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NUI ENVIRONMENTAL GROUP

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Sediment Decontamination Demonstration Project

Final Pilot Study Report

submitted by

NUI Environmental Group, Inc.

submitted to

State of New Jersey Department of Transportation
Office of New Jersey Maritime Resources

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Reference Documents

1. "Guidance Document for Processing and Beneficial Use of Dredged Material as Fill" (prepared for the Port Authority of NY&NJ by Parsons Brinckerhoff, May 1999)

2. "Effect of Lime Admixtures on Contaminated Dredged Sediments" (Samtani et. al, 1994)

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Executive Summary

This report presents the results of NUI's Dredged Material Process pilot study conducted by NUI Environmental Group, Inc. (NUIEG) under contract with the Office of New Jersey Maritime Resources (NJMR), as part of NJMR's Sediment Decontamination Demonstration Project Request for Proposals (RFP). This RFP was issued by NJMR 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.

NUI Environmental Group, Inc. was established in 1996 as a subsidiary to NUI Corporation in response to a crisis that threatened the continuing growth and viability of the New York Harbor. The simplified description of the problem is the inability of the port community to effectively manage large volumes of Harbor sediments or "dredged material". The factors leading to the dredged material management crisis include a naturally shallow harbor; heavy annual sediment deposition from four major rivers; and the closing of a long-time ocean disposal site without an acceptable, high volume disposal alternative for channel dredging.

As a consequence, dredging in the NY/NJ Harbor has been severely curtailed and the resulting accumulation of sediment interferes with shipping lanes and threatens the survival of the NY/NJ Harbor as a principal shipping center. This in turn threatens the economic well being of the entire region. It has been estimated that up to 6,000,000 cubic yards of dredged material must be dredged and disposed on a yearly basis. The proposed deepening of the Harbor would increase this quantity even further. Since the Harbor supports a $20 billion local economy and 200,000 jobs, there is a strong economic imperative to solve the problem.

NUIEG responded to the RFP issued by NJMR, and was selected as one of the contractors to first perform a pilot study and then develop a demonstration-scale facility to evaluate their processing technology under the terms outlined in the RFP. Included on NUIEG's team were:

- Parsons Brinckerhoff – General Engineering Consultant
- Foster Wheeler Environmental Corporation – Technology Consultant

- Converse Consultants – Field Services and Geotechnical Testing
- Environmental Testing Laboratories (ETL) – Analytical Testing
- Data/Analysis Technology (DAT) – Independent Data Validation

The NJMR Sediment Decontamination Demonstration Project, as described in the RFP, includes two principal tasks, a pilot study and a demonstration project. The first phase called for a pilot study facility capable of processing a minimum of 200 gallons of dredged materials, to be provided by NJMR. The purpose of the pilot study is to prove the effectiveness of the NUI Dredged Material Process on a small scale. This report summarizes the findings of the NUIEG Pilot Study.

For the second phase, the RFP stipulated that a larger-scale demonstration facility, based on the technology used and lessons learned in the pilot study and upon other technological improvements and enhancements, be constructed on a waterfront site adjacent to New Jersey waters within the New York/New Jersey Port District. This demonstration-scale facility would be required to process between 30,000 and 150,000 cubic yards, in order to show that the technology could feasibly be utilized in a cost-effective manner at a commercial scale.

The dredged material used in the NUIEG Pilot Study was obtained from the Stratus Petroleum site, located in Newark, New Jersey at the confluence of the Upper Newark Bay and the Lower Passaic River, as shown in Figure 3. The material was provided by NJMR and is reported by NJMR to be representative of typical dredged material from the New York/New Jersey Harbor. NUIEG received the material, which had been dredged and stored in an open-hopper scow, in 30-gallon barrels. Approximately 1,300 gallons were provided to NUIEG for the Pilot Study, of which roughly 650 gallons were processed in the pilot study. An additional 60 gallons were used to determine operating parameters for the facility equipment, and the remaining material was used by NUIEG in our development efforts to further improve the process.

The NUI Dredged Material Process

The NUI Dredged Material Process has been developed to convert contaminated dredged material into a beneficial use product. For the pilot study, the NUIEG technology was implemented in a batch process, as shown in the process flow diagrams (PFDs) presented as Figures 1 and 2. The core components of NUIEG's process include:

- **Sediment Dewatering** – An important aspect of the beneficial reuse program is the ability to significantly reduce the initial water content of the dredged material to enhance its physical/ mechanical properties. The NUI process incorporates dewatering as a significant step in the overall process and has identified several approaches to this key step, depending to some degree on the scale of the operation. For the purposes of the pilot study, simple manual mixing for air drying was selected to achieve the needed reduction of initial water content. Large-scale air-drying to dewater the sediment is not planned for the demonstration project because results from the pilot study indicate that the time and large land area required to achieve dewatering by air-drying would be uneconomical. Therefore, for the NUIEG Demonstration Project, the NUI technology will utilize a mechanical method of dewatering such as a belt filter press or centrifuge.

- **Chemical Oxidation** – For the NUI Dredged Material Process, decontamination of dredged material is achieved through the addition of oxidants. In the case of the pilot study, the oxidant selected was potassium permanganate ($KMnO_4$) in a solution of ionized water. The $KMnO_4$ dosage was estimated to be about 6,000 parts per million (ppm) by weight on the dry solids content of the raw sediment feed material. In preparation for proceeding with the demonstration project, NUIEG has investigated the use of alternative chemical oxidants to reduce processing costs and address environmental concerns related to manganese (Mn) being a regulated constituent. The use of hydrogen peroxide (H_2O_2), either in place of or in conjunction with $KMnO_4$, is being investigated because of the lower cost of H_2O_2 and the resulting reduction or elimination of Mn usage.

- **Stabilizing agents** – Agents such as pozzolanic additives were not employed in the pilot study, but may be incorporated into the NUI Dredged Material Process in the demonstration phase. Pozzolanic additives have been demonstrated to improve physical and leachability characteristics in dredged sediment from the New York/New Jersey Harbor and elsewhere. Key benefits to addition of pozzolanic agents include stabilization of metals and certain organic compounds in the matrix of the processed material; reduction of moisture content via curing to meet beneficial use market criteria and specifications; and provision of additional strength requirements as necessary to meet beneficial use specifications.

Pilot Study Activities

The pilot study was conducted at the NUI Elizabethtown Gas site on Erie Street in Elizabeth, New Jersey from February 13, 2001 to May 7, 2001 in accordance with the NJMR and New Jersey Department of Environmental Protection (NJDEP) approved Pilot Study Work Plan (Work Plan), submitted to NJMR in July 2000. 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.

The NUIEG Pilot Study utilized two buildings; one existing and one newly constructed pre-engineered building. The concrete floors of both buildings, and the area between them, were covered with two separate liners with a berm around their perimeter. The bottom liner was a 20-foot-wide, 6-mil polyethylene sheet, and the top liner was 10-foot-wide, 60-mil rubber roofing membrane with a 4" overlap and sealed at all the seams. In addition, an administrative mobile trailer was placed on-site for NUIEG's field personnel during the pilot study.

Prior to beginning the NUIEG Pilot Study, two 30-gallon drums of dredged material were used to test and troubleshoot the process equipment. This initial operation also allowed NUIEG to set the operating parameters for the study, such as batch size and the operating speed for the mortar mixer.

Prior to processing the dredged material, NUIEG took considerable steps, described in Figure 4, to minimize the variability of raw dredged material feed for each of the six batches to be processed during the study.

Two treatment runs were then performed, with each run consisting of three batches. Batch 1 in each run was a 'starter batch' in which the raw sediment feed was dried and treated with $KMnO_4$ and ionized water to establish a sufficiently dry, treated sediment for recycling and mixing with raw sediment for Batch 2. Recycling of dried sediment was introduced to reduce the drying time of the Batch 2 sediment. Batch 3 was a repeat of Batch 2 to demonstrate reproducibility of results. Process flow diagrams for the two runs are presented in Figures 1A through 1D (Run 1) and 2A through 2D (Run 2). Detailed process log sheets for all runs and batches are presented in the Summary of Field Program, attached as Appendix E.

Samples were taken at various points throughout the process, as shown in the process flow diagrams, and submitted for laboratory analysis to determine both the effectiveness of the process at reducing target contaminant levels, and the suitability of the treated material for beneficial use. All 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.

Samples received by the analytical testing laboratory (ETL) were classified as QA/QC Level 3, an internal designation that indicates 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. Once the analyses were completed and the results tables generated, the data packages underwent QA/QC review as described above. Appendix F contains the Laboratory Work Quality Assurance Plan adhered to by ETL.

The field superintendent, Bill Poole, recorded daily site activities on process log sheets (attached in Appendix E). These log sheets were prepared prior to the start of the pilot study, with their primary purpose being to guide the field personnel through the many steps required to complete the pilot study. During each day's activities, the field superintendent indicated progress of the study by checking off each activity on the log sheets and adding comments (sample weights, etc.) on the right-hand side of the log sheets.

During the processing of dredged material for the pilot study, air quality was monitored using stationary MIE Data Ram particulate meters and a handheld photoionization detector (PID). No elevated readings were detected throughout the monitoring program, which was implemented from February 12, 2001 through February 27, 2001. Air quality monitoring results and logs are presented in the Summary of Field Program, attached as Appendix E. In addition, at the request of Scott Douglas, NJMR's project manager, additional air quality monitoring for semi-volatile organic compounds (SVOCs) was performed using PUF Testing, which derives its name from the polyurethane foam (PUF) filter sorbent media used in the collection of samples for testing.

The PUF sampling program for the NUIEG Pilot Study was performed on both raw and treated material on May 7, 2001, using the protocols outlined in the "Guide to Sorbent-Based Sampling". This guide is published by Air Toxics Ltd. of Folsom, California, the testing laboratory selected for this program, and is included in Appendix G. Analysis of the resulting samples indicated that none of the targeted SVOCs was detected in either of the two samples, thereby confirming that the NUI Dredged Material Process as applied in the pilot study does not pose a health and safety concern related to SVOC emissions.

Pilot Study Results

As shown in Tables 17 and 18, analyses from the two pilot study runs revealed that the following organic contaminants were present at concentrations exceeding New Jersey Residential Direct Contact Soil Clean-up Criteria (RSCC) in at least one of the batches of raw material tested:

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

Benzo(a)pyrene was the only contaminant that exceeded New Jersey Non-Residential Direct Contact Soil Clean-up Criteria (NRSCC). Contaminant levels in the pilot study dredged material are within the typical range of contaminant levels found in New York/New Jersey Harbor sediments.

Review and evaluation of the pilot study test results clearly indicate that the NUI 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. In evaluating the data derived from the pilot study, NUIEG developed average total feed and product concentrations for each run to assess the pilot study performance (i.e. percent reduction of contaminants on a concentration basis). The average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the Site Remediation News, Spring 1995 ("Compliance Averaging", by Brian J. Sogorka, BEERA). This method uses the average contaminant concentration to determine compliance with NRSCC and RSCC, rather than the contaminant concentration of individual samples. Based on this approach, the overall average percent reduction for the organic chemicals were:

Analyte Group	% Reduction		
	Run 1	**Run 2**	**Overall Average (Runs 1 & 2)**
Semi-Volatile Organic Compounds (SVOCs)	60.9	57.6	59.2
Polychlorinated Biphenyls (PCBs)	42.5	-2.5	20.0
Dioxins	32.0	31.3	31.7

The performance data shown above demonstrates the ability of a chemical oxidant solution to reduce contaminant concentrations of the target semi-volatiles, based on the specific feed and chemical dosages used in the NUIEG Pilot Study. The data for PCBs, while showing overall reduced levels, varied over a wide range making these results less conclusive. There is no basis presented in the study test results or procedures to explain the variability of the organic chemical data, other than the fact that dredged material has a high degree of inherent variability in its physical and chemical make-up. To address the variability of the performance data discussed above, NUIEG intends to utilize a slurrying process for transfer of the sediment to the dewatering system in the demonstration facility treatment procedure to enhance the raw material homogenizing process prior to chemical treatment. This slurrying process is expected not only to reduce the variability of the dredged material in the demonstration project, but also to improve oxidant mixing with the sediment, with a corresponding improvement in contaminant reduction.

Semivolatile Organic Compounds (SVOCs) & Polycyclic Aromatic Hydrocarbons (PAHs)

Overall, the process achieved significant reduction of the seven target organic contaminants with concentrations in the sediment feed within one order of magnitude of the RSCC, as shown in Tables 17 and 18. The average percent reduction in Run 1 was about 60.9% and for Run 2 about 57.6%. Only one of these seven contaminants, benzo(a) pyrene, was above the NRSCC.

For both runs, the NUI process reduced average contaminant levels below the RSCC limits.

PCBs

The average percent reduction for total PCBs in Runs 1 & 2 was 42.5% and –2.5% (increase of 2.5%) respectively. Although the percent reduction for Run 1 was significant, it should be recognized that, except for one batch, all the concentrations were below the RSCC level.

Dioxins

The average percent reduction in Runs 1 and 2 was 32.0% and 31.3% respectively. While there are no RSCC or NRSCC criteria for dioxins, average dioxin concentrations for both runs were below the 1 part per billion (ppb) "non-health based" criteria recommended by NJDEP.

Suitability of Processed Material for Beneficial Use

The sampling and analysis plan (SAP) for a particular beneficial use is approved by the NJDEP on a case-by-case basis and takes into account specific facility requirements. The NJDEP uses New Jersey's Non-Residential and Residential Direct Contact Soil Clean-up Criteria (NRSCC and RSCC, respectively) as guidelines for the protection of human health and terrestrial ecosystems. Analytical results of the processed sediment from the pilot study show that all processed sediment is below the NRSCC.

Among the tests required for upland placement of processed dredged material is the Toxicity Characteristics Leaching Procedure (TCLP). TCLP is a subsurface fate and transport model that measures the potential of toxic constituents in a waste to leach and contaminate the groundwater causing environmental or health concerns. All treated sediment was within TCLP regulatory levels, indicating that the material processed using the NUI Dredged Material Process met TCLP criteria. In addition to TCLP, Multiple Extraction Procedure (MEP) analysis was performed on NUIEG's processed sediment to further assess the potential of contaminants to leach from the material. The results of these analyses indicate that concentrations of all target constituents with the exception of manganese were either below method detection limits (MDLs) or groundwater criteria (GWC). NUIEG intends to address the manganese concentrations in the final product in its demonstration project through the use of alternative chemical oxidants in place of or in conjunction with $KMnO_4$, and/or through the addition of stabilizing agents to the processed material to reduce the potential of manganese leaching from the material. Therefore, based on the TCLP, MEP, and analytical results, with process improvements to address manganese concentrations as discussed above, the processed material would be suitable for upland beneficial uses such as in landfills and as remediation material.

Prior to use as remediation material or in landfills, the material may need to be amended with pozzolanic agents such as fly ash and cement to improve its strength and workability and to stabilize metals. Strength and workability improvements through the addition of fly ash and cement result from cementation and hydration reactions with the dredged material, and have been demonstrated to be effective in previous studies, such as those documented in the "Guidance Document for Processing and Beneficial Use of Dredged Material as Fill", prepared for the Port Authority of NY&NJ by Parsons Brinckerhoff, May 1999 (attached as Reference Document 1). Stabilization of metals is achieved through reduction of the solubility and chemical reactivity of the metals resulting from changes in pH and alkalinity brought about through the addition of pozzolanic agents.

According to "The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters", NJDEP, 1997, there is a substantial need for landfill cover in New Jersey. As of 1997, there were 25 landfills in operation in New Jersey with "enormous" quantities of earthen materials needed for daily, intermediate, and final cover.

To further determine the suitability of the dredged material processed during the pilot study, NUIEG has evaluated the results from physical testing against the NJDEP Landfill Requirements for Fill, as presented in Table 5.4 of the "Guidance Document for Processing and Beneficial Use of Dredged Material as Fill" (Reference Document 1). Based on a review of these requirements, NUIEG has determined that the material processed during the pilot study would be suitable for use as either impermeable cap/liner material or unclassified fill.

Conclusions and Recommendations

The evaluation of the analytical results from the pilot study have confirmed that the NUI Dredged Material Process has demonstrated the ability to reduce target contaminant levels in dredged material from the New York/New Jersey Harbor to levels below NRSCC levels. In addition to the material being below TCLP criteria, is significant in that it is by these standards that the processed material is measured for potential upland beneficial reuses, such as daily landfill cover and brownfields remediation material. In addition, contaminant levels that exceeded the RSCC in the sediment feed were reduced below the RSCC limits.

NUIEG's innovative technology represents a low-cost approach to the creation of upland beneficial reuse products from New York/New Jersey Harbor dredged material. Furthermore, the process is non-thermal and runs at ambient temperature and pressure.

To further demonstrate the ability of the NUI Dredged Material Process to reduce contaminant levels and create beneficial use products, NUIEG intends to develop a demonstration facility, as prescribed by NJMR's 1998 RFP. This larger-scale facility, which will process at least 30,000 cubic yards of dredged material, will provide NUIEG the opportunity to apply its technology to a wider range of sediment contaminant levels than those used in the pilot study. In addition, the demonstration project will allow a better assessment of the cost-effectiveness of the technology to be made, in keeping with the goals of the RFP to produce a commercially viable decontamination process capable of treating sediments at a commercial scale for $35 per cubic yard.

Figure 5 presents our current conceptual process block flow diagram for the Demonstration Facility. The core objectives of the demonstration plant remain aligned with those of the NUIEG Pilot Study (dewatering, contaminant reduction, and beneficial use), with the core elements in the plant including:

- Sediment Dewatering Unit
- Addition of Oxidizing Agent(s)
- Beneficial Use Addition System

The results presented in this report clearly demonstrate that the NUI Dredged Material Process has the ability to reduce organic chemical contaminants in dredged material from the New York/New Jersey Harbor. As such, the NUI Dredged Material Process warrants further evaluation as part of the NJMR Demonstration Program.

1.0 Introduction

In an effort to promote the development of new technologies to process contaminated dredged materials in a manner that renders them useful, known as beneficial use, the Office of New Jersey Maritime Resources (NJMR) 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 Harbor.

NUI Environmental Group, Inc., (NUIEG) was among those selected by NJMR to demonstrate a new and innovative technology to process dredged material into marketable end products. The overall scope of the NJMR-sponsored project involves two principal tasks, a pilot study and a larger-scale demonstration project. The initial stage of the project consisted of a pilot study to demonstrate the effectiveness of the NUI 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. This report presents the results of the NUIEG Pilot Study, and provides conclusions related to the success of the pilot study and recommendations for continuance to the demonstration project phase.

1.1 Project Background

In March of 1998, NJMR 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 NJMR Program

The NJMR 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 NJMR called for a pilot study facility capable of processing a minimum of 200 gallons of dredged materials, to be provided to the contractor by NJMR. The purpose of the pilot study is to prove the effectiveness of the processing technology on a small-scale before proceeding to the larger-scale demonstration facility. Dredged material for the pilot study, taken from the Stratus Petroleum site in Newark, New Jersey, was provided by NJMR.

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 would be required to process between 30,000 and 150,000 cubic yards, 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 – NUI Environmental Group, Inc.

The pilot study was managed by NUIEG, a subsidiary of NUI Corporation, Inc. NUI is a multi-state gas distribution sales and services company based in Bedminster, New Jersey, with a history of nearly 150 years of service to the New Jersey community.

Overseeing the pilot study for NUIEG as Project Executive was Michael Behan, President of NUIEG. Mr. Behan has held management positions at NUI for nearly 20 years, and presently serves as an executive officer of NUI Corporation.

The project manager for NUIEG was Daniel J. Edwards, vice president of NUI Environmental Group, Inc. Mr. Edwards has extensive experience in the management and commercialization of new products and technologies, and is responsible for NUIEG's New York/New Jersey Harbor Project, which includes activities directed toward the design, construction and operation of a regional, permanent, full-scale dredged material processing decontamination and transfer facility.

Joseph Kelly managed on-site operations for the NUIEG Pilot Study. Mr. Kelly, a chemical and environmental engineer, has over 30 years of industry experience in process engineering, operations, and business planning. As site manager, he was responsible for the overall execution of the pilot study in accordance with the project's work plan as approved by NJMR and the New Jersey Department of Environmental Protection (NJDEP). Mr. Kelly has served as a consultant to NUIEG since 1997, assisting in the engineering, environmental and business development arenas.

William Poole coordinated daily site activities for the pilot study as site superintendent. Mr. Poole has over 30 years of government service, most recently with the United States Defense Department, as an engineering technician, master mechanic, and machinist. Since retiring from the Defense Department in 1996, Mr. Poole has worked as an independent consultant provided technical, inspection and operating services to clients such as NUIEG.

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 the NUIEG Pilot Study, providing engineering and permitting services for the facility, and supervising environmental and geotechnical testing efforts throughout the study. 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.

Leading the effort for PB was Vahan Tanal, P.E., vice president and director of the firm's marine and coastal engineering division. Mr. Tanal has over 30 years of experience in the field of geotechnical engineering, with special expertise in dredging, CDF design, and the beneficial use of amended contaminated dredged material. He has been instrumental in the design and construction of several large-scale stabilization/ solidification and CDF projects, including the Boston Central Artery Dredged Material Disposal program, and the Fort McHenry Tunnel Nearshore Confined Disposal Facility project. Assisting Mr. Tanal in PB's efforts for the NUIEG Pilot Study were several experienced professionals, including:

- Jeff Schechtman, P.E., a senior marine structural engineer with 6 years of experience in the design and construction of marine facilities. Mr. Schechtman provided engineering services related to the development of the facilities, including cost estimating, and coordinated the efforts of the pilot study participants.
- Andrea Rosenthal, a chemical and environmental engineer with PB, led the permitting efforts for the facility. Ms. Rosenthal has extensive experience in the preparation of environmental documents including permit applications, environmental impact statements (EISs), and environmental assessments (EAs). She has been in close contact with the permitting agencies with jurisdiction over the pilot study facilities for this project for the past year.

1.2.3 Technology Consultant – Foster Wheeler Environmental Corporation

Foster Wheeler Environmental Corporation (FWENC) served as the technology consultant for the pilot study, providing assistance in development of the pilot test program, evaluation of the analytical results, preparation of the engineering level material balances, and contributing to the final report.

Foster Wheeler Environmental Corporation is an international, full-service environmental consulting, engineering, and remediation contractor providing comprehensive environmental services in all aspects of hazardous and nonhazardous waste management. FWENC's dredging project experience covers a number of projects on both the East and West Coast including the New Bedford Harbor Project.

Leading the effort for FWENC was Bruce McClellan as Project Director. Mr. McClellan has over 28 years of experience in civil engineering projects including port development and associated dredging projects. Assisting Mr. McClellan in FWENC's efforts for the NUIEG Pilot Study were several experienced professionals including:

- Roger Gaire, P.E., a principal engineer with over 41 years experience in process engineering, environmental engineering, dredging and dredge related activities. Mr. Gaire developed the engineering level material balances.
- Dr. Peter Dunlop, a senior consulting engineer with over 26 years experience in civil and environmental projects in both engineering and design, and construction management. Dr. Dunlop is currently serving as a consultant to the Port Authority of New York and New Jersey in the area of dredging and dredged material disposal. Dr. Dunlop provided technical assistance in developing the Pilot Study report with focus on the nature and characteristics of NY/NJ Harbor sediments.
- Robert Hopman, P.E., a senior consulting engineer with over 30 years experience in navigation, dredging and dredge related activities. Mr. Hopman provided assistance in developing the Pilot Study with focus on the dredged sediment handling and treatment aspects.
- Gregory Hartman, P.E, a senior consulting engineer with 31 years experience in all aspects of waterway engineering with emphasis on dredging and disposal, and contaminated sediment remediation. Mr. Hartman provided assistance in developing the pilot sampling and analysis plan and review of the test results of the sediment treatment.

1.2.4 Testing Laboratories

Converse Consultants and Environmental Testing Laboratory (ETL) performed the geotechnical and environmental testing, respectively, for the pilot study. Both laboratories worked under subcontract to Parsons Brinckerhoff.

Converse Consultants has been involved in numerous recent dredging and dredged material treatment projects in the New York/New Jersey Harbor, and provided field services including environmental monitoring, and physical testing of the dredged material to assess its suitability for the proposed beneficial end uses. Converse also was responsible for the environmental and geotechnical sampling and shipping, as well as preparation and enforcement of the Health and Safety Plan (HASP). Donald Smith was Converse Consultants' Field Sampling Manager and Sinnadurai (Nathan) Sockanathan served as Converse Consultants' Quality Assurance (QA) Officer.

Environmental Testing Laboratories (ETL) of Farmingdale, NY (NJ Certification Number: 73812) and their testing partner Pace Analytical Services of Minneapolis, Minnesota. (NJ Certification Number: 63002) performed the environmental testing for the NUIEG Pilot Study. Pace Analytical Services performed the analysis for dioxins and furans, while ETL conducted all of the other analytical tests. Remo Gigante served as ETL's Program Manager, Peggy Paragoris served as Laboratory Manager, and Eleni Stavroulakis was ETL's Laboratory QA Officer. Chuck Sueper was Program and Laboratory Manager, and Steve Hannan served as QA Officer for Pace Analytical Services.

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 the NUIEG Pilot Study. Dr. Mitchum is an internationally recognized expert in the analytical chemistry and mass spectrometry of trace contaminants, EPA priority pollutants and quality assurance procedures. While directing the Quality Assurance Division of the U.S.

Environmental Protection Agency (EPA) in Las Vegas, Nevada, Dr. Mitchum led the development of regulatory methods and associated quality assurance procedures presently in use today by the EPA for measuring toxic organic compounds in hazardous waste matrices, air, soil and tissue. These methods have served as the basis for EPA regulatory activities in quality assurance and the monitoring area.

1.3 Project Objectives

1.3.1 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 on the order of 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, compactibility) of the material, which are critical to the successful beneficial use of the material. Dewatering is a core component of the NUI Dredged Material Process, and one of the primary objectives of the NUIEG Pilot Study was to assess the effectiveness of the dewatering process.

1.3.2 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 applicable thresholds are the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NRSCC) and the New Jersey Residential Direct Contact Soil Cleanup Criteria (RSCC), with the applicability of these thresholds depending on the intended beneficial use for the material. Contaminant reduction is a core component of the NUI Dredged Material Process. Consequently, a second objective of NUIEG's Pilot Study was to assess the effectiveness of the process to reduce target contaminants to levels below the applicable thresholds (NRSCC or RSCC) for the proposed beneficial use.

1.3.3 Beneficial Use

Estimated dredging requirement of up to 6,000,000 cubic yards per year in the New York/New Jersey Harbor have resulted in a disposal crisis in the Harbor in recent years. The proposed deepening of the Harbor would increase this quantity even further. As a consequence, dredging in the NY/NJ Harbor has been severely curtailed and the resulting accumulation of sediment interferes with shipping lanes and threatens the survival of the NY/NJ Harbor as a principal shipping center. In the interest of solving this problem, significant emphasis has been placed on beneficial use of dredged material, in which dredged material is processed such that it can be used in a productive manner as opposed to merely being disposed. In addition to 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 NUIEG has established its objective, consistent with the goals of the NJMR 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.

2.0 NUIEG Technology Pilot Process Description

The NUI Dredged Material Process has been developed to convert contaminated dredged material into a beneficial use product. The principal elements of the technology are moisture conditioning or dewatering, chemical oxidation for contaminant reduction and beneficial use conditioning. For the pilot study, the NUI Process was implemented in a batch process, as shown in the process flow diagrams (PFDs) presented as Figures 1 and 2. The pilot process achieved contaminant reductions via addition of a chemical oxidant, potassium permanganate ($KMnO_4$), in an ionized water solution and dewatering by simple air-drying facilitated by manual mixing.

The following provides a summary of process employed during the NUIEG Pilot Study to assess the contaminant reduction and dewatering capabilities of the NUI Process.

2.1 Dredged Material Dewatering

An important aspect of the beneficial use program is the ability to significantly reduce the water content of the dredged material to enhance its physical/ mechanical properties. The NUI Process incorporates dewatering as a core element in the overall process and has modified its process flow scheme to include several approaches to this key step, depending to some degree on the scale of the operation.

For the purposes of the pilot-scale tests, simple air-drying facilitated by mechanical mixing was employed as the dewatering step to achieve the needed reduction of the raw sediment's initial water content. This approach was taken during the pilot study due to the relatively small volume of material to be processed (approximately 3 cubic yards). In addition, this approach allowed NUIEG to assess if air-drying would be a viable approach to dewatering during large-scale operations. The wet sediment was spread out in pans to dry and periodically manually mixed and re-spread in the pans for continued drying. The approach during the pilot study also provided a simple method for mixing in the chemical oxidant and achieving as uniform a mixture as practical, recognizing the inherent heterogeneity of the sediment.

The amount of water evaporated can be determined from the water content in the process streams detailed in the Engineering Material Balances shown in Tables 1 to 6. The air-drying technique of dewatering employed in the pilot study successfully reduced the moisture content in the sediment. Accelerated air-drying of the sediment was expected to be achieved through the recycling of partially dried processed material from the previous batch by mixing it with fresh wet sediment feed. This is a commercially-proven technique used in land farming treatment of municipal sludge.

Large-scale air-drying to dewater the sediment is not planned for the Demonstration Project because we found from the pilot tests that the time required and the large land area required to achieve dewatering by air-drying was uneconomical. Therefore, for the NUIEG Demonstration Project, the NUI Process will utilize a mechanical method of dewatering such as a belt filter press or centrifuge. This is further discussed in Section 5.2.1.

2.2 Chemical Oxidant Addition

Chemical oxidant addition was achieved during the pilot study using a solution of $KMnO_4$ in ionized water. The addition of $KMnO_4$ was achieved using a 12-cubic-foot, 12-horsepower mortar mixer (Stone Construction Equipment Company, Model No.1285PM) for each of the six batches as shown in the process flow diagrams. This method of oxidant addition allowed, at the pilot-scale, the greatest degree of quality control over the amount added and achieved a reasonable degree of homogenization, thereby keeping down chemical oxidant cost. The target dosage of $KMnO_4$ was based on preliminary bench-scale tests conducted by a supplier of $KMnO_4$. The bench-scale tests used samples of dredged material from the New York/New Jersey Harbor supplied by NJMR and provided a preliminary basis for NUIEG to estimate the addition rate required for the pilot study. The dosage was estimated to be about 6,000 parts per million (ppm) by weight of the dry solids content of the feed material.

The ionized water dosage for Batches 1, 2 and 3 of Run 1 were 15.5, 35 and 25 gallons respectively, and for Run 2 were 7, 14 and 14 gallons respectively. These dosage quantities are shown in detail in the material balances (Tables 1 through 6).

NUIEG projected a required reaction time for oxidation of organics in the range of several hours, based on the body of available technical information. Because the pilot study also required the dredged material to be dried, the actual time between the sampling for before and after results was longer. The times for each of the three batches in Run 1 were about 72 hours, and for the three batches in Run 2 the times were 9 to 18 days because all of the sediment drying occurred after $KMnO_4$ addition.

2.3 Beneficial Use Conditioning

In addition to the process elements applied in the pilot study, stabilizing agents (such as pozzolanic additives) may be employed as needed in the Demonstration Project to achieve the desired beneficial use characteristics. Pozzolanic additives 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. Given the successfully demonstrated track record of pozzolanic agents and the small volume of dredged material handled, this element of the NUI technology was not executed during the pilot study. A further discussion of beneficial use conditioning is presented in Section 5.2.3.

2.4 Pilot Facility Equipment

The following comprises the primary equipment utilized in the NUIEG Pilot Study:

- Twelve-cubic-foot, 12-horsepower mortar mixer (Stone Construction Equipment Company, Model No.1285 PM), used periodically to either homogenize the sediment or to mix the $KMnO_4$ solution into the sediment;
- 400-pound capacity platform scale (Pelouze, Model No.4040), used to keep track of the weights of sediment throughout the various process steps for the Engineering Material Balances;
- 16-cubic-foot drying pans (Jackson No.45 Cement Mixing Box), used for air-drying of the wet sediment;
- Ion Collider™ unit, provided by Big Blue, used to ionize the water utilized in the process;
- Propane powered fork lift, 7 feet high and 7 feet long with 42-inch-long forks, used to move drums of sediment through the process;
- 30-gallon drum lifter adapter for forklift;
- ½-horsepower gas-powered cultivator, used to mix (i.e. turn over) the sediment to accelerate drying; and
- Drying lab for monitoring sediment moisture content (located inside the drying room). Drying Procedure used to track moisture content in small sediment samples was in accordance with ASTM 2216.

3.0 Pilot Study Project Activities

3.1 Project Planning

3.1.1 Project Plans and Documents

The pilot study was conducted from February 13 to May 7, 2001 in accordance with the NJMR- and NJDEP-approved Pilot Study Work Plan (Work Plan), submitted to NJMR in July 2000. 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 NUIEG Pilot Study was conducted at the Elizabethtown Gas Facility located on Erie Street in Elizabeth, New Jersey. This site was chosen because it is owned by NUIEG's parent, NUI Corporation, thereby facilitating establishment of the temporary pilot facility. In addition, because the site contains an active utility operation, the desired level of site security and access control measures were already in place.

3.1.3 Permits

The NUIEG Pilot Study facility did not incorporate any permanent structures, nor did the process generate point source air emissions or result in discharges to surface water or groundwater. Consequently, permits were not required for the pilot study.

3.2 Site Access and Security

Access to the site of NUIEG's pilot study was through the NUI Elizabethtown Gas facility's main gate near the intersection of Erie Street and Florida Avenue in Elizabeth, New Jersey. An electronic gate controlled site access, and all participants and visitors to the NUIEG pilot facility during business hours were required to sign in with security personnel prior to entering the site. All NUIEG personnel and visitors were required to notify security personnel when exiting the facility as well. Access to the site during evenings and weekends was limited to NUIEG personnel conducting the Pilot Study.

In the event that NUIEG personnel worked alone at the pilot facility, the following procedure was implemented to ensure their safety:

- Field personnel would check in at the security desk and notify security personnel that they would be working alone at the facility;
- The field personnel's cellular phone number was provided to security personnel. This cell phone remained activated at all times while the field personnel was working alone at the facility;

- All health & safety requirements as specified in the project HASP were strictly followed.
- Field personnel would check in with security personnel at two-hour intervals when working alone on-site. If the field personnel failed to check in, the security personnel would call the field personnel to verify their safety; and
- Field personnel would check out at the security desk upon leaving the facility.

3.3 Site Preparation

The NUIEG Pilot Study utilized two buildings; one existing and one newly constructed pre-engineered building. The concrete floors of the both buildings, and the area between them, were covered with two separate liners with a berm around their perimeter. The bottom liner was a 20-foot-wide, 6-mil polyethylene sheet, and the top liner was 10-foot-wide, 60-mil rubber roofing membrane with a 4" overlap and sealed at all the seams.

3.3.1 Buildings

The existing building is a 31-foot by 15-foot cinderblock building with a 2-foot square louvered air intake and a 10-inch exhaust fan. The building's floor is concrete, and includes heating pipes. In addition, portable air heaters were utilized to create an environment approximating the regional annual average ambient air temperature. This building was used as a drying room to avoid freezing conditions during cold weather. This room also contained the ionization system used to develop ionized water and $KMnO_4$ solution.

The new temporary building constructed for the pilot study was erected 15 feet from the drying room on a smooth existing 74-foot by 43-foot concrete slab, which was the previous site for two large gas processors. The new building was designed and constructed for use as a process building for the decontamination pilot study. Features of the temporary process building include:

- Pre-engineered temporary steel building, 30 feet long by 20 feet wide, with 10 feet clear to the underside of the main room support steel;
- 26-gauge galvanized steel panel walls and roof, insulated and sealed with white vinyl tape;
- One large chain-operated overhead door, 8 feet high by 8 feet wide, for forklift access on the front end of the building;
- Two personnel doors, 3 feet by 7 feet at the front and back of the building;
- One 18-inch square electrically-operated intake louver;
- One exhaust fan rated to produce 20 exchanges per hour with static operated exhaust louver (1-foot diameter);
- Fluorescent lighting to produce minimum 20-foot candles;
- Two 5-kw electric unit heaters, 440v in overhead to maintain ambient temperature with thermostat; and
- Two 120-v 60-hz outlets, one at each end of the building.

3.3.2 Office Facilities and Utilities

A mobile field office trailer, 44 feet long by 10 feet wide, was rented for the pilot study. The trailer contained two separate offices complete with:

- 10' long desk areas
- Two separate phone lines
- One separate fax phone line and fax machine
- Electric service
- Computer with internet access and printer
- Table and chairs for conference room
- Refrigerator
- Heat and or air conditioning
- Drafting table

- Storage room

3.4 Materials Handling and Preparation

3.4.1 Source Material Selection and Dredging

The dredged material used in the NUIEG Pilot Study was obtained from the Stratus Petroleum site, located in Newark, New Jersey at the confluence of the Upper Newark Bay and the Lower Passaic River, as shown in Figure 3. The material was provided by NJMR and is reported by NJMR to be representative of typical dredged material from the New York/New Jersey Harbor. The dredged material, which had been stored in an open-hopper scow, was received at the site in 30-gallon barrels. NJMR reconstituted the dredged material with dredge site water prior to placing it in the barrels. Approximately 1,300 gallons were provided to NUIEG for the pilot study, of which approximately 650 gallons were processing during the pilot study. An additional 60 gallons were used to determine the operating parameters for the facility equipment, and the remainder was used by NUIEG in our efforts to further improve the process. Characterization of the material is presented in Section 4.1 of this report.

3.4.2 Dredged Material Preparation

NUIEG took considerable measures to minimize the variability of raw dredged material feed for each of the six batches to be processed during the study. The following procedure was used (see Figure 4 for graphical depiction of procedure):

- Twenty-two (22) drums of raw dredged material, representing approximately 660 gallons, were opened and distributed evenly to six pans;
- The contents of the pans were mixed in a 12-cubic-foot mortar mixer to homogenize the material in each pan;
- Twenty-four (24) drums, each containing 27 to 28 gallons of material were then filled with the contents of the six pans; and

- Six batches of homogenized material were then created by grouping four drums containing material from different pans.

The resulting batches, containing approximately 108 gallons each, were then named according to the following convention:

- R1/B1 – Run 1, Batch 1
- R1/B2 – Run 1, Batch 2
- R1/B3 – Run 1, Batch 3
- R2/B1 – Run 2, Batch 1
- R2/B2 – Run 2, Batch 2
- R2/B3 – Run 2, Batch 3

3.5 Material Processing

3.5.1 Run 1 and 2 – Field Processing Procedures

Two treatment runs were performed, with each run consisting of three batches. Figures 1 and 2 present process flow diagrams of the batch procedure used by NUIEG to process the dredged material for the pilot study, with Figures 1A through 1D corresponding to Run 1 procedures and Figures 2A through 2D representing procedures for Run 2. A process description is presented below. Detailed process log sheets for all runs and batches are presented in the Summary of Field Program (Appendix E).

The two runs generally employed the same basic procedures, which included manual mixing and air drying as the dewatering step to achieve the desired moisture content and applying the $KMnO_4$ for decontamination. To accelerate the dewatering element of the NUI Process during each run in the pilot study, dried material from the first and second batches was combined with wet material of the subsequent batches. This "recycling" of the previously dried material with fresh wet material, is a common practice used to reduce the time required for dewatering sewage sludge in land-farming operations. The procedures followed in each of the two Runs are described below and the sequential steps for each run are shown in Figures 1 and 2.

Run No. 1

In Batch 1, the 'starter batch', raw sediment feed was first dried and then blended with $KMnO_4$ in an ionized water solution for decontamination and further drying to establish a sufficiently dry, processed sediment. This dried material was used to accelerate the dewatering process in the next batch by recycling and mixing with fresh, wet sediment for Batch 2.

In Batches 2 and 3 of Run 1, the dried recycle material from the previous batch was first blended with raw wet sediment feed and the combined feed plus recycle were dried to about 70% solids by weight before being blended with $KMnO_4$ and ionized water for decontamination and further dried to achieve the desired water content. Unfortunately, the mechanical mixer jammed during this step and could not blend the dried solids with the $KMnO_4$ solution without the addition of more water to reduce the viscosity of the mix. This precluded determining whether recycling of dried material was effective in accelerating the drying cycle.

Run No. 2

As was the case for Run 1, Batch 1 was the 'starter batch'; however, in this run, the $KMnO_4$ solution was applied to the wet sediment and the combined mixture was allowed to dry to the desired water content.

In Batches 2 and 3 of Run 2, dried recycle material from the previous batch was mixed with wet feed and the $KMnO_4$ solution was added to this mixture immediately after it was determined that the wet feed plus recycle were thoroughly blended. The blended material was then allowed to react and dry.

