet the requirements of the New Jersey Office of Maritime Resources' (NJMR) 1998 Request For Proposals (RFP) for the demonstration of new and innovative technologies for the decontamination of dredged material.

The off-loading of the dredged material is being regulated under an active Waterfront Development Permit (WFD) issued to Bayshore Recyling Corporation Dredged Material Storage and Handling facility on November 4, 2004 (DEP File #1225-04-0013.1 WFD 040001). The processing facility is to be located in an existing masonry industrial facility at the Bayshore Recycling Corporation facility. This AUD approval is only for the 4,000 yd^3 of DM from Darling International to be processed by the HREG. This AUD application is hereby approved subject to the conditions contained herein.

Project Description

This demonstration project will use approximately 4,000 yd^3 of dredged sediment from Darling International. Dredged material will be shipped by barge from the Darling International site on Wilson Avenue in Newark to the Bayshore Recycling Corporation facility located at 75 Crows Mill Road, Keasbey, Middlesex County. The DM will be off-loaded using an excavator for placement into roll-off (or similar) containers, and then transported to the HREG processing facility that is to be housed within an existing industrial building on the Bayshore property. The material will then be mixed with water within a slurry receiving/mixing through and then it will be pumped, using a pump with a 1½-inch screen, from the transfer trucks over vibratory screening equipment to remove material greater than ¼" in size. Material smaller than this size will drop into the sediment slurrying unit which consists of mix tanks which will be capable of providing the necessary

residence time for the oxidation step. An aqueous solution of oxidant (either $KMnO_4$ or H_2O_2) will be metered at a controlled flow rate into the slurry in the mix tanks to reduce organic concentrations in the sediment. The slurry will then be transferred into an agitated mixing tank for subsequent transfer to storage/mixing tanks prior to processing in the belt filter press. The mixing tank is part of the Dewatering Feed Conditioning System, which consists of 2 mix tanks. Recycle water will be added to dilute the slurry to approximately 15% solids. A sediment feed pump will pump material from the mix tanks to the belt filter press. The belt filter press will be equipped with batch tanks where polymer powder will be mixed with reclaimed filtrate water and combined with the sediment slurry when it is pumped from the storage tanks. This polymer, which serves as a flocculent to maximize water removal in the belt filter presses, will be metered into the sediment depending on sediment flow rate and the percentage and characteristics of solids present in the sediment. As the sediment is dewatered in the belt filter press, filtrate water will be produced. This filtrate water will be pumped to storage tanks for residual solids recovery. These storage tanks will be equipped with mixers which will be used should the solids in these tanks require resuspension and return to the dewatering operation. Additionally, some of this filtrate water will be pumped back to the initial stages of the processing facility as recycle water as previously described. Whatever volume of filtrate water which is **NOT** reintroduced into the HREG process will be collected and disposed of at a licensed/permitted wastewater treatment facility.

Filter cake produced during the mechanical dewatering operation will be stored in stockpiles to provide the proper residence time for contaminant reduction by oxidation. A front-end loader will then transfer the material into the feed system for a Ribbon Blender for mixing with cement to produce a beneficial use product. The beneficial use product will exit the Ribbon Blender and be conveyed to an adjacent area where it will be stockpiled, partially cured and then loaded into tandem-axle dump trucks for shipment to user location(s).

This AUD Approval is only for the 4,000 yd^3 of DM from Darling International (WFD/AUD Permit No. 0714-91-0002.20) site. No other dredging projects or materials are authorized by this AUD.

ACCEPTABLE USE DETERMINATION CONDITIONS

1. All oversized debris from the removal screens shall be properly characterized and the proper disposal documented prior to any materials/debris leaving the Bayshore Recycling Corporation facility. This condition applies only to the 4,000 yd^3 of DM from the Darling International facility. No other sources of dredged material or any other materials are authorized (by this AUD) unless they receive a specific project related AUD.

2. This HREG process has the potential to generate significantly large volumes of wastewater. No discharges of any materials to the waters and/or lands and/or air of the State of New Jersey are authorized by this AUD unless and only if a proper permit is received prior to the initiation of activities at the Bayshore Recycling Corporation facility. While a proposed plan to properly characterize and dispose of all wastewaters is included in the AUD application, the NJDEP is urging HREG to pay particular attention to this aspect of the proposed operations to identify and implement improvements to the process with the long-term objective to minimize all wastewater generation.

3. Any filter cake and/or sludge and/or residual products generated by any part of the process that is **NOT** re-introduced to the production line shall obtain the proper permits and/or approvals prior to being transported off-site for proper management or disposal.

4. Once the entire 4,000 yd^3 of DM has been processed and/or any volume of material is ready for beneficial use, HREG shall notify the NJDEP, OD&ST in writing prior to any off-site transporting of

any finished product, including but not limited to, a letter of acceptance from the receiving facility/beneficial use site.

5. HREG is proposing to manufacture a beneficial use product that will be properly managed at the EnCap Acceptable Use Site (EnCap site.) The NJDEP's understanding of the NJMR 1998 RFP is that the potential technologies must produce a "commercially viable product" which means a product that can be **sold** commercially. While it is understood that this demonstration project is only for the 4,000 yd^3 from Darling International, please be advised that the EnCap site **receives** a fee of \$5.23/yd^3 of processed dredged material. The NJDEP recognizes that the ultimate decision on the viability of the HREG process for acceptance under the 1998 RFP rests with the NJDOT.

6. Any major accidental release of (processed) dredged material or end product in areas in non-placement areas (i.e. surface waters of the state, etc.) at the Bayshore Recycling Corporation facility site shall be immediately reported to the NJDEP 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 taken to mitigate the discharge and any other information the Department may request at the time of the notification.

Should you have any questions in this regard, please do not hesitate to contact me at (609) 292-8838.

Sincerely,

Suzanne U. Dietrick, Chief
Office of Dredging and Sediment Technology
Site Remediation Program

C: Michael Behan, HREG
W. Scott Douglas, NJDOT, OMR

State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection
Office of Dredging and Sediment Technology
Site Remediation Program
P.O. Box 028
Trenton, NJ 08625
(609) 292-1250
FAX (609) 777-1914

Bradley M. Campbell
Commissioner

April 1, 2005

Mr. Jeffrey Schechtman
Parsons Brinkerhoff Quade & Douglas, Inc.
148 Eastern Blvd. Suite 200
Glastonbury, Ct. 06033

RE: **REVISED** Acceptable Use Determination (AUD)
Applicant: Harbor Resource Environmental Group (HREG)
Project: Dredged Sediment Decontamination Demonstration Project
Crows Mill Road, Keasbey, Middlesex County New Jersey

Dear Mr. Schechtman:

This is in response to your letter, dated March 30, 2005, in which you requested an amendment to the Acceptable Use Determination (AUD) issued February 14, 2005. The request to amend the AUD was for approval from the Department to change the facility designated to process the remaining 2,000 cy of material that was to be processed at the HREG facility under the NJMR Sediment Decontamination Demonstration Project.

