Draft

Work Plan for the Demonstration of the BioGenesis℠ Sediment Washing Technology Lower Passaic River Sediment Treatability Study

September 2005

MWH

DRAFT

WORK PLAN FOR THE DEMONSTRATION OF THE BIOGENESIS℠ SEDIMENT WASHING TECHNOLOGY LOWER PASSAIC RIVER SEDIMENT TREATABILITY STUDY

September 2005

Project No. 4270216.010101

Prepared by:

BioGenesis Enterprises, Inc.
West Chester, Pennsylvania 19380

MWH Americas, Inc.
Salt Lake City, Utah 84095

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

LIST OF TABLES

LIST OF FIGURES
(Figures follow respective sections)

1.0 INTRODUCTION

1.1 PURPOSE

This work plan presents the overall approach and basic work tasks to perform a full-scale sediment treatment test on sediment dredged from the lower Passaic River using the BioGenesis[SM] Sediment Washing Technology. The test will be performed in Keasbey, New Jersey as part of a coordinated effort funded and authorized by several entities including the U.S. Environmental Protection Agency (EPA) Water Resources Development Act (WRDA) Program, and the New Jersey Department of Transportation, Office of Maritime Resources (NJDOT).

1.2 PROJECT BACKGROUND

NJDOT is a partner with several other agencies on the Lower Passaic River Project, an on going effort to understand the effects of years of industrial contamination of the Passaic River from the Dundee Dam to Newark Bay. The stated goal of the project is to: "Develop a plan to improve water quality, remediate the sediments and restore the ecological health of the Lower Passaic River". As part of that plan, NJDOT is funding its share from the NY/NJ Joint Dredging Plan Fund and the Transportation Trust Fund.

One of the project goals is to conduct a pilot dredging test to determine the effect of removing sediment from the river and to "determine whether treatment processes to decontaminate the sediments are viable."

Since NJDOT was conducting a concurrent technology test with BioGenesis Washing, LLC, BioGenesis was approached about adding sediment from the lower Passaic River to the testing schedule under a separate contract and scope.

1.3 PROJECT SCOPE

BioGenesis will accept approximately 2,500 cubic yards of dredged sediment removed as part of the Lower Passaic River Dredging Study scheduled to take place in the fall of

2005. The sediment will be delivered to the project site in Keasbey, New Jersey, and will be processes to determine the effectiveness of the decontamination process, to perform a beneficial use evaluation, and to collect engineering data needed for the full-scale design of a sediment treatment facility. In summary the scope consists of:

- Arranging the dredging and delivery of contaminated sediment to the Keasbey Facility (by NJDOT)

- Operating the BioGenesis facility to decontaminate up to 2,500 cubic yards of contaminated sediment on a full-scale basis (plus an NJDOT optional task to decontaminate an additional 2,500 cyds)

- Transporting of the treated sediment to an off-site facility for blending and distribution/sale as a beneficial product