The drying curves for Run 2, attached in Appendix E, although very approximate in accuracy (due to the difficulty of obtaining representative samples during the drying cycle), indicate that for batches 2 & 3 (employing dried recycle sediment) to reach a moisture end point of 30 – 40% on a dry solids basis the drying time ranged from 14 to 18 days, with an average of 15.4 days. The drying curve data further indicate that, on average, there appeared to be about a 17% reduction in drying time for Batches 2 and 3 as compared to Batch 1

3.5.1.1 Run 1 Field Processing Procedures: Batch No. 1

Due to limitations of the processing equipment, two half-batches of 54 gallons each (i.e. two drums filled with 27 gallons each) of wet raw dredged material were sequentially screened to remove debris and oversize material, weighed and then mixed for a minimum of 20 minutes to ensure uniformity (note that no debris or oversize material was produced). After mixing, each half-batch of material was sampled (R1/B1/S1A & R1/B1/S1B), and then the samples were composited into a single sample (R1/B1/S1). This composite sample was submitted to ETL for analytical testing.

The mixed, wet sediment from each half-batch was then placed in one of the Jackson drying pans and moved into the drying room. When evenly spread out in the pan, the wet material was about eight inches deep. The material in the pans was tilled at regular intervals and the moisture content was taken frequently in order to develop sediment drying curves (see Appendix E). Drying logs were maintained to track drying rate as a function of temperature and humidity. The initial drying procedure called for the moisture content of the dredged material to be reduced to 30-35% by weight, where the moisture content (%) is calculated as the weight of moisture divided by the weight of dry solids times one hundred.

After drying, the material from each half-batch was placed back in the two drums and weighed. It was then placed back in the mixer, one drum at a time, because the mixer could not handle the combined volume of two drums of dry sediment. The recommended dosage of potassium permanganate and ionized water, consisting of approximately three to nine gallons of ionized water and 14 ounces of potassium permanganate ($KMnO_4$), was then added to the mixer and blended for a minimum of 20 minutes. The amount of ionized water added generally was determined by the amount required for thorough mixing that would eliminate the formation of lumps in the sediment.

The half-batches (consisting of two drums each) of treated sediment were again placed into two Jackson pans, manually mixed, and then moved into the drying room where the processing reactions and drying occurred. As before, the dredged material was tilled regularly to promote the drying process. The process reactions were expected to be complete within a few hours, but a minimum of 48 hours was provided. If after 48 hours the moisture content was greater than 40% by weight, additional drying time was provided. After thorough mixing in the pans as a result of the extensive tilling, two samples (R1/B1/S2A & R1/B1/S2B) were taken and then composited into a single sample (R1/B1/S2). This resulting composite sample was then submitted to ETL for analytical testing.

At the completion of Batch 1 processing, the treated material from the two half-batches was placed back into four drums and weighed. These drums were then readied for use as recycle material in Run 1, Batch 2.

3.5.1.2 Run 1 Field Processing Procedures: Batch No. 2

Batch No. 2 was divided into four quarter-batches of roughly 27 gallons of raw wet material each due to the limited size of the processing equipment. These quarter-batches were sequentially screened to remove debris, weighed, mixed for a minimum of 20 minutes to ensure uniformity, and then sampled (R1/B2/S3A; -S3B; -S3C; and -S3D). The four S3A/B/C/D samples were composited into a single sample (R1/B2/S1). This resulting composite sample was then submitted to ETL for analytical testing.

For each quarter-batch, one drum of dry $KMnO_4$-treated sediment was next added to the raw wet material already in the mixer, and the combined material was again mixed for 20 minutes, sampled (R1/B2/S4A; -S4B; -S4C; and -S4D), placed in a drying pan, and then moved into the drying room where the drying procedure used during Batch No. 1 again was followed. The four S4A/B/C/D samples were composited into a single sample (R1/B2/S2). The resulting composite sample was then submitted to ETL for analytical testing.

After drying, the sediment from each quarter-batch was placed back in the two drums and weighed. Then it was placed back in the mixer, one drum at a time (because the mixer could not handle two drums of dry sediment) where the recommended dosage potassium permanganate solution (containing 14 ounces of $KMnO_4$) for each drum was added and blended for a minimum of 20 minutes. Note, as in Batch No. 1, that the amount of ionized water added was determined by the amount required for thorough mixing.

The four quarter-batches (of two drums each) of treated material were again placed in the drying pans, manually mixed, and then moved into the drying room where the decontamination reactions and drying proceeded as in Batch No. 1. At the end of the reaction/drying period, samples (R1/B2/S5A; -S5B; -S5C; and -S5D) were taken and composited into a single sample (R1/B2/S3). This resulting composite sample was then submitted to ETL for analytical testing.

At the completion of Batch No. 2, the treated material was placed in eight drums and weighed. Four drums were then readied for use as recycle in Batch No. 3, and the other four drums were stored as finished product.

3.5.1.3 Run 1 Field Processing Procedures: Batch No. 3

The process steps for Batch No. 3 were identical to those of Batch No. 2, with the exception that the recycle material for Batch No. 3 was derived from Batch No. 2.

3.5.2 Run 2 Field Processing Procedure

Figures 2A through 2D present the process flow diagrams for Run No. 2. Run No. 2 batch operations are similar to Run No. 1, with the exception that the $KMnO_4$ and ionized water were added during the first mix/blend step as shown in the process flow diagrams.

3.6 Sample Management

All 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".

3.6.1 Sample Identification

Each sample taken during the pilot study 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:

- Run number from which the sample was taken (i.e. all samples from the first run were given the primary identifier "R1");
- Batch number from which the sample was taken (i.e. all samples from the second batch were given the secondary identifier "B2"); and
- Sample number (i.e. the first sample in a given batch was given the sample number "S1").

Duplicate samples also were taken and submitted in accordance with the project's QA/QC procedures. Consequently, each sample was assigned an "-A" or "-B" identifier at the end of the sample number. As an example, the third sample taken from the second batch of the first run was given the identifier "R1/B2/S3-A", and its duplicate was given the identifier "R1/B2/S3-B".

3.6.2 Sample Equipment and Tool Decontamination

Sampling equipment used in the NUIEG Pilot Study was decontaminated prior to initial use, and between each subsequent use. Decontamination of equipment was performed using a Hotsy-type pressure washer where applicable and a Liquinox (or equivalent) non-phosphate detergent. After washing, the equipment was double-rinsed using distilled water and allowed to air dry. In some cases, the equipment was dried with clean paper towels.

3.6.3 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 NUIEG field 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 were shipped via UPS next-day air to the appropriate laboratory for analysis.

3.7 Testing Procedures

3.7.1 Startup

Prior to beginning the NUIEG Pilot Study, two 30-gallon drums of dredged material were used to test and troubleshoot the process equipment and to set the operating parameters for the study, such as batch size and the operating speed for the mortar mixer.

3.7.2 Pilot Study Testing

Two types of testing were conducted during the pilot study — 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.

Thirty-four (34) samples were taken and analyzed for both analytical and geotechnical parameters during the course of the NUIEG Pilot Study, including two samples (original and duplicate) taken at each of eight (8) sampling points in Run 1 and Run 2, as well as a raw make-up water sample (original and duplicate). The sampling points were selected such that raw and processed material were sampled and analyzed in each batch of each run in order to provide sufficient data to develop engineering-level material balances and to evaluate the process's contaminant reduction efficiency. In addition, 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.

In Batch 1 of each run, two sampling points were specified:

- Homogenized and screened sediment feed; and
- Batch 1 product (after treatment with $KMnO_4$ and drying).

Because subsequent batches (2 and 3) of each Run included a recycle step, three (3) sampling points were established for these batches, including:

- Homogenized and screened sediment feed;
- Combined feed and recycle material; and
- Product (after treatment with $KMnO_4$ and drying).

A summary of the samples and tests performed on each sample is presented in Table 7.

3.7.2.1 Analytical Sampling & Testing Requirements

The Sampling and Analysis Plan (SAP) is detailed in Section 4.1 of the NJMR- and NJDEP-approved Pilot Study Work Plan dated July 2000. Process flow diagrams (Figures 1 and 2) for the pilot study identify the sample locations and the sampling procedures used by NUIEG to prepare composite samples for testing. Analytical methods used and sampling requirements are shown in Table 8.

The sampling procedures are further detailed in the process log sheets found in Appendix E. The associated Chain of Custody forms for all the samples are found in Appendix B. Results of the analytical testing are presented in Section 4 of this report. Full analytical laboratory reports are presented in Appendix C.

In addition to the sampling and testing requirements outlined in the Work Plan, Scott Douglas, NJMR's project manager, requested that NUIEG perform air quality testing, known as PUF (polyurethane foam) testing, to investigate the existence and concentrations of semi-volatile organic compounds (SVOCs) that may be present in the air in the vicinity of the raw material and/or resulting from using the NUI process to treat the dredged material. The request was made during a site visit held on March 12, 2001. The results of this testing effort are presented in Section 4.2.2.

3.7.2.2 Geotechnical Sampling & Testing Requirements

A geotechnical testing program was implemented for the pilot study 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 include:

- 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

3.8 Documentation

3.8.1 Recording of Site Activities

The field superintendent, Bill Poole, recorded daily site activities on the process log sheets (attached in Appendix E). These log sheets were prepared prior to the start of the pilot study, with their primary purpose being to guide the field personnel through the many steps required to complete the pilot study. During each day's activities, the field superintendent indicated progress of the study by checking off each activity on the log sheets and adding comments (sample weights, etc.) on the right-hand side of the log sheets.

3.8.2 Document Storage

Process log sheets, as well as other field communications, were stored in the NUIEG administrative trailer in a locked filing cabinet throughout the duration of the pilot study. Upon completion of the study, the files were transferred to NUIEG's offices in One Elizabethtown Plaza in Union, New Jersey.

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 pilot study analytical data (results) generated by ETL and Pace Analytical Services are intended for use primarily in evaluating the effectiveness of the NUI 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 NUIEG Pilot Study for various potential end users.

3.10 Process Residuals Management

3.10.1 Oversized Material

Prior to homogenizing the raw dredged material as described in Section 3.4.2, NUIEG's field personnel screened the material in order to eliminate any oversized material that could not be processed. During this screening process, no oversized material was identified.

3.10.2 Wastewater Disposal

Due to the drying process, which utilized evaporation as the dewatering method, the NUIEG Pilot Study generated no wastewater.

3.10.3 Raw and Processed Dredged Material

At the completion of the pilot study, the processed dredged material, as well as any unused raw dredged material, was returned to the 30-gallon barrels in which it was delivered, and placed into storage on the pilot study site.

3.10.4 Other Solid Waste

Personal protective equipment, such as Tyvek clothing and nitrile gloves were placed in plastic garbage bags and disposed as common waste.

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 being treated during the pilot study, a number of samples were taken at different points along the process (see Figures 1 and 2) 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 consistent with each other and with typical sediments found throughout New York/New Jersey

Harbor. Natural moisture content for the raw sediment samples was on the low end of the range of typical values in the Harbor, which normally are approximately 100% to 250%. The dredged material provided to NUIEG was not freshly dredged and was reconstituted with dredge site water by NJMR prior to being placed in drums for delivery to NUIEG's pilot study site. The delay between dredging and processing, and the subsequent reconstitution, is the most probable cause for the low natural water content values for the raw sediment. These low values, however, did not result in a negative impact on the results of the pilot study.

The fine-grained sediments processed during the NUIEG Pilot Study are classified as organic silt (OH) in accordance with the Unified Soil Classification System. Overall, physical properties for the samples, summarized in Table 9, can be generalized by:

- 70% silt; 27.5% clay; and 2.5% sand;
- Specific gravity of 2.60;
- pH of 7.0 – 7.5;
- Total Organic Content (TOC) of 6.7%;
- Chloride content of 9,200 to 12,700 ppm (0.92 to 1.27%); and
- Sulfate content of 800 to 3,500 ppm (0.08 to 0.35%).

Appendix D 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 4.7.3.

4.1.2 Analytical Characterization

NUIEG's approach in evaluating data from the pilot study was to track only those target contaminants whose concentrations in the feed sediment for the two pilot study runs were within one order of magnitude of the New Jersey Residential Direct Contact Soil Clean-up Criteria (RSCC). Of these analytes selected for evaluation, only the following contaminants were present in the material at concentrations exceeding the RSCC in at least one of the batches of raw material tested:

- Benzo(a)anthracene

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

Benzo(a)pyrene was the only contaminant that also exceeded New Jersey Non-Residential Direct Contact Soil Clean-up Criteria (NRSCC). Contaminant levels in the pilot study dredged material are within the typical range of contaminant levels found in New York/New Jersey Harbor sediments.

4.2 Air Quality Monitoring and Testing Results

4.2.1 Air Monitoring

Field monitoring for particulates and volatile organic compounds (VOCs) was performed at the pilot study facility using two MIE Data Ram particulate meters deployed at the site and a PhotoVac MicroTip photoionization detector (PID).

The particulate concentrations were monitored inside the drying room and outside at a location just east of the drying room. The MIE meters were calibrated daily with fresh air and the internal reference calibration probe. Both meters also were checked daily for accuracy.

The PID was calibrated with fresh air and 103 ppm Isobutylene span gas prior to each use and periodically during the day. Monitoring of VOCs was performed at the following locations:

- Raw dredged material in the mortar mixer;
- Process building breathing zone;
- Drying room;
- Dredged material in the drying pans; and
- Headspace in the sample jars, drums and ovens.

During the period from February 12, 2001 through February 27, 2001, no elevated readings were noted during the operations at the pilot study facility. Consequently, the air monitoring effort was suspended after February 27, 2001. Monitoring logs from the PID and MIE Data Ram meters are included in the Summary of Field Program, attached as Appendix E.

4.2.2 PUF Testing

During a site visit held on March 12, 2001, Scott Douglas of NJMR requested that NUIEG perform air quality testing, known as PUF testing, to investigate the existence and concentrations of semi-volatile organic compounds (SVOCs) that may be present in the air in the vicinity of the raw material and/or resulting from using the NUI process to treat the dredged material.

PUF testing derives its name from the polyurethane foam (PUF) filter sorbent media used in the collection of samples for testing. Testing for SVOCs using the PUF method requires the use of a modified TO-10A cartridge, which is packed with a combination of XAD-2 and PUF sorbent media. PUF sampling is performed by using a vacuum pump to pull air through the packed cartridge, causing contaminants in the air sample to adsorb on the surface of the filter. The entire cartridge is then shipped to a laboratory where the analytes are recovered for analysis using either heat or solvent extraction.

The PUF sampling program for the NUIEG Pilot Study was performed on both raw feed sediment and dredged material treated with $KMnO_4$ on May 7, 2001, using the protocols outlined in the "Guide to Sorbent-Based Sampling" published by Air Toxics Ltd. of Folsom, California, the testing laboratory selected for this program. The raw and treated sediment was placed into two separate drying pans, with a surface area of approximately 15 square feet each, and thoroughly mixed prior to testing. Each pan was then covered with plastic sheeting, with a sampling cartridge inserted under the sheeting and suspended approximately two inches above the dredged material. The cartridges were connected to a separate sampling train consisting of a Dwyer flow meter and a PVC throttling manifold, which in turn were connected to a Gast electric vacuum pump.

An airflow rate of five liters per minute (lpm) was maintained for four hours through each of the sampling cartridges. The airflow rate was checked and confirmed every 30 minutes during the test. Following sample collection, the cartridges were properly labeled, stored in a chilled cooler, and shipped via overnight delivery to Air Toxics Ltd in accordance with the "Guide to Sorbent-Based Sampling" published by Air Toxics Ltd. This document is included as Appendix G.

At Air Toxics, the analytes were recovered by solvent extraction (soxhlet extraction via modified method 3540) and the samples were analyzed for SVOCs using Modified EPA Method TO-13. The results of the analysis are presented in Table 10 for the SVOC analytes selected for further evaluation. The full laboratory report from Air Toxics is included in Appendix C of this report. The results presented in Table 10 and Appendix C indicate that none of the targeted SVOCs was detected above the laboratory reporting limits in either of the two samples. These results, coupled with NUIEG's extrapolation of the data to reflect the typical batch processing duration for the NUIEG Pilot Study (as described in Table 10), confirm that the NUI Dredged Material Process as implemented in the NUIEG Pilot Study does not pose a health and safety concern related to SVOC emissions.

4.3 Summary of Pilot Study Testing Results

In evaluating results for contaminants with initial concentrations either exceeding the NRSCC and RSCC, or within an order of magnitude of the RSCC, NUIEG developed average total feed and product concentrations for each run to assess the pilot study performance (i.e. percent reduction of contaminants on a concentration basis). The average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the Site Remediation News, Spring 1995 ("Compliance Averaging", by Brian J. Sogorka, BEERA). This method uses the average contaminant concentration to determine compliance with NRSCC and RSCC, rather than the contaminant concentration of individual samples. Although there is no reference in the article to the use of averaging for upland beneficial use of treated sediment, NUIEG believes this is a practical and technically sound approach for treated sediments since sediments can have an inherent variability in the analytical results similar to soils, and NUIEG's intended end use is a manufactured soil product.

4.3.1 Sediment Feed (S1A and B) Contaminant Analyses for Runs 1 and 2

Tables 11 through 16 present the sediment feed contaminant analyses for the six batches. A discussion of these analyses by contaminant group follows.

4.3.1.1 Volatiles and Pesticides

In general these two sets of analytical parameters are not present in raw dredged material at concentrations high enough to be a concern.

There were a few contaminant concentrations in the raw material, shown in bold face numbers (in Tables 11 to 16) that were above the Method Detection Limit (MDL). However, these contaminants were at such low concentrations, i.e. orders of magnitude below the RSCC, that tracking their percent reduction during the pilot study testing was not justified.

4.3.1.2 Semivolatiles

In the raw dredged material there were 19 semi-volatile constituents with concentrations above the MDL, and these are again shown in bold face numbers (Tables 11 to 16). However, only seven of these contaminants were at concentrations within one order of magnitude of the RSCC. These contaminant values were highlighted in Tables 11 to 16 and were used to track the component mass balances and process performance data presented in Tables 17 and 18. All the other semi-volatiles were orders of magnitude below the RSCC 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

4.3.1.3 PCBs

PCBs were also tracked in Tables 17 and 18 at a total PCB concentration for the Aroclors present above MDL. The concentrations for total PCBs were within one order of magnitude of the RSCC (490 parts per billion). Individual PCB Aroclors were not tracked because there was no set of consistent individual Aroclor analyses common to all six batches.

4.3.1.4 Dioxins

Total Dioxins, expressed as Total Equivalent Factor (TEF), also were tracked in Tables 17 and 18. Because NJDEP has not published values for Dioxins in either the RSCC or the NRSCC, the pilot study results have been evaluated against a "non health-based" criteria of 1 part per billion (ppb) as recommended by NJDEP.

4.3.1.5 Metals

The concentration profiles and mass balances were tracked in Table 19A-K for eleven (11) target toxic metals listed below:

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

- Mercury
- Nickel
- Silver
- Vanadium
- Zinc

The sediment feed concentrations for these metals were below the RSCC levels. In fact, most were orders of magnitude lower than the NRSCC as well.

At NJMR's request, a mass balance has been developed for mercury and is presented in Table 19G. NUIEG understands NJMR and NJDEP have a concern for the fate of mercury from the NJMR-funded pilot test programs, particularly with regard to air emissions. We have carefully evaluated the mercury data from the NUIEG Pilot Study and have concluded that there has been no loss of mercury from either Run 1 or Run 2 of the pilot study. Table 19G provides the basis for this conclusion as summarized below:

- A statistical analysis of the data using the standard Analysis of Variance statistical methodology (ANOVA*) at the 95% confidence level clearly shows there is no statistical difference among the three (3) streams (S1, S2 and S3) either in Run 1 or Run 2.

- It should be noted that there was one outlier in Table 19G, for sample R1/B1/S2, which was excluded from the ANOVA analysis. While mercury concentration in this sample was below MDL, the material from this batch (Run1, Batch 1) was recycled into Run 1 Batch 2 in equal parts with raw dredged material. Taking into consideration that the raw dredged material in Run 1 Batch 2 (represented by sample R1/B2/S1) had a concentration of 3.2 ppm and the combined raw and recycled material in Run 1 Batch 2 (represented by R1/B2/S2) had a concentration of 3.0 ppm, the non-detect value for R1/B1/S2 was incongruous with these subsequent concentrations, and therefore was discarded.

* The one-way Analysis of Variance (ANOVA) test is a standard statistical tool (widely accepted in industry and government offices) used to determine if the mean (or average) between two or more different groups are significantly different. In the case of the mercury data, we are looking to compare the concentration of mercury from each batch between 3 different groups (feed, feed + recycle, and product). ANOVA will calculate an F value, which is the mean square between groups divided by mean square within groups. This F value is then compared to the critical F value (which is based on the degrees of freedom for the variables and required significance level – typically, the 0.05 level or 95% confidence interval is used). If $F < F_{critical}$, then there is no significant difference at the specified significance level between the average concentrations for each group.

NUIEG appreciates the concerns expressed by NJMR and NJDEP with respect to mercury air emissions at the Demonstration Project phase. To that end, NUIEG will work to incorporate into its Demonstration Project the requirements put forth by NJDEP's Bureau of Air Quality Engineering (in their February 15, 2002 letter), including:

- Development of a sampling and testing protocol for raw dredged material; intermediate and final product; and the effluent produced through the dewatering operation;
- Development of a monitoring plan for particulate matter and mercury throughout the Demonstration Facility process; and

- Submitting specifications of process equipment and control devices to be used in the Demonstration Facility.

Because the version of the NUI Process employed in the pilot study was not intended to remove or stabilize metals, one of the objectives of tracking the concentration profiles of these metals was to determine the degree of variability of the sediment feed compared to the treated product.

In summary, all the metals data in Table 19 indicate statistically that there was no significant difference between the feed and product, with the exception of antimony.

To minimize variability in the Demonstration Facility design, the dredged sediment will be slurried in a pretreatment step, which is required for conveyance and conditioning of the sediment for dewatering. The slurrying step is expected to provide for a higher degree of mixing than was achieved in the pilot study and help to minimize the variability of the dredged material being processed.

4.3.1.6 Cyanide

There were no detectable concentrations of cyanide in the sediment feed.

4.3.2 Performance Data for Runs 1 and 2

Tables 17 and 18 present the performance data for Runs 1 and 2 covering the semi-volatiles, PCBs and Dioxins as discussed above.

4.3.3 Final Products (R1/B3/S3 and R2/B3/S3) - Supplementary Performance Data

Tables 20 through 23 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 C.

4.3.3.1 MEP Analyses

Results of MEP analyses are shown in Tables 20 and 21 for Runs 1 and 2, respectively.

Volatiles

All of the MEP analyses, attached in Appendix C, were either below MDL or below the Groundwater Criteria (GWC) with the exception of methylene chloride, which was detected above its GWC (3.0 ppb) for R1/B3/S3 for all 7-day extractions. These concentrations, however, were determined during data validation to be due to blank contamination; consequently, the validator (DAT)_ indicated that the methylene chloride results should be treated as non-detected. Therefore, all MEP analyses for volatiles are either below MDL or GWC.

SVOCs

The seven target SVOCs shown in Tables 20 & 21, and the balance of the SVOCs shown in Appendix C, all had MEP analyses that were either below the MDL or below the groundwater criteria (GWC).

PCBs

All of the MEP analyses for PCBs were below the MDLs as shown in Tables 20 and 21.

Pesticides

All of the MEP analyses were below the MDLs as shown in Appendix C.

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 Manganese, all of the MEP analyses were either below the MDLs or below the GWC for these metals. Tables 20 & 21 present the MEP data for Sb, As, Ba, Cd, Cu, Pb, Hg, Ni, Ag, Va and Zn. Results for the balance of the metals are found in Appendix C.

The MEP analyses for manganese were above the GWC of 50 ppb. Since Mn is a regulated contaminant (albeit only from a groundwater perspective), we recognize that the amount of $KMnO_4$ added for oxidation could potentially impact the placement or marketing criteria for certain beneficial use products. In this regard, over the past six months, NUIEG has been investigating alternative methods of contaminant reduction based on the use of different non-manganese based chemical oxidizers in combination and individually. The potential for concentrations of manganese to be of concern in the final product will also be addressed by the solidifying/stabilizing effect of the pozzolanic materials to be added during the Demonstration Project.

One alternative being considered is to supplement or replace $KMnO_4$ with Hydrogen Peroxide (H_2O_2). One obvious advantage of H_2O_2 is the reduction or elimination of the use of a regulated compound. NUIEG's additional investigations regarding the reduction of $KMnO_4$ dosage and substitution of alternative oxidizing agents to reduce $KMnO_4$ usage in the Demonstration Facility will be discussed in Section 5.2.2. The substitution of alternative oxidants also is discussed in NUIEG's patent application, titled "Method for Treating Dredged Material" (Patent Application #10-040,142).

4.3.3.2 TCLP Analyses

TCLP is used to determine whether processed dredged material is classified under the Resource Conservation and

Recovery Act (RCRA). Material that falls within TCLP thresholds and characteristics generally can be beneficially used provided further regulatory requirements (i.e. MEP) also are met. TCLP results for the pilot study are presented in Tables 22A-G and 23A-G for Runs 1 and 2, respectively. All of the TCLP analyses for the following groups of contaminants were either below MDL or below the allowable TCLP criteria:

- Semi-volatiles
- Herbicides
- Pesticides
- Metals

These results indicate that the NUIEG treated material met TCLP criteria. The TCLP and analytical results indicate that the treated material is appropriate for upland beneficial use.

4.3.3.3 Flash Point

As shown in Tables 22F and 23F, the Batch 3 treated sediments from Runs 1 and 2 were non-flammable.

4.3.3.4 Reactivity

As shown in Tables 22G and 23G, the Batch 3 treated sediment from Runs 1 and 2 had a negative cyanide and H_2S reactivity.

4.4 Engineering Material Balance

Tables 1 through 6 present the engineering material balances for Runs 1 and 2. The average solids balance closure for the six batches was 97.2%, which indicates a very acceptable level of closure for the pilot study results.

4.5 Process Validation

4.5.1 Data Validation Summary

Data validations for the pilot study 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" (February 1994), "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 A.

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 with the exception of 2-butanone and acetone, which were rejected in most samples. 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 both acetone and 2-butanone are 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. All data was determined to be usable.

4.5.1.3 Pesticides/PCBs

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:

- 12378-PeCDD (samples L1816, L1865, L1890, L2254, L2569, L3407, L3794, and L8508)
- 12378-PeCDF (samples L1816 and L1865)
- 123789-HxCDF (samples L1865 and L1890)
- 1234789-HpCDF (sample L2569)
- 123789-HxCDD (samples L2569 and L3407)
- 123478-HxCDD (samples L1816, L2254, L2569, and L3407)

Detected results for the above-referenced analytes and samples were qualified as estimated maximum possible concentration (EMP) by the testing laboratory (Pace Analytical Services). This qualifier indicates that the result does not meet ion abundance ratio criteria (listed in Section 2.5 of EPA Method 8290) and generally is used to give the validator the opportunity to evaluate the data using the wider ratio criteria of 10% of the daily calibration ratio and to assess the possibility of interferences.

For validation purposes, an EMP result is evaluated as "not detected" at a detection limit corresponding to the EMP value, particularly when the ion abundance ratio falls outside the 10% relative percent difference (RPD) of the most recent continuing calibration. This occurs when the cleanup and isolation of PCDD/PCDF analytes has resulted in the isolation of mass interferences either at or near the exact mass of the analyte being monitored. Potential interferences, which in effect lead to "false positive" readings, include polychlorinated diphenyl ethers (PCDPEs), polychlorinated biphenyls (PCBs), polychlorinated alkyldibenzofurans, and polychlorinated naphthalenes.

Consequently, the detected results for the analytes and samples listed above were rejected in accordance with the USEPA National Functional Guidelines because it is probable that the results form the laboratory testing were biased high and actual concentrations of these analytes were below method detection limits.

4.5.1.5 Metals

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

- Antimony (samples L3407 and L8508)
- Arsenic (sample L8508)
- Beryllium (samples L3794 and L8508)
- Cadmium (samples L3794 and L8508)
- Selenium (samples L2569, L2570, L3407, L3794, and L8508)
- Silver (samples L3407, L3794, and L8508)
- Thallium (samples L1870, L3407, L3794, and L8508)

Non-detect results for the above-referenced elements and samples were rejected by the data validator due to extremely low matrix spike recoveries (MS %Rs). Low spike recoveries, particularly those below 30%, indicate that detected results may be biased low (i.e. actual concentrations may be higher than reported) and false non-detects may have been reported. Similar to the data rejections for VOCs, the metals rejections arise from an inconsistency between analysis and validation requirements.

The October 1995 Statement of Work for CLP analysis indicates "when the pre-digestion/pre-distillation spike recovery falls outside the control limits and the sample result does not exceed 4x the spike added, a post-digestion/post-distillation spike must be performed for those elements that do not meet the specified criteria (exception: Ag)." In accordance with this requirement, Environmental Testing Laboratories, Inc. (ETL) performed post-digestion/post-distillation spikes for all necessary elements that had spike recoveries outside the 75% to 125% control limits for the project. The results of these post-digestion/post-distillation spike recoveries were within the control limits. The USEPA National Functional Guidelines for data validation concur with the requirement of post-digestion/post-distillation spike, but also indicate "The data from the post-spikes is not to be used to qualify sample results." Consequently, the validator was required to reject the data.

It should be noted that these rejections were not attributed to error on behalf of the laboratory, as all analysis requirements and objectives were met by ETL. Rather, it is likely that the low MS %Rs for the elements listed above were due to matrix interference, and hence were unavoidable.

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 Pilot Performance Evaluation

Review and evaluation of the pilot study test results indicate that the NUI 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. Taking the average of the percent reduction for the three batches in each run provides an approximate overall average percent reduction for the target organic chemicals as follows:

	% Reduction		
Analyte Group	**Run 1**	**Run 2**	**Overall Average (Runs 1 & 2)**
Semi-Volatile Organic Compounds (SVOCs)	60.9	57.6	59.2
Polychlorinated Biphenyls (PCBs)	42.5	-2.5	20.0
Dioxins	32.0	31.3	31.7

4.6.1 Overall Performance

Overall, the performance data shown in Table 18 demonstrated the ability of the chemical oxidant component of the NUI Process to reduce organic chemical contaminant concentrations based on the specific feed and chemical dosages used in the NUIEG Pilot Study. The data for PCBs and dioxins, while showing overall reduced levels, varied over a wide range making these results less conclusive. There is no basis presented in the study test results or procedures to explain the variability of the organic chemical data, other than the fact that dredged material has a high degree of inherent variability in its physical and chemical make-up. This inherent variability was also apparent from the metals analyses. Because the chemical oxidants will not remove metals, the high degree of variability in metals concentrations is further indication of variability inherent in the material.

To address the variability of the performance data discussed above, NUIEG intends to utilize a slurrying process for transfer of the sediment prior to the dewatering step in the demonstration facility. The slurrying will enhance and increase the raw material mixing compared to the pilot study mixing prior to chemical addition, and will help to reduce the observed variability.

Below is a discussion of the process effectiveness broken down by contaminant type; Semivolatiles; PCBs; and Dioxins. Note that a major objective of the Pilot Study Work Plan was to reduce organic contaminant concentrations below the NRSCC and that contaminant averaging has been used as discussed above in Section 4.3 as the basis for comparison with the NJDEP guidance values.

4.6.1.1 Contaminant Reduction of Semivolatiles including Polynuclear Aromatic Hydrocarbons (PAHs)

Overall, the process achieved significant reduction of the seven target organic contaminants identified in 4.3.2.2 above. The average percent reduction in Run1 was about 60.9% and for Run 2 about 57.6%. Only one contaminant, benzo(a) pyrene, was above the NRSCC in the feed sediment and six others were over the RSCC.

NUIEG considers this level of contaminant reduction to be significant particularly when considering beneficial use options for the treated sediment product. One issue is the sensitivity of the performance data to variability that is inherent in sediments. Analytical data variability is probably caused by the natural heterogeneity of the sediment, incomplete blending, the small quantity of material required for each sample, and/or combinations of these factors.

For both runs, the NUI process reduced the average contaminant levels below the RSCC limits. In the case of benzo(a)pyrene, R1/B2/S1 concentration is 835.5 ppb, which exceeds both the RSCC and the NRSCC of 660 ppb; however, when averaging this value with R2/B2/S3 at 304.0

and R2/B3/S3 at 166.0, the overall Run 2 average is 435.0 ppb, which is below both NRSCC and RSCC.

4.6.1.2 PCBs

The average percent reduction for total PCBs in Runs 1 and 2 was 42.5% and -2.5% respectively. Although the percent reduction for Run 1 was significant, it should be recognized that, except for one batch, all feed concentrations were below the RSCC level.

4.6.1.3 Dioxins

The average percent reduction in Runs 1 and 2 was 32.0% and 31.3% respectively. While there are no RSCC or NRSCC criteria for Dioxins, average Dioxin concentrations for both runs were below the 1 part per billion (ppb) "non-health based" criteria recommended by NJDEP.

4.6.2 $KMnO_4$ Consumption and Cost Data

As shown in Table 24, the $KMnO_4$ dosage per batch was in the range of 5,500 to 6,200 ppm by weight of the dry sediment feed solids. This resulted in a cost of roughly $7.88 per cubic yard of wet feed sediment. In preparation for proceeding with the demonstration project, NUIEG has investigated the use of alternative chemical oxidants to reduce processing costs and address concerns related to Mn concentrations in the final product. The use of H_2O_2, either in place of or in conjunction with $KMnO_4$, is being investigated because of the lower cost of H_2O_2 and the resulting reduction or elimination of Mn usage. It is NUIEG's opinion that, through the combination of $KMnO_4$ with H_2O_2 or other chemical oxidants, the overall cost for the optimum oxidant dosage to achieve target contaminant reductions to meet the beneficial use requirements can be reduced in the NUIEG Demonstration Project and future application of the process.

For any specific contaminant, the optimal addition of $KMnO_4$ is a function of the initial concentration of the specific contaminant in the raw dredged material, the reaction kinetic coefficients associated with the contaminant, and the target concentration of that contaminant in the processed dredged material. As multiple contaminants are typically present in raw dredged material, and at different and variable concentrations, the optimum addition of $KMnO_4$ for a particular raw dredged material must be determined from either empirical correlations or by pre-testing the particular raw dredged material with various dosages of $KMnO_4$. The NUI Process, as it will be implemented in the demonstration project, contains two separate decontamination zones, (1) in the slurry phase immediately upstream of mechanical dewatering, and (2) in the pug mill immediately downstream of mechanical dewatering.

Further, the NUI Process can utilize multiple oxidants, $KMnO_4$ and H_2O_2 being two examples. Thus, the optimum level of $KMnO_4$ must also consider the dual decontamination zones and multiple potential oxidants. Accordingly, for a particular raw dredged material, a pre-test will typically be required to determine the optimum oxidant addition rates until NUIEG can develop a larger data base. With the larger database, we anticipate that the optimum oxidant addition rates can then, in certain cases, be determined empirically.

In addition to the above, NUIEG recognizes that considerable attention must be given to the anticipated concentration of Mn (and other materials that might be present in any other NUIEG oxidants) in the processed dredged material. Again, until a larger database is available to permit an empirical determination of oxidant addition rates, the projected concentration of Mn (and other additives) in the processed dredged material will, in most cases, need to be validated by pre-testing, with this pre-testing thus providing the determination of the maximum $KMnO_4$ addition rate in the two decontamination zones of the NUI Process.

4.7 Beneficial Use Evaluation

4.7.1 Proposed Beneficial Use

The Dredged Material Management Plan for the Port of New York and New Jersey (DMMP) (US Army Corps of Engineers (USACE), September 1999) and the USACE document "Beneficial Uses of Dredged Material for

Habitat Creation, Enhancement, and Restoration in NY/NJ Harbor" (USACE, February 1999) identified landfills and remediation of brownfields sites as potential beneficial uses of Historic Area Remediation Site (HARS) unsuitable dredged material.

The NJDEP also supports beneficial use of dredged material for brownfields remediation and landfill cover, mentioning these uses in their October 1997 document "The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters" and through their support of projects such as the EnCap Golf Holdings Golf Course project in the Hackensack Meadowlands; OENJ Cherokee Corporation New Jersey Gardens Mall project in Elizabeth; and the OENJ Cherokee Corporation Golf Course Project in Bayonne. Landfill operations and brownfields reclamation also are listed in the Beneficial Use strategy section of New Jersey's Comprehensive Sediment Management Strategy ("Dredged Material Management in New Jersey: A Multifaceted Approach for Meeting Statewide Dredging Needs in the 21st Century", F.M. McDonough, G.A. Boehm, W.S. Douglas, WEDA, June 2000).

Prior to use as remediation material or in landfills, the material may need to be amended with pozzolanic agents such as fly ash and cement to improve its strength and workability and to stabilize metals. Strength and workability improvements through the addition of fly ash and cement result from cementation and hydration reactions with the dredged material, and have been demonstrated to be effective in previous studies, such as those documented in the "Guidance Document for Processing and Beneficial Use of Dredged Material as Fill", prepared for the Port Authority of NY&NJ by Parsons Brinckerhoff, May 1999 (attached as Reference Document 1). Stabilization of metals is achieved through reduction of the solubility and chemical reactivity of the metals resulting from changes in pH and alkalinity brought about through the addition of pozzolanic agents.

According to "The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters", NJDEP, 1997, there is a substantial need for landfill cover in New Jersey. As of 1997, there were 25 landfills in operation in New Jersey with "enormous" quantities of earthen materials needed for daily, intermediate, and final cover.

Projects where dredged material is or is potentially slated for use in the remediation of brownfields sites and/or landfills include:

- Hackensack Meadowlands Development Commission (HMDC) – EnCap Golf Holdings Meadowlands Golf Course Project – transformation of a thousand acres of former landfills and contaminated sites in southern Bergen and Hudson Counties into a world-class golf course complex. The project includes remediation of six landfills. Landfills will be filled and capped with a combination of materials, including sediments.
- City of Linden Landfill Closure – Proposal from Strategic Alliance LLC to cap the closed City of Linden landfill with dredged material.
- OENJ Cherokee Corporation Golf Course Project, Bayonne, NJ – Project site includes an inactive 69-acre abandoned landfill and an 87-acre brownfield. Approximately 4.5 million cubic yards of amended dredged material is being used as structural fill for a golf course.
- Koppers Coke (Seabord) Site, Kearny, NJ – 165-acre brownfield site identified for remediation and reuse as a manufacturing or warehouse facility. Formerly operated by SK Services, this site has the capacity to accept 3.5 million cubic yards of dredged material (DMMP, 1999).
- Brownfields listed in the DMMP that are proposed to accept dredged material include OENJ Sayerville, NJ; OENJ Port Reading, NJ; and Allied Signal, Elizabeth. According to the DMMP, these sites have a total capacity of 11 million cubic yards.

4.7.2 Suitability Determination

The sampling and analysis plan (SAP) for a particular beneficial use are approved by the NJDEP on a case-by-case basis and take into account specific facility requirements. The NJDEP uses New Jersey's Non-Residential and Residential Direct Contact Soil Clean-up Criteria (NRSCC and RSCC, respectively) as guidelines for the protection of human health and terrestrial ecosystems. Analytical results of the processed sediment for both runs in the pilot study, summarized in Table 18, were below NRSCC and RSCC levels.

Among the tests required for upland placement of processed dredged material is the Toxicity Characteristics Leaching Procedure (TCLP). TCLP is a subsurface fate and transport model that measures the potential of toxic constituents in a waste to leach and contaminate the groundwater causing environmental or health concerns. All processed sediment TCLP test results were within TCLP regulatory levels. In addition to TCLP, Multiple Extraction Procedure (MEP) analysis was performed on NUIEG's processed sediment to further assess the potential of contaminants to leach from the material. The results of these analyses indicate that concentrations of all target constituents with the exception of manganese were either below method detection limits (MDLs) or groundwater criteria (GWC). NUIEG intends to address the manganese concentrations in the final product through the use of alternative chemical oxidants in place of or in conjunction with $KMnO_4$, and/or through the addition of stabilizing agents to the processed material to reduce the potential of manganese leaching from the material. Therefore, based on the TCLP, MEP, and analytical results, with process improvements to address manganese concentrations as discussed above, the processed material would be suitable for upland beneficial uses such as in landfills and as remediation material.

To further determine the suitability of the dredged material processed during the pilot study, NUIEG has evaluated the results from physical testing against the NJDEP Landfill Requirements for Fill, as presented in Table 5.4 of the "Guidance Document for Processing and Beneficial Use of Dredged Material as Fill" (Reference Document 1). Based on a review of these requirements, NUIEG has determined that the material processed during the pilot study would be suitable for use as either impermeable cap/liner material or unclassified fill.