The March 30, 2005 letter states that due to circumstances encountered in the field during the initial processing of the dredged material at the HREG facility, that it is necessary to transport the remaining material in the scow (approximately 2,000 cy) to the DonJon Marine Processing Facility located at Berth 36 in Port Newark. The material would be processed at this facility, and transported to the Encap site for beneficial use as structural fill material in the remediation of the site.

Based on the information presented in the March 30, 2005 letter, the Department hereby amends the AUD issued February 14, 2005 as follows:

7. The remaining volume of approximately 2,000 cy of material from the Darling International berthing facility that was delivered to the HREG facility for processing is authorized to be processed at the DonJon Marine Processing Facility located at Berth 36 in Port Newark.

8. The material shall be processed using a minimum of 8% Portland Cement.

9. Donjon Marine Co. Inc. shall comply with all conditions specified in the Waterfront Development Permit and Acceptable Use Determination issued for the processing facility on June 6, 2003, as modified on December 1, 2004.

10. All trucks used to transport processed dredged material to the landfill shall be tarped pursuant to the applicable State DOT requirements or applicable regulatory agency requirements.

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GLASTONBURY, CT

Encap Site

11. Donjon Marine Co. Inc. shall comply with the fill protocol approvals issued for the EnCap site on December 18, 2001, as amended on April 7, 2004 (Protocol for Fill Below Barrier Layer) and November 7, 2002, as amended on April 29, 2004 (Protocol for Material Above Barrier Layer).

12. Donjon Marine Co. Inc. shall comply with all conditions specified in the AUDs issued for the Avon, Lyndhurst and Rutherford Landfills on January 17, 2003, and April 17, 2003 for the Kingsland Landfill.

13. Donjon Marine Co., Inc. shall comply with all conditions specified in the Remedial Action Workplan approvals and Closure Plan approvals issued for the Avon, Lydhurst and Rutherford landfills dated September 18, 2001, as modified on October 29, 2002, and all amendments thereto. Donjon Marine Co., Inc. shall comply with all conditions specified in the Closure Plan approval issued for the Kingsland Landfill on January 27, 2003 and all amendments thereto.

All other conditions of the AUD issued February 14, 2005 remain in full force and effect.

Should you have any questions in this regard, please do not hesitate to contact me at (609) 292-8838.

Sincerely,

Suzanne U. Dietrick, Chief
Office of Dredging and Sediment Technology
Site Remediation Program

C: Michael Behan, HREG
W. Scott Douglas, NJDOT, OMR

Ms. Kerri Mullins
Donjon Marine Co., Inc.
1250 Liberty Avenue
Hillside, NJ 07205

Darling International Dredging Permits

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
Site Remediation Program
Office of Dredging and Sediment Technology
P.O. Box 028
Trenton, NJ 08625
(609) 292-1250
FAX (609) 777-1914

Robert C. Shinn, Jr.
Commissioner

Ms. Jennifer Alleva
Environmental Scientist
Langan Engineering
River Drive Center 1
Elmwood, NJ 07407-1338

April 4, 2000

RE: Waterfront Development Permit/Water Quality Certificate/
Acceptable Use Determination (AUD)
Application No: 0714-91-0002.20
Project: Darling International
Newark, Essex County

Dear Ms. Alleva:

Enclosed, please find an approved Waterfront Development Permit/Water Quality Certificate/Acceptable Use Determination (AUD) for the above referenced project. Please review this permit and note any conditions which may have been imposed, and promptly complete and return the enclosed "Acceptance of Revocable Construction Permit/s" form to the Department at the above address. This approval is valid for five years from the date of the permit and all terms and conditions of the permit/s are detailed therein. Please note that the permittee must give notice of initiation of construction using the enclosed "Construction Report" form. Notice must be given at least 14 days prior to initiation of construction. Upon completion of construction, the "Completion Report" form must also be completed and submitted to the above address.

Any person who considers himself and herself aggrieved by this permit decision may request a hearing by addressing a written request for such hearing to the following address: Office of Legal Affairs, Department of Environmental Protection, P.O. Box 402, Trenton, New Jersey 08625-0402, Attention Adjudicatory Hearing Requests. This written request must include a completed copy of the attached Administrative Hearing Request Checklist and all information identified in Section III of that list.

In order to promote inter-governmental cooperation in the management of our natural resources, a copy of this decision shall be shared with appropriate local and federal agencies. Should you have any questions in this regard, please do not hesitate to contact Suzanne Dietrick at (609) 292-9203.

Sincerely,

Lawrence J. Baier

Lawrence J. Baier, Chief
Office of Dredging and Sediment Technology
Site Remediation Program

Enclosures

C: Mark Helman, New York District Corps of Engineers
Scott Douglas, NJ Maritime Resources
Marty Mosen, Bureau of Tidelands Management

City of Newark – Municipal Clerk
920 Broad Street
Newark, NJ 07102

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STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

(See Issuing Division below)

PERMIT*

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to the further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit.

Permit No. 0714-91-0002.20	Application No. 0714-91-0002.20

Issuance Date **APRIL 4, 2000**	Effective Date **APRIL 4, 2000**	Expiration Date **APRIL 4, 2005**

Name and Address of Applicant Darling International 825 Wilson Avenue Newark, NJ 07105	Name and Address of Owner Same As Applicant	Name and Address of Operator
Location of Activity/Facility *(Street Address)* Darling International 825 Wilson Avenue Newark, Essex County Lot: 47, 49 and 51 Block: 5070	Issuing Division Office of Dredging and Sediment Technology	Statute(s) NJSA 58:10A NJSA 12:5-3

Type of Permit Waterfront Development Permit Water Quality Certificate/Acceptable Use Determination	Maximum Approved Capacity, if applicable

This permit grants permission to:

Perform maintenance dredging of approximately 22,000 cubic yards of material to restore the berthing area to a depth of –31 feet below MLW + 2 feet overdredge. The material will be removed using a closed clamshell bucket. The dredged material is to be utilized in demonstration project of sediment decontamination technology with oversight by the Office of New Jersey Maritime Resources.

This permit serves to legalize the permanent mooring of a 180 feet long by 40 feet wide berthing barge that is moored via tie lines to the land and five pile clusters in Newark Bay. This structure has existed at the facility for over 20 years, and as such is grand-fathered from complying with the Rules on Coastal Zone Management (N.J.A.C. 7:7E) since it existed prior to the effective date of the regulations (September 26, 1980). This permit also authorizes the temporary mooring of a 90 foot long by 25 foot wide moored barge that is used only when ships are docked at the facility. The mooring barge is used for 14 days each month. If at any time the permittee proposes to change the dimensions and/or location of the berthing barge, a separate Waterfront Development Permit (WDP) must be obtained from the NJDEP pursuant to N.J.A.C. 7:7-2.3. Any WDP application must be able to demonstrate that the new structure complies with the Rules.