1.4 PROJECT SITE

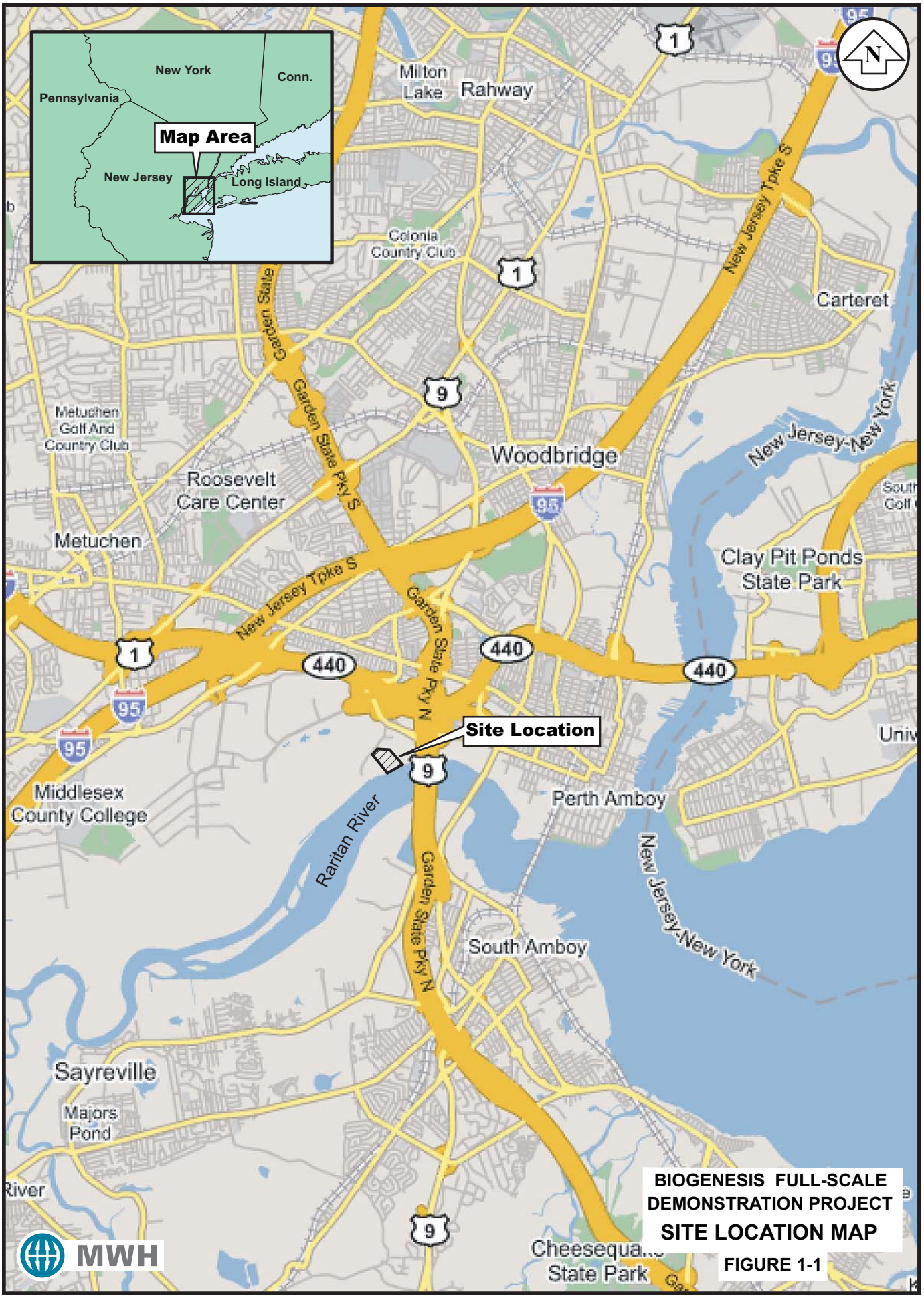
BioGenesis has entered into a lease agreement with Recycling Technology Development LLC for the use of an existing warehouse facility at 75 Crows Mill Road in Keasbey, Middlesex County, New Jersey, within which to assemble and operate the full-scale demonstration facility. The site is located along the Raritan River about 5 miles off of exit 10 of the NJ Turnpike along route 440 (exit to Crows Mill Road) as shown in Figure 1-1. The dredged material will be transported on scows from the lower Passaic River Dredging Pilot project and offloaded to an ore carrier, serving as the Dredged Material Storage and Handling Facility moored at the Keasbey facility. The raw sediment will be screened and stored on the ore carrier prior to being pumped to the BioGenesis Demonstration facility for treatment and disposal.

1.5 PROJECT OBJECTIVES

The main objectives of the demonstration project are as follows:

- To verify that the BioGenesis process is capable of consistently treating contaminated sediment such that it meets the NJ Residential/Non-Residential Soil Cleanup Standards and thus generate treated sediment that can be used for unrestricted beneficial uses.

- To estimate the unit sediment treatment costs for the BioGenesis process at the full-scale throughput rate of 40 cubic yards (CY) per hour.