The primary requirements for impermeable cap/liner material include:

- >50% of material passing #200 sieve;
- Permeability (cm/sec) range of 1.00E-05 to 1.00E-07;
- Liquid Limit >30; and
- Plasticity Index >15.

With the exception of permeability, which was not tested for in the pilot study, NUIEG's final product (represented by samples R1/B3/S3 and R2/B3/S3) meets all of the above requirements.

The NJDEP requirements for unclassified fill within a landfill include:

- Use of large or angular stone should be avoided; and
- Minimum bearing capacity is required for operation of equipment above the fill.

Based on the grain size distribution and moisture content of the pilot study product, NUIEG believes that these criteria could be met. The performance of NUIEG's product in this application is expected to be improved through the addition of pozzolanic agents in the Demonstration Project.

5.0 Proposed Process Improvements for Demonstration Project

In scaling-up the NUI Dredged Material Process from a 108-gallon per batch pilot process, resulting in a total study size of 650 gallons, to a Demonstration-scale, continuous flow process treating about 10,000 gallons per hour of dredged sediment, NUIEG will require an in-depth effort by its technical team to ensure a reliable design. Since the completion of the NUIEG Pilot Study last summer, NUIEG has been working over the last 6 months on developing the Demonstration Plant design. This section of the Pilot Report summarizes the status of this development.

5.1 Core Elements and Objectives of the NUI Process

Figure 5 presents our current conceptual process block flow diagram for this facility and Table 25 presents the preliminary engineering material balance. The objectives of the demonstration plant remain aligned with those of the NUIEG Pilot Study (dewatering, contaminant reduction, and beneficial use), with the primary elements in the plant including:

- Sediment Dewatering Unit
- Addition of Oxidizing Agent(s)
- Beneficial Use Addition System

5.1.1 Sediment Dewatering Unit

5.1.1.1 Objectives

The primary objective of the sediment dewatering unit is to reduce the water content as economically as possible in order to achieve physical characteristics required to produce a marketable beneficial use product.

5.1.1.2 Basis of Design

The NUIEG Pilot Study employed air drying to achieve the dewatering step as described in Section 2.1. Mixing or recycling of dried, processed sediment with wet feed in subsequent batches was also employed in an attempt to accelerate the dewatering cycle in similar fashion as currently performed in land farming operations with municipal sludge. Based on the rates of drying achieved during the pilot study, air drying has proved to be uneconomical due to the length of time and the large acreage required for large-scale operations. We estimate about 110 acres would be needed for a 15.4-day drying cycle at 70°F to dry at the planned treatment rate of 10,000 gallons per hour, taking into account the seasonal limitations unique to the New Jersey location.

Based on the air drying results, NUIEG turned to mechanical dewatering as the preferred approach to the dewatering step in the treatment process. Working with a dewatering equipment vendor, using pilot study sediment, NUIEG investigated several types of off-the-shelf pressure filters, belt filter presses, and a centrifuge. The primary results of the additional investigation indicated that a conventional belt filter press would require less than 5% of the land area for dewatering as compared to an air-drying operation. This mechanical dewatering system also will process in one day an amount of material equal to that processed in 15.4 days using air-drying methods. Based on this comparison, mechanical dewatering appears to be the most economical dewatering approach for the unit. Preliminary design parameters for a demonstration scale process have been identified, and include:

- Slurrying of the material to 15-18% solids both for transfer of sediment from barge by pumping and for additions of flocculent and chemical oxidant.
- Flocculent to be a high molecular weight, cationic, dry polymer. The specific polymer and supplier are company confidential at this time.
- Dewatered sediment from the belt filter press has tested in the range of 57% dry solids.

5.1.2 Addition of Oxidizing Agent(s)

5.1.2.1 Objectives

The primary objective of oxidant addition is to reduce organic contaminants (i.e. VOCs, SVOCs, PCBs, and Dioxins) present in dredged materials to a level sufficient to produce a marketable beneficial use product.

5.1.2.2 Basis of Design

During the Pilot Study, the NUI process successfully demonstrated the ability to achieve organic contaminant reductions through the application of a chemical oxidant, $KMnO_4$. Contaminant reduction was achieved by simply mixing the $KMnO_4$ into the dredged material and allowing it to react. The results of this process have been presented in Section 4. These results indicate some degree of variability in the level of organic contaminant reduction achieved. This observed variability may be in part due to the mixing method used during the NUIEG Pilot Study (simple mechanical mixing of thixotropic sediment).

For the NUIEG Demonstration Project, the degree of contaminant reduction is expected to be dependent in part on the degree of mixing of the oxidant with the dredged material. The slurrying to be performed during the demonstration program provides an excellent mixing medium. It is anticipated that this method of mixing will reduce the degree of variability in the analytical results. NUIEG has conducted a test program that successfully simulated the proposed demonstration operation of the dredged material slurry step with addition of the $KMnO_4$ oxidant. Based on the results of these tests, the following preliminary design parameters for the demonstration-scale process have been established:

- Addition of the oxidant into the sediment as it is being slurried to 15% - 18% solids in the slurry tank to maximize both dispersion and contact time of oxidant with contaminants.
- Reaction time in the slurry to be about 2 hours. (Preliminary contaminant reduction test data of the Pilot Study target SVOCs is in the range of about 50%, where increased mixing during slurrying should improve these results).
- If additional oxidant is required to further improve contaminant reduction, the NUI Process also has the capability of injecting additional oxidant further downstream in the Beneficial Use Addition System.
- The oxidizing solution will be prepared using ionized water.

Due to a possible concern for manganese concentrations in the final product (because it is a regulated compound) NUIEG has been evaluating alternative oxidants, including hydrogen peroxide (H_2O_2), to be used in place of or in conjunction with $KMnO_4$. One obvious advantage of H_2O_2 is the elimination of the use of a regulated compound. Published data indicate H_2O_2 may be substituted for $KMnO_4$ at a weight equivalent of approximately 1 Lb H_2O_2 to 3 Lbs $KMnO_4$; however, this projection will require verification during pre-demonstration testing.

5.1.3 Beneficial Use Addition System

5.1.3.1 Objectives

The primary objectives of the beneficial use addition system include:

- Stabilization of metals and organic compounds in matrix of processed material;
- Controlling moisture content via curing to meet beneficial use market criteria and specifications; and
- Providing additional strength requirements as necessary to meet beneficial use specifications.

5.1.3.2 Basis of Design

Pozzolanic additives, such as cement and/or fly ash, will be utilized, as necessary, in the NUIEG Demonstration Project to produce a marketable beneficial use product. NUIEG is currently evaluating beneficial use product characteristics based on various dosages of fly ash and cement. The Demonstration Project Proposal will provide an expanded discussion of the use of these additives and the expected results for the specific feed sediment provided by NJMR for the Demonstration Project. In the design of this unit, NUIEG plans to utilized a vast body of know how and experience in which the effect of pozzolanic additives has been well established through numerous studies, including the "Guidance Document for Processing and Beneficial Use of Dredged Material as Fill", (Reference Document 1) and through recent and on-going commercial operations.

Pozzolanic additives have been demonstrated to improve physical characteristics and stabilize metals in dredged sediment from the New York/New Jersey Harbor and elsewhere. One such example is the stabilization of contaminated dredged sediments with pozzolanic additives in conjunction with the Central Artery project in Boston, Massachusetts. The physical properties and contaminant profiles of these sediments, as described in "Effect of Lime Admixtures on Contaminated Dredged Sediments" (Samtani et. al, 1994; attached as Reference Document 2), were similar to those of the sediments processed during NUIEG's Pilot Study. Addition of lime and fly ash, the pozzolanic additives used in the Central Artery project, effectively stabilized the metals in the sediments such that results from TCLP and Sequential Batch Leach Tests (SBLT) yielded no detectable concentrations for target metals.

5.2 Wastewater Treatment

Referring to Figure 5 for the Demonstration Plant, a portion of the water removed by the belt filter press will be recycled back to the sediment feed barge in order to slurry the sediment, thereby making it pumpable for transfer to the NUIEG facility. The balance of the water (effluent) will either be sent to a local POTW or treated and discharged under a point source discharge permit (NJPDES).

In the event it is determined that a site specific NJPDES permit can be obtained cost-effectively and within a reasonable period of time, NUIEG may elect to treat and discharge process effluent water under this permit during the Demonstration Project. Because of the temporary nature of the project (which is only expected to operate for about 2 – 10 months) and the quantity of dredged material to be processed (between 30,000 and 150,000 cubic yards), it may be more prudent and expedient for the Demonstration Project to dispose of effluent water at a POTW. NUIEG will work with NJMR and NJDEP to determine the most advantageous manner for handling effluent water generated during the Demonstration Project.

6.0 Economic Considerations

6.1 Pilot-scale Processing Costs

The estimated total cost of the pilot study as stated in the NJMR- and NJDEP-approved work plan was $485,300. At the completion of the NUIEG Pilot Study, this budget will have been fully expended. The total cost for the project was divided among the following categories:

- **Engineering, Permitting, and Field Observations** includes costs for project management, full time site supervision, meetings, documentation, permitting, and preparation of an engineering level material balance. The cost for meetings includes attendance at meetings to be held in conjunction with the pilot study. The cost for administration and documentation of the Health and Safety Plan are also included as part of the engineering, permitting, and field observations cost.
- **Site Preparation and Field Operations** includes costs for equipment and materials, mobilization/demobilization, operations-related labor and expenses, and disposal of the processed dredged material.
- **Laboratory Testing and Reports** includes costs for laboratory testing, data validation, and preparation of the draft and final pilot study reports. The testing cost includes laboratory testing, field sampling, and packing and shipping the field samples to the laboratories.

The breakdown of costs among the three categories is shown below.

Category	Budget
Engineering, Permitting & Field Observations	$75,700
Site Preparation and Field Operations	$237,100
Laboratory Testing and Reports	$172,500

In addition to expending the Pilot Study budget, NUIEG has contributed a significant portion of funding of continuing studies based on the pilot study results from its developmental budget.

6.2 Demonstration Project Costs

NUIEG is in the process of evaluating the costs associated with scaling up its technology to process dredged material at the Demonstration Project scale, based on the proposed process improvements identified in this report. NUIEG's Demonstration Project costs will be tabulated, including both fixed and variable costs in accordance with NJMR's RFP, in NUIEG's Demonstration Project Proposal.

The RFP indicates that a minimum of 30,000 cubic yards of dredged material would be processed for the demonstration phase of the project, with a maximum expected quantity of approximately 150,000 cubic yards. NUIEG is prepared to process a quantity of material within this range. If it serves the interests of NJMR, NUIEG also would be willing to process an amount less than the minimum quantity stated in the RFP. We believe that the minimum quantity necessary for NUIEG to fulfill the objectives laid out in the RFP would be on the order of 10,000 cubic yards.

6.3 Commercial-scale Processing Costs

Based on the results presented in Section 4.3 of this report, NUIEG has demonstrated that its technology has the ability to reduce contaminant levels in dredged material from the New York/New Jersey Harbor to levels acceptable for beneficial use (based on New Jersey Non-Residential Direct Contact Soil Clean-up Criteria). Because of the small scale of the pilot study (approximately 650 gallons processed) it was not possible, based on the results of the pilot study alone, to precisely determine the processing costs for the technology at a commercial scale.

As part of the development process for a permanent facility, however, NUIEG has 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, presented in Table 26, indicate that NUIEG's net "tipping fee" for its commercial-scale facility would be approximately $30.15, exclusive of costs associated with dredging and delivery of the material to NUIEG's facility. This cost includes NUIEG's profit and contains all facility processing components, including:

- Gross debris removal;
- Dredged material transfer;

- Contaminant reduction;
- Sediment dewatering;
- Production of beneficial use material; and
- Recovery and reuse of filtrate within the NUI Process and treatment and discharge of water effluent.

7.0 Conclusions and Recommendations

The evaluation of the analytical results from the study have confirmed that the NUI Dredged Material Process has demonstrated the ability to reduce target organic contaminant levels in dredged material from the New York/New Jersey Harbor to levels below the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NRSCC). This fact in addition to the processed material being below TCLP criteria is significant in that it is by these standards that the processed material is measured for potential upland beneficial uses, such as daily landfill cover and brownfields remediation material. In addition, based on average percent reductions for both runs, contaminant levels that exceeded the New Jersey Residential Direct Contact Soil Cleanup Criteria (RSCC) in the sediment feed were reduced below the RSCC.

NUIEG's innovative technology represents a low-cost, non-thermal approach to the manufacture of beneficial use products from New York/New Jersey Harbor dredged material. To further demonstrate the ability of the NUI Dredged Material Process to reduce contaminant levels and create beneficial use products, NUIEG intends to develop a Demonstration Facility, as prescribed by NJMR's 1998 request for proposals (RFP). A discussion of the preliminary design and process flow diagram of the Demonstration Facility is presented in Section 5. This larger-scale facility, which will likely process at least 30,000 cubic yards of dredged material, will provide NUIEG the opportunity to apply its technology to a wider range of sediments than those used in the pilot study. In addition, the demonstration project will allow for a validation of the cost-effectiveness of the NUI Dredged Material Process, in keeping with the goal of the RFP, which is to produce a commercially viable beneficial use product at a commercial scale for $35 per cubic yard.

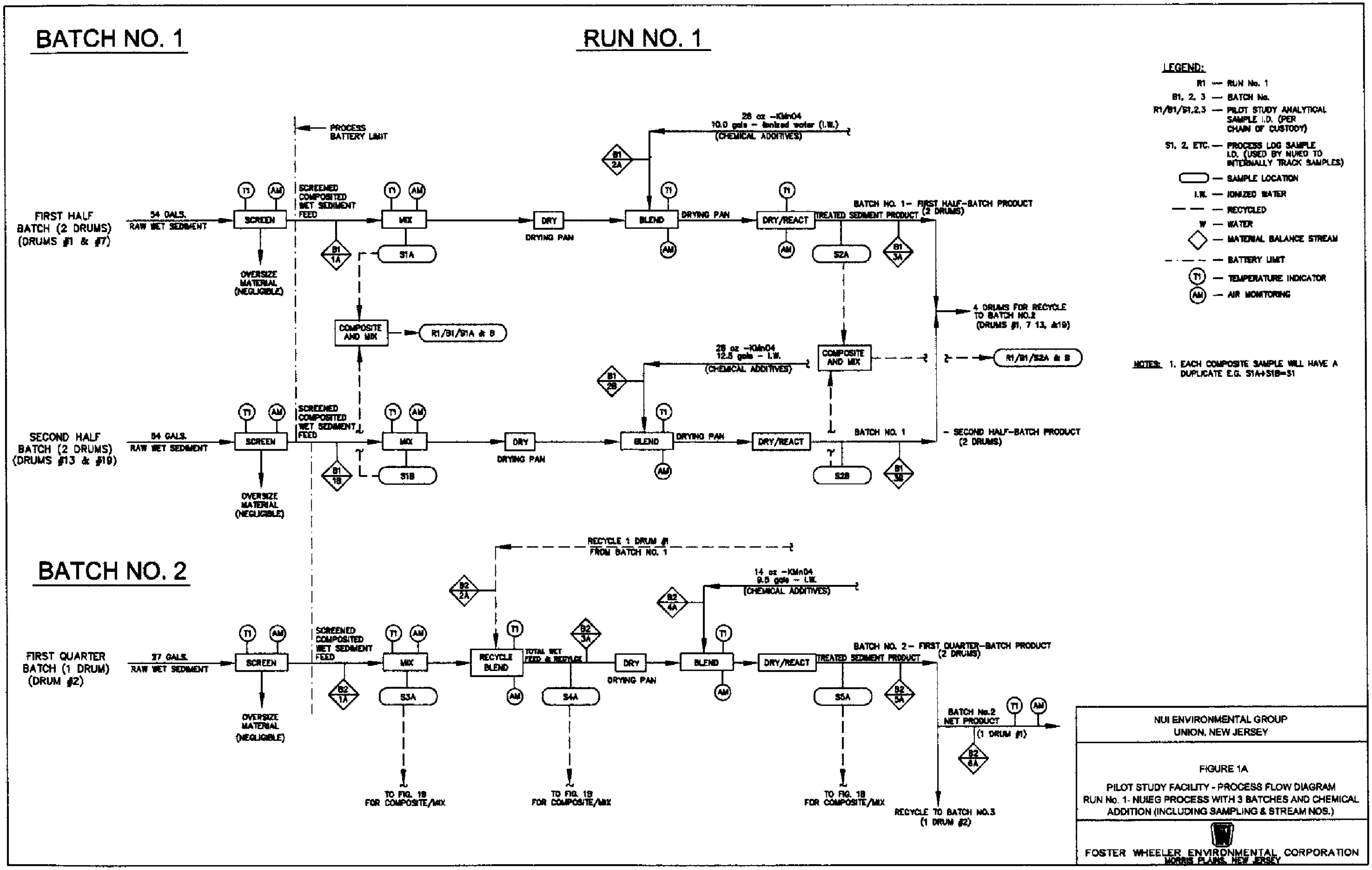
The results presented in this report clearly demonstrate that the NUI Dredged Material Process has the ability to reduce organic chemical constituents in dredged material from the New York/New Jersey Harbor. As such the NUI Dredged Material Process warrants further evaluation as part of the NJMR Demonstration Program.

For the demonstration facility, NUIEG plans to run its process as a continuous operation as opposed to the batch operation used for the small-volume pilot study. Consequently, the NUIEG Demonstration Process will include the following core process unit operations, based on the results of the NUIEG Pilot Study and subsequent evaluations and vendor tests as discussed in Section 5:

- Sediment Dewatering – the air drying technique used in the pilot study is being upgraded to a commercial-scale dewatering unit, which will include a belt filter press and possibly a centrifuge for dewatering.
- Addition of Oxidizing Agent – the oxidant will be prepared as a solution using ionized water and added in the sediment slurrying tank for organic contaminant reduction. The increased mixing of the dredged material with chemical oxidant provided during the slurrying process will help to ensure the maximum percent reduction of organic chemical contaminants. It will also be possible to add additional oxidant at the Beneficial Use Addition System if further reduction is required to meet beneficial use market specifications. NUIEG has identified H_20_2 as one possible supplement to or replacement for $KMnO_4$ if the use of $KMnO_4$ becomes problematic because manganese is a regulated constituent.
- Beneficial Use Addition System – Stabilizing agents such as fly ash and/or cement will be added to improve physical parameters as required to produce certain beneficial use products consistent with a variety of market needs. These agents reduce free water content in the dredged material through hydration reactions, improving workability of the processed material. In addition, they have the added benefit of stabilizing metals and certain organics that may be present in the raw dredged material by reducing their solubility or chemical reactivity through control of pH and alkalinity.

In summary, the results presented in this report clearly demonstrate that the NUI Dredged Material Process has the ability to reduce organic chemical constituents in dredged material from the New York/New Jersey Harbor. In addition, the NUI team has presented its preliminary design of a Demonstration Facility that will meet NJMR's RFP objectives. As such the NUI Dredged Material Process warrants further evaluation as part of the NJMR Demonstration Program.

Figures



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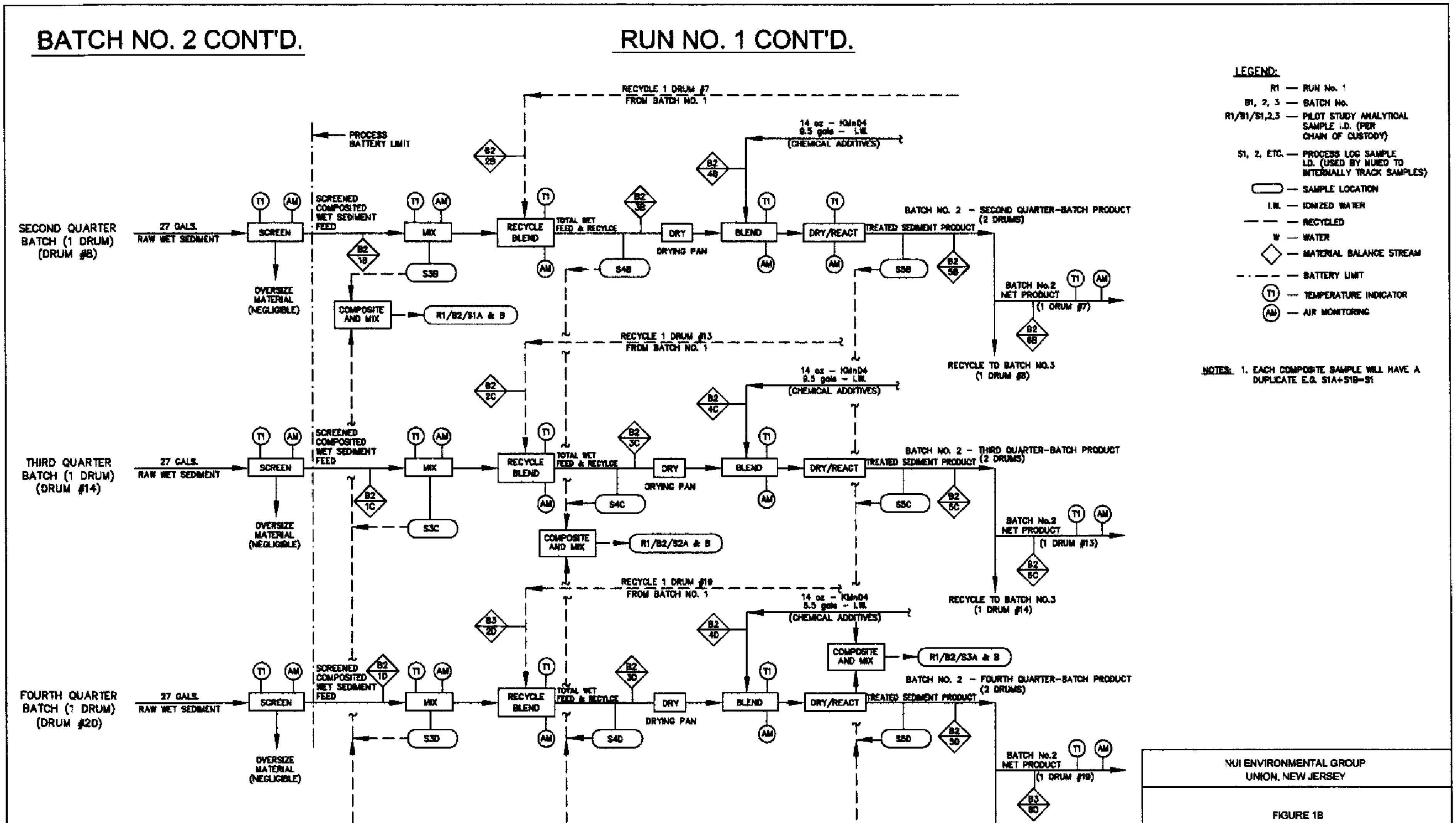

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FIGURE 1B

PILOT STUDY FACILITY - PROCESS FLOW DIAGRAM
RUN No. 1- NUIEG PROCESS WITH 3 BATCHES AND CHEMICAL ADDITION (INCLUDING SAMPLING & STREAM NOS.)

FOSTER WHEELER ENVIRONMENTAL CORPORATION
MORRIS PLAINS, NEW JERSEY

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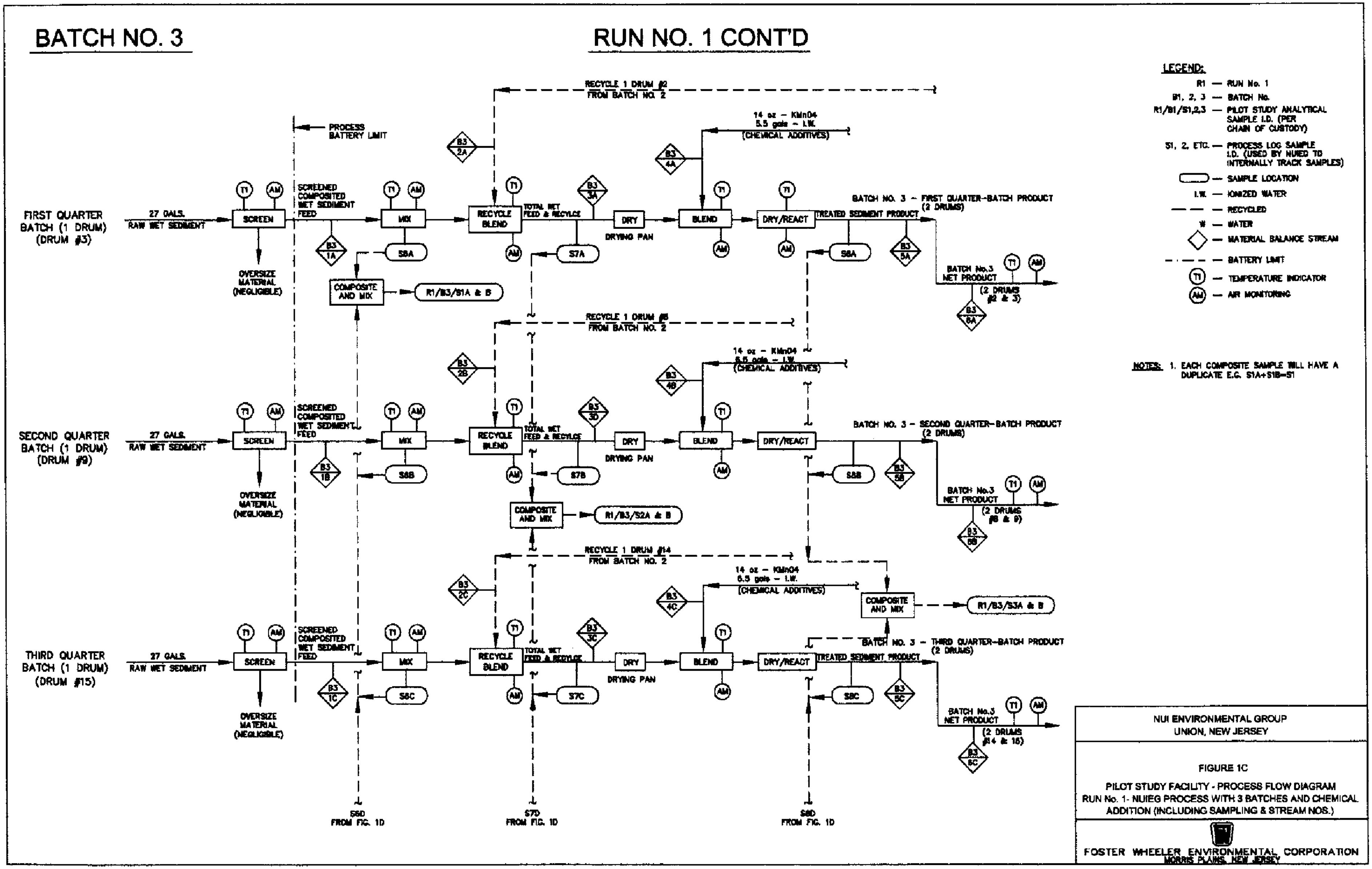

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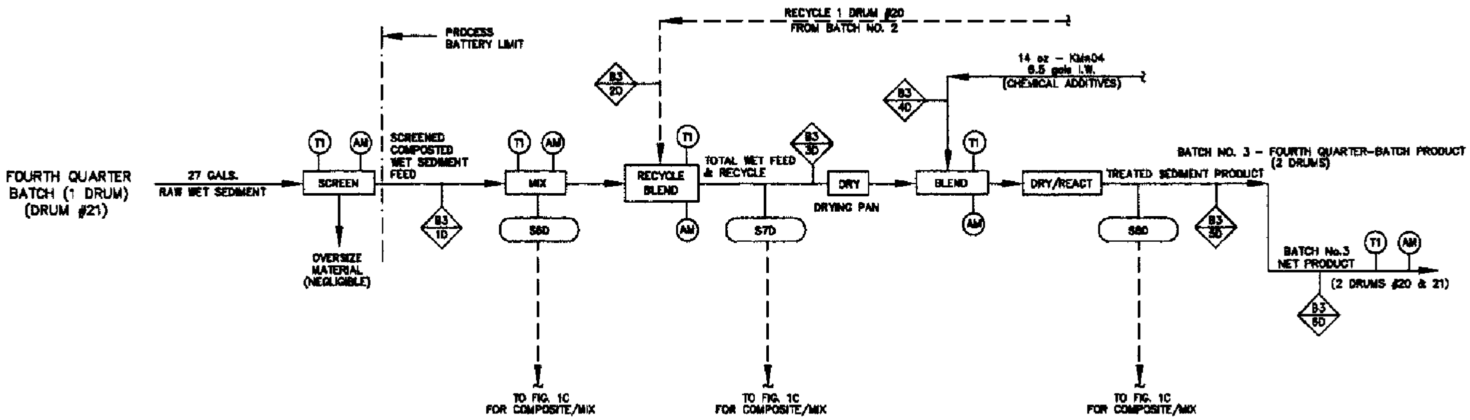
BATCH NO. 3 CONT'D.

RUN NO. 1 CONT'D.



LEGEND:

- R1 — RUN No. 1
- B1, 2, 3 — BATCH No.
- R1/B1/S1,2,3 — PILOT STUDY ANALYTICAL SAMPLE I.D. (PER CHAIN OF CUSTODY)
- S1, 2, ETC. — PROCESS LOG SAMPLE I.D. (USED BY NUIEG TO INTERNALLY TRACK SAMPLES)
- (oval) — SAMPLE LOCATION
- I.W. — IONIZED WATER
- — — — RECYCLED
- W — WATER
- (diamond) — MATERIAL BALANCE STREAM
- — · — — — BATTERY LIMIT
- (TI) — TEMPERATURE INDICATOR
- (AM) — AIR MONITORING

NOTES: 1. EACH COMPOSITE SAMPLE WILL HAVE A DUPLICATE E.G. S1A+S1B=S1

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FIGURE 1D

PILOT STUDY FACILITY - PROCESS FLOW DIAGRAM
RUN No. 1- NUIEG PROCESS WITH 3 BATCHES AND CHEMICAL ADDITION (INCLUDING SAMPLING & STREAM NOS.)

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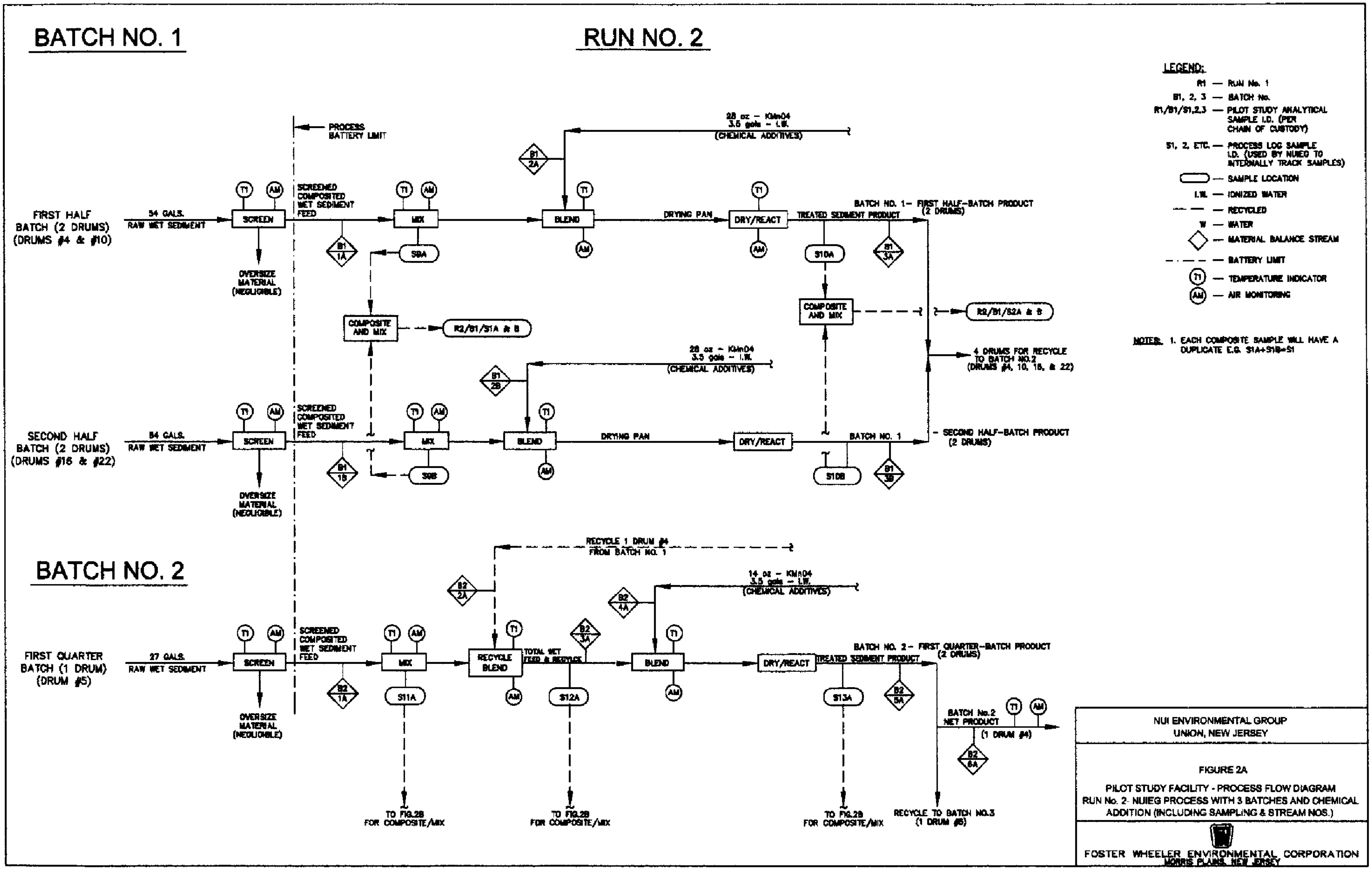

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FIGURE 2A

PILOT STUDY FACILITY - PROCESS FLOW DIAGRAM
RUN No. 2- NUIEG PROCESS WITH 3 BATCHES AND CHEMICAL ADDITION (INCLUDING SAMPLING & STREAM NOS.)

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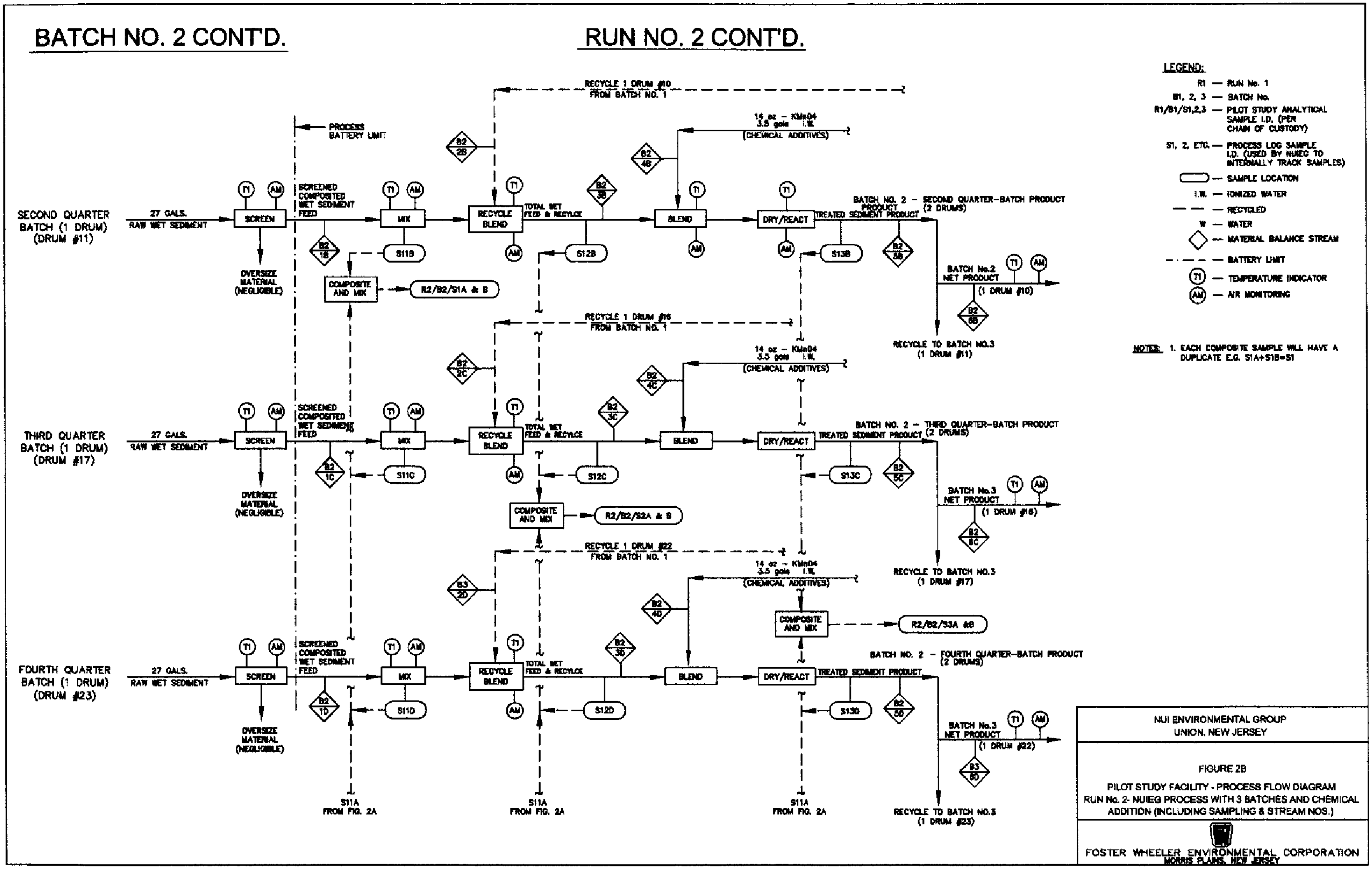

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FIGURE 2B

PILOT STUDY FACILITY - PROCESS FLOW DIAGRAM
RUN No. 2- NUIEG PROCESS WITH 3 BATCHES AND CHEMICAL ADDITION (INCLUDING SAMPLING & STREAM NOS.)

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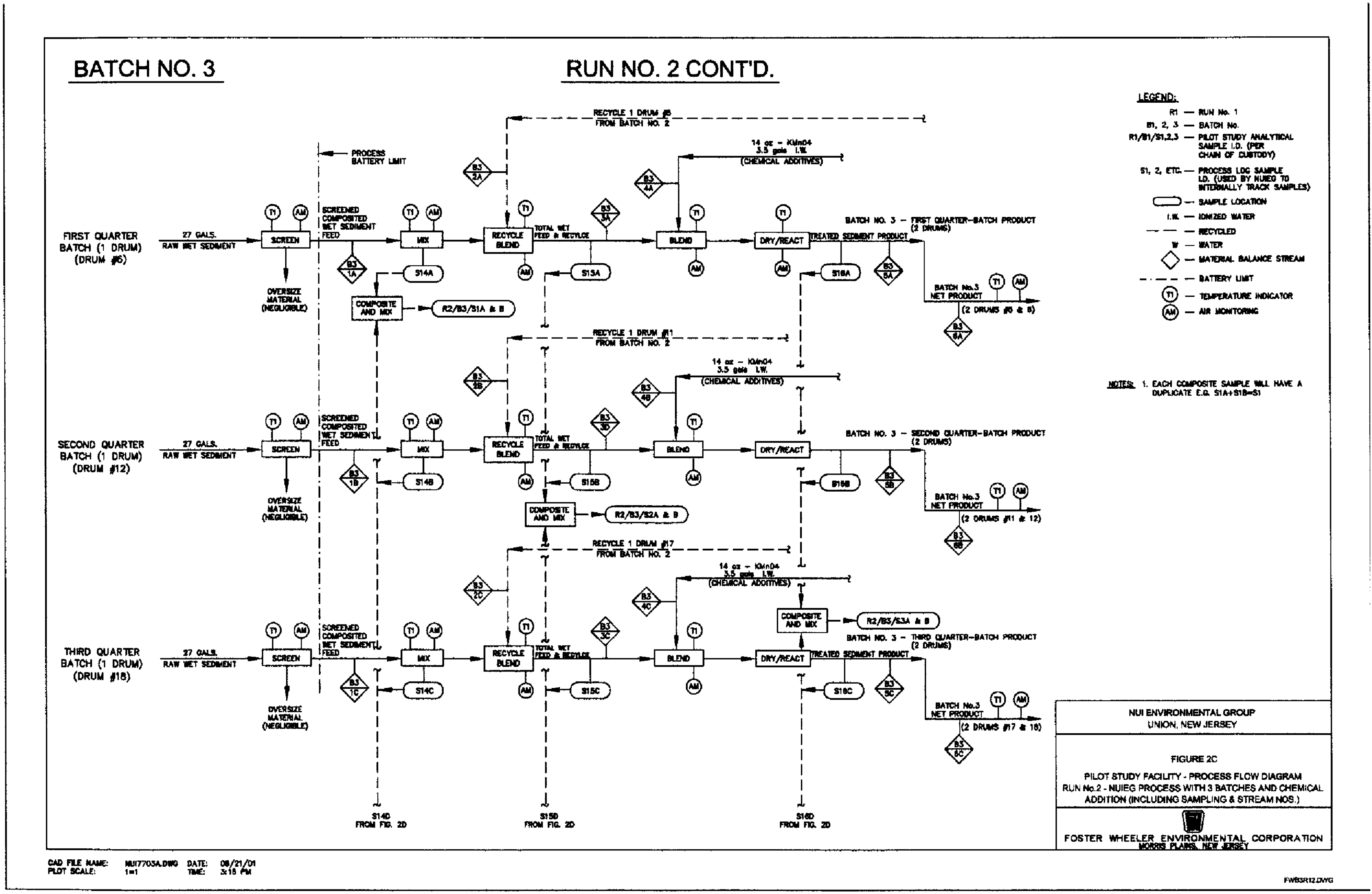

FIGURE 2C

PILOT STUDY FACILITY - PROCESS FLOW DIAGRAM
RUN No.2 - NUIEG PROCESS WITH 3 BATCHES AND CHEMICAL ADDITION (INCLUDING SAMPLING & STREAM NOS.)