This project is authorized as shown on plans consisting of two sheets entitled "Darling International Berth Dredging, Port Newark, New Jersey" dated November 15, 1998, and prepared by David T. Gockel, P.E. of Langan Engineering. The plans are referred to as "Dredging Plan" (Drawing 21.01), "Dredging Sections" (Drawing 21.02), and "Hydrographic Survey" (Drawing 07.01).

Prepared By: Suzanne Dietrick 4/4/00
Suzanne U. Dietrick Date
(See Page 1 of 4 pages for Chief's signature.)

Revised Date	Approved by the Department of Environmental Protection Name (Print or Type) _____ Title _____ Signature _____ Date

**The word permit means "approval, certification, registration, etc."* *(General Conditions are on Page Two)*

This permit is subject to the following general conditions:

1. This permit is revocable, or subject to modification or change at any time, pursuant to the applicable regulations, when in the judgement of the Department of Environmental Protection of the State of New Jersey such revocation, modification or change shall be necessary.

2. The issuance of the permit shall not be deemed to affect in any way action by the Department of Environmental Protection of the State of New Jersey on any future application.

3. The works, facilities, and/or activities shown by plans and/or other engineering data, which are this day approved, subject to the conditions herewith established, shall be constructed and/or executed in conformity with such plans and/or engineering data and the said conditions.

4. No change in plans or specifications shall be made except with the prior written permission of the Department of Environmental Protection of the State of New Jersey.

5. The granting of this permit shall not be construed to in any way affect the title or ownership of property, and shall not make the Department of Environmental Protection or the State a party in any suit or question of ownership.

6. This permit does not waive the obtaining of Federal or other State or local government consent when necessary. This permit is not valid and no work shall be undertaken until such time as all other required approvals and permits have been obtained.

7. A copy of this permit shall be kept at the work site, and shall be exhibited upon request of any person.

8. In cases of conflict, the conditions of this permit shall supersede the plans and/or engineering data.

This permit is approved subject to, and in accordance with, the permittee obtaining a tidelands license based on an application submitted by Langan Engineering and Environmental Services, Inc.on December 10, 1999. Issuance of this permit does not in any way relinquish the State's ownership interest in the property, if any exists.

This permit is issued subject to and provided that the following conditions can be met to the satisfaction of the Office of Dredging and Sediment Technology. All conditions must be met prior to construction unless otherwise specified. Compliance with Administrative conditions shall be determined once copies of all specified permits, certifications, plans, agreements, etc. have been received, not less than 30 days prior to construction, and approved by the Office of Dredging and Sediment Technology. All Physical Conditions are subject to on-site compliance inspection by the Bureau of Coastal and Land Use Enforcement. As per N.J.A.C. 7:7-1.4, you must notify the Bureau of Coastal and Land Use Enforcement, (P.O. Box 422, 401 E. State Street, Floor 4, Trenton, NJ 08625-0422), in writing at least 3 days prior to commencement of construction or site preparation.

This permit shall be RECORDED in the office of the County Clerk (the REGISTRAR OF DEEDS AND MORTGAGES in the applicable counties) in the county wherein the lands included in the permit are located within ten (10) days after the receipt of the permit by the applicant and verified notice shall be forwarded to the Land Use Regulation Program immediately thereafter.

This permit is NOT VALID until the permit acceptance form has been signed by the applicant, accepting and agreeing to adhere to all permit conditions, and returned to the Office of Dredging and Sediment Technology, 6th floor Assistant Commissioner's Suite, P.O. Box 028, Trenton, New Jersey 08625.

ADMINISTRATIVE CONDITIONS

1. The permittee shall allow an authorized representative of the NJDEP the right to inspect construction pursuant to N.J.A.C. 7:7-1.5.

2. The permittee shall obtain all required local, state and federal approvals.

3. Prior to initiation of dredging, the permittee shall receive Army Corps of Engineers authorization for the project. A copy of said authorization shall be forwarded to this Office upon receipt by the permittee.

4. The permittee shall obtain a tidelands license for the proposed dredging area as applied for on December 10, 1999.

5. If at any time the location and/or dimensions of the berthing barge is to be changed by the permittee, a separate Waterfront Development Permit must be obtained from the NJDEP. Any proposed changes to the berthing barge must comply with the Rules on Coastal Zone Management (N.J.A.C. 7:7E).

PHYSICAL CONDITIONS

1. Dredging is prohibited from January 1st through June 30th to protect demersal eggs and early life stages of winter flounder (January 1st to May 31st) and migrating anadromous fish (April 1st to June 30th).

2. If a discharge of decant water is necessary from this dredging project prior to the off-loading of the material at a particular decontamination facility, that water will be transported back to the dredging site. No discharge of decant to surface waters of the state is permitted at any processing facility unless a NJDPES/DSW permit is obtained by the facility. Any discharge of decant water at the dredging site shall meet a Total Suspended Solids action level of 30 mg/L. No discharge from the dewatering barge is

permitted unless the result of the analysis confirm that the TSS action level will be met. Additional decant water shall not be added to the dewatering barge between the time of sampling for TSS and the termination of the discharge for which the analysis is performed. All decant water shall be discharged to minimize the resuspension of bottom sediments in the receiving water.

3. Efforts shall be made to maximize the size of the "bite" of the closed clamshell bucket. The clamshell shall be lifted slowly through the water column, generally 2 feet per second or less.

4. The permittee shall maintain a "No barge overflow" during the entire dredging operation.

ACCEPTABLE USE DETERMINATION

1. Prior to the removal of any dredged material, the permittee shall submit a request for a modification of this AUD which identifies the sediment decontamination technology through which the material will be processed. The request shall include, the amount of material to be dredged, the sediment decontamination facility accepting the material, and the proposed end use of the decontaminated dredged material. The permittee shall receive the Department's approval of that modification prior to the removal of any dredged material for transport to a sediment decontamination facility.

2. All processed dredged material from this project shall be analyzed prior to transport to the final use or disposal location for that material. Analyses may include, but is not limited to, bulk sediment chemistry, and analysis using the Multiple Extraction Procedure (EPA method 1320). Required analyses will be dependent on the particular sediment decontamination facility and/or final use or disposal option. Any required analyses of the processed dredged material will be specified in an approval letter of the AUD modification request referenced above.

3. All processed dredged material from the project that is to be utilized at a location for structural fill/cover material shall be placed in a manner consistent with all approvals governing that site.

Lawrence J. Baier

Lawrence J. Baier, Chief
Office of Dredging and Sediment Technology

4/4/00
Date

ACCEPTANCE OF
REVOCABLE CONSTRUCTION PERMIT/S

Mail To:

State of New Jersey
Department of Environmental Protection
Site Remediation Program
Office of Dredging and Sediment Technology
P.O. Box 028
Trenton, NJ 08625

NJDEP Project Manager: Suzanne Dietrick

Permit Number(s): 0714-91-0002.20

Date Issued: April 4, 2000

The undersigned hereby accepts the above referenced revocable permit/s, subject to the terms and conditions included therein, including but not limited to the right of the State to revoke said permit/s with cause, and also subject to all provisions of law, rules, and regulations of any applicable government agency.