PROJECT NO. 1004464.010101 Fig 1-1 location map.ai 06/22/05 SLC

MWH

BIOGENESIS FULL-SCALE DEMONSTRATION PROJECT

SITE LOCATION MAP

FIGURE 1-1

2.0 OVERVIEW OF DEMONSTRATION FACILITIES AND DECONTAMINATION PROCESS

2.1 FACILITY OVERVIEW

The preliminary layout of the facilities for the demonstration project is shown in Figure 2-1. Contaminated sediment will be dredged and transported to an ore carrier barge serving as the Dredged Material Storage and Handling facility and moored at the Keasbey Facility. The raw sediment will be screened on the barge to remove debris and rocks larger than ¼-inch size. The screened raw sediment will be stored in the hold of the ore carrier until it is pumped to the BioGenesis treatment facility for the full-scale demonstration project. A raft-mounted pontoon pump with a mixer located within the barge will be used to convey the sediment from the barge hold to the processing facility, which will be housed in and around the existing warehouse building at the Keasbey facility. From this location, treated sediment will be loaded into trucks for transport to an off-site facility for blending into a beneficial product. Wastewater from the decontamination process will be treated to meet the Middlesex County Utility Authority (MCUA) pretreatment levels at the BioGenesis treatment facility. Treated wastewater will be pumped into tanks at the site for use as plant utility water and excess water will be discharged to the local POTW.

As shown in Figure 2-1, the site will provide for truck access to deliver chemicals, pickup roll-off containers of sludge from the wastewater treatment plant, and possibly to pickup treated sediment for transport off site.

2.2 DECONTAMINATION PROCESS

The general performance goals for the decontamination process are to:

- Be capable of processing sediment 24 hours per day, five days per week at an hourly throughput of 40 cubic yards and an average of plant uptime of 80%

- Treat sediment with characteristics similar to those shown in Table 2-1 as "Typical Range NY/NJ Harbor Federal Navigation Sediment" so that contaminant concentrations in the treated sediment do not exceed the NJ Residential/Non-Residential Soil Cleanup Standards (also shown in Table 2-1).

The BioGenesis[SM] Sediment Washing Technology involves three unit processes, namely:

a. Preprocessing,

b. Application of Collision Impact Forces, and

c. Cavitation/Oxidation.

An overview of the general BioGenesis process is shown in Figure 2-2. Figure 2-3 is a more specific process flow diagram for the Keasbey demonstration project.

The screened and diluted raw sediment will be pumped to the treatment facility from the barge storage to be mixed in a preprocessor mix tank with proprietary specialty chemicals such as surfactants, chelating agents, and defoamers. The specialty chemicals will be added at this stage to prepare the sediment for decontamination by decreasing the affinity among contaminants, sediment solids, and naturally occurring biomass. The sediment will then be pumped to the preprocessor unit where physical action from high-pressure water jets will dis-aggregate sediment particles from each other and separate loosely-associated material from the biomass-coated particles. The result will be that clumped particles will be dis-aggregated and suspended in the aqueous phase. Additionally, the biomass will be fractionated and transferred to the aqueous phase.

TABLE 2-1

RAW SEDIMENT CHARACTERISTICS AND NEW JERSEY RESIDENTIAL SOIL CLEANUP STANDARDS

Selected Chemical Constituent(s)	Typical Range NY/NJ Harbor Federal Navigation Sediment[1]	NJ Residential Soil Cleanup Standards[2]	NJ Industrial Soil Cleanup Standards[2]
Dioxins/Furans (pg/g)			
2,3,7,8-TCDD	0 - 529	-	-
TCDD/TCDF TEQ	61 - 224	-	-
Total Polychlorinated Biphenyls (mg/kg)	0.05 – 3.32	0.49	2
Polynuclear Aromatic Hydrocarbons (ug/kg)			
Anthracene	233 – 57,500	10,000,000	10,000,000
Benzo(a)anthracene	151 – 23,400	900	4000
Benzo(a)pyrene	214 – 19,400	660	660
Chrysene	175 – 23,500	9,000	40,000
Fluoranthene	233 – 57,500	2,300,000	10,000,000
Total PAHs	2,000 – 306,000	-	-
Pesticides (ug/kg)			
4-4'-DDD	0.1 – 2,070	3,000	12,000
4-4'-DDE	2 - 250	2,000	9,000
Metals (mg/kg)			
Arsenic	4 – 97	20	20
Cadmium	0.2 – 73	39	100
Chromium	15 – 245	240	6100
Lead	17 – 580	400	600
Mercury	0.2 – 13.6	14	270
Nickel	10 – 870	250	2400
Silver	0.15 – 16	110	4100
Zinc	41 - 625	1,500	1500
Grain Size Distribution			
Sand (>0.0625 mm)	4% - 28%	NA	NA
Silt (0.0039 to 0.0625 mm)	36% - 84%	NA	NA
Clay (<0.0039 mm)	12% - 36%	NA	NA