MAXUS2367449

BATCH NO. 3 CONT'D.

RUN NO. 2 CONT'D.

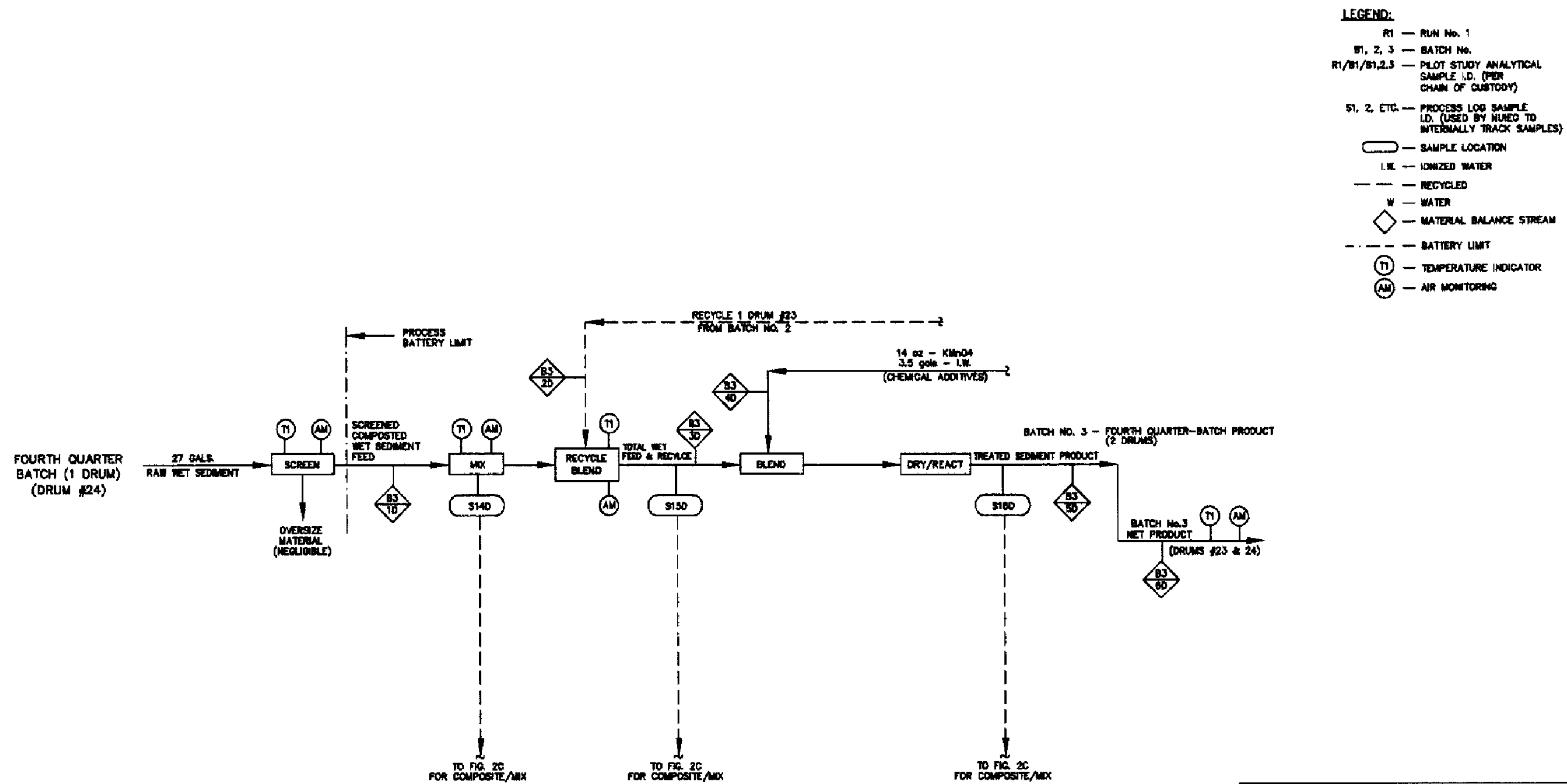

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FIGURE 2D

PILOT STUDY FACILITY - PROCESS FLOW DIAGRAM
RUN No. 2- NUIEG PROCESS WITH 3 BATCHES AND CHEMICAL ADDITION (INCLUDING SAMPLING & STREAM NOS.)

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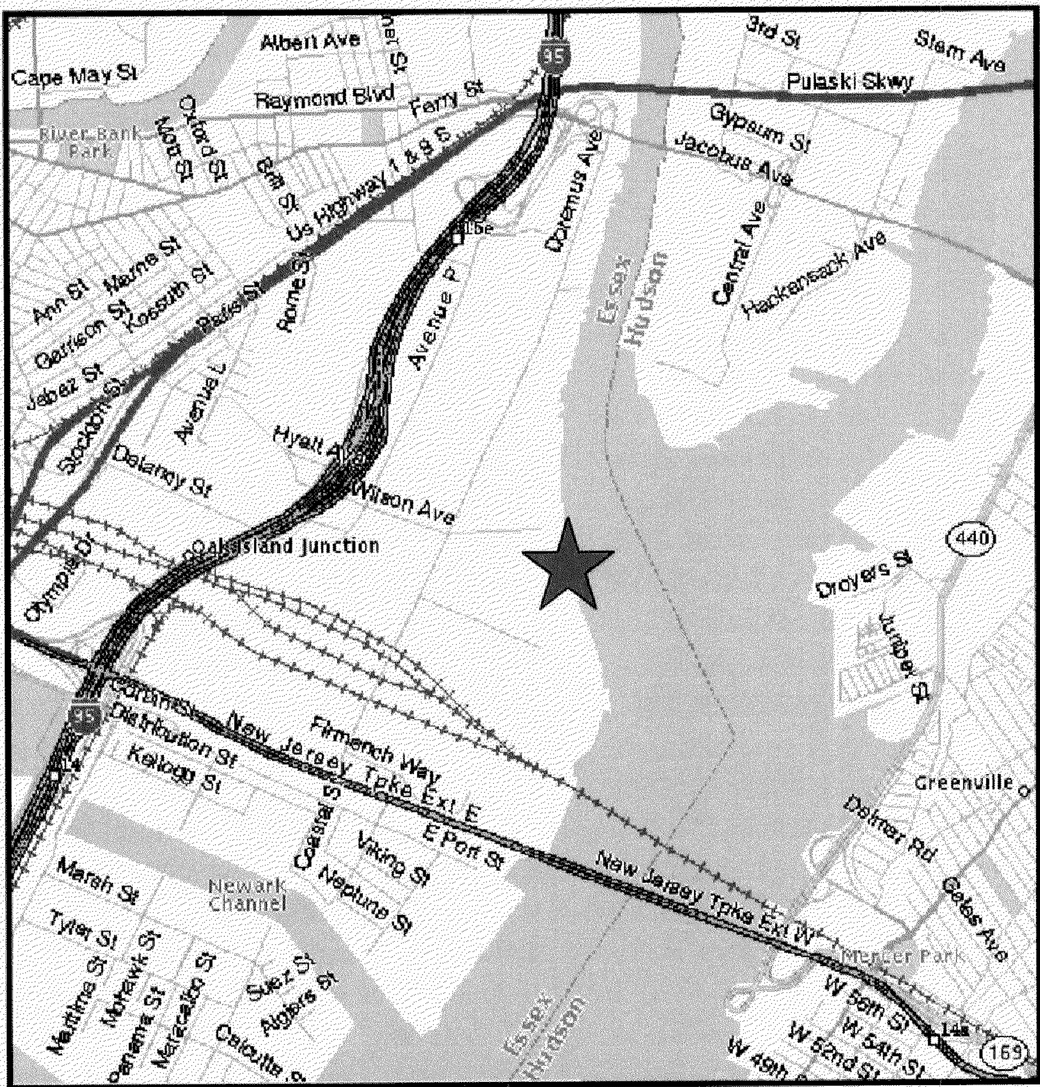
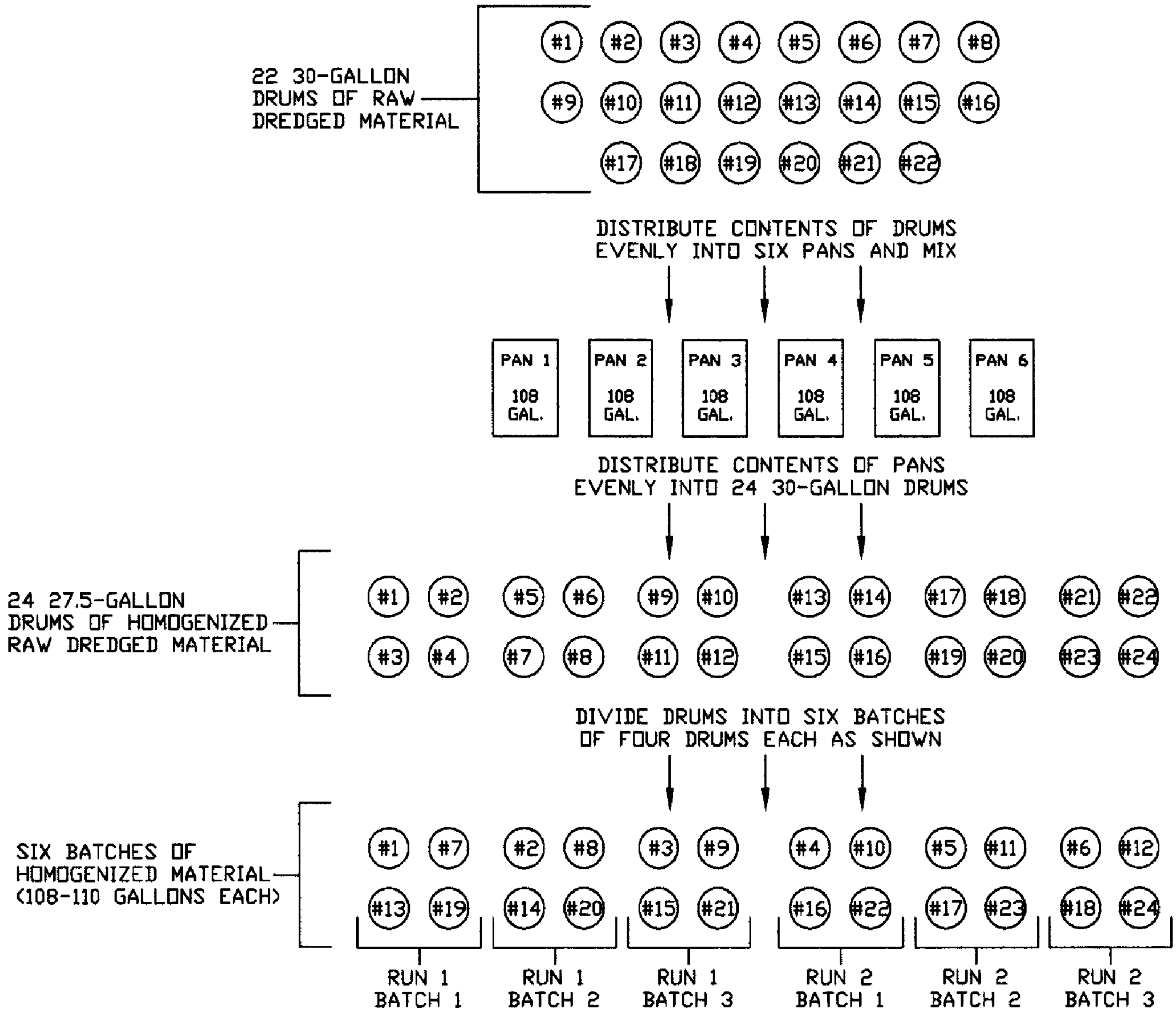


Figure 3 – Stratus Petroleum Site (Dredged Material Source)



PROJECT
NUIEG PILOT STUDY

DESCRIPTION
DREDGED MATERIAL PREPARATION PROCEDURE

DATE
23 AUGUST 2001

FIGURE 4

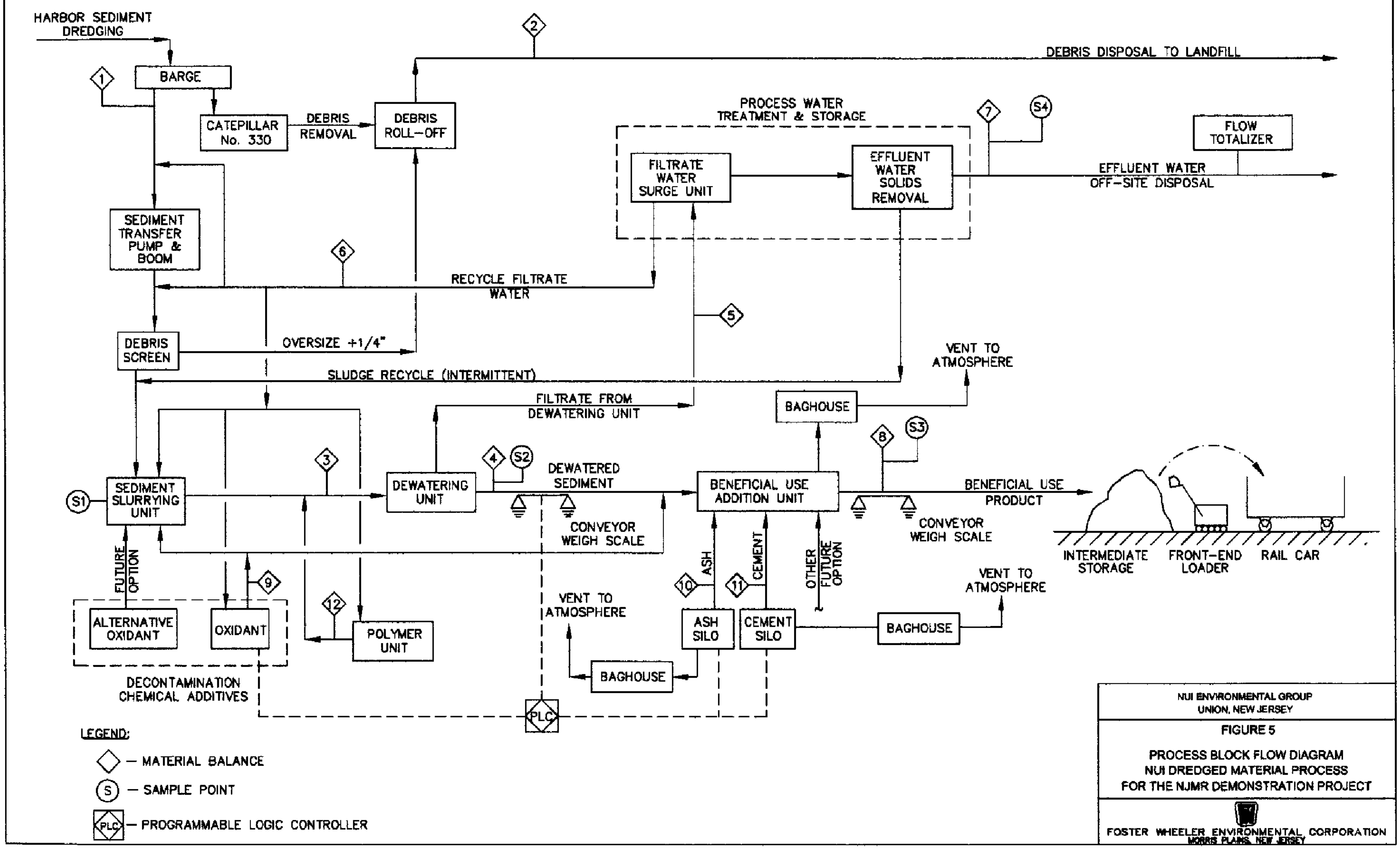


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FIGURE 5

PROCESS BLOCK FLOW DIAGRAM
NUI DREDGED MATERIAL PROCESS
FOR THE NJMR DEMONSTRATION PROJECT

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MORRIS PLAINS, NEW JERSEY

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PLOT SCALE: 1=1 TIME: 2:20 PM

Tables

Analytical Qualifiers

ORGANIC METHOD QUALIFIERS

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

U – The analytical result is a non-detect.

J – Indicates an estimated value. The concentration reported was detected below the Method Detection Limit.

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.

J – Indicates an estimated value. The concentration reported was detected below the Method Detection Limit.

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

NR – When the analyte is not required to be analyzed

P – ICP

T – Titrimetric

Table 1. Run No.1-Batch No.1 Engineering Material Balance, Lbs per Batch

Stream No.	B1/1	B1/2	B1/3	NA	
Description Component	Screened Composited Wet Sediment Feed (MATERIAL IN)	Chemical Additive	Treated Sediment Product	Estimated Sampling Weight	Treated Sediment Product + Sample Weight (MATERIAL OUT)
Dry Solids	583.6	-	543.4	15.1	558.5
Water	604.9	-	268.1	15.7	283.8
KMnO4	-	3.5	-		
Ionized Water	-	187.2	-		
Total	1188.5	190.7	811.5	30.8	842.3
Volume, Gallons	108.0	22.5		2.8	
Bulk Density, Lbs/gallon	11.0				
Chlorides, ppm	11700.0				
Sulfates, ppm	2250.0				
pH	7.6		7.6		
Organic Carbon, wt%	6.8		6.9		
KMnO4 Dosage, ppmw on dry solids feed		5997.0			
Solids Recovery, % (1)					95.1%

Notes

1. $\frac{\text{Solids out}}{\text{Solids in}} \times 100 = \frac{543.4 + 15.1}{583.6 + 3.5} \times 100 = 95.1$

Table 2. Run No.1-Batch No.2 Engineering Material Balance, Lbs per Batch

Stream No.	B2/1	B2/2	B2/3	B2/4	B2/6	NA	
Description Component	Screened Composited Wet Sediment Feed	Recycled Sediment from Batch No.1	Total Wet Feed + Recycle (MATERIAL IN)	Chemical Additive	Treated Sediment Product	Estimated Sampling Weight	Sediment Product + Sampling Weight (MATERIAL OUT)
Dry Solids	597.7	543.4	1141.1	-	1054.8	23.2	1078.0
Water	592.8	268.1	860.9	-	789.2	17.5	806.7
KMnO4	-			3.5	-		
Ionized Water	-			290.5	-		
Total	1190.5	811.5	2002.0	294.0	1844.0	40.7	1884.7
Volume, Gallons	108.0			35.0		3.7	
Bulk Density,	11.0						
Lbs/gallon							
Chlorides, ppm	9700.0				10800.0		
Sulfates, ppm	800.0				2800.0		
pH	7.3				7.3		
Organic Carbon, wt%	6.8				6.7		
KMnO4 Dosage,				5856.0			
ppmw on dry solids feed							
Solids Recovery, %							94.2%

Table 3. Run No.1-Batch No.3 Engineering Material Balance, Lbs per Batch

Stream No.	B3/1	B3/2	B3/3	B3/4	B3/6	NA	
Description Component	Screened Composited Wet Sediment Feed	Recycled Sediment from Batch No.1	Total Wet Feed + Recycle (MATERIAL IN)	Chemical Additive	Treated Sediment Product	Estimated Sampling Weight	Sediment Product + Sampling Weight (MATERIAL OUT)
Dry Solids	627.8	530.2	1158.0	-	1147.4	29.6	1177.0
Water	562.2	396.8	959.0	-	269.1	22.1	291.2
KMnO4	-			3.5	-		
Ionized Water	-			207.5	-		
Total	1190.0	927.0	2117.0	211.0	1416.5	51.7	1468.2
Volume, Gallons	108.0			25.0		3.7	
Bulk Density,	11.0						
Lbs/gallon							
Chlorides, ppm	9800.0				12700.0		
Sulfates, ppm	1100.0				3500.0		
pH	7.2				7.5		
Organic Carbon, wt%	6.7				6.7		
KMnO4 Dosage,				5575.0			
ppmw on dry solids feed							
Solids Recovery, %							101.3%

Table 4. Run No.2-Batch No.1 Engineering Material Balance, Lbs per Batch

Stream No.	B1/1	B1/2	B1/3	NA	
Description Component	Screened Composited Sediment Feed (MATERIAL IN)	Chemical Additive	Treated Sediment Product	Estimated Sampling Weight	Treated Sediment Product + Sample Weight (MATERIAL OUT)
Dry Solids	586.4	-	539.0	15.2	554.2
Water	603.1	-	300.5	15.6	316.1
KMnO4	-	3.5	-	-	
Ionized	-	58.1	-	-	
Water					
Total	1189.5	61.6	839.5	30.8	870.3
Volume, Gallons	108.0	7.0		2.8	
Bulk Density,	11.0				
Lbs/gallon					
Chlorides, ppm	11900.0				
Sulfates, ppm	2100.0				
pH	7.5		7.0		
Organic Carbon, wt%	6.8		6.8		
KMnO4 Dosage,		5969.0			
ppmw on dry solids feed					
Solids Recovery, %					93.9%

Table 5. Run No.2-Batch No.2 Engineering Material Balance, Lbs per Batch

Stream No.	B2/1	B2/2	B2/3	B2/4	B2/6	NA	
Description Component	Screened Composited Wet Sediment Feed	Recycle Sediment from Batch No.1	Total Wet Feed + Recycle (MATERIAL IN)	Chemical Additive	Treated Sediment Product	Estimated Sampling Weight	Sediment Product + Sampling Weight (MATERIAL OUT)
Dry Solids	606.1	539.0	1145.1	-	1103.4	25.2	1128.6
Water	588.4	300.5	888.9	-	682.1	15.5	697.6
KMnO4	-			3.5	-		
Ionized Water	-			116.2	-		
Total	1194.5	839.5	2034.0	119.7	1785.5	40.7	1826.2
Volume, Gallons	108.0			14.0		3.7	
Bulk Density, Lbs/gallon	11.0						
Chlorides, ppm	9200.0				10900.0		
Sulfates, ppm	1200.0				2700.0		
pH	7.3				7.1		
Organic Carbon, wt%	6.5				6.9		
KMnO4 Dosage, ppmw on dry solids feed				5775.0			
Solids Recovery, %							98.3%

Table 6. Run No.2-Batch No.3 Engineering Material Balance, Lbs per Batch

Stream No.	B3/1	B3/2	B3/3	B3/4	B3/6	NA	
Description Component	Screened Composited Wet Sediment Feed	Recycled Sedimen from Batch No.1	Total Wet Feed + Recycle (MATERIAL IN)	Chemical Additive	Treated Sediment Product	Estimated Sampling Weight	Sediment Product + Sampling Weight (MATERIAL OUT)
Dry Solids	569.8	554.8	1124.6	-	1106.7	28.1	1134.8
Water	619.7	326.7	946.4	-	353.3	23.6	376.9
KMnO4	-			3.5	-		
Ionized Water	-			116.2	-		
Total	1189.5	881.5	2071.0	119.7	1460.0	51.7	1511.7
Volume, Gallons	108.0			14.0		4.7	
Bulk Density,	11.0						
Lbs/gallon							
Chlorides, ppm	10600.0				12300.0		
Sulfates, ppm	1600.0				3400.0		
pH	7.3				7.3		
Organic Carbon, wt%	6.3				6.6		
KMnO4 Dosage,				6143.0			
ppmw on dry solids feed							
Solids Recovery, %							100.6%

Table 7: Sampling & Testing Summary

Sample ID	Sampling Point (Feed, Feed/Recycle, Product)	Atterberg Limits, pH, OC, Moisture Content	Contaminants	Specific Gravity	Grain Size with Hydrometer	Chemical Testing (CL, SO_3, Resistivity)	TCLP Leachate	MEP Leachate
R1/B1/S1 A/B	Feed	1	2	1	1	1		
R1/B1/S2 A/B	Product	1	2	0	0	0	0	0
R1/B2/S1 A/B	Feed	1	2	0	0	1		
R1/B2/S2 A/B	Feed/Recycle	0	2	0	0	0		
R1/B2/S3 A/B	Product	1	2	0	0	1		
R1/B3/S1 A/B	Feed	1	2	1	1	1		
R1/B3/S2 A/B	Feed/Recycle	0	2	0	0	0		
R1/B3/S3 A/B	Product	1	2	1	1	1	2	1
R2/B1/S1 A/B	Feed	1	2	1	1	1		
R2/B1/S2 A/B	Product	1	2	0	0	0		
R2/B2/S1 A/B	Feed	1	2	0	0	1		
R2/B2/S2 A/B	Feed/Recycle	0	2	0	0	0		
R2/B2/S3 A/B	Product	1	2	0	0	1		
R2/B3/S1 A/B	Feed	1	2	1	1	1		
R2/B3/S2 A/B	Feed/Recycle	0	2	0	0	0		
R2/B3/S3 A/B	Product	1	2	1	1	1	2	1
WS A/B	Raw Water		2					
Total		**12**	**34**	**6**	**6**	**10**	**4**	**2**

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Table 8: Analytical Methods and Sampling Requirements

Analysis Method	Description	Volume/Mass Required
Sediment Bulk Chemistry		
8260	NJDEP Appendix VOC TCL+10	One 2-ounce jar
8270C	TCL Semivolatile Organics by GC/MS +20	Three 8-ounce jars Triple sample amounts for QC samples
8290	Dioxins/Furans by HRGC/HRMS	
6010	TAL Metals by ICP	
9012A	Total Cyanide	
7471A	Mercury by CVAA	
8081A	TCL Pesticides by GC	
8082	TCL PCB Aroclors by GC	
Raw Water		
8260	NJDEP Appendix VOC TCL+10	Four, 1 liter amber glass jars + two, 40 ml. vials with HCl + one, 1 liter HDPE jar with nitric acid + one, 500 ml. HDPE jar with NaOH
8270C	TCL Semivolatile Organics by GC/MS +20	
8290	Dioxins/Furans by HRGC/HRMS	
6010	TAL Metals by ICP	
9012A	Total Cyanide	
7472	Mercury by CVAA	
8081A	TCL Pesticides by GC	
8082	TCL PCB Aroclors by GC	
Leachate Preparation		
1311	TCLP Leachate Preparation	Two 1 liter wide mouth glass jars
1320M	Multiple Extraction Procedure - NJ 10/97 Mod	
TCLP Leachate Analysis		
8260	TCLP VOC by GCMS	None
8050	TCLP Herbicides by GC	None
6010-7472	TCLP Metals	None
8081A	TCLP Pesticides by GC	None
8270C	TCLP Semivolatiles by GC/MS + 20 TICs	None
Waste Characterization		
SW 846 Chapter 6	Reactivity to Sulfides and Cyanides	None
1030	Ignitability	None
9045C	Corrosivity (pH)	None
Modified MEP Leachate Analysis		
8260	NJDEP Appendix VOC TCL+10	None
8270C	TCL Semivolatile Organics by GC/MS +20	
8290	Dioxins/Furans by HRGC/HRMS	
6010	TAL Metals by ICP	
9012A	Total Cyanide	
6010-7472	Mercury by CVAA	
8081A	TCL Pesticides by GC	
8082	TCL PCB Aroclors by GC	

NUIEG PILOT STUDY
TABLE 9 - SUMMARY OF GEOTECHNICAL TESTING RESULTS

SAMPLE NUMBER	CLASSIFICATION	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		PLASTICITY INDEX	SPECIFIC GRAVITY	ORGANIC CONTENT (%)	RESISTIVITY (OHM-CM)	pH	CHLORIDES (PPM)	SULFATES (PPM)
			LIQUID LIMIT	PLASTIC LIMIT							
R1/B1/S1	Gray Organic Silt (OH)	104.5	63	45	18	2.62	6.8	70	7.6	11,700	2,250
R1/B1/S2	Gray Organic Silt (OH)	47.4	72	40	32		6.9		7.6		
R1/B2/S1	Gray Organic Silt (OH)	100.9	71	45	26		6.8	77	7.3	9,700	800
R1/B2/S3	Gray Organic Silt (OH)	72.7	58	43	15		6.7	65	7.3	10,800	2,800
R1/B3/S1	Gray Organic Silt (OH)	102.3	60	49	11	2.57	6.7	78	7.2	9,800	1,100
R1/B3/S3	**Gray Organic Silt (OH)**	**25.3**	**72**	**41**	**31**	**2.60**	**6.7**	**260**	**7.5**	**12,700**	**3,500**
R2/B1/S1	Gray Organic Silt (OH)	103.1	65	37	28	2.59	6.8	76	7.5	11,900	2,100
R2/B1/S2	Gray Organic Silt (OH)	57.2	86	47	39		6.8		7.0		
R2/B2/S1	Gray Organic Silt (OH)	104.3	61	46	15		6.5	76	7.3	9,200	1,200
R2/B2/S3	Gray Organic Silt (OH)	62.1	82	51	31		6.9	64	7.1	10,900	2,700
R2/B3/S1	Gray Organic Silt (OH)	102.2	69	46	23	2.60	6.3	79	7.3	10,600	1,600
R2/B3/S3	**Gray Organic Silt (OH)**	**29.4**	**77**	**43**	**34**	**2.61**	**6.6**	**195**	**7.3**	**12,300**	**3,400**

Note: **Bolded** fields are samples representative of final processed material.

NUIEG PILOT STUDY
Table 10 - PUF Testing Results and Evaluation

Sample #0105169A-01A (Treated Sediment)			
Constituents	**Method Reporting Limit (ug)**	**Amount Detected (ug)**	**Estimated Maximum Possible Emission(1) (mg)**
Benzo(a)anthracene	1.0	ND	0.1
Benzo(b)fluoranthene	1.0	ND	0.1
Benzo(k)fluoranthene	1.0	ND	0.1
Benzo(a)pyrene	1.0	ND	0.1
bis(2-Ethylhexyl)phthalate	5.0	ND	0.6
Chrysene	1.0	ND	0.1
Indeno(1,2,3-cd)pyrene	1.0	ND	0.1

Sample #0105169A-02A (Raw Sediment)			
Constituents	**Method Reporting Limit (ug)**	**Amount Detected (ug)**	**Estimated Maximum Possible Emission(1) (mg)**
Benzo(a)anthracene	1.0	ND	0.1
Benzo(b)fluoranthene	1.0	ND	0.1
Benzo(k)fluoranthene	1.0	ND	0.1
Benzo(a)pyrene	1.0	ND	0.1
bis(2-Ethylhexyl)phthalate	5.0	ND	0.6
Chrysene	1.0	ND	0.1
Indeno(1,2,3-cd)pyrene	1.0	ND	0.1

NOTES:

1. Estimated maximum possible emission represents an extrapolation of the results of the PUF testing Because all emissions in the PUF testing were below method reporting limits (MRLs), the estimated maximum possible emission, in milligrams, is based on the MRLs for each constituent, adjusted to reflect a 21-day processing period for a batch of dredged material.

SEDIMENT FEED CONTAMINANT ANALYSIS

Table 11A: Run1-Batch1 Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L8508								
Date Received: 02/15/01								
		R1/B1/S1-A			R1/B1/S1-B			
VOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Chloromethane	ppb	0.69	0.69	U	0.69	0.69	U	520,000
Bromomethane	ppb	0.79	0.8	U	0.79	0.79	U	79,000
Vinyl Chloride	ppb	0.69	0.69	U	0.69	0.69	U	2,000
Chloroethane	ppb	0.39	0.39	U	0.39	0.39	U	NR
Methylene Chloride	ppb	1.10	1.1	U	1.10	1.1	U	49,000
Acetone	ppb	8.81	8.85	U	8.81	8.81	U	1,000,000
Carbon disulfide	ppb	0.55	**4.2**		0.55	**4.7**		**NR**
1,1-Dichloroethene	ppb	0.43	0.43	U	0.43	0.43	U	8,000
1,1-Dichloroethane	ppb	0.32	0.33	U	0.32	0.32	U	570,000
t-1,2-Dichloroethene	ppb	0.83	0.84	U	0.83	0.83	U	1,000,000
c-1,2-Dichloroethene	ppb	1.01	1.02	U	1.01	1.01	U	79,000
Chloroform	ppb	0.35	0.35	U	0.35	0.35	U	19,000
1,2-Dichloroethane	ppb	0.61	0.61	U	0.61	0.61	U	6,000
2-Butanone	ppb	5.10	5.12	U	5.10	5.1	U	1,000,000
1,1,1-Trichloroethane	ppb	0.57	0.57	U	0.57	0.57	U	210,000
Carbon Tetrachloride	ppb	0.55	0.55	U	0.55	0.55	U	2,000
Bromodichloromethane	ppb	0.39	0.39	U	0.39	0.39	U	11,000
1,2-Dichloropropane	ppb	0.37	0.37	U	0.37	0.37	U	10,000
cis-1,3-Dichloropropene	ppb	0.51	0.51	U	0.51	0.51	U	4,000
Trichloroethene	ppb	0.61	0.61	U	0.61	0.61	U	23,000
Dibromochloromethane	ppb	0.59	0.59	U	0.59	0.59	U	110,000
1,1,2-Trichloroethane	ppb	0.95	0.96	U	0.95	0.95	U	22,000
Benzene	ppb	0.57	0.57	U	0.57	0.57	U	3,000
trans-1,3-Dichloropropene	ppb	0.83	0.84	U	0.83	0.83	U	4,000
Bromoform	ppb	0.97	0.98	U	0.97	0.97	U	86,000
4-Methyl-2-pentanone	ppb	3.00	3.02	U	3.00	3.00	U	1,000,000
2-Hexanone	ppb	3.15	3.16	U	3.15	3.15	U	NR
Tetrachloroethene	ppb	0.57	0.57	U	0.57	0.57	U	4,000
Toluene	ppb	0.67	0.67	U	0.67	0.67	U	1,000,000
1,1,2,2-Tetrachloroethane	ppb	1.01	1.02	U	1.01	1.01	U	34,000
Chlorobenzene	ppb	0.59	0.59	U	0.59	0.59	U	37,000
Ethylbenzene	ppb	0.69	0.69	U	0.69	0.69	U	1,000,000
Styrene	ppb	0.59	0.59	U	0.59	0.59	U	23,000
m,p-xylene	ppb	1.28	**1.7**		1.28	1.28	U	**410,000**
o-xylene	ppb	0.57	0.57	U	0.57	0.57	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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11B: Run1-Batch1 Semi-Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L8508								
Date Received: 02/15/01								
		R1/B1/S1-A			R1/B1/S1-B			
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Phenol	ppb	122	122	U	121	121	U	10,000,000
bis(2-Chloroethyl)ether	ppb	157	157	U	157	157	U	660
2-Chlorophenol	ppb	148	**139**	J	147	147	U	**280,000**
1,3-Dichlorobenzene	ppb	161	161	U	161	161	U	5,100,000
1,4-Dichlorobenzene	ppb	153	**122**	J	153	153	U	**570,000**
1,2-Dichlorobenzene	ppb	173	173	U	172	172	U	5,100,000
2-Methylphenol	ppb	155	155	U	154	154	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	164	164	U	163	163	U	2,300,000
3+4-Methylphenol	ppb	155	155	U	155	155	U	2,800,000
N-Nitrosodi-n-propylamine	ppb	143	143	U	142	142	U	660
Hexachloroethane	ppb	137	137	U	137	137	U	6,000
Nitrobenzene	ppb	171	171	U	170	170	U	28,000
Isophorone	ppb	139	139	U	139	139	U	1,100,000
2-Nitrophenol	ppb	130	130	U	129	129	U	NR
2,4-Dimethylphenol	ppb	121	121	U	121	121	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	159	159	U	159	159	U	NR
2,4-Dichlorophenol	ppb	143	143	U	143	143	U	170,000
1,2,4-Trichlorobenzene	ppb	175	**85.7**	J	174	174	U	**68,000**
Naphthalene	ppb	169	**188**		168	**97.6**	J	**230,000**
4-Chloroaniline	ppb	86.7	86.7	U	86.4	86.4	U	230,000
Hexachlorobutadiene	ppb	164	164	U	163	163	U	1,000
4-Chloro-3-methylphenol	ppb	168	168	U	168	168	U	10,000,000
2-Methylnaphthalene	ppb	144	**53**	J	143	143	U	**NR**
Hexachlorocyclopentadiene	ppb	72.4	72.4	U	72.2	72.2	U	400,000
2,4,6-Trichlorophenol	ppb	144	144	U	143	143	U	62,000
2,4,5-Trichlorophenol	ppb	128	128	U	128	128	U	5,600,000
2-Chloronaphthalene	ppb	167	167	U	167	167	U	NR
2-Nitroaniline	ppb	126	126	U	125	125	U	NR
Dimethylphthalate	ppb	167	167	U	166	166	U	10,000,000
Acenaphthylene	ppb	164	**261**		163	**209**		**NR**
2,6-Dinitrotoluene	ppb	124	124	U	124	124	U	1,000
3-Nitroaniline	ppb	80.0	80	U	79.7	79.7	U	NR
Acenaphthene	ppb	176	**196**		176	**71.1**	J	**3,400,000**
2,4-Dinitrophenol	ppb	119	119	U	118	118	U	110,000
4-Nitrophenol	ppb	266	266	U	265	265	U	NR
Dibenzofuran	ppb	172	172	U	171	171	U	NR
2,4-Dinitrotoluene	ppb	113	113	U	113	113	U	1,000
Diethylphthalate	ppb	110	**51**	J	109	109	U	**10,000,000**
4-Chlorophenyl phenyl ether	ppb	198	198	U	197	197	U	NR
Fluorene	ppb	179	**104**	J	178	**93.5**	J	**2,300,000**
4-Nitroaniline	ppb	92.2	92.2	U	91.9	91.9	U	NR
4,6-Dinitro-2-methylphenol	ppb	156	156	U	155	155	U	NR
N-Nitrosodiphenylamine	ppb	164	164	U	163	163	U	140,000

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11B: Run1-Batch1 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L8508
Date Received: 02/15/01

SEMIVOLATILES	Units:	R1/B1/S1-A Method Detection Limit	R1/B1/S1-A Concentration	R1/B1/S1-A Q	R1/B1/S1-B Method Detection Limit	R1/B1/S1-B Concentration	R1/B1/S1-B Q	Residential Direct Contact Soil Cleanup Criteria
4-Bromophenyl phenyl ether	ppb	149	149	U	149	149	U	NR
Hexachlorobenzene	ppb	146	146	U	146	146	U	660
Pentachlorophenol	ppb	99.6	99.6	U	99.2	99.2	U	6,000
Phenanthrene	ppb	144	**488**	B	143	**327**	B	**NR**
Anthracene	ppb	146	**367**		146	**285**		**10,000,000**
Carbazole	ppb	116	116	U	116	116	U	NR
Di-n-butylphthalate	ppb	441	**453**		439	**228**	J	**5,700,000**
Fluoranthene	ppb	130	**1490**		129	**1090**		**2,300,000**
Pyrene	ppb	107	**1670**	B	107	**1120**	B	**1,700,000**
Butylbenzylphthalate	ppb	97.5	**81.6**	J	97.2	**118**		**1,100,000**
3,3'-Dichlorobenzidine	ppb	169	169	U	168	168	U	2,000
Benzo(a)anthracene	ppb	102	**985**		102	**774**		**900**
Chrysene	ppb	102	**1030**		102	**852**		**9,000**
bis(2-Ethylhexyl)phthalate	ppb	663	**8970**	B	661	**6300**	B	**49,000**
Di-n-octylphthalate	ppb	126	**100**	J	125	**48.8**	J	**NR**
Benzo(b)fluoranthene	ppb	167	**869**		167	**947**		**900**
Benzo(k)fluoranthene	ppb	136	**822**		135	**413**		**900**
Benzo(a)pyrene	ppb	111	**1040**		111	**752**		**660**
Indeno(1,2,3-cd)pyrene	ppb	130	**249**		129	**370**		**900**
Dibenz(a,h)anthracene	ppb	122	**188**		122	**108**	J	**660**
Benzo(g,h,i)perylene	ppb	108	**720**		108	**415**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11C: Run1-Batch1 PCBs