Signature: _____

Printed Name: _____

Title/Affiliation: _____

Attest: _____

(To be properly witnessed, signed and sealed)

ADJUDICATORY HEARING REQUEST CHECKLIST AND TRACKING FORM

I. Permit Being Appealed:

_____
Facility Name

_____ _____
Issuance Date of Final Permit Decision Permit Number

II. Person Requesting Hearing:

_____ _____
Name/Organization Name of Attorney (if applicable)

_____ _____
_____ _____
_____ _____
Address Address of Attorney

_____ _____
Telephone Number Telephone Number of Attorney

III. Please include the following information as part of your request:

A. The date the permittee received the permit;
B. A copy of the Denial of Permit and a list of all issues being appealed;
C. The legal and factual questions at issue;
D. A statement as to whether you raised each legal and factual issue during the public comment period;
E. An estimate of the amount of time required for the hearing;
G. A request, if necessary, for a barrier-free hearing location for disabled persons;
H. A clear indication of any willingness to negotiate a settlement with the Department prior to the Department's processing of your hearing request to the Office of Administrative Law; and
I. This form, completed, signed and dated with all of the information listed above, including attachments, to:
   1. Office of Legal Affairs
      ATTENTION: Adjudicatory Hearing Requests
      Department of Environmental Protection
      401 East State Street
      PO Box 402, Trenton, New Jersey 08625-0402
   2. Lawrence Baier, Chief
      Office of Dredging and Sediment Technology
      401 East State Street
      PO Box 028, Trenton, New Jersey 08625-0029
   3. Any other person named on the permit (if you are a permittee under that permit).
   4. The permittee(s) (if you are a person seeking consideration as a party to the action).

IV. Signature: _____ Date: _____

CONSTRUCTION REPORT

Mail To:

State of New Jersey
Department of Environmental Protection
Site Remediation Program
Office of Dredging and Sediment Technology
P.O. Box 028
Trenton, NJ 08625

NJDEP Project Manager: _____

Permit Number(s): _____

_____

_____

Date Issued: _____

Applicant: _____

Name of Project: _____

Municipality/County: _____

Date Construction
Is to Begin: _____

I hereby give notice that construction will begin on the above noted project on the date stated above (must give at least 14 days notice). Also, as required by condition 7 of the stream encroachment permit, a copy of the above referenced permit/s along with all approved drawings shall be available for inspection at the project site throughout construction.

Engineer's Signature and Seal: _____

N.J. License Number: _____

Date: _____

COMPLETION REPORT

Mail To:

State of New Jersey
Department of Environmental Protection
Site Remediation Program
Office of Dredging and Sediment Technology
P.O. Box 028
Trenton, NJ 08625

NJDEP Project Manager:_____

Permit Number(s): _____

_____

_____

Date Issued: _____

Applicant: _____

Name of Project: _____

Municipality/County: _____

Date of Completion: _____

The undersigned hereby certifies that all activities approved by the Department within the above referenced permit/s have been constructed and completed in accordance with the plans approved therein, that said project is in compliance with all terms and conditions of the same, and that all unauthorized encroachments have been removed.

Engineer's Signature and Seal:_____

N.J. License Number: _____

Date: _____

ACCEPTANCE OF
REVOCABLE CONSTRUCTION PERMIT/S

Mail To:

State of New Jersey
Department of Environmental Protection
Site Remediation Program
Office of Dredging and Sediment Technology
P.O. Box 028
Trenton, NJ 08625

NJDEP Project Manager: Suzanne Dietrick

Permit Number(s): 0714-91-0002.20

Date Issued: April 4, 2000

The undersigned hereby accepts the above referenced revocable permit/s, subject to the terms and conditions included therein, including but not limited to the right of the State to revoke said permit/s with cause, and also subject to all provisions of law, rules, and regulations of any applicable government agency.

Signature: Edward J. Schlagenhoff

Printed Name: Edward J. Schlagenhoff

Title/Affiliation: General Mgr. Darling International

Attest: James R. Ferguson Jr
(To be properly witnessed, signed and sealed)

JAMES R. FERGUSON, JR.
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Oct. 26, 2004

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

June 28, 2000

REPLY TO
ATTENTION OF:
Regulatory Branch

SUBJECT: Department of the Army Permit No. 1999-13370

Ed Schlagenhaft
Darling International, Inc.
825 Wilson Avenue
Newark, New Jersey 07105

Dear Mr. Schlagenhaft:

Enclosed is a Department of the Army permit for your work.

You are required to submit to this office the dates of commencement and completion of your work. Enclosed are two forms for you to use to submit the required dates.

If for any reason, a change in your plans or construction methods is found necessary, please contact us immediately to discuss modification of your permit. Any changes must be approved before they are undertaken.

Sincerely,

Joseph J. Seebode
Chief, Regulatory Branch

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF:

CENAN-OP-RH

IMPORTANT

This letter must be completed and mailed to the Harbor Supervision & Compliance Section at the above address prior to commencement of any work authorized under the permit.

Permittee: Darling International, Inc. Permit No. 1999-13370

Date Permit Issued: June 28, 2000 Expiration Date: June 28, 2000

Waterway: Newark Bay

City & State: City of Newark, Essex County, New Jersey

Work will commence on or about: _____
Name, Address & Telephone Number of Contractor:

_____ _____
Signature of Permittee Date

Fold this form into thirds, with the bottom third facing outward. Tape it together and mail to the address below **or FAX to (212) 264-4260.**

_____
_____
_____

Place Stamp
Here

Department of the Army
New York District Corps of Engineers
Jacob K. Javits Federal Building
ATTN: CENAN-OP-RH
New York, New York 10278-0090

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF:

CENAN-OP-RH

IMPORTANT

This letter must be completed and mailed to the Harbor Supervision & Compliance Section at the above address following completion or cancellation of work authorized under the permit.

Permittee: Darling International, Inc. Permit No. 1999-13370

Date Permit Issued: June 28, 2000 Expiration Date: June 28, 2010

Waterway: Newark Bay

City & State: City of Newark, Essex County, New Jersey

Check and complete applicable item(s) listed below:

____ Work was completed on _____.
____ Work will not be performed on the project.
____ Deviation from work authorized in permit is explained below.
____ Other (explain) _____

_____

_____

_____ _____
Signature of Permittee Date

Fold this form into thirds, with the bottom third facing outward. Tape it together and mail to the address below **or FAX to (212) 264-4260.**

_____
_____
_____

Place Stamp
Here

Department of the Army
New York District Corps of Engineers
Jacob K. Javits Federal Building
ATTN: CENAN-OP-RH
New York, New York 10278-0090

PERMITTEE: Darling International, Inc.
PERMIT NO.: 1999-13370

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) 6/13/00 (DATE)

Darling International, Inc.