mm	millimeters	TEQ	toxicity equivalency
mg/kg	milligrams per kilogram	DDD	dichlorodiphenyldichloroethane
ug/kg	micrograms per kilogram	DDE	Dichlorodiphenyldichloroethylene
pg/g	picograms per gram	PAH	polynuclear aromatic hydrocarbons
TCDD	tetrachlorodibenzodioxins	NA	Not applicable
TCDF	tetrachlorodibenzofurnas		

[1] From the "New York and New Jersey Federal Navigation and Private Berthing Sediment Database" which was obtained through a personal communication with Mark Reiss, U.S. EPA, Region 2, December 1999.

[2] NJDEP, 1999

In Step 2, collision impact forces will be applied to the isolated particles in the collision chamber to strip the biofilm layer from the solids particles and transfer it into the aqueous phase and away from the sediment particle surfaces. After Step 2, contamination that was adsorbed to the individual solid particles as well as the biomass will have been transferred to the aqueous phase.

Step 3 involves the destruction of organic contaminants and biomass, which have been segregated from the sediment particles, using cavitation and oxidation. Hydrogen peroxide, a strong oxidizing agent, will be added to the sediment slurry upstream of the cavitation system. Cavitation will occur when air bubbles created in the slurry implode. The implosion will cause instantaneous high pressure and temperature, which in the presence of a strong oxidizing agent will cause organic molecules to break down into carbon dioxide and water. At the conclusion of Step 3, the slurry will consist of inorganic sediment particles that have been washed of contaminants, suspended organic biomass containing residual organic and inorganic contaminants, and water that contains the majority of contaminants (mainly inorganic) that have been desorbed from the sediment particles and biomass.

Following the above decontamination steps, the slurry will be immediately processed through solid/liquid separation units to segregate the decontaminated solids fraction from the liquid fraction containing the inorganic contaminants and the residual organic contaminants. The solid/liquid separation system will include a primary settling device such as a hydrocyclone followed by a centrifuge. The cleaned sediment solids separated from the aqueous phase will then be stockpiled for transport to the off-site beneficial use preparation facility. The aqueous phase containing the inorganic and organic contaminants will be processed through a wastewater treatment system as shown in Figure 2-3. Part of the treated water may be reused within the decontamination process with the remainder being discharged to the local sewer system.

LOT 4B - BLOCK 51
NEW JERSEY STEEL CORP.
PO BOX 96, N. CROSSMAN ROAD
SAYREVILLE, NJ 08871

LOT 3B - BLOCK 41-C
NEW JERSEY STEEL CORP.
PO BOX 96, N. CROSSMAN ROAD
SAYREVILLE, NJ 08871

LOT 1B - BLOCK 51
NEW JERSEY STEEL CORP.
PO BOX 96, N. CROSSMAN ROAD
SAYREVILLE, NJ 08871

LOT 1 - BLOCK 52
NEW JERSEY STEEL CORP.
PO BOX 96, N. CROSSMAN ROAD
SAYREVILLE, NJ 08871

FLOODWAY LINE

FLOOD HAZARD AREA LINE

JERSEY BARRIERS (TYP.)

BUILDING

BITUMINOUS CONCRETE PAVEMENT

APPROX. CRMX CENTERLINE

WATERS EDGE

INVERT 24" RCP 0.72

K I N S E Y C R E E K

VARIOUS COURSES ALONG THE APPROX. CRMX CENTERLINE, BASED ON FIELD AND RECRD DATA.