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L8508
Date Received: 02/15/01

		R1/B1/S1-A			R1/B1/S1-B			
PCB (Aroclor)	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
PCB 1016	ppb	4.16	**331**		4.15	**362**		
PCB 1221	ppb	19.6	19.6	U	19.5	19.5	U	
PCB 1232	ppb	4.35	4.35	U	4.33	4.33	U	
PCB 1242	ppb	3.26	3.26	U	3.25	3.25	U	
PCB 1248	ppb	7.34	7.34	U	7.32	7.32	U	
PCB 1254	ppb	11.1	11.1	U	11.1	11.1	U	
PCB 1260	ppb	12.8	**391**		12.7	**395**		
PCB Total	ppb	NA	**722**		NA	**757**		**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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11D: Run1-Batch1 Pesticides

Summary of Results									
Project: PB-NUI									
ETL Chain of Custody #: L8508									
Date Received: 02/15/01									
		R1/B1/S1-A			R1/B1/S1-B				
Pesticides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
alpha-BHC	ppb	1.88	1.88	U	1.87	1.87	U	NR
beta-BHC	ppb	2.21	2.21	U	2.2	2.2	U	NR
delta-BHC	ppb	1.57	1.57	U	1.57	1.57	U	NR
gamma-BHC (Lindane)	ppb	1.92	1.92	U	1.91	1.91	U	520
Heptachlor	ppb	2.15	2.15	U	2.13	2.13	U	150
Aldrin	ppb	1.74	1.74	U	1.73	1.73	U	40
Heptachlor epoxide	ppb	2.45	2.45	U	2.44	2.44	U	NR
Endosulfan I	ppb	2.74	2.74	U	2.72	2.72	U	340,000
Dieldrin	ppb	2.25	2.25	U	2.24	2.24	U	42
4,4'-DDE	ppb	2.02	**44.8**		2.01	**46.7**		**2,000**
Endrin	ppb	2.41	2.41	U	2.4	2.4	U	17,000
Endosulfan II	ppb	2.00	2	U	1.99	1.99	U	340,000
4,4'-DDD	ppb	1.29	**38.8**		1.28	**35.8**		**3,000**
Endosulfan sulfate	ppb	1.64	1.64	U	1.63	1.63	U	NR
4,4'-DDT	ppb	2.43	2.43	U	2.42	2.42	U	2,000
Methoxychlor	ppb	2.66	2.66	U	2.64	2.64	U	280,000
Endrin ketone	ppb	2.17	2.17	U	2.15	2.15	U	NR
Endrin aldehyde	ppb	5.71	5.71	U	5.67	5.67	U	NR
alpha-Chlordane	ppb	2.88	2.88	U	2.87	2.87	U	NR
gamma-Chlordane	ppb	1.88	1.88	U	1.87	1.87	U	NR
Toxaphene	ppb	41.3	41.3	U	41.1	41.1	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.
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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11E: Run1-Batch1 Metals

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L8508
Date Received: 02/15/01

		R1/B1/S1-A			R1/B1/S1-B			
Metals	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Aluminum	ppm	17.6	**5630**		17.5	**12500**		NR
Antimony *	ppm	0.73	**0.098**	J	0.73	0.73	U	14
Arsenic *	ppm	0.98	0.98	U	0.97	0.97	U	20
Barium *	ppm	0.24	**55.5**		0.24	**38.8**		700
Beryllium	ppm	0.24	0.24	U	0.24	0.24	U	1
Cadmium *	ppm	0.24	**1.22**		0.24	0.24	U	39
Calcium	ppm	26.9	**70400**		26.8	**17700**		NR
Chromium	ppm	0.45	**20.6**		0.45	**2.03**		NR
Cobalt	ppm	0.24	**7.55**		0.24	**25.8**		NR
Copper *	ppm	0.45	**103**		0.45	**359**		600
Iron	ppm	19.5	**16000**		19.4	**36700**		NR
Lead *	ppm	0.45	**50.4**		0.45	**135**		400
Magnesium	ppm	18.4	**38600**		18.3	**8850**		NR
Manganese	ppm	0.24	**213**		0.24	**371**		NR
Mercury *	ppm	0.72	**3.58**		0.71	**3.56**		14
Nickel *	ppm	0.35	**12.4**		0.35	**13.4**		250
Potassium	ppm	241	241	U	240	240	U	NR
Selenium	ppm	0.96	0.96	U	0.95	0.95	U	63
Silver *	ppm	0.31	0.31	U	0.3	0.3	U	110
Sodium	ppm	19.2	**1060**		19.1	**1440**		NR
Thallium	ppm	0.80	0.8	U	0.79	0.79	U	2
Vanadium *	ppm	0.57	**28.6**		0.57	**108**		370
Zinc *	ppm	0.74	**127**		0.74	**90.9**		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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11F: Run1-Batch1 Dioxins

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L8508
Date Received: 02/15/01

		R1/B1/S1-A			R1/B1/S1-B			
Dioxins	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
2,3,7,8-TCDF	ng/Kg	1.40	**18**		0.71	**18**		
Total TCDF	ng/Kg	1.40	**470**		0.71	**340**		
2,3,7,8-TCDD	ng/Kg	0.75	**200**		1.10	**120**		
Total TCDD	ng/Kg	0.75	**260**		1.10	**160**		
1,2,3,7,8-PeCDF	ng/Kg	1.90	**130**	EMP	1.80	**36**		
2,3,4,7,8-PeCDF	ng/Kg	0.63	**45**		0.99	**38**	EMP	
Total PeCDF	ng/Kg	1.30	**710**		1.40	**450**		
1,2,3,7,8-PeCDD	ng/Kg	1.00	**8.7**	EMP	0.51	**6.1**	EMP	
Total PeCDD	ng/Kg	1.00	**39**		0.51	**37**		
1,2,3,4,7,8-HxCDF	ng/Kg	1.00	**270**		0.62	**380**		
1,2,3,6,7,8-HxCDF	ng/Kg	0.65	**330**	EMP	0.94	**310**	EMP	
2,3,4,6,7,8-HxCDF	ng/Kg	0.51	**41**		0.52	**33**		
1,2,3,7,8,9-HxCDF	ng/Kg	0.88	**15**		0.50	**13**		
Total HxCDF	ng/Kg	0.76	**730**		0.64	**1000**		
1,2,3,4,7,8-HxCDD	ng/Kg	1.20	**10**		0.85	**6.5**		
1,2,3,6,7,8-HxCDD	ng/Kg	1.10	**29**		1.90	**27**		
1,2,3,7,8,9-HxCDD	ng/Kg	1.20	**14**		0.68	**13**		
Total HxCDD	ng/Kg	1.20	**340**		1.20	**310**		
1,2,3,4,6,7,8-HpCDF	ng/Kg	0.91	**970**		2.20	**1800**		
1,2,3,4,7,8,9-HpCDF	ng/Kg	1.10	**33**		2.00	**57**		
Total HpCDF	ng/Kg	1.00	**1000**		2.10	**2100**		
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.20	**400**		1.70	**400**		
Total HpCDD	ng/Kg	1.20	**980**		1.70	**1100**		
OCDF	ng/Kg	2.10	**1500**		3.00	**3000**		
OCDD	ng/Kg	2.40	**3600**		3.30	**4000**		
TEF (Total)	ng/Kg	NA	**280**		NA	**210**		**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, 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. ppt is on dry weight basis

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 11G: Run1-Batch1 Cyanide

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L8508								
Date Received: 02/15/01								
		R1/B1/S1-A			R1/B1/S1-B			
Cyanide	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Cyanide	ppm	0.49	0.49	U	0.52	0.52	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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12A: Run1-Batch2 Volatiles

Summary of Results									
Project: PB-NUI									
ETL Chain of Custody #: L1865									
Date Received: 03/08/01									
		R1/B2/S1-A			R1/B2/S1-B				
VOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria	
Chloromethane	ppb	0.69	1.59	U	0.69	1.63	U	520,000	
Bromomethane	ppb	0.79	1.61	U	0.79	1.65	U	79,000	
Vinyl Chloride	ppb	0.69	1.92	U	0.69	1.96	U	2,000	
Chloroethane	ppb	0.39	1.69	U	0.39	1.73	U	NR	
Methylene Chloride	ppb	1.10	1.98	U	1.10	2.03	U	49,000	
Acetone	ppb	8.81	4.73	U	8.81	4.85	U	1,000,000	
Carbon disulfide	ppb	0.55	1.47	U	0.55	1.5	U	NR	
1,1-Dichloroethene	ppb	0.43	1.35	U	0.43	1.38	U	8,000	
1,1-Dichloroethane	ppb	0.32	1.2	U	0.32	1.23	U	570,000	
t-1,2-Dichloroethene	ppb	0.83	0.69	U	0.83	0.71	U	1,000,000	
c-1,2-Dichloroethene	ppb	1.01	1.47	U	1.01	1.5	U	79,000	
Chloroform	ppb	0.35	1.37	U	0.35	1.4	U	19,000	
1,2-Dichloroethane	ppb	0.61	0.94	U	0.61	0.96	U	6,000	
2-Butanone	ppb	5.10	1.9	U	5.10	1.94	U	1,000,000	
1,1,1-Trichloroethane	ppb	0.57	1.45	U	0.57	1.48	U	210,000	
Carbon Tetrachloride	ppb	0.55	1.53	U	0.55	1.57	U	2,000	
Bromodichloromethane	ppb	0.39	1.39	U	0.39	1.42	U	11,000	
1,2-Dichloropropane	ppb	0.37	1.31	U	0.37	1.34	U	10,000	
cis-1,3-Dichloropropene	ppb	0.51	1.29	U	0.51	1.32	U	4,000	
Trichloroethene	ppb	0.61	1.53	U	0.61	1.57	U	23,000	
Dibromochloromethane	ppb	0.59	1.12	U	0.59	1.15	U	110,000	
1,1,2-Trichloroethane	ppb	0.95	1.18	U	0.95	1.21	U	22,000	
Benzene	ppb	0.57	0.27	U	0.57	0.27	U	3,000	
trans-1,3-Dichloropropene	ppb	0.83	1.14	U	0.83	1.17	U	4,000	
Bromoform	ppb	0.97	0.69	U	0.97	0.71	U	86,000	
4-Methyl-2-pentanone	ppb	3.00	3.51	U	3.00	3.59	U	1,000,000	
2-Hexanone	ppb	3.15	2.86	U	3.15	2.93	U	NR	
Tetrachloroethene	ppb	0.57	1.29	U	0.57	1.32	U	4,000	
Toluene	ppb	0.67	**1.7**		0.67	0.36	U	**1,000,000**	
1,1,2,2-Tetrachloroethane	ppb	1.01	1.2	U	1.01	1.23	U	34,000	
Chlorobenzene	ppb	0.59	0.55	U	0.59	0.56	U	37,000	
Ethylbenzene	ppb	0.69	0.18	U	0.69	0.19	U	1,000,000	
Styrene	ppb	0.59	1.47	U	0.59	1.5	U	23,000	
m,p-xylene	ppb	1.28	**7.5**		1.28	0.33	U	**410,000**	
o-xylene	ppb	0.57	**2.3**		0.57	0.25	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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12B: Run1-Batch2 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1865
Date Received: 03/08/01

		R1/B2/S1-A			R1/B2/S1-B			
SEMIVOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Phenol	ppb	122	121	U	121	125	U	10,000,000
bis(2-Chloroethyl)ether	ppb	157	157	U	157	162	U	660
2-Chlorophenol	ppb	148	148	U	147	152	U	280,000
1,3-Dichlorobenzene	ppb	161	161	U	161	165	U	5,100,000
1,4-Dichlorobenzene	ppb	153	**83.5**	J	153	**64.9**	J	**570,000**
1,2-Dichlorobenzene	ppb	173	173	U	172	177	U	5,100,000
2-Methylphenol	ppb	155	155	U	154	159	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	164	163	U	163	168	U	2,300,000
3+4-Methylphenol	ppb	155	155	U	155	159	U	2,800,000
N-Nitrosodi-n-propylamine	ppb	143	143	U	142	147	U	660
Hexachloroethane	ppb	137	137	U	137	141	U	6,000
Nitrobenzene	ppb	171	171	U	170	175	U	28,000
Isophorone	ppb	139	139	U	139	143	U	1,100,000
2-Nitrophenol	ppb	130	130	U	129	133	U	NR
2,4-Dimethylphenol	ppb	121	121	U	121	124	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	159	159	U	159	163	U	NR
2,4-Dichlorophenol	ppb	143	143	U	143	147	U	170,000
1,2,4-Trichlorobenzene	ppb	175	175	U	174	179	U	68,000
Naphthalene	ppb	169	**210**		168	**205**		**230,000**
4-Chloroaniline	ppb	86.7	86.6	U	86.4	88.9	U	230,000
Hexachlorobutadiene	ppb	164	163	U	163	168	U	1,000
4-Chloro-3-methylphenol	ppb	168	168	U	168	173	U	10,000,000
2-Methylnaphthalene	ppb	144	**95.7**	J	143	**90**	J	**NR**
Hexachlorocyclopentadiene	ppb	72.4	72.3	U	72.2	74.3	U	400,000
2,4,6-Trichlorophenol	ppb	144	144	U	143	148	U	62,000
2,4,5-Trichlorophenol	ppb	128	128	U	128	132	U	5,600,000
2-Chloronaphthalene	ppb	167	167	U	167	172	U	NR
2-Nitroaniline	ppb	126	125	U	125	129	U	NR
Dimethylphthalate	ppb	167	167	U	166	171	U	10,000,000
Acenaphthylene	ppb	164	**334**		163	**320**		**NR**
2,6-Dinitrotoluene	ppb	124	124	U	124	127	U	1,000
3-Nitroaniline	ppb	80.0	79.8	U	79.7	82	U	NR
Acenaphthene	ppb	176	**134**	J	176	**105**	J	**3,400,000**
2,4-Dinitrophenol	ppb	119	118	U	118	122	U	110,000
4-Nitrophenol	ppb	266	266	U	265	273	U	NR
Dibenzofuran	ppb	172	**77.4**	J	171	**50.2**	J	**NR**
2,4-Dinitrotoluene	ppb	113	113	U	113	116	U	1,000
Diethylphthalate	ppb	110	**48.9**	J	109	**48.1**	J	**10,000,000**
4-Chlorophenyl phenyl ether	ppb	198	197	U	197	203	U	NR
Fluorene	ppb	179	**155**	J	178	**121**	J	**2,300,000**
4-Nitroaniline	ppb	92.2	92.1	U	91.9	94.6	U	NR
4,6-Dinitro-2-methylphenol	ppb	156	155	U	155	160	U	NR
N-Nitrosodiphenylamine	ppb	164	164	U	163	168	U	140,000

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12B: Run1-Batch2 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1865
Date Received: 03/08/01

		R1/B2/S1-A			R1/B2/S1-B			
SEMIVOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
4-Bromophenyl phenyl ether	ppb	149	149	U	149	153	U	NR
Hexachlorobenzene	ppb	146	146	U	146	150	U	660
Pentachlorophenol	ppb	99.6	99.4	U	99.2	102	U	6,000
Phenanthrene	ppb	144	**790**		143	**567**		**NR**
Anthracene	ppb	146	**713**		146	**446**		**10,000,000**
Carbazole	ppb	116	**67.2**	J	116	**60.7**	J	**NR**
Di-n-butylphthalate	ppb	441	**310**	J	439	**79.5**	J	**5,700,000**
Fluoranthene	ppb	130	**2580**		129	**1930**		**2,300,000**
Pyrene	ppb	107	**2600**		107	**2030**		**1,700,000**
Butylbenzylphthalate	ppb	97.5	**122**		97.2	**146**		**1,100,000**
3,3'-Dichlorobenzidine	ppb	169	169	U	168	173	U	2,000
Benzo(a)anthracene	ppb	102	**1520**		102	**1130**		**900**
Chrysene	ppb	102	**1610**		102	**1270**		**9,000**
bis(2-Ethylhexyl)phthalate	ppb	663	**14900**	B	661	**12200**	B	**49,000**
Di-n-octylphthalate	ppb	126	**169**		125	**211**		**NR**
Benzo(b)fluoranthene	ppb	167	**1590**		167	**1410**		**900**
Benzo(k)fluoranthene	ppb	136	**1180**		135	**795**		**900**
Benzo(a)pyrene	ppb	111	**1370**		111	**1150**		**660**
Indeno(1,2,3-cd)pyrene	ppb	130	**466**		129	**421**		**900**
Dibenz(a,h)anthracene	ppb	122	122	U	122	**83.7**	J	**660**
Benzo(g,h,i)perylene	ppb	108	**580**		108	**508**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12C: Run1-Batch2 PCBs

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L1865								
Date Received: 03/08/01								
		R1/B2/S1-A			**R1/B2/S1-B**			
PCB (Aroclor)	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
PCB 1016	ppb	4.16	4.15	U	4.15	4.27	U	
PCB 1221	ppb	19.6	19.6	U	19.5	20.1	U	
PCB 1232	ppb	4.35	4.34	U	4.33	4.46	U	
PCB 1242	ppb	3.26	3.26	U	3.25	3.35	U	
PCB 1248	ppb	7.34	**93.8**		7.32	**290**		
PCB 1254	ppb	11.1	**142**		11.1	**305**		
PCB 1260	ppb	12.8	**33.9**		12.7	**130**		
PCB Total	ppb	NA	**269.7**		NA	**725**		**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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12D: Run1-Batch2 Pesticides

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1865
Date Received: 03/08/01

		R1/B2/S1-A			R1/B2/S1-B			
Pesticides	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
alpha-BHC	ppb	1.88	1.87	U	1.87	1.92	U	NR
beta-BHC	ppb	2.21	2.2	U	2.2	2.26	U	NR
delta-BHC	ppb	1.57	1.57	U	1.57	1.61	U	NR
gamma-BHC (Lindane)	ppb	1.92	1.91	U	1.91	1.97	U	520
Heptachlor	ppb	2.15	2.14	U	2.13	2.2	U	150
Aldrin	ppb	1.74	1.73	U	1.73	1.78	U	40
Heptachlor epoxide	ppb	2.45	2.44	U	2.44	2.51	U	NR
Endosulfan I	ppb	2.74	2.73	U	2.72	2.8	U	340,000
Dieldrin	ppb	2.25	**2.7**		2.24	**8.41**		**42**
4,4'-DDE	ppb	2.02	**5.64**		2.01	**24**		**2,000**
Endrin	ppb	2.41	2.4	U	2.4	2.47	U	17,000
Endosulfan II	ppb	2.00	2	U	1.99	2.05	U	340,000
4,4'-DDD	ppb	1.29	**4.09**		1.28	**15.5**		**3,000**
Endosulfan sulfate	ppb	1.64	1.63	U	1.63	1.67	U	NR
4,4'-DDT	ppb	2.43	**12.1**		2.42	**43.9**		**2,000**
Methoxychlor	ppb	2.66	2.65	U	2.64	2.72	U	280,000
Endrin ketone	ppb	2.17	2.16	U	2.15	2.22	U	NR
Endrin aldehyde	ppb	5.71	5.68	U	5.67	5.84	U	NR
alpha-Chlordane	ppb	2.88	**2.28**	J	2.87	**0.68**	J	**NR**
gamma-Chlordane	ppb	1.88	**5.99**		1.87	**4.57**		**NR**
Toxaphene	ppb	41.3	41.1	U	41.1	42.3	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.
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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12E: Run1-Batch2 Metals

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1865
Date Received: 03/08/01

		R1/B2/S1-A			R1/B2/S1-B			
Metals	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Aluminum	ppm	17.6	**11400**		17.5	**12500**		**NR**
Antimony *	ppm	0.73	**1.32**		0.73	**1.39**		**14**
Arsenic *	ppm	0.98	**7.57**		0.97	**8.25**		**20**
Barium *	ppm	0.24	**98.6**		0.24	**104**		**700**
Beryllium	ppm	0.24	0.12	U	0.24	0.13	U	1
Cadmium *	ppm	0.24	**1.91**		0.24	**2.07**		**39**
Calcium	ppm	26.9	**6060**		26.8	**6730**		**NR**
Chromium	ppm	0.45	**131**		0.45	**136**		**NR**
Cobalt	ppm	0.24	**9.45**		0.24	**9.96**		**NR**
Copper *	ppm	0.45	**144**		0.45	**149**		**600**
Iron	ppm	19.5	**25400**		19.4	**27200**		**NR**
Lead *	ppm	0.45	**128**		0.45	**135**		**400**
Magnesium	ppm	18.4	**6880**		18.3	**7870**		**NR**
Manganese	ppm	0.24	**488**		0.24	**512**		**NR**
Mercury *	ppm	0.72	**3.22**		0.71	**3.27**		**14**
Nickel *	ppm	0.35	**31.2**		0.35	**32.9**		**250**
Potassium	ppm	241	**2190**		240	**2580**		**NR**
Selenium	ppm	0.96	0.48	U	0.95	0.49	U	63
Silver *	ppm	0.31	0.15	U	0.3	0.16	U	**110**
Sodium	ppm	19.2	**6270**		19.1	**11400**		**NR**
Thallium	ppm	0.80	0.4	U	0.79	0.41	U	2
Vanadium *	ppm	0.57	**29.7**		0.57	**31.5**		**370**
Zinc *	ppm	0.74	**227**		0.74	**236**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12F: Run1-Batch2 Dioxins

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1865
Date Received: 03/08/01

		R1/B2/S1-A			R1/B2/S1-B			
Dioxins	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
2,3,7,8-TCDF	ng/Kg	1.40	**39**	EMP	0.71	**39**	EMP	
Total TCDF	ng/Kg	1.40	**480**		0.71	**510**		
2,3,7,8-TCDD	ng/Kg	0.75	**140**		1.10	**150**		
Total TCDD	ng/Kg	0.75	**180**		1.10	**200**		
1,2,3,7,8-PeCDF	ng/Kg	1.90	**18**		1.80	**6.2**	EMP	
2,3,4,7,8-PeCDF	ng/Kg	0.63	**33**		0.99	**34**		
Total PeCDF	ng/Kg	1.30	**380**		1.40	**360**		
1,2,3,7,8-PeCDD	ng/Kg	1.00	**5.8**		0.51	**6.5**		
Total PeCDD	ng/Kg	1.00	**26**		0.51	**34**		
1,2,3,4,7,8-HxCDF	ng/Kg	1.00	**160**		0.62	**180**		
1,2,3,6,7,8-HxCDF	ng/Kg	0.65	**140**	EMP	0.94	**170**	EMP	
2,3,4,6,7,8-HxCDF	ng/Kg	0.51	**23**		0.52	**22**		
1,2,3,7,8,9-HxCDF	ng/Kg	0.88	**7.3**		0.50	**7**		
Total HxCDF	ng/Kg	0.76	**420**		0.64	**440**		
1,2,3,4,7,8-HxCDD	ng/Kg	1.20	**8.4**		0.85	**8.7**		
1,2,3,6,7,8-HxCDD	ng/Kg	1.10	**29**		1.90	**27**		
1,2,3,7,8,9-HxCDD	ng/Kg	1.20	**15**		0.68	**14**		
Total HxCDD	ng/Kg	1.20	**310**		1.20	**300**		
1,2,3,4,6,7,8-HpCDF	ng/Kg	0.91	**720**		2.20	**750**		
1,2,3,4,7,8,9-HpCDF	ng/Kg	1.10	**22**		2.00	**22**		
Total HpCDF	ng/Kg	1.00	**760**		2.10	**770**		
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.20	**390**		1.70	**390**		
Total HpCDD	ng/Kg	1.20	**1000**		1.70	**1000**		
OCDF	ng/Kg	2.10	**1100**		3.00	**1100**		
OCDD	ng/Kg	2.40	**4000**		3.30	**4200**		
TEF (Total)	ng/Kg	NA	**200**		NA	**210**		**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, 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. ppt is on dry weight basis

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 12G: Run1-Batch2 Cyanide

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L1865								
Date Received: 03/08/01								
		R1/B2/S1-A			R1/B2/S1-B			
Cyanide	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Cyanide	ppm	0.29	0.29	U	0.29	0.29	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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13A: Run1-Batch3 Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3407								
Date Received: 03/22/01								
		R1/B3/S1-A			R1/B3/S1-B			
VOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Chloromethane	ppb	0.69	1.6	U	0.69	1.65	U	520,000
Bromomethane	ppb	0.79	1.62	U	0.79	1.67	U	79,000
Vinyl Chloride	ppb	0.69	1.93	U	0.69	1.98	U	2,000
Chloroethane	ppb	0.39	1.7	U	0.39	1.75	U	NR
Methylene Chloride	ppb	1.10	**9.2**	B	1.10	**12.4**	B	**49,000**
Acetone	ppb	8.81	4.76	U	8.81	4.9	U	1,000,000
Carbon disulfide	ppb	0.55	**8.5**		0.55	**9**		**NR**
1,1-Dichloroethene	ppb	0.43	1.35	U	0.43	1.39	U	8,000
1,1-Dichloroethane	ppb	0.32	1.21	U	0.32	1.24	U	570,000
t-1,2-Dichloroethene	ppb	0.83	0.7	U	0.83	0.72	U	1,000,000
c-1,2-Dichloroethene	ppb	1.01	1.48	U	1.01	1.52	U	79,000
Chloroform	ppb	0.35	1.37	U	0.35	1.41	U	19,000
1,2-Dichloroethane	ppb	0.61	0.94	U	0.61	0.97	U	6,000
2-Butanone	ppb	5.10	1.91	U	5.10	1.96	U	1,000,000
1,1,1-Trichloroethane	ppb	0.57	1.46	U	0.57	1.5	U	210,000
Carbon Tetrachloride	ppb	0.55	1.54	U	0.55	1.58	U	2,000
Bromodichloromethane	ppb	0.39	1.39	U	0.39	1.43	U	11,000
1,2-Dichloropropane	ppb	0.37	1.31	U	0.37	1.35	U	10,000
cis-1,3-Dichloropropene	ppb	0.51	1.29	U	0.51	1.33	U	4,000
Trichloroethene	ppb	0.61	1.54	U	0.61	1.58	U	23,000
Dibromochloromethane	ppb	0.59	1.13	U	0.59	1.16	U	110,000
1,1,2-Trichloroethane	ppb	0.95	1.19	U	0.95	1.22	U	22,000
Benzene	ppb	0.57	0.27	U	0.57	0.27	U	3,000
trans-1,3-Dichloropropene	ppb	0.83	1.15	U	0.83	1.18	U	4,000
Bromoform	ppb	0.97	0.7	U	0.97	0.72	U	86,000
4-Methyl-2-pentanone	ppb	3.00	3.53	U	3.00	3.63	U	1,000,000
2-Hexanone	ppb	3.15	2.87	U	3.15	2.95	U	NR
Tetrachloroethene	ppb	0.57	1.29	U	0.57	1.33	U	4,000
Toluene	ppb	0.67	**2.8**		0.67	**2.3**		**1,000,000**
1,1,2,2-Tetrachloroethane	ppb	1.01	1.21	U	1.01	1.24	U	34,000
Chlorobenzene	ppb	0.59	0.55	U	0.59	0.57	U	37,000
Ethylbenzene	ppb	0.69	0.18	U	0.69	0.19	U	1,000,000
Styrene	ppb	0.59	1.48	U	0.59	1.52	U	23,000
m,p-xylene	ppb	1.28	**3.3**		1.28	**1.9**		**410,000**
o-xylene	ppb	0.57	**1.8**		0.57	0.25	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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13B: Run1-Batch3 Semi-Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3407								
Date Received: 03/22/01								
		R1/B3/S1-A			R1/B3/S1-B			
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Phenol	ppb	122	40.8	U	121	41.8	U	10,000,000
bis(2-Chloroethyl)ether	ppb	157	52.8	U	157	54.2	U	660
2-Chlorophenol	ppb	148	49.6	U	147	50.9	U	280,000
1,3-Dichlorobenzene	ppb	161	**19.2**	J	161	**18.9**	J	**5,100,000**
1,4-Dichlorobenzene	ppb	153	**51.3**	J	153	**47.7**	J	**570,000**
1,2-Dichlorobenzene	ppb	173	58	U	172	59.5	U	5,100,000
2-Methylphenol	ppb	155	52	U	154	53.3	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	164	54.9	U	163	56.3	U	2,300,000
3+4-Methylphenol	ppb	155	52.1	U	155	53.4	U	2,800,000
N-Nitrosodi-n-propylamine	ppb	143	48	U	142	49.2	U	660
Hexachloroethane	ppb	137	46.1	U	137	47.3	U	6,000
Nitrobenzene	ppb	171	57.4	U	170	58.8	U	28,000
Isophorone	ppb	139	46.8	U	139	47.9	U	1,100,000
2-Nitrophenol	ppb	130	43.5	U	129	44.6	U	NR
2,4-Dimethylphenol	ppb	121	40.7	U	121	41.8	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	159	53.5	U	159	54.8	U	NR
2,4-Dichlorophenol	ppb	143	48.1	U	143	49.3	U	170,000
1,2,4-Trichlorobenzene	ppb	175	58.7	U	174	60.1	U	68,000
Naphthalene	ppb	169	**120**		168	**121**		**230,000**
4-Chloroaniline	ppb	86.7	29.1	U	86.4	29.8	U	230,000
Hexachlorobutadiene	ppb	164	54.9	U	163	56.3	U	1,000
4-Chloro-3-methylphenol	ppb	168	56.5	U	168	57.9	U	10,000,000
2-Methylnaphthalene	ppb	144	**34.2**	J	143	**37.9**	J	**NR**
Hexachlorocyclopentadiene	ppb	72.4	24.3	U	72.2	24.9	U	400,000
2,4,6-Trichlorophenol	ppb	144	48.3	U	143	49.5	U	62,000
2,4,5-Trichlorophenol	ppb	128	43.1	U	128	44.1	U	5,600,000
2-Chloronaphthalene	ppb	167	56.1	U	167	57.5	U	NR
2-Nitroaniline	ppb	126	42.2	U	125	43.2	U	NR
Dimethylphthalate	ppb	167	56.1	U	166	57.5	U	10,000,000
Acenaphthylene	ppb	164	**220**		163	**247**		**NR**
2,6-Dinitrotoluene	ppb	124	41.6	U	124	42.7	U	1,000
3-Nitroaniline	ppb	80.0	26.8	U	79.7	27.5	U	NR
Acenaphthene	ppb	176	**99.9**		176	**94.7**		**3,400,000**
2,4-Dinitrophenol	ppb	119	39.8	U	118	40.8	U	110,000
4-Nitrophenol	ppb	266	89.3	U	265	91.6	U	NR
Dibenzofuran	ppb	172	**37.0**	J	171	**37.2**	J	**NR**
2,4-Dinitrotoluene	ppb	113	38.1	U	113	39.0	U	1,000
Diethylphthalate	ppb	110	**17.8**	J	109	**17.5**	J	**10,000,000**
4-Chlorophenyl phenyl ether	ppb	198	66.3	U	197	68.0	U	NR
Fluorene	ppb	179	**72.6**		178	**80.0**		**2,300,000**
4-Nitroaniline	ppb	92.2	30.9	U	91.9	31.7	U	NR
4,6-Dinitro-2-methylphenol	ppb	156	52.2	U	155	53.5	U	NR
N-Nitrosodiphenylamine	ppb	164	55	U	163	56.4	U	140,000

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13B: Run1-Batch3 Semi-Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3407								
Date Received: 03/22/01								
		R1/B3/S1-A			**R1/B3/S1-B**			
SEMIVOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
4-Bromophenyl phenyl ether	ppb	149	50.1	U	149	51.4	U	NR
Hexachlorobenzene	ppb	146	49.1	U	146	50.4	U	660
Pentachlorophenol	ppb	99.6	33.4	U	99.2	34.2	U	6,000
Phenanthrene	ppb	144	**419**		143	**413**		**NR**
Anthracene	ppb	146	**283**		146	**309**		**10,000,000**
Carbazole	ppb	116	39.1	U	116	**33.0**	J	**NR**
Di-n-butylphthalate	ppb	441	**76.0**	JB	439	**87.7**	JB	**5,700,000**
Fluoranthene	ppb	130	**1100**		129	**1170**		**2,300,000**
Pyrene	ppb	107	**1280**		107	**1440**		**1,700,000**
Butylbenzylphthalate	ppb	97.5	**58.2**		97.2	**80.0**		**1,100,000**
3,3'-Dichlorobenzidine	ppb	169	56.7	U	168	58.1	U	2,000
Benzo(a)anthracene	ppb	102	**787**		102	**890**		**900**
Chrysene	ppb	102	**825**		102	**1020**		**9,000**
bis(2-Ethylhexyl)phthalate	ppb	663	**14600**	B	661	**6970**	B	**49,000**
Di-n-octylphthalate	ppb	126	**80.1**		125	**53.3**		**NR**
Benzo(b)fluoranthene	ppb	167	**684**		167	**785**		**900**
Benzo(k)fluoranthene	ppb	136	**543**		135	**641**		**900**
Benzo(a)pyrene	ppb	111	**720**		111	**787**		**660**
Indeno(1,2,3-cd)pyrene	ppb	130	**343**		129	**307**		**900**
Dibenz(a,h)anthracene	ppb	122	**107**		122	**135**		**660**
Benzo(g,h,i)perylene	ppb	108	**430**		108	**432**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13C: Run1-Batch3 PCBs

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3407								
Date Received: 03/22/01								
		R1/B3/S1-A			**R1/B3/S1-B**			
PCB (Aroclor)	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
PCB 1016	ppb	4.16	4.19	U	4.15	4.29	U	
PCB 1221	ppb	19.6	19.7	U	19.5	20.2	U	
PCB 1232	ppb	4.35	4.37	U	4.33	4.48	U	
PCB 1242	ppb	3.26	3.29	U	3.25	3.37	U	
PCB 1248	ppb	7.34	**299**		7.32	**193**		
PCB 1254	ppb	11.1	**346**		11.1	**191**		
PCB 1260	ppb	12.8	**187**		12.7	**118**		
PCB Total	ppb	NA	**832**		NA	**502**		**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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13D: Run1-Batch3 Pesticides

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3407
Date Received: 03/22/01

		R1/B3/S1-A			R1/B3/S1-B			
Pesticides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
alpha-BHC	ppb	1.88	**9.06**		1.87	**9.86**		**NR**
beta-BHC	ppb	2.21	2.22	U	2.2	2.27	U	NR
delta-BHC	ppb	1.57	1.58	U	1.57	1.62	U	NR
gamma-BHC (Lindane)	ppb	1.92	**0.93**	J	1.91	**1.46**	J	**520**
Heptachlor	ppb	2.15	2.16	U	2.13	2.21	U	150
Aldrin	ppb	1.74	1.75	U	1.73	1.79	U	40
Heptachlor epoxide	ppb	2.45	2.46	U	2.44	2.53	U	NR
Endosulfan I	ppb	2.74	2.75	U	2.72	2.82	U	340,000
Dieldrin	ppb	2.25	2.26	U	2.24	2.32	U	42
4,4'-DDE	ppb	2.02	**24.3**		2.01	**18.8**		**2,000**
Endrin	ppb	2.41	2.42	U	2.4	2.48	U	17,000
Endosulfan II	ppb	2.00	2.01	U	1.99	2.06	U	340,000
4,4'-DDD	ppb	1.29	**13.3**		1.28	**10**		**3,000**
Endosulfan sulfate	ppb	1.64	1.64	U	1.63	1.68	U	NR
4,4'-DDT	ppb	2.43	**7.16**		2.42	**9.41**		**2,000**
Methoxychlor	ppb	2.66	2.67	U	2.64	2.74	U	280,000
Endrin ketone	ppb	2.17	**2.32**		2.15	**2.5**		**NR**
Endrin aldehyde	ppb	5.71	**3.81**	J	5.67	**3.9**	J	**NR**
alpha-Chlordane	ppb	2.88	**2.77**	J	2.87	**2.08**	J	**NR**
gamma-Chlordane	ppb	1.88	**8.87**		1.87	**5.22**		**NR**
Toxaphene	ppb	41.3	41.5	U	41.1	42.5	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.
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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13E: Run1-Batch3 Metals

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3407
Date Received: 03/22/01

		R1/B3/S1-A			R1/B3/S1-B			
Metals	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Aluminum	ppm	17.6	**8840**		17.5	**8320**		**NR**
Antimony *	ppm	0.73	**1.08**		0.73	**1.28**		**14**
Arsenic *	ppm	0.98	**5.67**		0.97	**5.63**		**20**
Barium *	ppm	0.24	**77.6**		0.24	**72**		**700**
Beryllium	ppm	0.24	**0.082**	J	0.24	**0.084**	J	**1**
Cadmium *	ppm	0.24	**1.5**		0.24	**1.42**		**39**
Calcium	ppm	26.9	**4820**		26.8	**4420**		**NR**
Chromium	ppm	0.45	**100**		0.45	**95.1**		**NR**
Cobalt	ppm	0.24	**7.4**		0.24	**7.01**		**NR**
Copper *	ppm	0.45	**108**		0.45	**102**		**600**
Iron	ppm	19.5	**20500**		19.4	**19300**		**NR**
Lead *	ppm	0.45	**98.3**		0.45	**91.4**		**400**
Magnesium	ppm	18.4	**5420**		18.3	**5130**		**NR**
Manganese	ppm	0.24	**387**		0.24	**367**		**NR**
Mercury *	ppm	0.72	**2.1**		0.71	**3.55**		**14**
Nickel *	ppm	0.35	**24.3**		0.35	**23**		**250**
Potassium	ppm	241	**1810**		240	**1710**		**NR**
Selenium	ppm	0.96	0.96	U	0.95	0.99	U	63
Silver *	ppm	0.31	0.31	U	0.3	0.32	U	110
Sodium	ppm	19.2	**5130**		19.1	**5020**		**NR**
Thallium	ppm	0.80	0.8	U	0.79	0.82	U	2
Vanadium *	ppm	0.57	**22.2**		0.57	**20.6**		**370**
Zinc *	ppm	0.74	**175**		0.74	**164**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13F: Run1-Batch3 Dioxins

Summary of Results									
Project: PB-NUI									
ETL Chain of Custody #: L3407									
Date Received: 03/22/01									
		R1/B3/S1-A			R1/B3/S1-B				
Dioxins	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria	
2,3,7,8-TCDF	ng/Kg	1.40	**26**		0.71	**14**			
Total TCDF	ng/Kg	1.40	**320**		0.71	**250**			
2,3,7,8-TCDD	ng/Kg	0.75	**130**		1.10	**100**			
Total TCDD	ng/Kg	0.75	**140**		1.10	**140**			
1,2,3,7,8-PeCDF	ng/Kg	1.90	**430**	EMP	1.80	**33**	EMP		
2,3,4,7,8-PeCDF	ng/Kg	0.63	**47**		0.99	**34**	EMP		
Total PeCDF	ng/Kg	1.30	**240**		1.40	**210**			
1,2,3,7,8-PeCDD	ng/Kg	1.00	**8.5**	EMP	0.51	**4.2**	EMP		
Total PeCDD	ng/Kg	1.00	**20**		0.51	**17**			
1,2,3,4,7,8-HxCDF	ng/Kg	1.00	**360**	EMP	0.62	**160**			
1,2,3,6,7,8-HxCDF	ng/Kg	0.65	**45**		0.94	**29**			
2,3,4,6,7,8-HxCDF	ng/Kg	0.51	**17**		0.52	**27**	EMP		
1,2,3,7,8,9-HxCDF	ng/Kg	0.88	**8.3**		0.50	**6.9**			
Total HxCDF	ng/Kg	0.76	**390**		0.64	**460**			
1,2,3,4,7,8-HxCDD	ng/Kg	1.20	**7.3**		0.85	**5.9**			
1,2,3,6,7,8-HxCDD	ng/Kg	1.10	**26**		1.90	**20**			
1,2,3,7,8,9-HxCDD	ng/Kg	1.20	**15**		0.68	**12**			
Total HxCDD	ng/Kg	1.20	**300**		1.20	**220**			
1,2,3,4,6,7,8-HpCDF	ng/Kg	0.91	**670**		2.20	**720**			
1,2,3,4,7,8,9-HpCDF	ng/Kg	1.10	**26**	EMP	2.00	**24**			
Total HpCDF	ng/Kg	1.00	**950**		2.10	**740**			
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.20	**310**		1.70	**300**			
Total HpCDD	ng/Kg	1.20	**800**		1.70	**860**			
OCDF	ng/Kg	2.10	**1200**		3.00	**1300**			
OCDD	ng/Kg	2.40	**3000**		3.30	**3100**			
TEF (Total)	ng/Kg	NA	**180**		NA	**140**		**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, 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. ppt is on dry weight basis