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

x (DISTRICT ENGINEER) June 28, 2000 (DATE)

FOR AND IN BEHALF OF
William H. Pearce
Colonel, Corps of Engineers
District Engineer

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below. A copy of the permit signed by the transferee should be sent to this office.

(TRANSFEREE) (DATE)

DEPARTMENT OF THE ARMY PERMIT

Permittee: Darling International, Inc., 825 Wilson Avenue, Newark, NJ 07105 (973) 465-1900

Permit No.: 1999-13370

Issuing Office: New York District Corps of Engineers

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

Dredge, with ten years maintenance, approximately 22,000 cubic yards of sediment from an 80,000 square foot berthing area to a depth of 31 feet below the plane of Mean Low Water with an allowable 2 foot overdepth. Dredged sediment shall be loaded into solid bottom scows and transported to an upland disposal facility as designated and approved by New Jersey Maritime Resources, where it shall be suitably retained so as not to reenter any waterway. Dewatering of the sediment shall occur at the disposal site with decant water returned to the waterway at the dredge site. Permanent mooring of a 180 foot x 40 foot berthing barge is authorized. Berthing barge shall be removed when the facility is no longer in use. All work shall be done in accordance with the attached diagrams and New Jersey Department of Environmental Protection Permit No. 0714-91-0002.20, which are hereby made a part of this permit.

Project Location: IN: Newark Bay

AT: City of Newark, Essex County, New Jersey

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on June 28, 2010. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

1145b (Newark Bay - Darling International, Inc. - dredging with upland disposal)

PERMITTEE: Darling International, Inc.
PERMIT NO.: 1999-13370

Special Conditions:

A) To protect demersal egg and larval stages of winter flounder, no dredging activities may occur between January 1st and May 31st of any year for which this permit may be valid.

B) To protect migratory anadromous fish, no dredging activities may occur between April 1st and June 30th of any year for which this permit may be valid.

C) The permittee shall provide written notification of any change in the disposal location at least 3 months prior to undertaking any maintenance dredging/ disposal operations. Such notification shall be provided to the U.S. Army Corps of Engineers, New York District, Regulatory Branch, 26 Federal Plaza, New York, NY 10278-0090 and to the U.S. Fish and Wildlife Service, New Jersey Field Office, 927 North Main Street (Building D-1), Pleasantville, NJ 08232.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. Code 403).

(X) Section 404 of the Clean Water Act (33 U.S. Code 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization:

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

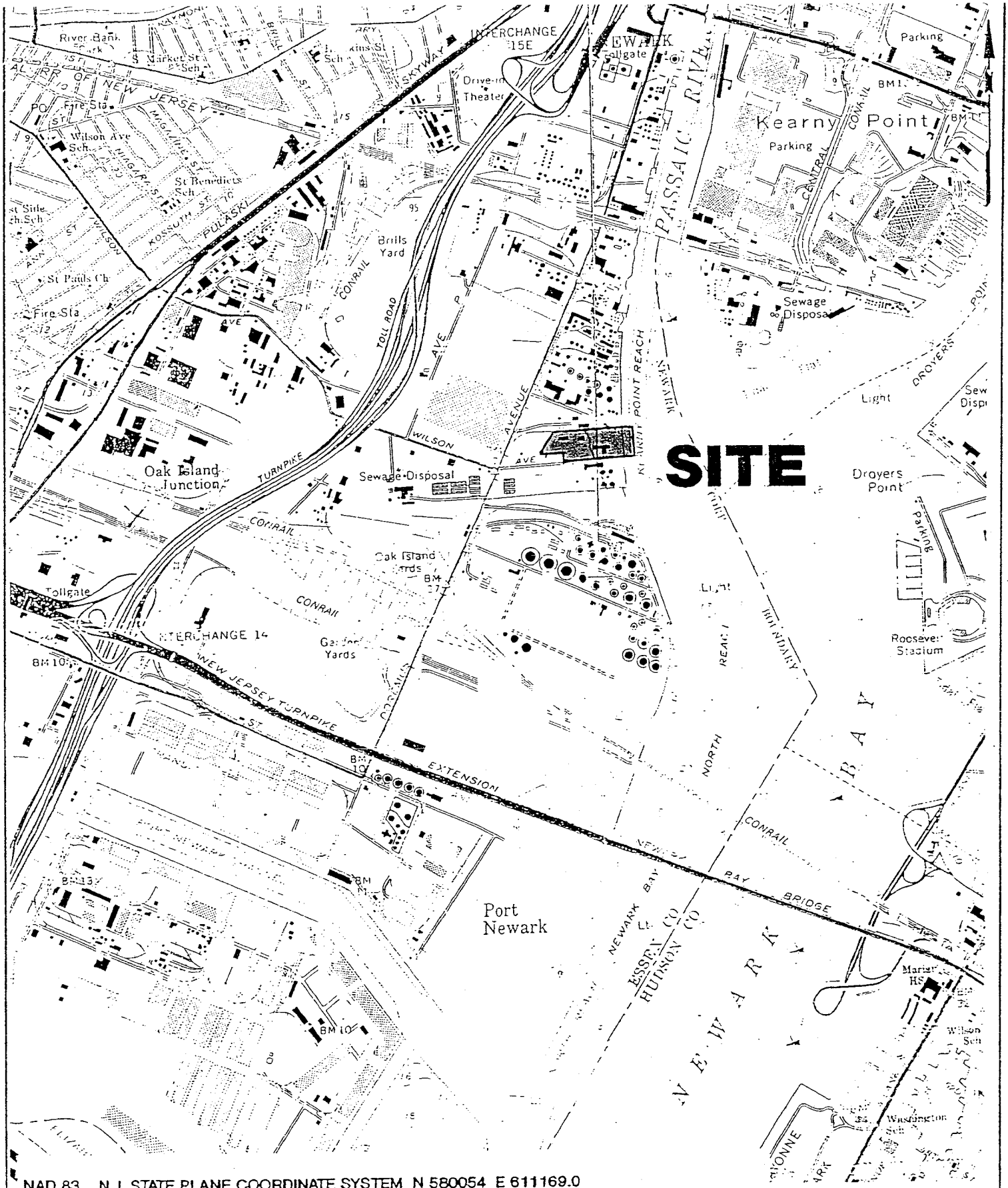
d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.