WATER TOWER

CONC. PAD w/ 7-300 GAL. TANKS

PUMP HOUSE 1-STORY BDG.

CRUSHER

40YD. CONTAINERS

30,000 GAL. LIQUID PROPANE TANK

LIQUID PROPANE FILL STATION

PROPANE VAPORIZER SYSTEM

PROPANE-AIR MIXING SHED

GRAVEL

PROPANE MARK-OUT

FIRE HOSE SHED

HYD

WV

SAN MH

LOT 1-R BLOCK 51
166,124 sf - 3.814 ac.

BAYSHORE RECYCLING CORPORATION
CLASS B RECYCLING
CENTER

LOT 1 BLOCK 51
672,262 sf - 15.433 ac.

B A Y V I E W A V E N U E
50' R.O.W.

BUILDING

GARAGE

LOT 2-C BLOCK 51
155,702 sf - 3.575 ac.

JERSEY BARRIERS (TYP.)

DRAINAGE

GUARD HOUSE

PUMP STATION AREA (INACCESSIBLE)

BIT. CONC. PAVEMENT

TYPE A

TYPE A GR 9.35

RAMP UP

MASONRY INDUSTRIAL BUILDING

BITUMINOUS CONCRETE PAVEMENT

INVERT 12" CMP (-)0.04

R A R I T A N R I V E R

To Atlantic Ocean

EMERGENCY ACCESS

CONRAIL-WEBER BRANCH

WHITE HOUSE UTILITIES BUNKER

METAL DOOR ACCESS

AREA 'A'

WALL

30' GATE

TRUCK LOADING

GRAVEL

NORTH TRANSFORMER

BIOGENESIS SEDIMENT DECONTAMINATION
DEMONSTRATION PROJECT AREA
(APPROX. 16,775 SF)

FIRE/BULKHEAD REMAINS

WATERS EDGE 10/29/98

INVERT 18" RCP 2.82

INVERT 24" RCP (-)0.83

CONC PAD

FIRE HOSE SHED

SOUTH TRANSFORMER

BOILER ROOM

CONCRETE

STONE

NATURAL GAS METER. STATION

STOP LINE

FLOODWAY LINE

C R O W S M I L L R O A D
Variable Width R.O.W.

LOCATION OF SCALES AND SCALE HOUSE ARE APPROXIMATE BASED ON FIELD MEASUREMENTS

(2)-14'x70' TRUCK SCALES

SCALE HOUSE

RAMP UP (TYP.)

SCALE BY-PASS FOR EMPLOYEE AND VISITOR TRAFFIC

LOT 2 BLOCK 51
117,536 sf - 2.698 ac.

LOT 2-B BLOCK 51
25,748 sf - 0.591 ac.

LOT 5 - BLOCK 51
LEFCOURT ASSOC. LTD.
516 SYLVAN AVE
ENGLEWOOD CLIFF, NJ 07632

FLAG POLE WITH DECORATIVE LIGHTS

4'x6' FACILITY SIGNS

DEED BOOK 3610, PAGE 761

LOT 3 - BLOCK 51
LEFCOURT ASSOC. LTD.
516 SYLVAN AVE
ENGLEWOOD CLIFF, NJ 07632

LOT 1 - BLOCK 75
LEFCOURT ASSOC. LTD.
516 SYLVAN AVE
ENGLEWOOD CLIFF, NJ 07632

LOT SUMMARY - RECYCLING TECHNOLOGY DEVELOPMENT, L.L.C.