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 13G: Run1-Batch3 Cyanide

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3407								
Date Received: 03/22/01								
		R1/B3/S1-A			R1/B3/S1-B			
Cyanide	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Cyanide	ppm	0.28	**0.29**		0.25	**0.27**		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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14A: Run2-Batch1 Volatiles

Summary of Results									
Project: PB-NUI									
ETL Chain of Custody #: L3794									
Date Received: 02/21/01									
		R2/B1/S1-A			R2/B1/S1-B				
VOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Chloromethane	ppb	0.69	0.69	U	0.69	1.38	U	520,000
Bromomethane	ppb	0.79	0.79	U	0.79	1.58	U	79,000
Vinyl Chloride	ppb	0.69	0.69	U	0.69	1.38	U	2,000
Chloroethane	ppb	0.39	0.39	U	0.39	0.77	U	NR
Methylene Chloride	ppb	1.10	1.1	U	1.10	**13.2**	B	**49,000**
Acetone	ppb	8.81	8.81	U	8.81	17.6	U	1,000,000
Carbon disulfide	ppb	0.55	0.55	U	0.55	1.1	U	NR
1,1-Dichloroethene	ppb	0.43	0.43	U	0.43	0.85	U	8,000
1,1-Dichloroethane	ppb	0.32	0.32	U	0.32	0.65	U	570,000
t-1,2-Dichloroethene	ppb	0.83	0.83	U	0.83	1.66	U	1,000,000
c-1,2-Dichloroethene	ppb	1.01	1.01	U	1.01	2.03	U	79,000
Chloroform	ppb	0.35	0.35	U	0.35	0.69	U	19,000
1,2-Dichloroethane	ppb	0.61	0.61	U	0.61	1.22	U	6,000
2-Butanone	ppb	5.10	5.1	U	5.10	10.2	U	1,000,000
1,1,1-Trichloroethane	ppb	0.57	0.57	U	0.57	1.14	U	210,000
Carbon Tetrachloride	ppb	0.55	0.55	U	0.55	1.1	U	2,000
Bromodichloromethane	ppb	0.39	0.39	U	0.39	0.77	U	11,000
1,2-Dichloropropane	ppb	0.37	0.37	U	0.37	0.73	U	10,000
cis-1,3-Dichloropropene	ppb	0.51	0.51	U	0.51	1.01	U	4,000
Trichloroethene	ppb	0.61	0.61	U	0.61	1.22	U	23,000
Dibromochloromethane	ppb	0.59	0.59	U	0.59	1.18	U	110,000
1,1,2-Trichloroethane	ppb	0.95	0.95	U	0.95	1.91	U	22,000
Benzene	ppb	0.57	0.57	U	0.57	1.14	U	3,000
trans-1,3-Dichloropropene	ppb	0.83	0.83	U	0.83	1.66	U	4,000
Bromoform	ppb	0.97	0.97	U	0.97	1.95	U	86,000
4-Methyl-2-pentanone	ppb	3.00	3	U	3.00	6.01	U	1,000,000
2-Hexanone	ppb	3.15	3.15	U	3.15	6.29	U	NR
Tetrachloroethene	ppb	0.57	0.57	U	0.57	1.14	U	4,000
Toluene	ppb	0.67	0.67	U	0.67	1.34	U	1,000,000
1,1,2,2-Tetrachloroethane	ppb	1.01	1.01	U	1.01	2.03	U	34,000
Chlorobenzene	ppb	0.59	0.59	U	0.59	1.18	U	37,000
Ethylbenzene	ppb	0.69	0.69	U	0.69	1.38	U	1,000,000
Styrene	ppb	0.59	0.59	U	0.59	1.18	U	23,000
m,p-xylene	ppb	1.28	**1.6**		1.28	2.56	U	**410,000**
o-xylene	ppb	0.57	0.57	U	0.57	1.14	U	410,000

Notes:

1. In reference to the Qualifiers columns above (Q), refer to the Environmental Testing Laboratories, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14B: Run2-Batch1 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3794
Date Received: 02/21/01

		R2/B1/S1-A			R2/B1/S1-B			
SEMIVOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Phenol	ppb	122	114	U	121	114	U	10,000,000
bis(2-Chloroethyl)ether	ppb	157	144	U	157	144	U	660
2-Chlorophenol	ppb	148	118	U	147	118	U	280,000
1,3-Dichlorobenzene	ppb	161	144	U	161	144	U	5,100,000
1,4-Dichlorobenzene	ppb	153	147	U	153	147	U	570,000
1,2-Dichlorobenzene	ppb	173	148	U	172	148	U	5,100,000
2-Methylphenol	ppb	155	118	U	154	118	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	164	85.8	U	163	85.8	U	2,300,000
3+4-Methylphenol	ppb	155	96.6	U	155	96.6	U	2,800,000
N-Nitrosodi-n-propylamine	ppb	143	120	U	142	120	U	660
Hexachloroethane	ppb	137	149	U	137	149	U	6,000
Nitrobenzene	ppb	171	165	U	170	165	U	28,000
Isophorone	ppb	139	111	U	139	111	U	1,100,000
2-Nitrophenol	ppb	130	127	U	129	127	U	NR
2,4-Dimethylphenol	ppb	121	71	U	121	71	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	159	130	U	159	130	U	NR
2,4-Dichlorophenol	ppb	143	122	U	143	122	U	170,000
1,2,4-Trichlorobenzene	ppb	175	135	U	174	135	U	68,000
Naphthalene	ppb	169	**91.3**	J	168	**97.4**	J	**230,000**
4-Chloroaniline	ppb	86.7	149	U	86.4	149	U	230,000
Hexachlorobutadiene	ppb	164	137	U	163	137	U	1,000
4-Chloro-3-methylphenol	ppb	168	92.9	U	168	92.9	U	10,000,000
2-Methylnaphthalene	ppb	144	134	U	143	**48.7**	J	**NR**
Hexachlorocyclopentadiene	ppb	72.4	222	U	72.2	222	U	400,000
2,4,6-Trichlorophenol	ppb	144	149	U	143	149	U	62,000
2,4,5-Trichlorophenol	ppb	128	138	U	128	138	U	5,600,000
2-Chloronaphthalene	ppb	167	139	U	167	139	U	NR
2-Nitroaniline	ppb	126	96.8	U	125	96.8	U	NR
Dimethylphthalate	ppb	167	124	U	166	124	U	10,000,000
Acenaphthylene	ppb	164	**146**		163	**158**		**NR**
2,6-Dinitrotoluene	ppb	124	102	U	124	102	U	1,000
3-Nitroaniline	ppb	80.0	87.2	U	79.7	87.2	U	NR
Acenaphthene	ppb	176	**69.0**	J	176	**62.9**	J	**3,400,000**
2,4-Dinitrophenol	ppb	119	122	U	118	122	U	110,000
4-Nitrophenol	ppb	266	166	U	265	166	U	NR
Dibenzofuran	ppb	172	132	U	171	132	U	NR
2,4-Dinitrotoluene	ppb	113	76.1	U	113	76.1	U	1,000
Diethylphthalate	ppb	110	97.2	U	109	97.2	U	10,000,000
4-Chlorophenyl phenyl ether	ppb	198	135	U	197	135	U	NR
Fluorene	ppb	179	**66.9**	J	178	**75.1**	J	**2,300,000**
4-Nitroaniline	ppb	92.2	130	U	91.9	130	U	NR
4,6-Dinitro-2-methylphenol	ppb	156	133	U	155	133	U	NR
N-Nitrosodiphenylamine	ppb	164	119	U	163	119	U	140,000

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14B: Run2-Batch1 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3794
Date Received: 02/21/01

		R2/B1/S1-A			R2/B1/S1-B			
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
4-Bromophenyl phenyl ether	ppb	149	127	U	149	127	U	NR
Hexachlorobenzene	ppb	146	116	U	146	116	U	660
Pentachlorophenol	ppb	99.6	85.6	U	99.2	85.6	U	6,000
Phenanthrene	ppb	144	**416**		143	**355**		**NR**
Anthracene	ppb	146	**308**		146	**280**		**10,000,000**
Carbazole	ppb	116	93.7	U	116	93.7	U	NR
Di-n-butylphthalate	ppb	441	396	U	439	**66.9**	J	**5,700,000**
Fluoranthene	ppb	130	**1460**		129	**1370**		**2,300,000**
Pyrene	ppb	107	**1440**		107	**1320**		**1,700,000**
Butylbenzylphthalate	ppb	97.5	**62.9**	J	97.2	**73**	J	**1,100,000**
3,3'-Dichlorobenzidine	ppb	169	246	U	168	246	U	2,000
Benzo(a)anthracene	ppb	102	**888**		102	**786**	0	**900**
Chrysene	ppb	102	**1030**		102	**846**	0	**9,000**
bis(2-Ethylhexyl)phthalate	ppb	663	**6250**	B	661	**7320**	B	**49,000**
Di-n-octylphthalate	ppb	126	**54.8**	J	125	**85.2**	J	**NR**
Benzo(b)fluoranthene	ppb	167	**942**		167	**914**		**900**
Benzo(k)fluoranthene	ppb	136	**570**		135	**572**		**900**
Benzo(a)pyrene	ppb	111	**914**		111	**840**		**660**
Indeno(1,2,3-cd)pyrene	ppb	130	**310**		129	**284**		**900**
Dibenz(a,h)anthracene	ppb	122	**99.4**		122	75.3	U	**660**
Benzo(g,h,i)perylene	ppb	108	**318**		108	**317**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14C: Run2-Batch1 PCBs

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3794
Date Received: 02/21/01

		R2/B1/S1-A			R2/B1/S1-B			
PCB (Aroclor)	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
PCB 1016	ppb	4.16	4.14	U	4.15	4.14	U	
PCB 1221	ppb	19.6	19.5	U	19.5	19.5	U	
PCB 1232	ppb	4.35	4.32	U	4.33	4.32	U	
PCB 1242	ppb	3.26	3.25	U	3.25	3.25	U	
PCB 1248	ppb	7.34	**165**		7.32	**97.5**		
PCB 1254	ppb	11.1	**292**		11.1	**154**		
PCB 1260	ppb	12.8	12.7	U	12.7	12.7	U	
PCB Total	ppb	NA	**457**		NA	**251.5**		**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

SEDIMENT FEED CONTAMINANT ANALYSIS

Table 14D: Run2-Batch1 Pesticides

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3794
Date Received: 02/21/01

		R2/B1/S1-A			R2/B1/S1-B			
Pesticides	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
alpha-BHC	ppb	1.88	1.87	U	1.87	1.87	U	NR
beta-BHC	ppb	2.21	2.19	U	2.2	2.19	U	NR
delta-BHC	ppb	1.57	1.56	U	1.57	1.56	U	NR
gamma-BHC (Lindane)	ppb	1.92	1.91	U	1.91	1.91	U	520
Heptachlor	ppb	2.15	2.13	U	2.13	2.13	U	150
Aldrin	ppb	1.74	1.72	U	1.73	1.72	U	40
Heptachlor epoxide	ppb	2.45	2.43	U	2.44	2.43	U	NR
Endosulfan I	ppb	2.74	2.72	U	2.72	2.72	U	340,000
Dieldrin	ppb	2.25	**8.79**		2.24	**4.84**		**42**
4,4'-DDE	ppb	2.02	**22.2**		2.01	**10.9**		**2,000**
Endrin	ppb	2.41	2.39	U	2.4	2.39	U	17,000
Endosulfan II	ppb	2.00	1.99	U	1.99	1.99	U	340,000
4,4'-DDD	ppb	1.29	**10.4**		1.28	**6.45**		**3,000**
Endosulfan sulfate	ppb	1.64	1.62	U	1.63	1.62	U	NR
4,4'-DDT	ppb	2.43	**23.7**		2.42	**15.9**		**2,000**
Methoxychlor	ppb	2.66	2.64	U	2.64	2.64	U	280,000
Endrin ketone	ppb	2.17	2.15	U	2.15	2.15	U	NR
Endrin aldehyde	ppb	5.71	5.66	U	5.67	5.66	U	NR
alpha-Chlordane	ppb	2.88	**3.9**		2.87	**1.57**	J	**NR**
gamma-Chlordane	ppb	1.88	**5.81**		1.87	**2.43**		**NR**
Toxaphene	ppb	41.3	41	U	41.1	41	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.
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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14E: Run2-Batch1 Metals

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L3794
Date Received: 02/21/01

		R2/B1/S1-A			R2/B1/S1-B			
Metals	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Aluminum	ppm	17.6	**13500**		17.5	**14500**		**NR**
Antimony *	ppm	0.73	**2.13**		0.73	**2.31**		**14**
Arsenic *	ppm	0.98	**4.32**		0.97	**6.47**		**20**
Barium *	ppm	0.24	**100**		0.24	**107**		**700**
Beryllium	ppm	0.24	**0.041**	J	0.24	**0.02**	J	**1**
Cadmium *	ppm	0.24	**1.6**		0.24	**1.85**		**39**
Calcium	ppm	26.9	**5360**		26.8	**5520**		**NR**
Chromium	ppm	0.45	**134**		0.45	**138**		**NR**
Cobalt	ppm	0.24	**9.33**		0.24	**9.8**		**NR**
Copper *	ppm	0.45	**142**		0.45	**146**		**600**
Iron	ppm	19.5	**26000**		19.4	**26800**		**NR**
Lead *	ppm	0.45	**127**		0.45	**129**		**400**
Magnesium	ppm	18.4	**6620**		18.3	**6880**		**NR**
Manganese	ppm	0.24	**469**		0.24	**493**		**NR**
Mercury *	ppm	0.72	**3.69**		0.71	**3.59**		**14**
Nickel *	ppm	0.35	**34.3**		0.35	**35.1**		**250**
Potassium	ppm	241	**48100**		240	**53400**		**NR**
Selenium	ppm	0.96	0.95	U	0.95	0.95	U	63
Silver *	ppm	0.31	0.3	U	0.3	0.3	U	110
Sodium	ppm	19.2	**4190**		19.1	**3940**		**NR**
Thallium	ppm	0.80	0.79	U	0.79	0.79	U	2
Vanadium *	ppm	0.57	**39.9**		0.57	**41.8**		**370**
Zinc *	ppm	0.74	**228**		0.74	**248**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14F: Run2-Batch1 Dioxins

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3794								
Date Received: 02/21/01								
		R2/B1/S1-A			R2/B1/S1-B			
Dioxins	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
2,3,7,8-TCDF	ng/Kg	1.40	**21**		0.71	**17**		
Total TCDF	ng/Kg	1.40	**440**		0.71	**340**		
2,3,7,8-TCDD	ng/Kg	0.75	**130**		1.10	**130**		
Total TCDD	ng/Kg	0.75	**160**		1.10	**160**		
1,2,3,7,8-PeCDF	ng/Kg	1.90	**19**		1.80	**13**		
2,3,4,7,8-PeCDF	ng/Kg	0.63	**44**		0.99	**30**		
Total PeCDF	ng/Kg	1.30	**580**		1.40	**450**		
1,2,3,7,8-PeCDD	ng/Kg	1.00	**4.2**	EMP	0.51	**5.9**		
Total PeCDD	ng/Kg	1.00	**24**		0.51	**5.9**		
1,2,3,4,7,8-HxCDF	ng/Kg	1.00	**420**		0.62	**170**		
1,2,3,6,7,8-HxCDF	ng/Kg	0.65	**360**	EMP	0.94	**180**	EMP	
2,3,4,6,7,8-HxCDF	ng/Kg	0.51	**33**		0.52	**21**		
1,2,3,7,8,9-HxCDF	ng/Kg	0.88	**14**		0.50	**7.8**		
Total HxCDF	ng/Kg	0.76	**1100**		0.64	**460**		
1,2,3,4,7,8-HxCDD	ng/Kg	1.20	**10**		0.85	**6.6**		
1,2,3,6,7,8-HxCDD	ng/Kg	1.10	**29**		1.90	**21**		
1,2,3,7,8,9-HxCDD	ng/Kg	1.20	**14**		0.68	**12**		
Total HxCDD	ng/Kg	1.20	**320**		1.20	**240**		
1,2,3,4,6,7,8-HpCDF	ng/Kg	0.91	**1900**		2.20	**700**		
1,2,3,4,7,8,9-HpCDF	ng/Kg	1.10	**45**		2.00	**24**		
Total HpCDF	ng/Kg	1.00	**2000**		2.10	**750**		
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.20	**440**		1.70	**340**		
Total HpCDD	ng/Kg	1.20	**1100**		1.70	**850**		
OCDF	ng/Kg	2.10	**3300**		3.00	**970**		
OCDD	ng/Kg	2.40	**4600**		3.30	**3400**		
TEF (Total)	ng/Kg	NA	**240**		NA	**190**		**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, 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. ppt is on dry weight basis

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 14G: Run2-Batch1 Cyanide

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L3794								
Date Received: 02/21/01								
		R2/B1/S1-A			**R2/B1/S1-B**			
Cyanide	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Cyanide	ppm	0.27	0.27	U	0.27	0.27	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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15A: Run2-Batch2 Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1870
Date Received: 03/15/01

		R2/B2/S1-A			R2/B2/S1-B			
VOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Chloromethane	ppb	0.69	1.62	U	0.69	1.6	U	520,000
Bromomethane	ppb	0.79	1.64	U	0.79	1.62	U	79,000
Vinyl Chloride	ppb	0.69	1.96	U	0.69	1.93	U	2,000
Chloroethane	ppb	0.39	1.73	U	0.39	1.7	U	NR
Methylene Chloride	ppb	1.10	**2.8**	B	1.10	**2.7**	B	**49,000**
Acetone	ppb	8.81	4.83	U	8.81	4.76	U	1,000,000
Carbon disulfide	ppb	0.55	**6.8**		0.55	**5.5**		**NR**
1,1-Dichloroethene	ppb	0.43	1.37	U	0.43	1.35	U	8,000
1,1-Dichloroethane	ppb	0.32	1.23	U	0.32	1.21	U	570,000
t-1,2-Dichloroethene	ppb	0.83	0.71	U	0.83	0.7	U	1,000,000
c-1,2-Dichloroethene	ppb	1.01	1.5	U	1.01	1.48	U	79,000
Chloroform	ppb	0.35	1.39	U	0.35	1.37	U	19,000
1,2-Dichloroethane	ppb	0.61	0.96	U	0.61	0.94	U	6,000
2-Butanone	ppb	5.10	1.93	U	5.10	1.91	U	1,000,000
1,1,1-Trichloroethane	ppb	0.57	1.48	U	0.57	1.46	U	210,000
Carbon Tetrachloride	ppb	0.55	1.56	U	0.55	1.54	U	2,000
Bromodichloromethane	ppb	0.39	1.41	U	0.39	1.39	U	11,000
1,2-Dichloropropane	ppb	0.37	1.33	U	0.37	1.31	U	10,000
cis-1,3-Dichloropropene	ppb	0.51	1.31	U	0.51	1.29	U	4,000
Trichloroethene	ppb	0.61	1.56	U	0.61	1.54	U	23,000
Dibromochloromethane	ppb	0.59	1.14	U	0.59	1.13	U	110,000
1,1,2-Trichloroethane	ppb	0.95	1.21	U	0.95	1.19	U	22,000
Benzene	ppb	0.57	**44.3**		0.57	0.27	U	**3,000**
trans-1,3-Dichloropropene	ppb	0.83	1.16	U	0.83	1.15	U	4,000
Bromoform	ppb	0.97	0.71	U	0.97	0.7	U	86,000
4-Methyl-2-pentanone	ppb	3.00	3.58	U	3.00	3.53	U	1,000,000
2-Hexanone	ppb	3.15	2.91	U	3.15	2.87	U	NR
Tetrachloroethene	ppb	0.57	1.31	U	0.57	1.29	U	4,000
Toluene	ppb	0.67	**152**		0.67	**2.3**		**1,000,000**
1,1,2,2-Tetrachloroethane	ppb	1.01	1.23	U	1.01	1.21	U	34,000
Chlorobenzene	ppb	0.59	0.56	U	0.59	0.55	U	37,000
Ethylbenzene	ppb	0.69	**65.9**		0.69	0.18	U	1,000,000
Styrene	ppb	0.59	1.5	U	0.59	1.48	U	23,000
m,p-xylene	ppb	1.28	**94.9**		1.28	**4.2**		**410,000**
o-xylene	ppb	0.57	**30.3**		0.57	**2**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15B: Run2-Batch2 Semi-Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L1870								
Date Received: 03/15/01								
		R2/B2/S1-A			R2/B2/S1-B			
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Phenol	ppb	122	124	U	121	122	U	10,000,000
bis(2-Chloroethyl)ether	ppb	157	161	U	157	158	U	660
2-Chlorophenol	ppb	148	151	U	147	149	U	280,000
1,3-Dichlorobenzene	ppb	161	165	U	161	162	U	5,100,000
1,4-Dichlorobenzene	ppb	153	157	U	153	154	U	570,000
1,2-Dichlorobenzene	ppb	173	177	U	172	174	U	5,100,000
2-Methylphenol	ppb	155	158	U	154	156	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	164	167	U	163	164	U	2,300,000
3+4-Methylphenol	ppb	155	159	U	155	156	U	2,800,000
N-Nitrosodi-n-propylamine	ppb	143	146	U	142	144	U	660
Hexachloroethane	ppb	137	140	U	137	138	U	6,000
Nitrobenzene	ppb	171	175	U	170	172	U	28,000
Isophorone	ppb	139	142	U	139	140	U	1,100,000
2-Nitrophenol	ppb	130	132	U	129	130	U	NR
2,4-Dimethylphenol	ppb	121	124	U	121	122	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	159	163	U	159	160	U	NR
2,4-Dichlorophenol	ppb	143	146	U	143	144	U	170,000
1,2,4-Trichlorobenzene	ppb	175	179	U	174	176	U	68,000
Naphthalene	ppb	169	**194**		168	**221**		**230,000**
4-Chloroaniline	ppb	86.7	88.5	U	86.4	87.1	U	230,000
Hexachlorobutadiene	ppb	164	167	U	163	164	U	1,000
4-Chloro-3-methylphenol	ppb	168	172	U	168	169	U	10,000,000
2-Methylnaphthalene	ppb	144	**68.7**	J	143	**82**	J	**NR**
Hexachlorocyclopentadiene	ppb	72.4	74	U	72.2	72.7	U	400,000
2,4,6-Trichlorophenol	ppb	144	147	U	143	145	U	62,000
2,4,5-Trichlorophenol	ppb	128	131	U	128	129	U	5,600,000
2-Chloronaphthalene	ppb	167	171	U	167	168	U	NR
2-Nitroaniline	ppb	126	128	U	125	126	U	NR
Dimethylphthalate	ppb	167	171	U	166	168	U	10,000,000
Acenaphthylene	ppb	164	**460**		163	**357**		**NR**
2,6-Dinitrotoluene	ppb	124	127	U	124	125	U	1,000
3-Nitroaniline	ppb	80.0	81.7	U	79.7	80.3	U	NR
Acenaphthene	ppb	176	**171**	J	176	**152**	J	**3,400,000**
2,4-Dinitrophenol	ppb	119	121	U	118	119	U	110,000
4-Nitrophenol	ppb	266	272	U	265	267	U	NR
Dibenzofuran	ppb	172	**72.9**	J	171	**65.6**	J	**NR**
2,4-Dinitrotoluene	ppb	113	116	U	113	114	U	1,000
Diethylphthalate	ppb	110	**41.7**	J	109	110	U	**10,000,000**
4-Chlorophenyl phenyl ether	ppb	198	202	U	197	199	U	NR
Fluorene	ppb	179	**179**	J	178	**135**	J	**2,300,000**
4-Nitroaniline	ppb	92.2	94.2	U	91.9	92.6	U	NR
4,6-Dinitro-2-methylphenol	ppb	156	159	U	155	156	U	NR
N-Nitrosodiphenylamine	ppb	164	167	U	163	165	U	140,000

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15B: Run2-Batch2 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1870
Date Received: 03/15/01

		R2/B2/S1-A			R2/B2/S1-B			
SEMIVOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
4-Bromophenyl phenyl ether	ppb	149	152	U	149	150	U	NR
Hexachlorobenzene	ppb	146	150	U	146	147	U	660
Pentachlorophenol	ppb	99.6	102	U	99.2	100	U	6,000
Phenanthrene	ppb	144	**669**		143	**678**		**NR**
Anthracene	ppb	146	**533**		146	**465**		**10,000,000**
Carbazole	ppb	116	119	U	116	117	U	NR
Di-n-butylphthalate	ppb	441	**258**	JB	439	**359**	JB	**5,700,000**
Fluoranthene	ppb	130	**2100**		129	**1920**		**2,300,000**
Pyrene	ppb	107	**2820**		107	**2780**		**1,700,000**
Butylbenzylphthalate	ppb	97.5	99.6	U	97.2	**150**		**1,100,000**
3,3'-Dichlorobenzidine	ppb	169	172	U	168	170	U	2,000
Benzo(a)anthracene	ppb	102	**1580**		102	**1390**		**900**
Chrysene	ppb	102	**1800**		102	**1470**		**9,000**
bis(2-Ethylhexyl)phthalate	ppb	663	**18700**	B	661	**19500**	B	**49,000**
Di-n-octylphthalate	ppb	126	**275**		125	**178**		**NR**
Benzo(b)fluoranthene	ppb	167	**1660**		167	**1390**		**900**
Benzo(k)fluoranthene	ppb	136	**1140**		135	**1150**		**900**
Benzo(a)pyrene	ppb	111	**1240**		111	**1100**		**660**
Indeno(1,2,3-cd)pyrene	ppb	130	**450**		129	**385**		**900**
Dibenz(a,h)anthracene	ppb	122	125	U	122	123	U	660
Benzo(g,h,i)perylene	ppb	108	**531**		108	**420**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15C: Run2-Batch2 PCBs

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1870
Date Received: 03/15/01

		R2/B2/S1-A			R2/B2/S1-B			
PCB (Aroclor)	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
PCB 1016	ppb	4.16	4.25	U	4.15	4.18	U	
PCB 1221	ppb	19.6	20	U	19.5	19.7	U	
PCB 1232	ppb	4.35	4.44	U	4.33	4.36	U	
PCB 1242	ppb	3.26	3.33	U	3.25	3.28	U	
PCB 1248	ppb	7.34	**157**		7.32	**126**		
PCB 1254	ppb	11.1	**232**		11.1	**201**		
PCB 1260	ppb	12.8	**118**		12.7	**105**		
PCB Total	ppb	NA	**507**		NA	**432**		**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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15D: Run2-Batch2 Pesticides

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1870
Date Received: 03/15/01

		R2/B2/S1-A			R2/B2/S1-B			
Pesticides	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
alpha-BHC	ppb	1.88	1.92	U	1.87	1.89	U	NR
beta-BHC	ppb	2.21	2.25	U	2.2	2.21	U	NR
delta-BHC	ppb	1.57	1.6	U	1.57	1.58	U	NR
gamma-BHC (Lindane)	ppb	1.92	1.96	U	1.91	1.93	U	520
Heptachlor	ppb	2.15	2.19	U	2.13	2.15	U	150
Aldrin	ppb	1.74	1.77	U	1.73	1.74	U	40
Heptachlor epoxide	ppb	2.45	2.5	U	2.44	2.46	U	NR
Endosulfan I	ppb	2.74	2.79	U	2.72	2.75	U	340,000
Dieldrin	ppb	2.25	2.29	U	2.24	2.25	U	42
4,4'-DDE	ppb	2.02	**27.9**		2.01	**31.3**		**2,000**
Endrin	ppb	2.41	2.46	U	2.4	2.42	U	17,000
Endosulfan II	ppb	2.00	2.04	U	1.99	2.01	U	340,000
4,4'-DDD	ppb	1.29	**16.7**		1.28	**12.8**		**3,000**
Endosulfan sulfate	ppb	1.64	1.67	U	1.63	1.64	U	NR
4,4'-DDT	ppb	2.43	**10.3**		2.42	**9.32**		**2,000**
Methoxychlor	ppb	2.66	2.71	U	2.64	2.66	U	280,000
Endrin ketone	ppb	2.17	2.21	U	2.15	2.17	U	NR
Endrin aldehyde	ppb	5.71	5.81	U	5.67	5.72	U	NR
alpha-Chlordane	ppb	2.88	2.94	U	2.87	2.89	U	NR
gamma-Chlordane	ppb	1.88	1.92	U	1.87	1.89	U	NR
Toxaphene	ppb	41.3	42.1	U	41.1	41.4	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.
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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15E: Run2-Batch2 Metals

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1870
Date Received: 03/15/01

		R2/B2/S1-A			R2/B2/S1-B			
Metals	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
Aluminum	ppm	17.6	**14400**		17.5	**13400**		**NR**
Antimony *	ppm	0.73	**1.66**		0.73	**1.49**		**14**
Arsenic *	ppm	0.98	**8.98**		0.97	**8.11**		**20**
Barium *	ppm	0.24	**114**		0.24	**107**		**700**
Beryllium	ppm	0.24	0.13	U	0.24	0.12	U	1
Cadmium *	ppm	0.24	**2.36**		0.24	**2.19**		**39**
Calcium	ppm	26.9	**7330**		26.8	**6930**		**NR**
Chromium	ppm	0.45	**152**		0.45	**149**		**NR**
Cobalt	ppm	0.24	**11.1**		0.24	**10.6**		**NR**
Copper *	ppm	0.45	**168**		0.45	**173**		**600**
Iron	ppm	19.5	**30300**		19.4	**28600**		**NR**
Lead *	ppm	0.45	**148**		0.45	**147**		**400**
Magnesium	ppm	18.4	**8290**		18.3	**7920**		**NR**
Manganese	ppm	0.24	**557**		0.24	**535**		**NR**
Mercury *	ppm	0.72	**3.68**		0.71	**3.39**		**14**
Nickel *	ppm	0.35	**36.8**		0.35	**36.1**		**250**
Potassium	ppm	241	**2800**		240	**2670**		**NR**
Selenium	ppm	0.96	0.49	U	0.95	0.48	U	63
Silver *	ppm	0.31	0.16	U	0.3	0.15	U	110
Sodium	ppm	19.2	**9380**		19.1	**9080**		**NR**
Thallium	ppm	0.80	0.41	U	0.79	0.4	U	2
Vanadium *	ppm	0.57	**36.2**		0.57	**34.3**		**370**
Zinc *	ppm	0.74	**289**		0.74	**251**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15F: Run2-Batch2 Dioxins

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L1870
Date Received: 03/15/01

		R2/B2/S1-A			R2/B2/S1-B			
Dioxins	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
2,3,7,8-TCDF	ng/Kg	1.40	**39**	EMP	0.71	**30**	EMP	
Total TCDF	ng/Kg	1.40	**470**		0.71	**360**		
2,3,7,8-TCDD	ng/Kg	0.75	**160**		1.10	**120**		
Total TCDD	ng/Kg	0.75	**190**		1.10	**170**		
1,2,3,7,8-PeCDF	ng/Kg	1.90	**23**		1.80	**16**		
2,3,4,7,8-PeCDF	ng/Kg	0.63	**32**		0.99	**34**		
Total PeCDF	ng/Kg	1.30	**430**		1.40	**360**		
1,2,3,7,8-PeCDD	ng/Kg	1.00	**5.8**		0.51	**6.1**		
Total PeCDD	ng/Kg	1.00	**30**		0.51	**30**		
1,2,3,4,7,8-HxCDF	ng/Kg	1.00	**83**		0.62	**150**		
1,2,3,6,7,8-HxCDF	ng/Kg	0.65	**48**	EMP	0.94	**150**	EMP	
2,3,4,6,7,8-HxCDF	ng/Kg	0.51	**24**		0.52	**24**		
1,2,3,7,8,9-HxCDF	ng/Kg	0.88	**7.4**		0.50	**7.4**		
Total HxCDF	ng/Kg	0.76	**350**		0.64	**460**		
1,2,3,4,7,8-HxCDD	ng/Kg	1.20	**8.8**		0.85	**6**		
1,2,3,6,7,8-HxCDD	ng/Kg	1.10	**26**		1.90	**26**		
1,2,3,7,8,9-HxCDD	ng/Kg	1.20	**13**		0.68	**13**		
Total HxCDD	ng/Kg	1.20	**300**		1.20	**290**		
1,2,3,4,6,7,8-HpCDF	ng/Kg	0.91	**740**		2.20	**800**		
1,2,3,4,7,8,9-HpCDF	ng/Kg	1.10	**21**		2.00	**24**		
Total HpCDF	ng/Kg	1.00	**800**		2.10	**990**		
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.20	**390**		1.70	**380**		
Total HpCDD	ng/Kg	1.20	**960**		1.70	**940**		
OCDF	ng/Kg	2.10	**1100**		3.00	**1200**		
OCDD	ng/Kg	2.40	**4100**		3.30	**4000**		
TEF (Total)	ng/Kg	NA	**210**		NA	**180**		**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, 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. ppt is on dry weight basis

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SEDIMENT FEED CONTAMINANT ANALYSIS
Table 15G: Run2-Batch2 Cyanide

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L1870								
Date Received: 03/15/01								
		R2/B2/S1-A			R2/B2/S1-B			
Cyanide	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Cyanide	ppm	0.27	0.27	U	0.27	0.27	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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16A: Run2-Batch3 Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L2254
Date Received: 03/28/01

VOLATILES	Units:	R2/B3/S1-A Method Detection Limit	R2/B3/S1-A Concentration	Q	R2/B3/S1-B Method Detection Limit	R2/B3/S1-B Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Chloromethane	ppb	0.69	1.61	U	0.69	1.61	U	520,000
Bromomethane	ppb	0.79	1.63	U	0.79	1.64	U	79,000
Vinyl Chloride	ppb	0.69	1.94	U	0.69	1.95	U	2,000
Chloroethane	ppb	0.39	1.71	U	0.39	1.72	U	NR
Methylene Chloride	ppb	1.10	2	U	1.10	**5.8**	B	**49,000**
Acetone	ppb	8.81	**224**	B	8.81	**152**	B	**1,000,000**
Carbon disulfide	ppb	0.55	**5.6**		0.55	**5**		**NR**
1,1-Dichloroethene	ppb	0.43	1.36	U	0.43	1.37	U	8,000
1,1-Dichloroethane	ppb	0.32	1.22	U	0.32	1.22	U	570,000
t-1,2-Dichloroethene	ppb	0.83	0.7	U	0.83	0.7	U	1,000,000
c-1,2-Dichloroethene	ppb	1.01	1.48	U	1.01	1.49	U	79,000
Chloroform	ppb	0.35	1.38	U	0.35	1.39	U	19,000
1,2-Dichloroethane	ppb	0.61	0.95	U	0.61	0.95	U	6,000
2-Butanone	ppb	5.10	**26.6**		5.10	1.93	U	**1,000,000**
1,1,1-Trichloroethane	ppb	0.57	1.46	U	0.57	1.47	U	210,000
Carbon Tetrachloride	ppb	0.55	1.54	U	0.55	1.55	U	2,000
Bromodichloromethane	ppb	0.39	1.4	U	0.39	1.41	U	11,000
1,2-Dichloropropane	ppb	0.37	1.32	U	0.37	1.32	U	10,000
cis-1,3-Dichloropropene	ppb	0.51	1.3	U	0.51	1.3	U	4,000
Trichloroethene	ppb	0.61	1.54	U	0.61	1.55	U	23,000
Dibromochloromethane	ppb	0.59	1.13	U	0.59	1.14	U	110,000
1,1,2-Trichloroethane	ppb	0.95	1.19	U	0.95	1.2	U	22,000
Benzene	ppb	0.57	0.27	U	0.57	0.27	U	3,000
trans-1,3-Dichloropropene	ppb	0.83	1.15	U	0.83	1.16	U	4,000
Bromoform	ppb	0.97	0.7	U	0.97	0.7	U	86,000
4-Methyl-2-pentanone	ppb	3.00	3.54	U	3.00	3.56	U	1,000,000
2-Hexanone	ppb	3.15	2.88	U	3.15	2.9	U	NR
Tetrachloroethene	ppb	0.57	1.3	U	0.57	1.3	U	4,000
Toluene	ppb	0.67	0.35	U	0.67	0.35	U	1,000,000
1,1,2,2-Tetrachloroethane	ppb	1.01	1.22	U	1.01	1.22	U	34,000
Chlorobenzene	ppb	0.59	0.56	U	0.59	0.56	U	37,000
Ethylbenzene	ppb	0.69	0.19	U	0.69	0.19	U	1,000,000
Styrene	ppb	0.59	1.48	U	0.59	1.49	U	23,000
m,p-xylene	ppb	1.28	0.33	U	1.28	**1.9**		**410,000**
o-xylene	ppb	0.57	0.25	U	0.57	0.25	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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16B: Run2-Batch3 Semi-Volatiles

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L2254								
Date Received: 03/28/01								
		R2/B3/S1-A			R2/B3/S1-B			
SEMIVOLATILES	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Phenol	ppb	122	40.9	U	121	67.3	U	10,000,000
bis(2-Chloroethyl)ether	ppb	157	53	U	157	64.8	U	660
2-Chlorophenol	ppb	148	49.7	U	147	66.1	U	280,000
1,3-Dichlorobenzene	ppb	161	**16.5**	J	161	70.7	U	**5,100,000**
1,4-Dichlorobenzene	ppb	153	**38.4**	J	153	68.7	U	**570,000**
1,2-Dichlorobenzene	ppb	173	58.2	U	172	69.4	U	5,100,000
2-Methylphenol	ppb	155	52.1	U	154	57.3	U	2,800,000
bis(2-Chloroisopropyl)ether	ppb	164	55	U	163	74.8	U	2,300,000
3+4-Methylphenol	ppb	155	52.2	U	155	55.5	U	2,800,000
N-Nitrosodi-n-propylamine	ppb	143	48.1	U	142	67.4	U	660
Hexachloroethane	ppb	137	46.2	U	137	71.1	U	6,000
Nitrobenzene	ppb	171	57.5	U	170	77.8	U	28,000
Isophorone	ppb	139	46.8	U	139	71.1	U	1,100,000
2-Nitrophenol	ppb	130	43.6	U	129	54.1	U	NR
2,4-Dimethylphenol	ppb	121	40.8	U	121	32.7	U	1,100,000
bis(2-Chloroethoxy)methane	ppb	159	53.6	U	159	65.4	U	NR
2,4-Dichlorophenol	ppb	143	48.2	U	143	56.7	U	170,000
1,2,4-Trichlorobenzene	ppb	175	58.8	U	174	68.6	U	68,000
Naphthalene	ppb	169	**95.3**		168	**62.8**	J	**230,000**
4-Chloroaniline	ppb	86.7	29.2	U	86.4	71.4	U	230,000
Hexachlorobutadiene	ppb	164	55	U	163	68.7	U	1,000
4-Chloro-3-methylphenol	ppb	168	56.6	U	168	55.3	U	10,000,000
2-Methylnaphthalene	ppb	144	**32.2**	J	143	**23.5**	J	**NR**
Hexachlorocyclopentadiene	ppb	72.4	24.3	U	72.2	57.5	U	400,000
2,4,6-Trichlorophenol	ppb	144	48.4	U	143	54.7	U	62,000
2,4,5-Trichlorophenol	ppb	128	43.1	U	128	52.7	U	5,600,000
2-Chloronaphthalene	ppb	167	56.2	U	167	63	U	NR
2-Nitroaniline	ppb	126	42.3	U	125	49.5	U	NR
Dimethylphthalate	ppb	167	56.2	U	166	60.3	U	10,000,000
Acenaphthylene	ppb	164	**235**		163	**271**		**NR**
2,6-Dinitrotoluene	ppb	124	41.7	U	124	55.7	U	1,000
3-Nitroaniline	ppb	80.0	26.9	U	79.7	53.2	U	NR
Acenaphthene	ppb	176	**74.8**		176	**58.7**	J	**3,400,000**
2,4-Dinitrophenol	ppb	119	39.9	U	118	63.3	U	110,000
4-Nitrophenol	ppb	266	89.5	U	265	41.1	U	NR
Dibenzofuran	ppb	172	**35.7**	J	171	**26.2**	J	**NR**
2,4-Dinitrotoluene	ppb	113	38.1	U	113	52.9	U	1,000
Diethylphthalate	ppb	110	**17.8**	J	109	38.7	U	**10,000,000**
4-Chlorophenyl phenyl ether	ppb	198	66.5	U	197	61.3	U	NR
Fluorene	ppb	179	**67.2**		178	**53.8**	J	**2,300,000**
4-Nitroaniline	ppb	92.2	31	U	91.9	46.5	U	NR
4,6-Dinitro-2-methylphenol	ppb	156	52.3	U	155	58.6	U	NR
N-Nitrosodiphenylamine	ppb	164	55.1	U	163	55.3	U	140,000

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16B: Run2-Batch3 Semi-Volatiles

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L2254
Date Received: 03/28/01