NAD 83 N.J. STATE PLANE COORDINATE SYSTEM N 580054 E 611169.0

MAP REFERENCE: ELIZABETH AND JERSEY CITY, NEW JERSEY U.S.G.S. MAPS (DATED 1981)

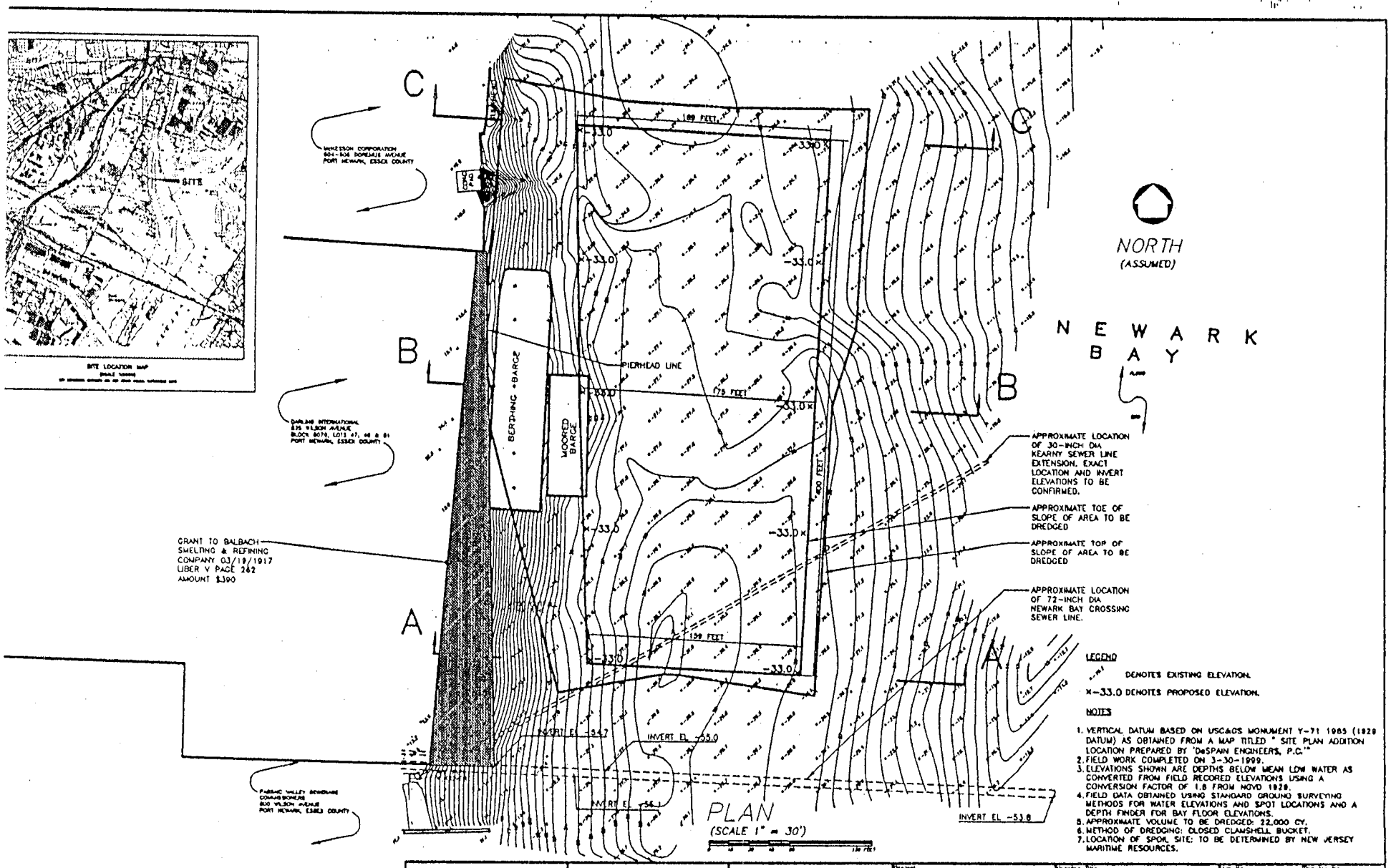
Langan Engineering and Environmental Services
(201) 794-6900 (215) 348-7101
Elmwood Park, NJ Doylestown, PA

Project **U.S.G.S. LOCATION MAP**
DARLING INTERNATIONAL

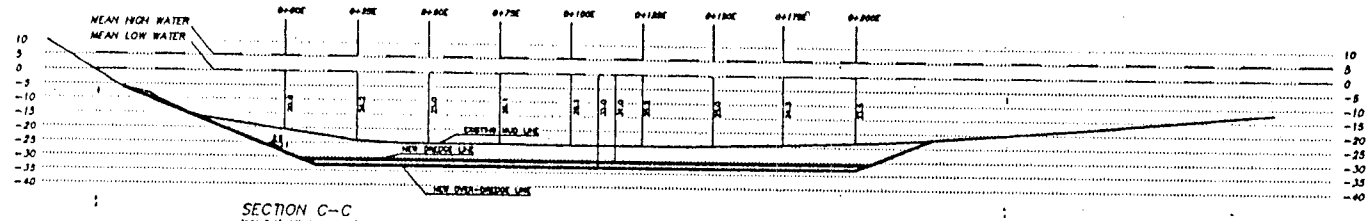
NEWARK **NEW JERSEY**

Job No.	Date	Scale	Dwg. No.
1398001	7/26/99	1"=2000'	1 of 3

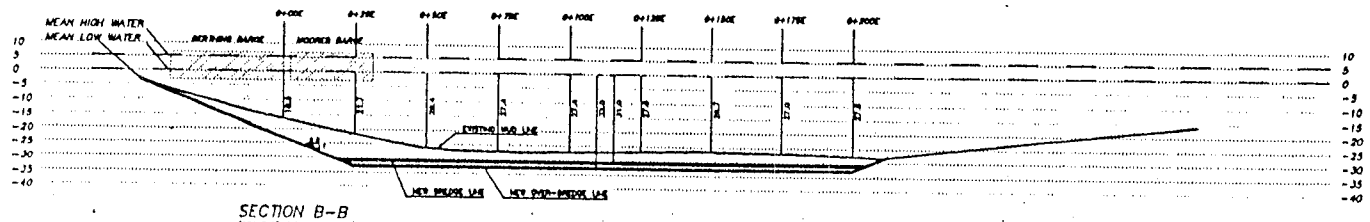
1145b (Newark Bay - Darling International, Inc. - dredging with upland disposal)



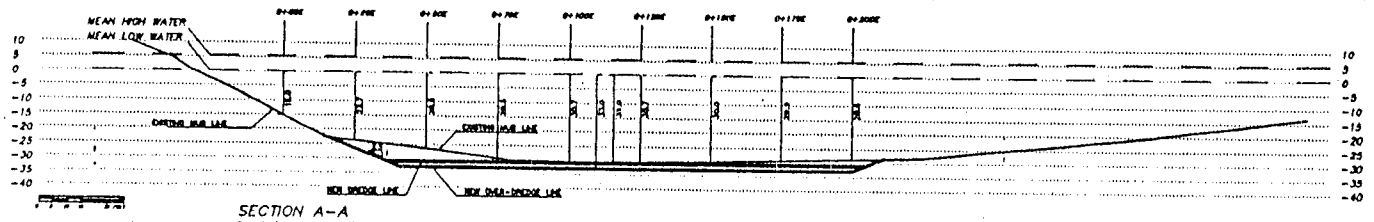
2 of 3



SECTION C–C
(SCALE 1"=30' VERTICAL, 1"=20' HORIZONTAL)