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

11/26/2003 6:48 AM Bayshore Site Plan.dwg

REV	DATE	BY	DESCRIPTION

SCALE
0 125 ft 300 ft

DESIGNED J. SONTAG 11/22/2003
DRAWN J. SONTAG 11/22/2003
CHECKED

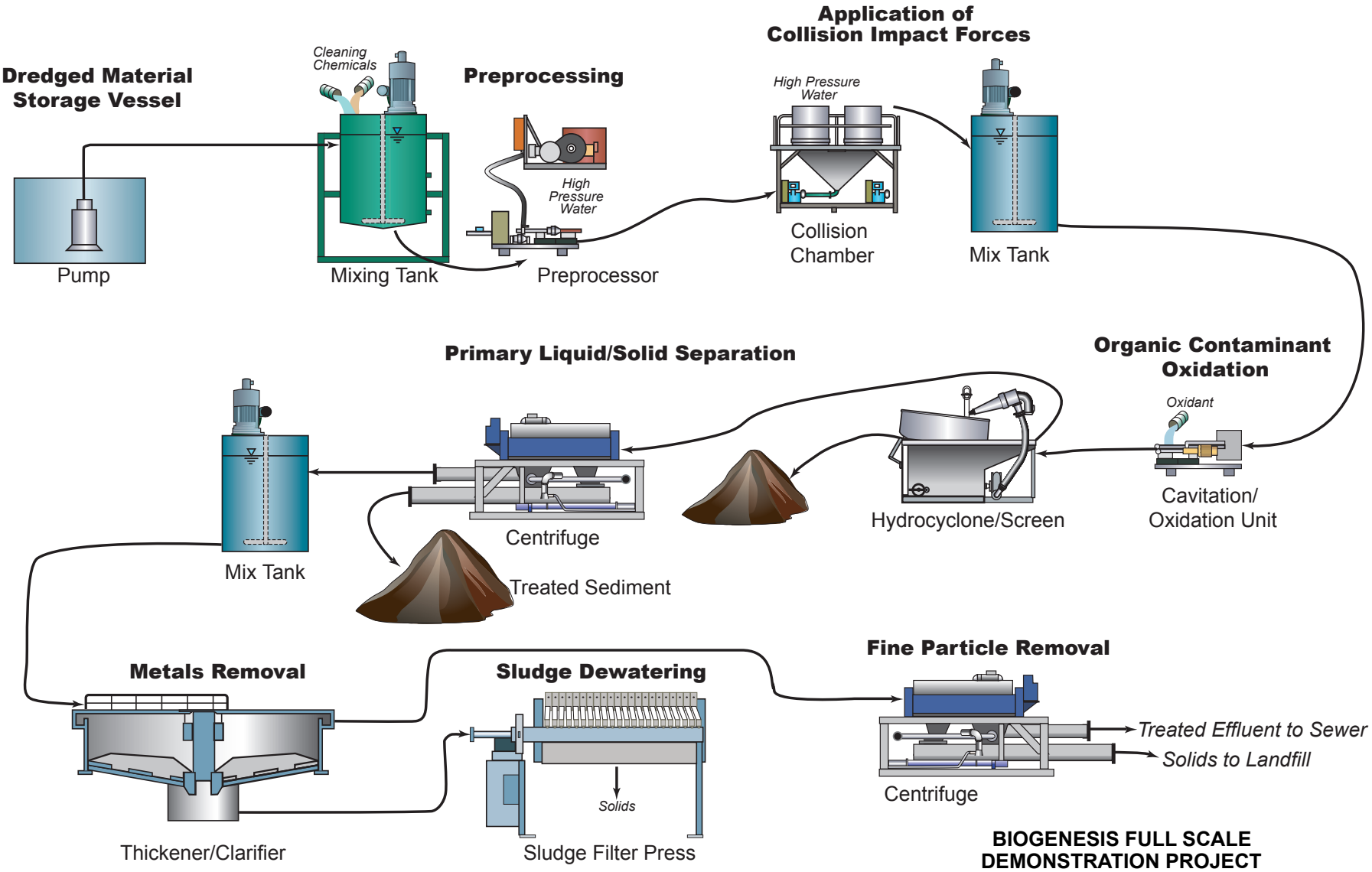
MWH

NJDOT DEMONSTRATION PROJECT

SITE LAYOUT
BIOGENESIS SEDIMENT WASHING FACILITY