		R2/B3/S1-A			R2/B3/S1-B			
SEMIVOLATILES	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**	**Residential Direct Contact Soil Cleanup Criteria**
4-Bromophenyl phenyl ether	ppb	149	50.2	U	149	56	U	NR
Hexachlorobenzene	ppb	146	49.2	U	146	61.4	U	660
Pentachlorophenol	ppb	99.6	33.5	U	99.2	41.6	U	6,000
Phenanthrene	ppb	144	**345**		143	**333**		**NR**
Anthracene	ppb	146	**273**		146	**282**		**10,000,000**
Carbazole	ppb	116	39.2	U	116	**137**	J	**NR**
Di-n-butylphthalate	ppb	441	**40.5**	J	439	**22.8**	J	**5,700,000**
Fluoranthene	ppb	130	**1100**		129	**1170**		**2,300,000**
Pyrene	ppb	107	**1560**		107	**984**		**1,700,000**
Butylbenzylphthalate	ppb	97.5	32.8	U	97.2	**31.1**	J	**1,100,000**
3,3'-Dichlorobenzidine	ppb	169	56.8	U	168	134	U	2,000
Benzo(a)anthracene	ppb	102	**1050**		102	**811**		**900**
Chrysene	ppb	102	**984**		102	**885**		**9,000**
bis(2-Ethylhexyl)phthalate	ppb	663	**9660**		661	**3880**	B	**49,000**
Di-n-octylphthalate	ppb	126	**74.8**		125	37.1	U	NR
Benzo(b)fluoranthene	ppb	167	**774**		167	**685**		**900**
Benzo(k)fluoranthene	ppb	136	**674**		135	**686**		**900**
Benzo(a)pyrene	ppb	111	**760**		111	**756**		**660**
Indeno(1,2,3-cd)pyrene	ppb	130	**269**		129	**236**		**900**
Dibenz(a,h)anthracene	ppb	122	**112**		122	**93.2**		**660**
Benzo(g,h,i)perylene	ppb	108	**290**		108	**248**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16C: Run2-Batch3 PCBs

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L2254								
Date Received: 03/28/01								
		R2/B3/S1-A			R2/B3/S1-B			
PCB (Aroclor)	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
PCB 1016	ppb	4.16	4.2	U	4.15	4.22	U	
PCB 1221	ppb	19.6	19.8	U	19.5	19.9	U	
PCB 1232	ppb	4.35	4.38	U	4.33	4.41	U	
PCB 1242	ppb	3.26	3.29	U	3.25	3.31	U	
PCB 1248	ppb	7.34	**274**		7.32	**222**		
PCB 1254	ppb	11.1	**351**		11.1	**272**		
PCB 1260	ppb	12.8	**166**		12.7	**123**		
PCB Total	ppb	NA	**791**		NA	**617**		**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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16D: Run2-Batch3 Pesticides

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L2254								
Date Received: 03/28/01								
		R2/B3/S1-A			R2/B3/S1-B			
Pesticides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
alpha-BHC	ppb	1.88	1.89	U	1.87	1.9	U	NR
beta-BHC	ppb	2.21	2.22	U	2.2	2.24	U	NR
delta-BHC	ppb	1.57	**5.12**		1.57	**4.88**		**NR**
gamma-BHC (Lindane)	ppb	1.92	1.93	U	1.91	1.95	U	520
Heptachlor	ppb	2.15	2.16	U	2.13	2.17	U	150
Aldrin	ppb	1.74	1.75	U	1.73	1.76	U	40
Heptachlor epoxide	ppb	2.45	2.47	U	2.44	2.48	U	NR
Endosulfan I	ppb	2.74	2.76	U	2.72	2.77	U	340,000
Dieldrin	ppb	2.25	2.26	U	2.24	2.28	U	42
4,4'-DDE	ppb	2.02	**18**		2.01	**14.7**		**2,000**
Endrin	ppb	2.41	2.43	U	2.4	2.44	U	17,000
Endosulfan II	ppb	2.00	2.02	U	1.99	2.03	U	340,000
4,4'-DDD	ppb	1.29	**10**		1.28	**8.25**		**3,000**
Endosulfan sulfate	ppb	1.64	1.65	U	1.63	1.66	U	NR
4,4'-DDT	ppb	2.43	**11.1**		2.42	**11.7**		**2,000**
Methoxychlor	ppb	2.66	2.67	U	2.64	2.69	U	280,000
Endrin ketone	ppb	2.17	2.18	U	2.15	2.19	U	NR
Endrin aldehyde	ppb	5.71	5.74	U	5.67	5.78	U	NR
alpha-Chlordane	ppb	2.88	**1.69**	J	2.87	**1.71**	J	**NR**
gamma-Chlordane	ppb	1.88	**5.93**		1.87	**5.16**		**NR**
Toxaphene	ppb	41.3	41.6	U	41.1	41.8	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.
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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16E: Run2-Batch3 Metals

Summary of Results
Project: PB-NUI
ETL Chain of Custody #: L2254
Date Received: 03/28/01

		R2/B3/S1-A			R2/B3/S1-B			
Metals	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Aluminum	ppm	17.6	**5670**		17.5	**6350**		**NR**
Antimony *	ppm	0.73	**0.73**		0.73	**0.86**		**14**
Arsenic *	ppm	0.98	**2.94**		0.97	**2.88**		**20**
Barium *	ppm	0.24	**45.8**		0.24	**52.4**		**700**
Beryllium	ppm	0.24	**0.021**	J	0.24	**0.041**	J	**1**
Cadmium *	ppm	0.24	**0.77**		0.24	**0.91**		**39**
Calcium	ppm	26.9	**3520**		26.8	**2900**		**NR**
Chromium	ppm	0.45	**55**		0.45	**63.3**		**NR**
Cobalt	ppm	0.24	**4.12**		0.24	**4.74**		**NR**
Copper *	ppm	0.45	**55.6**		0.45	**64**		**600**
Iron	ppm	19.5	**11700**		19.4	**13500**		**NR**
Lead *	ppm	0.45	**52.7**		0.45	**62.3**		**400**
Magnesium	ppm	18.4	**2950**		18.3	**3370**		**NR**
Manganese	ppm	0.24	**214**		0.24	**240**		**NR**
Mercury *	ppm	0.72	**2.14**		0.71	**3.57**		**14**
Nickel *	ppm	0.35	**14.3**		0.35	**16.3**		**250**
Potassium	ppm	241	**1330**		240	**1460**		**NR**
Selenium	ppm	0.96	0.48	U	0.95	0.49	U	63
Silver *	ppm	0.31	0.15	U	0.3	0.16	U	110
Sodium	ppm	19.2	**2920**		19.1	**3150**		**NR**
Thallium	ppm	0.80	0.4	U	0.79	0.4	U	2
Vanadium *	ppm	0.57	**13.5**		0.57	**15.8**		**370**
Zinc *	ppm	0.74	**103**		0.74	**118**		**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, 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

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16F: Run2-Batch3 Dioxins

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L2254								
Date Received: 03/28/01								
		R2/B3/S1-A			R2/B3/S1-B			
Dioxins	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
2,3,7,8-TCDF	ng/Kg	1.40	**17**		0.71	**15**		
Total TCDF	ng/Kg	1.40	**290**		0.71	**450**		
2,3,7,8-TCDD	ng/Kg	0.75	**140**		1.10	**210**		
Total TCDD	ng/Kg	0.75	**190**		1.10	**410**		
1,2,3,7,8-PeCDF	ng/Kg	1.90	**15**	EMP	1.80	**25**	EMP	
2,3,4,7,8-PeCDF	ng/Kg	0.63	**25**		0.99	**26**		
Total PeCDF	ng/Kg	1.30	**410**		1.40	**450**		
1,2,3,7,8-PeCDD	ng/Kg	1.00	**8.6**	EMP	0.51	**9.5**	EMP	
Total PeCDD	ng/Kg	1.00	**20**		0.51	**52**		
1,2,3,4,7,8-HxCDF	ng/Kg	1.00	**160**		0.62	**170**		
1,2,3,6,7,8-HxCDF	ng/Kg	0.65	**39**		0.94	**47**		
2,3,4,6,7,8-HxCDF	ng/Kg	0.51	**33**	EMP	0.52	**28**		
1,2,3,7,8,9-HxCDF	ng/Kg	0.88	**8.3**		0.50	**6.9**		
Total HxCDF	ng/Kg	0.76	**590**		0.64	**570**		
1,2,3,4,7,8-HxCDD	ng/Kg	1.20	**6.7**		0.85	**6.2**	EMP	
1,2,3,6,7,8-HxCDD	ng/Kg	1.10	**25**		1.90	**27**		
1,2,3,7,8,9-HxCDD	ng/Kg	1.20	**13**		0.68	**14**		
Total HxCDD	ng/Kg	1.20	**270**		1.20	**280**		
1,2,3,4,6,7,8-HpCDF	ng/Kg	0.91	**870**		2.20	**710**		
1,2,3,4,7,8,9-HpCDF	ng/Kg	1.10	**29**		2.00	**24**		
Total HpCDF	ng/Kg	1.00	**900**		2.10	**900**		
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.20	**380**		1.70	**370**		
Total HpCDD	ng/Kg	1.20	**920**		1.70	**930**		
OCDF	ng/Kg	2.10	**1400**		3.00	**1100**		
OCDD	ng/Kg	2.40	**4100**		3.30	**4000**		
TEF (Total)	ng/Kg	NA	**200**		NA	**270**		**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, 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. ppt is on dry weight basis

SEDIMENT FEED CONTAMINANT ANALYSIS
Table 16G: Run2-Batch3 Cyanide

Summary of Results								
Project: PB-NUI								
ETL Chain of Custody #: L2254								
Date Received: 03/28/01								
		R2/B3/S1-A			R2/B3/S1-B			
Cyanide	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	Residential Direct Contact Soil Cleanup Criteria
Cyanide	ppm	0.28	0.28	U	0.28	0.28	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

TABLE 17A

FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Benzo(a)anthracene

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	583.6	583.6	543.4		
Benzo(a)anthracene (3)	Avg conc, ppbw (2)	879.5	879.5	237.0		
	wt in mgs	232.8	232.8	58.4	< 0.1 (5)	174.4

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8		
Benzo(a)anthracene (3)	Avg conc, ppbw (2)	1325.0	872.0	830.0		
	wt in mgs	359.2	451.3	397.1	< 0.1 (5)	54.2

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4		
Benzo(a)anthracene (3)	Avg conc, ppbw (2)	838.5	943.5	109.5		
	wt in mgs	238.8	495.6	57.0	< 0.1 (5)	438.6

Run 1 Compliance Average (Avg Concentration for 3 Batches)	conc. 898.3	conc. 392.2		mgs. 222.4
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 4000		

Performance Data % Contaminant Reduction
Compliance Average Concentration Basis
56.3%

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	586.4	586.4	539.0		
Benzo(a)anthracene (4)	Avg conc, ppbw (2)	837.0	837.0	841.0		
	wt in mgs	222.6	222.6	205.6	< 0.1 (5)	17.0

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4		
Benzo(a)anthracene (4)	Avg conc, ppbw (2)	1485.0	1530.0	341.0		
	wt in mgs	408.3	794.7	170.7	< 0.1 (5)	624.0

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7		
Benzo(a)anthracene (4)	Avg conc, ppbw (2)	930.5	771.0	172.0		
	wt in mgs	240.5	393.3	86.3	< 0.1 (5)	307.0

Run 2 Compliance Average (Avg Concentration for 3 Batches)	conc. 1046.0	conc. 451.3		mgs. 316.0
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 4000		

Performance Data % Contaminant Reduction
Compliance Average Concentration Basis
56.9%

REFERENCES FROM THE NJIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The averages concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the] Site Remediation News, Spring 1995 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather then the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

TABLE 17B

FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Benzo(b)fluoranthene

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	
Solids	Total dry solids, lb (1)	583.6	583.6	543.4			
Benzo(b)fluoranthene (3)	Avg conc, ppbw (2)	908.0	908.0	231.0			
	wt in mgs	240.4	240.4	56.9	< 0.1 (5)	183.4	
BATCH NO. 2		**B2/1 S1**	**B2/3 S2**	**B2/6 S3**			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8			
Benzo(b)fluoranthene (3)	Avg conc, ppbw (2)	1500.0	977.5	739.0			
	wt in mgs	406.7	505.9	353.6	< 0.1 (5)	152.4	
BATCH NO. 3		**B3/1 S1**	**B3/3 S2**	**B3/6 S3**			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4			Compliance Average Concentration Basis
Benzo(b)fluoranthene (3)	Avg conc, ppbw (2)	734.5	980.5	104.7			
	wt in mgs	209.2	515.0	54.5	< 0.1 (5)	460.5	
Run 1 Compliance Average (Avg Concentration for 3 Batches)			conc. 985.3	conc. 388.2		mgs. 265.4	62.8%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 4000			

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/6 S2			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	
Solids	Total dry solids, lb (1)	586.4	586.4	539.0			
Benzo(b)fluoranthene (4)	Avg conc, ppbw (2)	928.0	928.0	985.0			
	wt in mgs	246.8	246.8	240.8	< 0.1 (5)	6.0	
BATCH NO. 2		**B2/1 S1**	**B2/3 S2**	**B2/6 S3**			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4			
Benzo(b)fluoranthene (4)	Avg conc, ppbw (2)	1525.0	1600.0	259.0			
	wt in mgs	419.3	831.1	129.6	< 0.1 (5)	701.4	
BATCH NO. 3		**B3/1 S1**	**B3/3 S2**	**B3/6 S3**			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7			Compliance Average Concentration Basis
Benzo(b)fluoranthene (4)	Avg conc, ppbw (2)	729.5	727.5	153.0			
	wt in mgs	188.5	371.1	76.8	< 0.1 (5)	294.3	
Run 2 Compliance Average (Avg Concentration for 3 Batches)			conc. 1086.2	conc. 456.7		mgs. 333.9	67.1%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 4000			

REFERENCES FROM THE NJIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The average concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the] Site Remediation News, Spring 1995 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather than the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

TABLE 17C
FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Benzo(k)fluoranthene

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2	Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product		
Solids	Total dry solids, lb (1)	583.6	583.6	543.4		
Benzo(k)fluoranthene (3)	Avg conc, ppbw (2)	617.5	617.5	179.5		
	wt in mgs	163.5	163.5	44.2	< 0.1 (5)	119.2

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3	Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product		
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8		
Benzo(k)fluoranthene (3)	Avg conc, ppbw (2)	987.5	718.0	495.0		
	wt in mgs	267.7	371.6	236.8	< 0.1 (5)	134.8

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3	Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction Compliance Average Concentration Basis
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product			
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4			
Benzo(k)fluoranthene (3)	Avg conc, ppbw (2)	592.0	692.5	75.0			
	wt in mgs	168.8	363.7	39.0	< 0.1 (5)	324.7	
Run 1 Compliance Average (Avg Concentration for 3 Batches)			conc. [illegible]	conc. [illegible]		mgs. 192.9	[illegible]
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 4000			

RUN NO. 2

BATCH NO. 1		B1/1 S1	B1/3 S2	B1/5 S3	Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product		
Solids	Total dry solids, lb (1)	586.4	586.4	539.0		
Benzo(k)fluoranthene (4)	Avg conc, ppbw (2)	571.0	571.0	500.0		
	wt in mgs	151.9	151.9	122.2	< 0.1 (5)	29.6

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3	Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product		
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4		
Benzo(k)fluoranthene (4)	Avg conc, ppbw (2)	1145.0	1235.0	271.5		
	wt in mgs	314.8	641.5	135.9	< 0.1 (5)	505.6

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3	Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction Compliance Average Concentration Basis
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product			
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7			
Benzo(k)fluoranthene (4)	Avg conc, ppbw (2)	680.0	683.0	132.0			
	wt in mgs	175.8	348.4	66.3	< 0.1 (5)	282.1	
Run 2 Compliance Average (Avg Concentration for 3 Batches)			conc. 829.7	conc. 301.1		mgs. 272.4	63.7%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 4000			

REFERENCES FROM THE NUIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The average concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the} Site Remediation News, Spring 1995 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather than the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

TABLE 17D

FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Benzo(a)pyrene

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	583.6	583.6	543.4		
Benzo(a)pyrene (3)	Avg conc, ppbw (2)	896.0	896.0	242.0		
	wt in mgs	237.2	237.2	59.6	< 0.1 (5)	177.5

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8		
Benzo(a)pyrene (3)	Avg conc, ppbw (2)	1260.0	870.5	632.0		
	wt in mgs	341.6	450.6	302.4	< 0.1 (5)	148.2

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4		
Benzo(a)pyrene (3)	Avg conc, ppbw (2)	753.5	805.5	108.0		
	wt in mgs	214.8	423.1	66.2	< 0.1 (5)	367.9

Performance Data % Contaminant Reduction
Compliance Average Concentration Basis

Run 1 Compliance Average (Avg Concentration for 3 Batches)	conc. 857.0	conc. 326.7		mgs. 231.2	61.9%
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 660			

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	566.4	566.4	539.0		
Benzo(a)pyrene (4)	Avg conc, ppbw (2)	877.0	877.0	835.5		
	wt in mgs	233.3	233.3	204.3	< 0.1 (5)	29.0

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4		
Benzo(a)pyrene (4)	Avg conc, ppbw (2)	1170.0	1360.0	304.0		
	wt in mgs	321.7	701.2	152.2	< 0.1 (5)	549.1

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7		
Benzo(a)pyrene (4)	Avg conc, ppbw (2)	756.0	734.0	166.0		
	wt in mgs	195.9	374.4	83.3	< 0.1 (5)	291.1

Performance Data % Contaminant Reduction
Compliance Average Concentration Basis

Run 2 Compliance Average (Avg Concentration for 3 Batches)	conc. 967.0	conc. 436.6		mgs. 290.0	55.9%
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 660			

REFERENCES FROM THE NJIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The average concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the] Site Remediation News, Spring 1995 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather than the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

TABLE 17E
FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

bis(2-Ethylhexyl)phthalate

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product			
Solids	Total dry solids, lb (1)	583.6	583.6	543.4			
bis(2-Ethylhexyl)phthalate	Avg conc, ppbw (2)	7635.0	7635.0	1465.0			
(3)	wt in mgs	2021.1	2021.1	361.1		< 0.6 (5)	1660.0

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product			
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8			
bis(2-Ethylhexyl)phthalate	Avg conc, ppbw (2)	13550.0	8945.0	6055.0			
(3)	wt in mgs	3673.6	4629.9	2897.0		< 0.6 (5)	1732.9

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		Air Emissions	Estimated Amount Destroyed (6)		Performance Data % Contaminant Reduction
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product					Compliance Average Concentration Basis
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4					
bis(2-Ethylhexyl)phthalate	Avg conc, ppbw (2)	10785.0	10335.0	886.5					
(3)	wt in mgs	3071.2	5426.6	462.4		< 0.6 (5)	4966.1		

Run 1 Compliance Average (Avg Concentration for 3 Batches)	conc. 8971.7	conc. 2802.2			mgs. 2766.3		68.8%
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 210,000					

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/5 S2		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product			
Solids	Total dry solids, lb (1)	586.4	586.4	539.0			
bis(2-Ethylhexyl)phthalate	Avg conc, ppbw (2)	6785.0	6785.0	7210.0			
(4)	wt in mgs	1804.7	1804.7	1762.7		< 0.6 (5)	42.0

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product			
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4			
bis(2-Ethylhexyl)phthalate	Avg conc, ppbw (2)	19100.0	17200.0	1305.0			
(4)	wt in mgs	5251.0	8933.8	653.1		< 0.6 (5)	8280.7

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		Air Emissions	Estimated Amount Destroyed (6)		Performance Data % Contaminant Reduction
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product					Compliance Average Concentration Basis
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7					
bis(2-Ethylhexyl)phthalate	Avg conc, ppbw (2)	6770.0	4515.0	1175.0					
(4)	wt in mgs	1749.8	2303.1	589.8		< 0.6 (5)	1713.3		

Run 2 Compliance Average (Avg Concentration for 3 Batches)	conc. 9500.0	conc. 3230.0			mgs. 3345.3		66.0%
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 210,000					

REFERENCES FROM THE NJIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The average concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the] Site Remediation News, Spring 1995 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather than the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

TABLE 17F

FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Chrysene

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product			
Solids	Total dry solids, lb (1)	583.6	583.6	543.4			
Chrysene (3)	Avg conc, ppbw (2)	941.0	941.0	264.5			
	wt in mgs	249.1	249.1	65.2		< 0.1 (5)	183.9

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/6 S3		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product			
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8			
Chrysene (3)	Avg conc, ppbw (2)	1440.0	969.5	833.0			
	wt in mgs	390.4	501.8	398.5		< 0.1 (5)	103.3

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/6 S3		Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product				Compliance Average Concentration Basis
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4				
Chrysene (3)	Avg conc, ppbw (2)	922.5	1067.0	146.5				
	wt in mgs	262.7	560.5	76.2		< 0.1 (5)	484.2	
Run 1 Compliance Average (Avg Concentration for 3 Batches)			conc. 992.5	conc. 414.7			mgs. 257.1	58.2%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 40,000				

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product			
Solids	Total dry solids, lb (1)	586.4	586.4	539.0			
Chrysene (4)	Avg conc, ppbw (2)	938.0	938.0	946.5			
	wt in mgs	249.5	249.5	231.4		< 0.1 (5)	18.1

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/6 S3		Air Emissions	Estimated Amount Destroyed (6)
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product			
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4			
Chrysene (4)	Avg conc, ppbw (2)	1635.0	1585.0	358.5			
	wt in mgs	449.5	823.3	179.4		< 0.1 (5)	643.8

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/6 S3		Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product				Compliance Average Concentration Basis
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7				
Chrysene (4)	Avg conc, ppbw (2)	934.6	815.5	198.0				
	wt in mgs	241.5	416.0	99.4		< 0.1 (5)	316.6	
Run 2 Compliance Average (Avg Concentration for 3 Batches)			conc. 1112.8	conc. 501.0			mgs. 326.2	55.0%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 40,000				

REFERENCES FROM THE NUIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

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1 lb = 453,592.4 milligrams (mgs)

TABLE 17G

FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Indeno(1,2,3-cd)pyrene

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/5 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	583.6	583.6	543.4		
Indeno(1,2,3-cd)pyrene (3)	Avg conc, ppbw (2)	309.5	309.5	111.4		
	wt in mgs	81.9	81.9	27.5	< 0.1 (5)	54.5

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/6 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8		
Indeno(1,2,3-cd)pyrene (3)	Avg conc, ppbw (2)	443.5	309.5	246.0		
	wt in mgs	120.2	160.2	117.7	< 0.1 (5)	42.5

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/6 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4		
Indeno(1,2,3-cd)pyrene (3)	Avg conc, ppbw (2)	325.0	323.5	80.8		
	wt in mgs	92.5	169.9	31.6	< 0.1 (5)	138.3

Run 1 Compliance Average (Avg Concentration for 3 Batches)	conc. 314.2	conc. 139.4		mgs. 78.4	55.6%
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 4000			

Performance Data % Contaminant Reduction
Compliance Average Concentration Basis

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/5 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	586.4	586.4	539.0		
Indeno(1,2,3-cd)pyrene (4)	Avg conc, ppbw (2)	297.0	297.0	275.0		
	wt in mgs	79.0	79.0	67.2	< 0.1 (5)	11.8

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/6 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4		
Indeno(1,2,3-cd)pyrene (4)	Avg conc, ppbw (2)	417.5	408.5	105.6		
	wt in mgs	114.8	212.2	52.8	< 0.1 (5)	159.4

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/6 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7		
Indeno(1,2,3-cd)pyrene (4)	Avg conc, ppbw (2)	252.5	206.0	91.1		
	wt in mgs	65.3	105.1	45.7	< 0.1 (5)	59.4

Run 2 Compliance Average (Avg Concentration for 3 Batches)	conc. 303.8	conc. 157.2		mgs. 76.9	48.3%
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 4000			

Performance Data % Contaminant Reduction
Compliance Average Concentration Basis

REFERENCES FROM THE NUIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

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1 lb = 453,592.4 milligrams (mgs)

MAXUS2367521

TABLE 17H
FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Total PCBs

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	583.6	583.6	543.4		
Total PCBs (3)	Avg conc, ppbw (2)	739.5	739.5	141.9		
	wt in mgs	195.8	195.8	35.0	< 0.1 (5)	160.8

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8		
Total PCBs (3)	Avg conc, ppbw (2)	497.4	362.8	531.5		
	wt in mgs	134.8	187.8	254.3	< 0.1 (5)	-66.5

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4			Compliance Average Concentration Basis
Total PCBs (3)	Avg conc, ppbw (2)	687.0	558.0	281.3			
	wt in mgs	169.9	293.1	146.4	< 0.1 (5)	146.7	
Run 1 Compliance Average (Avg Concentration for 3 Batches)			conc. 553.4	conc. 316.2		mgs. 80.3	42.8%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 2000			

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	586.4	586.4	539.0		
Total PCBs (4)	Avg conc, ppbw (2)	354.3	354.3	361.3		
	wt in mgs	94.2	94.2	88.3	< 0.1 (5)	5.9

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4		
Total PCBs (4)	Avg conc, ppbw (2)	469.5	314.4	460.0		
	wt in mgs	129.1	163.3	230.2	< 0.1 (5)	-87.0

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3			
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)	Performance Data % Contaminant Reduction
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7			Compliance Average Concentration Basis
Total PCBs (4)	Avg conc, ppbw (2)	704.0	495.8	372.1			
	wt in mgs	182.0	252.9	186.8	< 0.1 (5)	66.1	
Run 2 Compliance Average (Avg Concentration for 3 Batches)			conc. 388.1	conc. 397.8		mgs. 1.7	-2.5%
NJ Non-Residential Direct Contact Soil Cleanup Criteria				conc. 2000			

REFERENCES FROM THE NUIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per billion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The average concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the] Site Remediation News, Spring 1996 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather than the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

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TABLE 17I
FINAL PILOT STUDY REPORT - COMPONENT MASS BALANCE AND PERFORMANCE DATA

Dioxins

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	583.6	583.6	543.4		
Dioxins (3)	Avg conc, ng/kg wt (2)	245.0	245.0	85.0		
	wt in mgs	0.065	0.065	0.021	< 0.1 (5)	0.044

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8		
Dioxins (3)	Avg conc, ng/kg wt (2)	205.0	200.0	135.0		
	wt in mgs	0.056	0.104	0.065	< 0.1 (5)	0.039

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4		
Dioxins (3)	Avg conc, ng/kg wt (2)	160.0	160.0	190.0		
	wt in mgs	0.046	0.084	0.099	< 0.1 (5)	-0.015

					Performance Data % Contaminant Reduction Compliance Average Concentration Basis
Run 1 Compliance Average (Avg Concentration for 3 Batches)	conc. 201.6	conc. 136.7		mgs. 0.022	32.8%
NJDEP-Recommended "Non-Health Based" Criteria		1000			

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	586.4	586.4	539.0		
Dioxins (4)	Avg conc, ng/kg wt (2)	215.0	215.0	63.5		
	wt in mgs	0.057	0.057	0.016	< 0.1 (5)	0.042

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4		
Dioxins (4)	Avg conc, ng/kg wt (2)	195.0	215.0	240.0		
	wt in mgs	0.054	0.112	0.120	< 0.1 (5)	-0.008

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3		
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product	Air Emissions	Estimated Amount Destroyed (6)
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7		
Dioxins (4)	Avg conc, ng/kg wt (2)	--	--	140.0		
	wt in mgs	--	--	0.070	< 0.1 (5)	--

					Performance Data % Contaminant Reduction Compliance Average Concentration Basis
Run 2 Compliance Average (Avg Concentration for 3 Batches)	conc. 215.0	conc. 147.8		mgs. 0.017	31.3%
NJDEP-Recommended "Non-Health Based" Criteria		1000			

REFERENCES FROM THE NUIEG DRAFT PILOT STUDY REPORT:

(1) See Tables 1-6 of the Draft Pilot Study Report

(2) Parts per trillion by weight, dry basis

(3) Table 8A - Run 1 Performance Data

(4) Table 9A - Run 2 Performance Data

(5) The PUF Tests for air emissions showed <0.1 mgs loss (i.e. negligible).

(6) There is a small error introduced due to the material removed for sampling. This material is 7-10 lbs per sample and the error is estimated to be about 1%. There is also a small error introduced due to the lack of complete closure of the overall mass balance (% solid recovery) as shown in Tables 1-6. However, these are considered to be well within acceptance pilot plant performance.

(7) The average concentrations for the 3 batches, total feed (wet feed plus recycle) and product, used in assessing the Pilot Study results are shown for each run. These average values were developed in a manner consistent with the compliance average approach recommended by NJDEP for site remediation based on an article in the] Site Remediation News, Spring 1995 ("Compliance Averaging", Brian J. Sogorka, BEERA). This method uses the average contaminant concentration for the 3 batches to determine compliance with NRDCSCC rather than the concentration of individual samples.

1 lb = 453,592.4 milligrams (mgs)

TABLE 18
Summary of Performance Data

	Run 1			Run 2			
	Feed + Recycle concentration (ppbw) [1]	Treated concentration (ppbw) [1]	% Contaminant Reduction	Feed + Recycle concentration (ppbw) [1]	Treated concentration (ppbw) [1]	% Contaminant Reduction	Overall % Contaminant Reduction Average (Run 1 + Run 2)
SVOCs							
Benzo(a)anthracene	898.3	392.2	56.3%	1046.0	451.3	56.9%	56.6%
Benzo(b)fluoranthene	955.3	358.2	62.5%	1085.2	465.7	57.1%	59.8%
Benzo(k)fluoranthene	676.0	249.8	63.0%	829.7	301.1	63.7%	63.4%
Benzo(a)pyrene	857.0	326.7	61.9%	987.0	435.0	55.9%	58.9%
bis(2-Ethylhexyl)phthalate	8971.7	2802.8	68.8%	9500.0	3230.0	66.0%	67.4%
Chrysene	992.5	414.7	58.2%	1112.8	501.0	55.0%	56.6%
Indeno(1,2,3-cd)pyrene	314.2	139.4	55.6%	303.8	157.2	48.3%	52.0%
Total SVOCs	--	--	60.9%	--	--	57.6%	59.2%
PCBs, Total	553.4	318.2	42.5%	388.1	397.8	-2.5%	20.0%
Dioxins	201[2]	136.7[2]	32.0%	215.0[2]	147.8[2]	31.3%	31.7%

Notes:

(1) Concentration represents average over all 3 batches.

(2) Dioxin concentrations presented in parts per **trillion** wet (pptw)

TABLE 19A
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Antimony

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Antimony	Avg conc, ppmw (2)	<0.7 (3)	<0.7 (3)	0.9
	wt in mgs	(4)	(4)	221.8

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Antimony	Avg conc, ppmw (2)	1.4	1.2	1.0
	wt in mgs	379.6	621.1	478.4

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	627.6	1158.0	1147.4
Antimony	Avg conc, ppmw (2)	1.2	1.1	0.9
	wt in mgs	341.7	577.8	488.4

(6) Run 1 Average (Avg Concentration of 3 Batches)	conc. 1.3 (5)	conc. 1.2 (5)	conc. 0.9
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 340	

RUN NO. 2

BATCH NO. 1		B1/1 S1	[illegible] S2	B1/3 S2
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Antimony	Avg conc, ppmw (2)	2.2	2.2	9.6
	wt in mgs	585.2	585.2	2347.1

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	608.1	1145.1	1103.4
Antimony	Avg conc, ppmw (2)	1.6	1.7	1.0
	wt in mgs	439.9	883.0	500.5

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	569.8	1124.8	1106.7
Antimony	Avg conc, ppmw (2)	0.8	0.7	1.3
	wt in mgs	206.8	357.1	652.6

(7) Run 2 Average (Avg Concentration of 3 Batches)	conc. 1.5	conc. 1.5	conc. 4.0
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 340	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Outlier because then concentration is below MDL (Method Detection Limit)
(4) Indeterminate
(5) Average between Batch 2 and Batch 3
(6) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, there is a statistical difference among the 3 streams from Run No. 1. This is demonstrated by the fact that F > Fcritical (shown to the right). The ANOVA methodology is discussed in Section 4.3. This difference is due to variability.
(7) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	<0.7 (3)	<0.7 (3)	0.9
Batch 2	1.4	1.2	1.0
Batch 3	1.2	1.1	0.9

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	2	2.6	1.3	0.02
Column 2	2	2.3	1.15	0.005
Column 3	3	2.8	0.933333	0.003333

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.168333	2	0.084167	10.63158	0.025069	6.944276
Within Groups	0.031667	4	0.007917			
Total	0.2	6				

RUN 2 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	2.2	2.2	9.6
Batch 2	1.6	1.7	1.0
Batch 3	0.8	0.7	1.3

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	4.6	1.533333	0.493333
Column 2	3	4.6	1.533333	0.583333
Column 3	3	11.9	3.966667	23.82333

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	11.84222	2	5.921111	0.713387	0.527294	5.143249
Within Groups	49.8	6	8.3			
Total	61.64222	8				

TABLE 19B
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Arsenic

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/5 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Arsenic	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	4.9
	wt in mgs	(4)	(4)	1207.8

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1064.8
Arsenic	Avg conc, ppmw (2)	7.9	7.2	5.3
	wt in mgs	2141.8	3726.7	2535.8

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.6	1158.0	1147.4
Arsenic	Avg conc, ppmw (2)	5.7	5.0	3.8
	wt in mgs	1623.2	2626.3	1977.7

(6) Run 1 Average (Avg Concentration of 3 Batches)	conc. 6.8 (5)	conc. 6.1 (5)	conc. 4.7
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 20	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B1/3 S2	B1/5 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Arsenic	Avg conc, ppmw (2)	5.4	5.4	10.7
	wt in mgs	1436.3	1436.3	2616.0

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Arsenic	Avg conc, ppmw (2)	8.5	6.9	5.1
	wt in mgs	2336.8	3583.9	2552.5

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.6	1124.6	1106.7
Arsenic	Avg conc, ppmw (2)	2.9	2.0	3.4
	wt in mgs	749.5	1020.2	1706.8

(7) Run 2 Average (Avg Concentration of 3 Batches)	conc. 5.6	conc. 4.8	conc. 6.4
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 20	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Outlier because then concentration is below MDL (Method Detection Limit)
(4) Indeterminate
(5) Average between Batch 2 and Batch 3
(6) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(7) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	Feed + Recycle	Product
Batch 1	<1.0 (3)	<1.0 (3)	4.9
Batch 2	7.9	7.2	5.3
Batch 3	5.7	5.0	3.8

SUMMARY FOR RUN 1

Groups	Count	Sum	Average	Variance
Column 1	2	13.6	6.8	2.42
Column 2	2	12.2	6.1	2.42
Column 3	3	14	4.666667	0.603333

ANOVA FOR RUN 1

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.941905	2	2.970952	1.965349	0.254388	6.944276
Within Groups	6.046667	4	1.511667			
Total	11.98857	6				

RUN 2 DATA

	Feed	Feed + Recycle	Product
Batch 1	5.4	5.4	10.7
Batch 2	8.5	6.9	5.1
Batch 3	2.9	2.0	3.4

SUMMARY FOR RUN 2

Groups	Count	Sum	Average	Variance
Column 1	3	16.8	5.6	7.87
Column 2	3	14.3	4.766667	6.303333
Column 3	3	19.2	6.4	14.59

ANOVA FOR RUN 2

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	4.002222	2	2.001111	0.208715	0.817279	5.143249
Within Groups	57.52667	6	9.587778			
Total	61.52889	8				

TABLE 19C
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Barium

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Barium	Avg conc, ppmw (2)	47.2	47.2	64.2
	wt in mgs	12494.6	12494.6	15824.2

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Barium	Avg conc, ppmw (2)	101.3	90.1	72.8
	wt in mgs	27463.7	46635.2	34831.1

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4
Barium	Avg conc, ppmw (2)	74.8	72.0	51.4
	wt in mgs	21300.4	37818.7	26751.2

(3) Run 1 Average (Avg Concentration of 3 Batches)	conc. 74.4	conc. 69.8	conc. 62.8
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 47000	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Barium	Avg conc, ppmw (2)	104.0	104.0	90.3
	wt in mgs	27662.6	27662.6	22077.1

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Barium	Avg conc, ppmw (2)	111.0	95.6	72.3
	wt in mgs	30516.4	49655.5	36185.7

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7
Barium	Avg conc, ppmw (2)	49.0	36.2	54.5
	wt in mgs	12664.4	18466.0	27358.5

(4) Run 2 Average (Avg Concentration of 3 Batches)	conc. 88.0	conc. 78.6	conc. 72.4
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 47000	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	47.2	47.2	64.2
Batch 2	101.3	90.1	72.8
Batch 3	74.6	72.0	51.4

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	223.3	74.43333	731.6033
Column 2	3	209.3	69.76667	463.6433
Column 3	3	188.4	62.8	115.96

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	205.6467	2	102.8233	0.235185	0.797382	5.143249
Within Groups	2623.213	6	437.2022			
Total	2828.86	8				

RUN 2 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	104.0	104.0	90.3
Batch 2	111.0	95.6	72.3
Batch 3	49.0	36.2	54.5

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	264	88	1153
Column 2	3	235.8	78.6	1365.96
Column 3	3	217.1	72.36667	320.4133

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	371.6156	2	185.8078	0.196319	0.826825	5.143249
Within Groups	5678.747	6	946.4578			
Total	6050.362	8				

TABLE 19D
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Cadmium

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Cadmium	Avg conc, ppmw (2)	1.2	1.2	1.4
	wt in mgs	323.0	323.0	345.1

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/6 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.6
Cadmium	Avg conc, ppmw (2)	2.0	1.9	1.5
	wt in mgs	542.2	983.4	717.7

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/6 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4
Cadmium	Avg conc, ppmw (2)	1.5	1.5	1.1
	wt in mgs	427.1	787.9	572.5

(3) Run 1 Average (Avg Concentration of 3 Batches)	conc. 1.6	conc. 1.5	conc. 1.3
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 100	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Cadmium	Avg conc, ppmw (2)	1.7	1.7	5.3
	wt in mgs	452.2	452.2	1295.8

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Cadmium	Avg conc, ppmw (2)	2.3	1.9	1.3
	wt in mgs	632.3	988.9	650.6

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7
Cadmium	Avg conc, ppmw (2)	0.8	0.6	1.1
	wt in mgs	206.8	306.1	552.2

(4) Run 2 Average (Avg Concentration of 3 Batches)	conc. 1.6	conc. 1.4	conc. 2.6
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 100	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	Feed + Recycle	Product
Batch 1	1.2	1.2	1.4
Batch 2	2.0	1.9	1.5
Batch 3	1.5	1.5	1.1

SUMMARY FOR RUN 1

Groups	Count	Sum	Average	Variance
Column 1	3	4.72	1.573333	0.156133
Column 2	3	4.62	1.54	0.1168
Column 3	3	4	1.333333	0.043333

ANOVA FOR RUN 1

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.101422	2	0.050711	0.481029	0.64009	5.143249
Within Groups	0.632533	6	0.105422			
Total	0.733956	8				

RUN 2 DATA

	Feed	Feed + Recycle	Product
Batch 1	1.7	1.7	5.3
Batch 2	2.3	1.9	1.3
Batch 3	0.8	0.6	1.1

SUMMARY FOR RUN 2

Groups	Count	Sum	Average	Variance
Column 1	3	4.8	1.6	0.57
Column 2	3	4.2	1.4	0.49
Column 3	3	7.7	2.566667	5.613333

ANOVA FOR RUN 2

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.335556	2	1.167778	0.524975	0.616447	5.143249
Within Groups	13.34667	6	2.224444			
Total	15.68222	8				

TABLE 19E
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Copper

RUN NO. 1

BATCH NO. 1		[illegible]		[illegible]
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Copper	Avg conc, ppmw (2)	231.0	231.0	93.9
	wt in mgs	61149.5	61149.5	23144.7

BATCH NO. 2		[illegible]	[illegible]	[illegible]
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.9
Copper	Avg conc, ppmw (2)	146.5	137.0	114.5
	wt in mgs	39717.9	70910.4	54762.4

BATCH NO. 3		[illegible]	[illegible]	[illegible]
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4
Copper	Avg conc, ppmw (2)	105.0	107.0	81.7
	wt in mgs	29900.4	58202.6	42520.9

(3) Run 1 Average (Avg Concentration of 3 Batches)	**conc. 160.8**	**conc. 158.3**	**conc. 96.7**
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 600	

RUN NO. 2

BATCH NO. 1		[illegible]	[illegible]	[illegible]
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Copper	Avg conc, ppmw (2)	144.0	144.0	114.5
	wt in mgs	38302.1	38302.1	27993.7

BATCH NO. 2		[illegible]	[illegible]	[illegible]
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Copper	Avg conc, ppmw (2)	170.5	136.0	101.0
	wt in mgs	46874.3	70639.6	50549.9