SECTION B–B
(SCALE 1"=30' VERTICAL, 1"=20' HORIZONTAL)



SECTION A–A
(SCALE 1"=30' VERTICAL, 1"=20' HORIZONTAL)

NOTES

1. ELEVATIONS SHOWN ARE TO MEAN LOW WATER DATUM.
2. EXISTING MUD LINE SHOWN ON CROSS SECTIONS IS BASED ON FIELD MEASUREMENTS CARRIED OUT BY LANGAN ON 3-30-99 AND MAY HAVE CHANGED SINCE THAT TIME.
3. FIELD DATA OBTAINED USING STANDARD GROUND SURVEYING METHODS FOR WATER ELEVATIONS AND SPOT LOCATIONS AND A DEPTH FINDER FOR BAY FLOOR ELEVATIONS.

Date	Description	No.
	Revisions	

Stephen T. Bechtel, P.E. NJ License No. 30037

Langan Engineering and Environmental Services
Newark Office Center 1, Suite 1100, Newark, NJ 07102 (201) 794-8800
• Doylestown, PA • Miami, FL • New York, NY

Project: DARLING INTERNATIONAL BERTH DREDGING
PORT NEWARK NEW JERSEY

Drawing Title: DREDGING SECTIONS

Job No. 13980
Date 11/15/99
Scale AS SHOWN
Drn. By RB
Chkd. By
Drawing No.

X:\13980\SECTIONS.DWG

3 of 3

11450 (Newark Bay - Darling International, Inc. - dredging with upland disposal)

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

(See Issuing Division below)

PERMIT*

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to the further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit.

Permit No. 0714-91-0002.20	Application No. 0714-91-0002.20	
Issuance Date **APRIL 4, 2000**	Effective Date **APRIL 4, 2000**	Expiration Date **APRIL 4, 2005**
Name and Address of Applicant Darling International 825 Wilson Avenue Newark, NJ 07105	Name and Address of Owner Same As Applicant	Name and Address of Operator
Location of Activity/Facility *(Street Address)* Darling International 825 Wilson Avenue Newark, Essex County Lot: 47, 49 and 51 Block: 5070	Issuing Division Office of Dredging and Sediment Technology	Statute(s) NJSA 58:10A NJSA 12:5-3
Type of Permit Waterfront Development Permit Water Quality Certificate/Acceptable Use Determination	Maximum Approved Capacity, if applicable	

This permit grants permission to:

Perform maintenance dredging of approximately 22,000 cubic yards of material to restore the berthing area to a depth of –31 feet below MLW + 2 feet overdredge. The material will be removed using a closed clamshell bucket. The dredged material is to be utilized in demonstration project of sediment decontamination technology with oversight by the Office of New Jersey Maritime Resources.

This permit serves to legalize the permanent mooring of a 180 feet long by 40 feet wide berthing barge that is moored via tie lines to the land and five pile clusters in Newark Bay. This structure has existed at the facility for over 20 years, and as such is grand-fathered from complying with the Rules on Coastal Zone Management (N.J.A.C. 7:7E) since it existed prior to the effective date of the regulations (September 26, 1980). This permit also authorizes the temporary mooring of a 90 foot long by 25 foot wide moored barge that is used only when ships are docked at the facility. The mooring barge is used for 14 days each month. If at any time the permittee proposes to change the dimensions and/or location of the berthing barge, a separate Waterfront Development Permit (WDP) must be obtained from the NJDEP pursuant to N.J.A.C. 7:7-2.3. Any WDP application must be able to demonstrate that the new structure complies with the Rules.

This project is authorized as shown on plans consisting of two sheets entitled "Darling International Berth Dredging, Port Newark, New Jersey" dated November 15, 1998, and prepared by David T. Gockel, P.E. of Langan Engineering. The plans are referred to as "Dredging Plan" (Drawing 21.01), "Dredging Sections" (Drawing 21.02), and "Hydrographic Survey" (Drawing 07.01).

Prepared By: Suzanne Dietrick 4/4/00
Suzanne U. Dietrick — Date
(See Page 1 of 4 pages for Chief's signature.)

Revised Date	Approved by the Department of Environmental Protection Name (Print or Type) _____ Title _____ Signature _____ Date

**The word permit means "approval, certification, registration, etc."* *(General Conditions are on Page Two)*

This permit is subject to the following general conditions:

1. This permit is revocable, or subject to modification or change at any time, pursuant to the applicable regulations, when in the judgement of the Department of Environmental Protection of the State of New Jersey such revocation, modification or change shall be necessary.

2. The issuance of the permit shall not be deemed to affect in any way action by the Department of Environmental Protection of the State of New Jersey on any future application.

3. The works, facilities, and/or activities shown by plans and/or other engineering data, which are this day approved, subject to the conditions herewith established, shall be constructed and/or executed in conformity with such plans and/or engineering data and the said conditions.

4. No change in plans or specifications shall be made except with the prior written permission of the Department of Environmental Protection of the State of New Jersey.

5. The granting of this permit shall not be construed to in any way affect the title or ownership of property, and shall not make the Department of Environmental Protection or the State a party in any suit or question of ownership.

6. This permit does not waive the obtaining of Federal or other State or local government consent when necessary. This permit is not valid and no work shall be undertaken until such time as all other required approvals and permits have been obtained.

7. A copy of this permit shall be kept at the work site, and shall be exhibited upon request of any person.

8. In cases of conflict, the conditions of this permit shall supersede the plans and/or engineering data.

This permit is approved subject to, and in accordance with, the permittee obtaining a tidelands license based on an application submitted by Langan Engineering and Environmental Services, Inc.on December 10, 1999. Issuance of this permit does not in any way relinquish the State's ownership interest in the property, if any exists.

This permit is issued subject to and provided that the following conditions can be met to the satisfaction of the Office of Dredging and Sediment Technology. All conditions must be met prior to construction unless otherwise specified. Compliance with Administrative conditions shall be determined once copies of all specified permits, certifications, plans, agreements, etc. have been received, not less than 30 days prior to construction, and approved by the Office of Dredging and Sediment Technology. All Physical Conditions are subject to on-site compliance inspection by the Bureau of Coastal and Land Use Enforcement. As per N.J.A.C. 7:7-1.4, you must notify the Bureau of Coastal and Land Use Enforcement, (P.O. Box 422, 401 E. State Street, Floor 4, Trenton, NJ 08625-0422), in writing at least 3 days prior to commencement of construction or site preparation.

This permit shall be RECORDED in the office of the County Clerk (the REGISTRAR OF DEEDS AND MORTGAGES in the applicable counties) in the county wherein the lands included in the permit are located within ten (10) days after the receipt of the permit by the applicant and verified notice shall be forwarded to the Land Use Regulation Program immediately thereafter.