BATCH NO. 3		[illegible]	[illegible]	[illegible]
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	569.6	1124.6	1106.7
Copper	Avg conc, ppmw (2)	59.8	44.0	91.0
	wt in mgs	15455.7	22444.8	45681.2

(4) Run 2 Average (Avg Concentration of 3 Batches)	**conc. 124.8**	**conc. 108.0**	**conc. 102.2**
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 600	

Notes:

(1) See Tables 1-8
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level. It is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level. It is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	231.0	231.0	93.9
Batch 2	146.5	137.0	114.5
Batch 3	105	107.0	81.7

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	482.5	160.8333	4123.083
Column 2	3	475	158.3333	4185.333
Column 3	3	290.1	96.7	274.84

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	7918.002	2	3959.001	1.383741	0.320501	5.143249
Within Groups	17166.51	6	2861.086			
Total	25084.52	8				

RUN 2 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	144.0	144.0	114.5
Batch 2	170.5	136.0	101.0
Batch 3	59.8	44.0	91.0

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	374.3	124.7667	3341.083
Column 2	3	324	108	3088
Column 3	3	306.5	102.1667	139.0833

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	825.9089	2	412.9544	0.188617	0.832831	5.143249
Within Groups	13136.29	6	2189.382			
Total	13962.2	8				

TABLE 19F
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Lead

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Lead	Avg conc, ppmw (2)	92.7	92.7	84.8
	wt in mgs	24539.2	24539.2	20901.7

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Lead	Avg conc, ppmw (2)	131.5	120.5	100.8
	wt in mgs	35651.3	62370.1	48227.7

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4
Lead	Avg conc, ppmw (2)	94.9	94.9	70.5
	wt in mgs	27024.2	49847.2	36891.9

(3) Run 1 Average (Avg Concentration of 3 Batches)	conc. 106.4	conc. 102.7	conc. 85.4
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 600	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B1/3 S2	B1/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Lead	Avg conc, ppmw (2)	128.0	128.0	107.0
	wt in mgs	34046.3	34046.3	26160.0

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Lead	Avg conc, ppmw (2)	147.5	117.5	92.8
	wt in mgs	40551.0	61030.5	46445.8

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7
Lead	Avg conc, ppmw (2)	57.5	43.2	74.9
	wt in mgs	14861.3	22036.6	37599.1

(4) Run 2 Average (Avg Concentration of 3 Batches)	conc. 111.0	conc. 96.2	conc. 91.6
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 600	

Notes:

(1) See Tables 1-8
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	Feed + Recycle	Product
Batch 1	92.7	92.7	84.8
Batch 2	131.5	120.5	100.8
Batch 3	94.9	94.9	70.5

SUMMARY FOR RUN 1

Groups	Count	Sum	Average	Variance
Column 1	3	319.1	106.3667	474.9733
Column 2	3	308.1	102.7	238.84
Column 3	3	256.1	85.36667	229.7633

ANOVA FOR RUN 1

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	754.8889	2	377.4444	1.200044	0.36442	5.143249
Within Groups	1887.153	6	314.5256			
Total	2642.042	8				

RUN 2 DATA

	Feed	Feed + Recycle	Product
Batch 1	128.0	128.0	107.0
Batch 2	147.5	117.5	92.8
Batch 3	57.5	43.2	74.9

SUMMARY FOR RUN 2

Groups	Count	Sum	Average	Variance
Column 1	3	333	111	2241.75
Column 2	3	288.7	96.23333	2136.963
Column 3	3	274.7	91.56667	258.7433

ANOVA FOR RUN 2

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	617.4867	2	308.7433	0.199728	0.824185	5.143249
Within Groups	9274.913	6	1545.819			
Total	9892.4	8				

TABLE 19G
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Mercury

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Mercury	Avg conc, ppmw (2)	3.6	3.6	<0.7 (3)
	wt in mgs	945.0	945.0	(4)

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Mercury	Avg conc, ppmw (2)	3.2	3.0	2.6
	wt in mgs	879.6	1547.6	1244.0

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.6	1156.0	1147.4
Mercury	Avg conc, ppmw (2)	2.8	3.1	3.8
	wt in mgs	797.3	1628.3	1972.5

(6) Run 1 Average (Avg Concentration of 3 Batches)	conc. 3.2	conc. 3.2	conc. 3.2 (5)
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 270	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	566.4	566.4	539.0
Mercury	Avg conc, ppmw (2)	3.8	3.8	3.4
	wt in mgs	968.2	966.2	836.1

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Mercury	Avg conc, ppmw (2)	3.5	3.5	3.7
	wt in mgs	971.9	1797.2	1851.8

BATCH NO. 3		B3/1 S1	B3/3 S2	B4/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7
Mercury	Avg conc, ppmw (2)	2.9	3.5	3.8
	wt in mgs	739.2	1782.6	1890.0

(7) Run 2 Average (Avg Concentration of 3 Batches)	conc. 3.3	conc. 3.5	conc. 3.6
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 270	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Outlier: Streams B1/3-S2 and B2/1-S1 are at a 1:1 ratio. Therefore, if the concentration of mercury in B1/3-S2 truly was a non-detect, then the concentration of mercury in B2/3-S2 would be much lower than 3.0. For example, if B1/3-S2 was 0, then B2/3-S2 would be (0+3.2)/2 = 1.6. Since B2/3-S2 shows a concentration of 3.0, it is clear that there is some mercury present in B1/3-S2. Therefore we have concluded that this is an outlier.
(4) Indeterminate
(5) Average between B2/5-S3 and B3/5-S3
(6) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(7) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed - Recycle*	*Product*
Batch 1	3.6	3.6	< 0.7 (3)
Batch 2	3.2	3.0	2.6
Batch 3	2.8	3.1	3.8

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Run 1 Feed	3	9.6	3.2	0.16
Run 1 Feed + Recycle	3	9.7	3.233333	0.103333
Run 1 Product	2	6.4	3.2	0.72

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.002083	2	0.001042	0.004178	0.995834	5.786148
Within Groups	1.246667	5	0.249333			
Total	1.24875	7				

RUN 2 DATA

	Feed	*Feed - Recycle*	*Product*
Batch 1	3.8	3.6	3.4
Batch 2	3.5	3.5	3.7
Batch 3	2.9	3.5	3.8

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Run 2 Feed	3	10	3.333333	0.143333
Run 2 Feed + Recycle	3	10.6	3.533333	0.003333
Run 2 Product	3	10.9	3.633333	0.043333

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.14	2	0.07	1.105263	0.390248	5.143249
Within Groups	0.38	6	0.063333			
Total	0.52	8				

Nickel

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Nickel	Avg conc, ppmw (2)	12.9	12.9	20.8
	wt in mgs	3414.8	3414.6	5126.8

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Nickel	Avg conc, ppmw (2)	32.1	29.7	25.1
	wt in mgs	8702.7	15372.8	12009.1

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.8	1156.0	1147.4
Nickel	Avg conc, ppmw (2)	23.7	23.4	18.4
	wt in mgs	6748.9	12291.1	9576.3

(3) Run 1 Average (Avg Concentration of 3 Batches)	conc. 22.9	conc. 22.0	conc. 21.4
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 2400	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Nickel	Avg conc, ppmw (2)	34.7	34.7	29.7
	wt in mgs	9229.7	9229.7	7261.2

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Nickel	Avg conc, ppmw (2)	36.5	29.1	22.9
	wt in mgs	10034.7	15114.6	11461.3

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.6	1124.6	1106.7
Nickel	Avg conc, ppmw (2)	15.3	11.3	19.3
	wt in mgs	3954.4	5764.2	9688.4

(4) Run 2 Average (Avg Concentration of 3 Batches)	conc. 28.8	conc. 25.0	conc. 24.0
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 2400	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	12.9	12.9	20.8
Batch 2	32.1	29.7	25.1
Batch 3	23.7	23.4	18.4

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	68.7	22.9	92.64
Column 2	3	66	22	72.03
Column 3	3	64.3	21.43333	11.52333

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	3.282222	2	1.641111	0.027943	0.97257	5.143249
Within Groups	352.3867	6	58.73111			
Total	355.6689	8				

RUN 2 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	34.7	34.7	29.7
Batch 2	36.5	29.1	22.9
Batch 3	15.3	11.3	19.3

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	86.5	28.83333	138.1733
Column 2	3	75.1	25.03333	149.2933
Column 3	3	71.9	23.96667	27.69333

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	39.26222	2	19.63111	0.18675	0.834296	5.143249
Within Groups	630.72	6	105.12			
Total	669.9822	8				

TABLE 19I
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Silver

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Silver	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	<1.0 (3)
	wt in mgs	(4)	(4)	(4)

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Silver	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	<1.0 (3)
	wt in mgs	(4)	(4)	(4)

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	827.8	1158.0	1147.4
Silver	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	<1.0 (3)
	wt in mgs	(4)	(4)	(4)

Run 1 Average (Avg Concentration of 3 Batches)	**conc. (4)**	**conc. (4)**	**conc. (4)**
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 4100	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Silver	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	<1.0 (3)
	wt in mgs	(4)	(4)	(4)

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Silver	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	<1.0 (3)
	wt in mgs	(4)	(4)	(4)

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7
Silver	Avg conc, ppmw (2)	<1.0 (3)	<1.0 (3)	<1.0 (3)
	wt in mgs	(4)	(4)	(4)

Run 2 Average (Avg Concentration of 3 Batches)	**conc. (4)**	**conc. (4)**	**conc. (4)**
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 4100	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Concentration below MDL (Method Detection Limit)
(4) Indeterminate

1 lb = 453,592.4 milligrams (mgs)

TABLE 19J
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Vanadium

RUN NO. 1

BATCH NO. 1		B1/1 S1		B1/3 S2
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Vanadium	Avg conc, ppmw (2)	68.3	68.3	20.0
	wt in mgs	18080.1	18080.1	4929.6

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	597.7	1141.1	1054.8
Vanadium	Avg conc, ppmw (2)	30.8	29.0	22.4
	wt in mgs	8298.0	15010.2	10717.3

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Treated Sediment Product**
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4
Vanadium	Avg conc, ppmw (2)	21.4	21.7	17.3
	wt in mgs	6094.0	11396.1	9003.8

(3) Run 1 Average (Avg Concentration of 3 Batches)	conc. 40.1	conc. 39.7	conc. 19.9
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 7100	

RUN NO. 2

BATCH NO. 1		B1/1 S1	B2/3 S2	B1/3 S2
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Vanadium	Avg conc, ppmw (2)	40.9	40.9	34.2
	wt in mgs	10876.9	10876.9	8361.4

BATCH NO. 2		B2/1 S1	B2/3 S2	B2/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Vanadium	Avg conc, ppmw (2)	35.3	42.6	24.9
	wt in mgs	9704.8	22126.8	12482.3

BATCH NO. 3		B3/1 S1	B3/3 S2	B3/5 S3
Component	**Batch Flow**	**Wet Sediment Feed**	**Total Wet Feed Plus Recycle**	**Sediment Product**
Solids	Total dry solids, lb (1)	569.8	1124.6	1106.7
Vanadium	Avg conc, ppmw (2)	14.7	10.9	18.4
	wt in mgs	3799.3	5560.2	9236.6

(4) Run 2 Average (Avg Concentration of 3 Batches)	conc. 30.3	conc. 31.5	conc. 25.8
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 7100	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level, it is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	68.3	68.3	20
Batch 2	30.8	29.0	22.4
Batch 3	21.4	21.7	17.3

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	120.3	40.1	617.59
Column 2	3	119	39.66667	628.2233
Column 3	3	59.7	19.9	6.51

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	798.9489	2	399.4744	0.95696	0.435792	5.143249
Within Groups	2504.647	6	417.4411			
Total	3303.596	8				

RUN 2 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	40.9	40.9	34.2
Batch 2	35.3	42.8	24.9
Batch 3	14.7	10.9	18.4

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	90.9	30.3	190.36
Column 2	3	94.4	31.46667	317.9633
Column 3	3	77.5	25.83333	63.06333

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	53.04667	2	26.52333	0.139258	0.872736	5.143249
Within Groups	1142.773	6	190.4622			
Total	1195.82	8				

TABLE 19K
FINAL PILOT STUDY REPORT - METALS COMPONENT MASS BALANCE

Zinc

RUN NO. 1

BATCH NO. 1		S1/1 S1		S1/3 S2
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	583.6	583.6	543.4
Zinc	Avg conc, ppmw (2)	109.0	109.0	156.5
	wt in mgs	28854.1	28854.1	38574.5

BATCH NO. 2		S2/1 S1	S2/5 S2	S2/6 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	597.7	1141.1	1064.8
Zinc	Avg conc, ppmw (2)	231.5	214.0	173.0
	wt in mgs	62762.5	110765.2	82771.7

BATCH NO. 3		S3/1 S1	S3/5 S2	S3/7 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Treated Sediment Product
Solids	Total dry solids, lb (1)	627.8	1158.0	1147.4
Zinc	Avg conc, ppmw (2)	169.5	168.0	132.0
	wt in mgs	48267.7	88243.7	68699.7

(3) Run 1 Average (Avg Concentration of 3 Batches)	conc. 170.0	conc. 163.7	conc. 153.8
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 1500	

RUN NO. 2

BATCH NO. 1		S1/1 S1	S2/3 S2	S1/3 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	586.4	586.4	539.0
Zinc	Avg conc, ppmw (2)	238.0	238.0	201.0
	wt in mgs	63304.8	63304.8	49141.7

BATCH NO. 2		S2/1 S1	S2/5 S2	S2/8 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	606.1	1145.1	1103.4
Zinc	Avg conc, ppmw (2)	270.0	211.0	163.0
	wt in mgs	74229.0	109595.2	81560.5

BATCH NO. 3		S3/1 S1	S3/3 S2	S3/8 S3
Component	Batch Flow	Wet Sediment Feed	Total Wet Feed Plus Recycle	Sediment Product
Solids	Total dry solids, lb (1)	569.8	1124.8	1106.7
Zinc	Avg conc, ppmw (2)	111.0	80.0	148.0
	wt in mgs	28686.7	40808.8	74294.8

(4) Run 2 Average (Avg Concentration of 3 Batches)	conc. 206.3	conc. 176.3	conc. 170.7
NJ Non-Residential Direct Contact Soil Cleanup Criteria		conc. 1500	

Notes:

(1) See Tables 1-6
(2) Parts per million by weight, dry basis
(3) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level. It is clear that there is no statistical difference among the 3 stream from Run No. 1. This is demonstrated by the fact that F < Fcritical (shown to the right).
(4) Using the standard Analysis of Variance statistical methodology (ANOVA) at the 95% confidence level. It is clear that there is no statistical difference among the 3 stream from Run No. 2. This is demonstrated by the fact that F < Fcritical (shown to the right).

1 lb = 453,592.4 milligrams (mgs)

RUN 1 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	109.0	109.0	156.5
Batch 2	231.5	214.0	173.0
Batch 3	169.5	166.0	132.0

SUMMARY FOR RUN 1

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	510	170	3751.75
Column 2	3	491	163.6667	2770.333
Column 3	3	461.5	153.8333	425.5833

ANOVA FOR RUN 1

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	398.1667	2	199.0833	0.085964	0.918737	5.143249
Within Groups	13895.33	6	2315.889			
Total	14293.5	8				

RUN 2 DATA

	Feed	*Feed + Recycle*	*Product*
Batch 1	238.0	238.0	201.0
Batch 2	270.0	211.0	163.0
Batch 3	111.0	80.0	148.0

SUMMARY FOR RUN 2

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	3	619	206.3333	7072.333
Column 2	3	529	176.3333	7142.333
Column 3	3	512	170.6667	746.3333

ANOVA FOR RUN 2

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2204.222	2	1102.111	0.220997	0.807966	5.143249
Within Groups	29922	6	4987			
Total	32126.22	8				

Table 20 - Run 1
MEP Results for Targetted SVOCs, Metals, PCBs and Dioxins
For NUIEG Pilot Study

	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	0.47	U	0.62	U	0.62	U	0.62	U	0.47	U	0.62	U	0.62	U
Chrysene	ppb	0.56	U	0.69	U	0.69	U	0.69	U	0.56	U	0.69	U	0.69	U
bis(2-Ethylhexyl)phthalate	ppb	0.76	J	2.1		2.1		1.8	B	1.8	B	2	B	1.9	B
Benzo(b)fluoranthene	ppb	0.45	U	1.54	U	1.54	U	1.54	U	0.45	U	1.54	U	1.54	U
Benzo(k)fluoranthene	ppb	0.29	U	1.1	U	1.1	U	1.1	U	0.29	U	1.1	U	1.1	U
Benzo(a)pyrene	ppb	0.36	U	0.77	U	0.77	U	0.77	U	0.36	U	0.77	U	0.77	U
Indeno(1,2,3-cd)pyrene	ppb	0.45	U	0.61	U	0.61	U	0.61	U	0.45	U	0.61	U	0.61	U
PCB (AROCLOR)															
PCB 1016	ppb	0.08	U	0.08	U	0.08	U	0.1	U	0.1	U	0.1	U	0.1	U
PCB 1221	ppb	0.03	U	0.03	U	0.03	U	0.07	U	0.07	U	0.07	U	0.07	U
PCB 1232	ppb	0.11	U	0.11	U	0.11	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1242	ppb	0.02	U	0.02	U	0.02	U	0.01	U	0.01	U	0.01	U	0.01	U
PCB 1248	ppb	0.09	U	0.09	U	0.09	U	0.02	U	0.02	U	0.02	U	0.02	U
PCB 1254	ppb	0.04	U	0.04	U	0.04	U	0.03	U	0.03	U	0.03	U	0.03	U
PCB 1260	ppb	0.08	U	0.08	U	0.08	U	0.05	U	0.05	U	0.05	U	0.05	U
TOTAL METALS															
Antimony	ppm	0.0019	J	0.0004	J	0.0036	U	0.0036	U	0.0036	U	0.0018	J	0.0009	J
Arsenic	ppm	0.0019	J	0.0029	J	0.0045	J	0.0042	J	0.0019	J	0.0016	J	0.0037	J
Barium	ppm	0.092		0.052		0.25		0.14		0.026		0.021		0.026	
Cadmium	ppm	0.0004	J	0.0001	J	0.0002	J	0.0001	J	0.0012	U	0.0012	U	0.0012	U
Copper	ppm	0.02		0.022		0.078		0.014		0.014		0.035		0.0053	
Lead	ppm	0.0016	J	0.0001	J	0.003		0.0014	J	0.0004	J	0.0008	J	0.0022	U
Mercury	ppm	0.000033	J	0.00005	U	0.00005	U	0.00005	U	0.00005	U	0.00005	U	0.00005	U
Nickel	ppm	0.0051		0.0028		0.0021		0.0015	J	0.0012	J	0.0019		0.0007	J
Silver	ppm	0.001	J	0.0002	J	0.0015	U	0.0015	U	0.0015	U	0.0015	U	0.0015	U
Vanadium	ppm	0.0028	U	0.001	J	0.0054		0.0049		0.0037		0.003		0.0027	J
Zinc	ppm	0.081		0.064		0.081		0.049		0.038		0.04		0.029	
DIOXINS															
2,3,7,8-TCDF	ng/L	0.002	U	NR		NR		NR		NR		NR		0.002	U
Total TCDF	ng/L	0.002	U	NR		NR		NR		NR		NR		0.002	U
2,3,7,8-TCDD	ng/L	0.002	U	NR		NR		NR		NR		NR		0.002	U
Total TCDD	ng/L	0.002	U	NR		NR		NR		NR		NR		0.002	U
1,2,3,7,8-PeCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
2,3,4,7,8-PeCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total PeCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,7,8-PeCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total PeCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,7,8-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,6,7,8-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
2,3,4,6,7,8-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,7,8,9-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,7,8-HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,6,7,8-HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,7,8,9-HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,6,7,8-HpCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,7,8,9-HpCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HpCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,6,7,8-HpCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HpCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
OCDF	ng/L	0.02	U	NR		NR		NR		NR		NR		0.02	U
OCDD	ng/L	0.02	U	NR		NR		NR		NR		NR		0.02	U
TEF	ng/L	0	U	NR		NR		NR		NR		NR		0	U

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. NR - not regulated
3. Ng/L = parts per trillion (ppt)

Table 21- Run 2
MEP Results for Targetted SVOCs, Metals, PCBs and Dioxins
For NUIEG Pilot Study

	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	0.47	U	0.62	U	0.62	U	0.47	U	0.47	U	0.47	U	0.47	U
Chrysene	ppb	0.56	U	0.69	U	0.69	U	0.56	U	0.56	U	0.56	U	0.56	U
bis(2-Ethylhexyl)phthalate	ppb	0.67	J	2.6		1.8		0.66	JB	0.66	JB	0.82	JB	0.84	JB
Benzo(b)fluoranthene	ppb	0.45	U	1.54	U	1.54	U	0.45	U	0.45	U	0.45	U	0.45	U
Benzo(k)fluoranthene	ppb	0.29	U	1.1	U	1.1	U	0.29	U	0.29	U	0.29	U	0.29	U
Benzo(a)pyrene	ppb	0.36	U	0.77	U	0.77	U	0.36	U	0.36	U	0.36	U	0.36	U
Indeno(1,2,3-cd)pyrene	ppb	0.45	U	0.61	U	0.61	U	0.45	U	0.45	U	0.45	U	0.45	U
PCB (AROCLOR)															
PCB 1016	ppb	0.08	U	0.08	U	0.08	U	0.1	U	0.1	U	0.1	U	0.1	U
PCB 1221	ppb	0.03	U	0.03	U	0.03	U	0.07	U	0.07	U	0.07	U	0.07	U
PCB 1232	ppb	0.11	U	0.11	U	0.11	U	0.09	U	0.09	U	0.09	U	0.09	U
PCB 1242	ppb	0.02	U	0.02	U	0.02	U	0.01	U	0.01	U	0.01	U	0.01	U
PCB 1248	ppb	0.09	U	0.09	U	0.09	U	0.02	U	0.02	U	0.02	U	0.02	U
PCB 1254	ppb	0.04	U	0.04	U	0.04	U	0.03	U	0.03	U	0.03	U	0.03	U
PCB 1260	ppb	0.08	U	0.08	U	0.08	U	0.05	U	0.05	U	0.05	U	0.05	U
TOTAL METALS															
Antimony	ppm	0.0016	J	0.0012	J	0.0036	U	0.0036	U	0.0036	U	0.0009	J	0.0036	U
Arsenic	ppm	0.002	J	0.0022	J	0.0031	J	0.0028	J	0.0043	J	0.002	J	0.0011	J
Barium	ppm	0.067		0.16		0.34		0.32		0.021		0.14		0.021	
Cadmium	ppm	0.0003	J	0.0001	J	0.0001	J	0.0001	J	0.0001	J	0.0001	J	0.0001	J
Copper	ppm	0.085		0.045		0.016		0.011		0.058		0.016		0.0056	
Lead	ppm	0.0041		0.0021	J	0.0013	J	0.0008	J	0.0019	J	0.0011	J	0.0017	J
Mercury	ppm	0.00005	U	0.00005	U	0.00005	U	0.0000076	J	0.00005	U	0.00005	U	0.00005	U
Nickel	ppm	0.0041		0.003		0.0014	J	0.0013	J	0.0007	J	0.0002	J	0.0002	J
Silver	ppm	0.0009	J	0.0004	J	0.0015	U	0.0015	U	0.0015	U	0.0003	J	0.0015	U
Vanadium	ppm	0.0028	U	0.0028	U	0.0043		0.0035		0.0026	J	0.0026	J	0.0025	J
Zinc	ppm	0.11		0.13		0.041		0.033		0.054		0.027		0.025	
DIOXINS															
2,3,7,8-TCDF	ng/L	0.002	U	NR		NR		NR		NR		NR		0.0021	U
Total TCDF	ng/L	0.002	U	NR		NR		NR		NR		NR		0.0021	U
2,3,7,8-TCDD	ng/L	0.002	U	NR		NR		NR		NR		NR		0.0021	U
Total TCDD	ng/L	0.002	U	NR		NR		NR		NR		NR		0.0021	U
1,2,3,7,8-PeCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
2,3,4,7,8-PeCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total PeCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,7,8-PeCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total PeCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,7,8-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,6,7,8-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
2,3,4,6,7,8-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,7,8,9-HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HxCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,7,8-HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,6,7,8-HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,7,8,9-HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HxCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,6,7,8-HpCDF	ng/L	0.011	EMP	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,7,8,9-HpCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HpCDF	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
1,2,3,4,6,7,8-HpCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
Total HpCDD	ng/L	0.01	U	NR		NR		NR		NR		NR		0.01	U
OCDF	ng/L	0.02	U	NR		NR		NR		NR		NR		0.021	U
OCDD	ng/L	0.043		NR		NR		NR		NR		NR		0.021	U
TEF	ng/L	0.000043		NR		NR		NR		NR		NR		0	U

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. NR - not regulated
3. Ng/L = parts per trillion (ppt)

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FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 22A: Run1-Batch3-Sample3 Semivolatiles TCLP

Summary of Results
Project: NUIEG Pilot Study
ETL Chain of Custody #: L2569-1,2
Date Analyzed: 05/03/01

		R1/B3/S3-A			R1/B3/S3-B		
Semivolatiles	**Units:**	**Method Detection Limit**	**Concentration**	**Q**	**Method Detection Limit**	**Concentration**	**Q**
o-cresol	ppm	0.0076	0.0076	U	0.0076	0.0076	U
m,p-cresol	ppm	0.0072	0.0072	U	0.0072	0.0072	U
Cresol	ppm	0.015	0.015	U	0.015	0.015	U
1,4-Dichlorobenzene	ppm	0.0085	0.0085	U	0.0085	0.0085	U
2,4-Dinitrotoluene	ppm	0.0061	0.0061	U	0.0061	0.0061	U
Hexachlorobenzene	ppm	0.006	0.006	U	0.006	0.006	U
Hexachlorobutadiene	ppm	0.0083	0.0083	U	0.0083	0.0083	U
Hexachloroethane	ppm	0.009	0.009	U	0.009	0.009	U
Nitrobenzene	ppm	0.0089	0.0089	U	0.0089	0.0089	U
Pentachlorophenol	ppm	0.0059	0.0059	U	0.0059	0.0059	U
Pyridine	ppm	0.0054	0.0054	U	0.0054	0.0054	U
1,4,5-Trichlorophenol	ppm	0.0058	0.0058	U	0.0058	0.0058	U
2,4,6-Trichlorophenol	ppm	0.0047	0.0047	U	0.0047	0.0047	U

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix C 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

FINAL PRODUCTS SUPPLEMENTARY PERFORMANCE DATA
(TCLP, FLASH POINT AND REACTIVITY)
Table 22B: Run1-Batch3-Sample3 Herbicides TCLP

Summary of Results								
Project: NUIEG Pilot Study								
ETL Chain of Custody #: L2569-1,2								
Date Analyzed: 05/04/01								
		R1/B3/S3-A			R1/B3/S3-B			
Herbicides	Units:	Method Detection Limit	Concentration	Q	Method Detection Limit	Concentration	Q	
2,4-D	ppm	0.000021	0.000021	U	0.000021	0.000021	U	
2,4,5-TP (Silvex)	ppm	0.000020	0.000020	U	0.000020	0.000020	U	

Notes:

1. In reference to the Qualifiers columns above (Q), refer to Appendix C 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

Table 24
Summary of $KMnO_4$ Dosage and Cost for Runs 1 and 2

	Wet Feed Sediment				100% $KMnO_4$ Dosage on Dry Solid Feeds		Feed Solids Content	$KMnO_4$ Cost**
	Total lbs	**Dry Solids lbs**	**gallons**	**cu.yds.**	**ppmw on Dry Basis**	**Total lbs.**	**Weight %**	**$/cu. yd.**
Run 1 Batch 1	1188.5	583.6	108		5997	3.5	49.1	
Run 1 Batch 2	1190.5	597.7	108		5856	3.5	48.5	
Run 1 Batch 3	1190	627.7	108		5575	3.5	48.1	
Total	3569	1809	324	1.6	5804	10.5		**$7.88**
Run 2 Batch 1	1189.5	586.4	108		5969	3.5	49.3	
Run 2 Batch 2	1189.5	606.1	108		5775	3.5	48.4	
Run 2 Batch 3	1189.5	569.8	108		6143	3.5	48.5	
Total	3568.5	1762.3	324	1.6	5958	10.5		**$7.88**

* Bulk density is 11 lbs./gal.
** Lowest quote is $1.16/lb for industrial grade KMnO4 crystals at 97% minimum purity or $1.20 per lb (100%).

Table 25
NUIEG Pilot Study Report
Demonstration Project Preliminary Engineering Material Balance, lb/hr

Stream No.	1	2	3	4	5	6	7	8	9	10	11	12
Description (Note 1)	Raw Barge Sediment	Debris To Disposal (Note 2)	Slurry Feed to Dewatering Unit	Dewatered Sediment	Filtrate from Dewatering Unit	Recycle Filtrate Water	Effluent Water Discharge	Beneficial Use Product	Chemical Oxidant (Note 5)	Beneficial Use Additive Ash (Note 3)	Beneficial Use Additive Cement (Note 4)	Dewatering Polymer (coagulant) (Note 6)
Dry Sediment	33,783.8	2,079.0	31,822.1	31,806.5	15.6	14.2	1.4	41,292.6	-	-	-	-
Water	70,166.3	-	180,325.3	23,994.4	156,330.9	110,159.0	46,171.9	22,041.4	-	-	-	4,960.0
Decon. Chemical Additives:												
Oxidant	-	-	-	-	-	-	-	-	79.3	-	-	-
Ionized Water	-	-	-	-	-	-	-	-	2,676.3	-	-	-
Dewatering Polymer	-	-	-	-	-	-	-	-	-	-	-	23.8
Beneficial Use Additives:												
Ash	-	-	-	-	-	-	-	-	-	5,580.1	-	-
Cement	-	-	-	-	-	-	-	-	-	-	1,953.0	-
Other	-	-	-	-	-	-	-	-	-	-	-	-
Total, lbs/hr	103,950.1	2,079.0	212,147.4	55,800.9	156,346.5	110,173.2	46,173.3	63,334.0	2,755.6	5,580.1	1,953.0	4,983.8
Bulk Density, lbs/cf	77.0	80.0	70.0	92.0	64.0	64.0	64.0	84.3	64.0	45.0	94.0	64.0
Volume Flow												
GPM	168.3	-	377.9	75.6	304.6	214.7	90.0	93.7	5.4	-	-	9.7
cubic yards/hr	50.0	1.0	112.2	22.5	90.5	63.8	26.7	27.8	1.6	4.6	0.8	2.9
Wt% Solids	32.5	100.0	15.0	57.0	TRACE	TRACE	30 ppm	65.2	97.1	100.0	100.0	0.5
Wt% Water	67.5	-	85.0	43.0	100.0	100.0	100.0	34.8	2.9	-	-	99.5
Wt% Water As % Dry Solids	207.7	NA	566.7	75.4	NA	NA	NA	53.4	NA	NA	NA	NA
Water Removed:												
Gallons per Cubic Yard of Raw Barge Sediment							107.9					
Water Volume Removed as % of Raw Barge Sediment							53.4					
Oxidant, ppm of dry solids									2,500.0			
Polymer, lb per ton of dry solids												1.5

Notes:

1. See discussion of material balance for detailed discussion of expected dosage ranges for all additives.
2. Expected range of debris is 0-8% of raw barge sediment. Assume 2.0% for material balance.
3. Expected dosage range of ash on wet basis is 0-20%. Assume 10.0% for material balance.
4. Expected dosage range of cement on wet basis is 0-7%. Assume 3.5% for material balance.
5. Expected dosage range of Oxidant is 1000-6000 ppm on dry sediment feed basis. Assume 2500 ppm for material balance.
6. Since NUIEG is proposing using recycle filtrate to minimize water consumption, polymer tests will be required during pre-Demonstration testing to ensure polymer dewatering performance is acceptable. Design dosage of 1.5 lbs polymer per ton of dry sediment is based on recent bench-scale test by polymer vendor.

NA = Not Applicable

NUIEG Sediment Decontamination Demonstration Project

Table 26A

Pilot Study Report
Economic Analysis for Commercial-Scale (500,000 cy/yr) Facility

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	$ 239,000	$ 0.48
C-5	Equipment Procurement	$ 1,871,000	$ 3.74
C-6	Equipment Installation/Testing	$ 394,600	$ 0.79

Total Capital Cost Per Cubic Yard of Sediment $ 5.83

Operating Costs

Item #	Description	Annual Cost	Unit Cost
O-1	Facility Management	$ 552,000	$ 1.10
O-2	Operating Personnel	$ 1,738,800	$ 3.48
O-3	Operation/Maintenance of Equipment	$ 1,232,800	$ 2.47
O-4	Additives	$ 5,342,200	$ 10.68
O-5	Laboratory Testing/Reporting Costs	$ 776,300	$ 1.55
O-6	Debris Disposal (solid waste)	$ 745,200	$ 1.49
O-7	Utilities	$ 402,500	$ 0.81

Total Operating Cost Per Cubic Yard of Sediment $ 21.58

Total Unit Cost $ 27.41

NUI Profit (@10%) $ 2.74

Net Cost (Tipping Fee) $ 30.15

NUIEG Sediment Decontamination Demonstration Project
Pilot Study Report
Economic Analysis for Commercial-Scale (500,000 cy/yr) Facility
Capital Costs

Table 26B

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
				Incl. contingency (@15%)	**$ 3,622,500**
				Annual Cost	**$ 291,924**

1. Site purchase covered by 30-year loan

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
				Incl. contingency (@15%)	**$ 948,750**
				Annual Cost	**$ 76,456**

1. Engineering amortized over 30-yr life of facility

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
				Incl. contingency (@15%)	**$ 517,500**
				Annual Cost	**$ 41,703**

1. Permitting amortized over 30-yr life of facility

C-4 Site Preparation

NUIEG Sediment Decontamination Demonstration Project **Table 26B**
Pilot Study Report
Economic Analysis for Commercial-Scale (500,000 cy/yr) Facility
Capital Costs

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	$ 3,790	$ 22,740
C-4-3	Site grading	9,680	Cubic Yards	$ 27	$ 261,360
C-4-4	Liner installation (50% of site)	130,680	Square foot	$ 1.65	$ 215,663
C-4-5	Gravel fill (9" layer over liner)	14,520	Cubic Yards	$ 5.60	$ 81,312
C-4-6	Drainage (4" plastic pipe)	2,700	Linear Foot	$ 21	$ 56,700
C-4-7	Foundations	1	Lump Sum	$ 120,000	$ 120,000
C-4-8	Berms/dikes	1	Lump Sum	$ 50,000	$ 50,000
C-4-9	Storm water	1	Lump Sum	$ 55,000	$ 55,000
C-4-10	Paving (50% of site)	130,680	Square foot	$ 2.05	$ 267,944
C-4-11	Rail Facilities	1,530	Linear Foot	$ 112	$ 171,360
C-4-12	Lighting (Exterior, pole-mounted)	15	Each	$ 5,340	$ 80,100
C-4-13	Utilities (gas, water)	1	Lump Sum	$ 36,000	$ 36,000
C-4-14	Electric service	1	Lump Sum	$ 120,000	$ 120,000
					$ 2,578,179
				Incl. contingency (@15%)	**$ 2,964,906**
				Annual Cost	**$ 238,931**

1. Site preparation amortized over 30-yr life of facility

C-5 Equipment Procurement					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
C-5-1	Long-stick excavators (w/ pump & rake)	2	Each	$ 806,000	$ 1,612,000
C-5-2	8x6 Pumps	5	Each	$ 15,360	$ 76,800
C-5-4	Shaker Screening Equipment	2	Each	$ 40,200	$ 80,400
C-5-6	Mixing Tanks	8	Each	$ 64,800	$ 518,400
C-5-8	Lot Hose & Piping (incl. Installation)	1	Lump Sum	$ 98,000	$ 98,000
C-5-9	Belt Filter Presses	10	Each	$ 393,000	$ 3,930,000
C-5-11	Effluent Surge Tank System (incl. Installation)	1	Lump Sum	$ 112,000	$ 112,000
C-5-12	Water Treatment (incl. Installation)	1	Lump Sum	$ 189,000	$ 189,000
C-5-13	Conveyors	6	Each	$ 19,800	$ 118,800
C-5-15	Cement Silos w/ Pneumatic Feed	2	Each	$ 140,000	$ 280,000
C-5-17	Pugmill Mixers	2	Each	$ 356,068	$ 712,136
C-5-19	Radial Stackers	2	Each	$ 60,000	$ 120,000
C-5-21	Front End Loaders (CAT 980 & IT28 CAT)	1	Lump Sum	$ 463,000	$ 463,000
C-5-22	Forklift	1	Each	$ 42,300	$ 42,300
C-5-23	Site Vehicles	3	Each	$ 18,000	$ 54,000
C-5-24	Unheated Enclosure Structure	1	Lump Sum	$ 361,000	$ 361,000
					$ 8,767,836
				Incl. contingency (@15%)	**$ 10,083,011**
				Annual Cost	**$ 1,870,935**

1. Equipment costs amortized over 7-yr term

C-6 Equipment Installation and Testing

NUIEG Sediment Decontamination Demonstration Project **Table 26B**
Pilot Study Report
Economic Analysis for Commercial-Scale (500,000 cy/yr) Facility
Capital Costs

Item	Description	Quantity	Unit	Unit Cost	Total
C-6-1	8x6 Pump Installation	1	Lump Sum	$ 22,750	$ 22,750
C-6-2	Shaker Screening Equipment Installation	1	Lump Sum	$ 9,375	$ 9,375
C-6-3	Mixing Tank Installation	1	Lump Sum	$ 97,750	$ 97,750
C-6-4	Belt Filter Press Installation	1	Lump Sum	$ 259,000	$ 259,000
C-6-5	Conveyor Installation	1	Lump Sum	$ 45,063	$ 45,063
C-6-6	Cement Silo Installation	1	Lump Sum	$ 350,000	$ 350,000
C-6-7	Pugmill Installation	1	Lump Sum	$ 915,170	$ 915,170
C-6-8	Radial Stacker Installation	1	Lump Sum	$ 150,000	$ 150,000
					$ 1,849,108
				Incl. contingency (@15%)	**$ 2,126,474**
				Annual Cost	**$ 394,574**

1. Installation costs amortized over 7-yr term

NUIEG Sediment Decontamination Demonstration Project **Table 26C**
Pilot Study Report
Economic Analysis for Commercial-Scale (500,000 cy/yr) Facility
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	$ 75.00	$ 180,000
O-1-3	Administrative Personnel (1 FTE @ 8 hour days)	1,600	Manhours	$ 75.00	$ 120,000
					$ 480,000
				Incl. contingency (@15%)	**$ 552,000**

O-2 Operating Personnel					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-2-1	Union Labor (12 FTEs @ 12 hour days)	28,800	Manhours	$ 50.00	$ 1,440,000
O-2-2	Labor, Union Vacation (15 8-hour days per FTE)	1,440	Manhours	$ 50.00	$ 72,000
					$ 1,512,000
				Incl. contingency (@15%)	**$ 1,738,800**

O-3 Operations/Maintenance of Equipment					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-3-1	Fuel	200	Days	$ 475	$ 95,000
O-3-2	Maintenance (8% of capital equipment costs)	1	Lump Sum	$ 977,000	$ 977,000
					$ 1,072,000
				Incl. contingency (@15%)	**$ 1,232,800**

O-4 Additives					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-4-1	Potassium permanganate	540	Tons	$ 2,840	$ 1,533,600
O-4-2	Hydrogen peroxide		Gallons		$ -
O-4-3	Polymer flocculant	540	Tons	$ 2,500	$ 1,350,000
O-4-4	Fly ash	81,000	Tons	$ 7.61	$ 616,410
O-4-5	Cement	16,200	Tons	$ 70.70	$ 1,145,340
					$ 4,645,350
				Incl. contingency (@15%)	**$ 5,342,153**

O-5 Laboratory Testing					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-5-1	Bulk chemistry (contaminants per NJNRDCSCC)	50	Sample	$ 2,500.00	$ 125,000
O-5-2	MEP	50	Sample	$ 10,500.00	$ 525,000
O-5-2	Physical testing (for beneficial use requirements)	50	Sample	$ 500.00	$ 25,000
					$ 675,000
				Incl. contingency (@15%)	**$ 776,250**

O-6 Waste Disposal					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-6-1	Debris and oversize material (solid waste)	10,800	Ton	$ 60.00	$ 648,000
					$ 648,000
				Incl. contingency (@15%)	**$ 745,200**

O-7 Utilities					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total**
O-7-1	Electricity	200	Days	$ 1,750	$ 350,000
					$ 350,000
				Incl. contingency (@15%)	**$ 402,500**