This permit is NOT VALID until the permit acceptance form has been signed by the applicant, accepting and agreeing to adhere to all permit conditions, and returned to the Office of Dredging and Sediment Technology, 6th floor Assistant Commissioner's Suite, P.O. Box 028, Trenton, New Jersey 08625.

ADMINISTRATIVE CONDITIONS

1. The permittee shall allow an authorized representative of the NJDEP the right to inspect construction pursuant to N.J.A.C. 7:7-1.5.

2. The permittee shall obtain all required local, state and federal approvals.

3. Prior to initiation of dredging, the permittee shall receive Army Corps of Engineers authorization for the project. A copy of said authorization shall be forwarded to this Office upon receipt by the permittee.

4. The permittee shall obtain a tidelands license for the proposed dredging area as applied for on December 10, 1999.

5. If at any time the location and/or dimensions of the berthing barge is to be changed by the permittee, a separate Waterfront Development Permit must be obtained from the NJDEP. Any proposed changes to the berthing barge must comply with the Rules on Coastal Zone Management (N.J.A.C. 7:7E).

PHYSICAL CONDITIONS

1. Dredging is prohibited from January 1st through June 30th to protect demersal eggs and early life stages of winter flounder (January 1st to May 31st) and migrating anadromous fish (April 1st to June 30th).

2. If a discharge of decant water is necessary from this dredging project prior to the off-loading of the material at a particular decontamination facility, that water will be transported back to the dredging site. No discharge of decant to surface waters of the state is permitted at any processing facility unless a NJDPES/DSW permit is obtained by the facility. Any discharge of decant water at the dredging site shall meet a Total Suspended Solids action level of 30 mg/L. No discharge from the dewatering barge is

permitted unless the result of the analysis confirm that the TSS action level will be met. Additional decant water shall not be added to the dewatering barge between the time of sampling for TSS and the termination of the discharge for which the analysis is performed. All decant water shall be discharged to minimize the resuspension of bottom sediments in the receiving water.

3. Efforts shall be made to maximize the size of the "bite" of the closed clamshell bucket. The clamshell shall be lifted slowly through the water column, generally 2 feet per second or less.

4. The permittee shall maintain a "No barge overflow" during the entire dredging operation.

ACCEPTABLE USE DETERMINATION

1. Prior to the removal of any dredged material, the permittee shall submit a request for a modification of this AUD which identifies the sediment decontamination technology through which the material will be processed. The request shall include, the amount of material to be dredged, the sediment decontamination facility accepting the material, and the proposed end use of the decontaminated dredged material. The permittee shall receive the Department's approval of that modification prior to the removal of any dredged material for transport to a sediment decontamination facility.

2. All processed dredged material from this project shall be analyzed prior to transport to the final use or disposal location for that material. Analyses may include, but is not limited to, bulk sediment chemistry, and analysis using the Multiple Extraction Procedure (EPA method 1320). Required analyses will be dependent on the particular sediment decontamination facility and/or final use or disposal option. Any required analyses of the processed dredged material will be specified in an approval letter of the AUD modification request referenced above.

3. All processed dredged material from the project that is to be utilized at a location for structural fill/cover material shall be placed in a manner consistent with all approvals governing that site.

Lawrence J. Baier

Lawrence J. Baier, Chief
Office of Dredging and Sediment Technology

4/4/00
Date

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
Land Use Management & Compliance
Bureau of Tidelands Management
P. O. Box 439
Trenton, New Jersey 08625-0439
Tel. #609 292-2573
Fax #609 633-6493

Robert C. Shinn, Jr.
Commissioner

June 29, 2000

Ms. Jennifer Alleva
Langan Engineering
River Drive Center 1
Elmwood Park, New Jersey 07407

RE: DARLING INTERNATIONAL, tidelands license, Newark Bay, Lots 47, 49 and 51, Block 5070, Newark, Essex County

FILE: #00-0010-T

Dear Ms. Alleva:

Receipt is acknowledged of your two checks in the amounts of $3088.00 (#17048) and $300.00 (#17046) representing payment of the license (lease) fee for the first year and the fee required for processing of the license (lease) document, respectively.

Sincerely,

Jo Ann Cubberley, C.P. (ASPRS)
Manager
Bureau of Tidelands Management

JAC/tmg
cc: Bureau of Revenue

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
Land Use Management & Compliance
Bureau of Tidelands Management
P.O. Box 439
Trenton, New Jersey 08625-0439
Tel. #609 292-2573
Fax #609 633-6493

Robert C. Shinn, Jr.
Commissioner

June 28, 2000

Ms. Jennifer Alleva
Langan Engineering
River Drive Center !
Elmwood, New Jersey 07407

RE: DARLING INTERNATIONAL, tidelands license, Newark Bay, Lots 47, 49 and 51, Block 5070, Newark, Essex County

FILE: #00-0009-T

Dear Ms. Alleva:

Receipt is acknowledged of your two checks in the amounts of $8800.00 (#17047) and $150.00 (#17045) representing payment for one year dredging and the fee required for processing of the license (lease) document, respectively.

Sincerely,

Jo Ann Cubberley, C.P. (ASPRS)
Manager
Bureau of Tidelands Management

JAC/tmg
cc: Bureau of Revenue

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Appendix B

Photos of Processing Equipment

Photo 1: Excavator used to load dredged material from scow into roll-offs

Photo 2: Scow containing dredged material

Photo 3: Roll-off loaded on truck and delivered to head end of facility

Photo 4: Raw dredged material in roll-off container

Photo 5: Sediment being pumped from roll-off into surge tank

Photo 6: General view of sediment being pumped from roll-off

Photo 7: Bar screen & shaker screen over surge tank

Photo 8: Surge tank used for initial sediment storage & dilution

Photo 9: Sediment being mixed in surge tank

Photo 10: Oxidant feed system

Photo 11: Baker “short tank” oxidation tank

Photo 12: Mix tank for polymer flocculent

Photo 13: Venturi mixer used to mix polymer solution with slurry

Photo 14: Belt filter press used to dewater sediment

Photo 15: Sediment moving through belt filter press

Photo 16: Dewatered sediment at discharge of belt filter press

Photo 17: Baker “short tank” filtrate water surge tanks

Photo 18: Sand filter used to clarify effluent

Photo 19: Baker effluent storage tank

Photo 20: Skid-steer loader transferring dewatered sediment

Photo 21: Ribbon blender used to mix cement into dewatered sediment

Photo 22: Cement storage “pig”

Photo 23: Baghouse

Photo 24: Loading dewatered sediment into ribbon blender

Photo 25: Ribbon blender in operation during discharge stage

Photo 26: Ribbon blender mechanism

Photo 27: Ribbon blender discharging beneficial use product

Photo 28: Finished product stockpile

Photo 29: PUF test (air monitoring) setup

Photo 30: HREG project trailer