KEASBEY, NEW JERSEY

SHEET
FIG 2-1

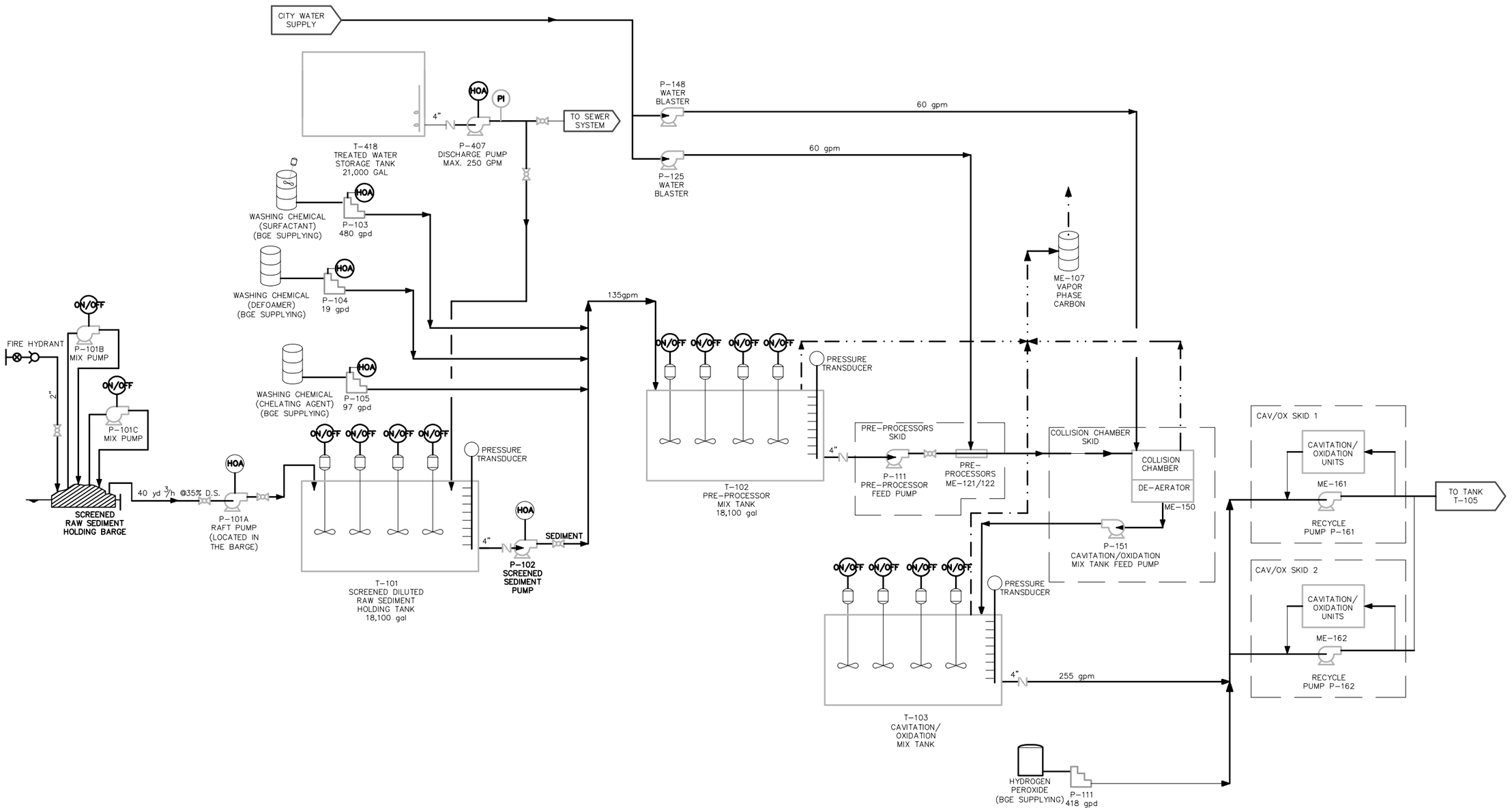
PROJECT NO. *1004464.010101 Fig 2-2 Biogensis Sediment washing.ai 06/27/05 SLC*



BIOGENESIS FULL SCALE DEMONSTRATION PROJECT

GENERAL OVERVIEW OF THE BIOGENESIS[SM] SEDIMENT WASHING PROCESS

FIGURE 2-2



REV	DATE	BY	DESCRIPTION

SCALE: NTS

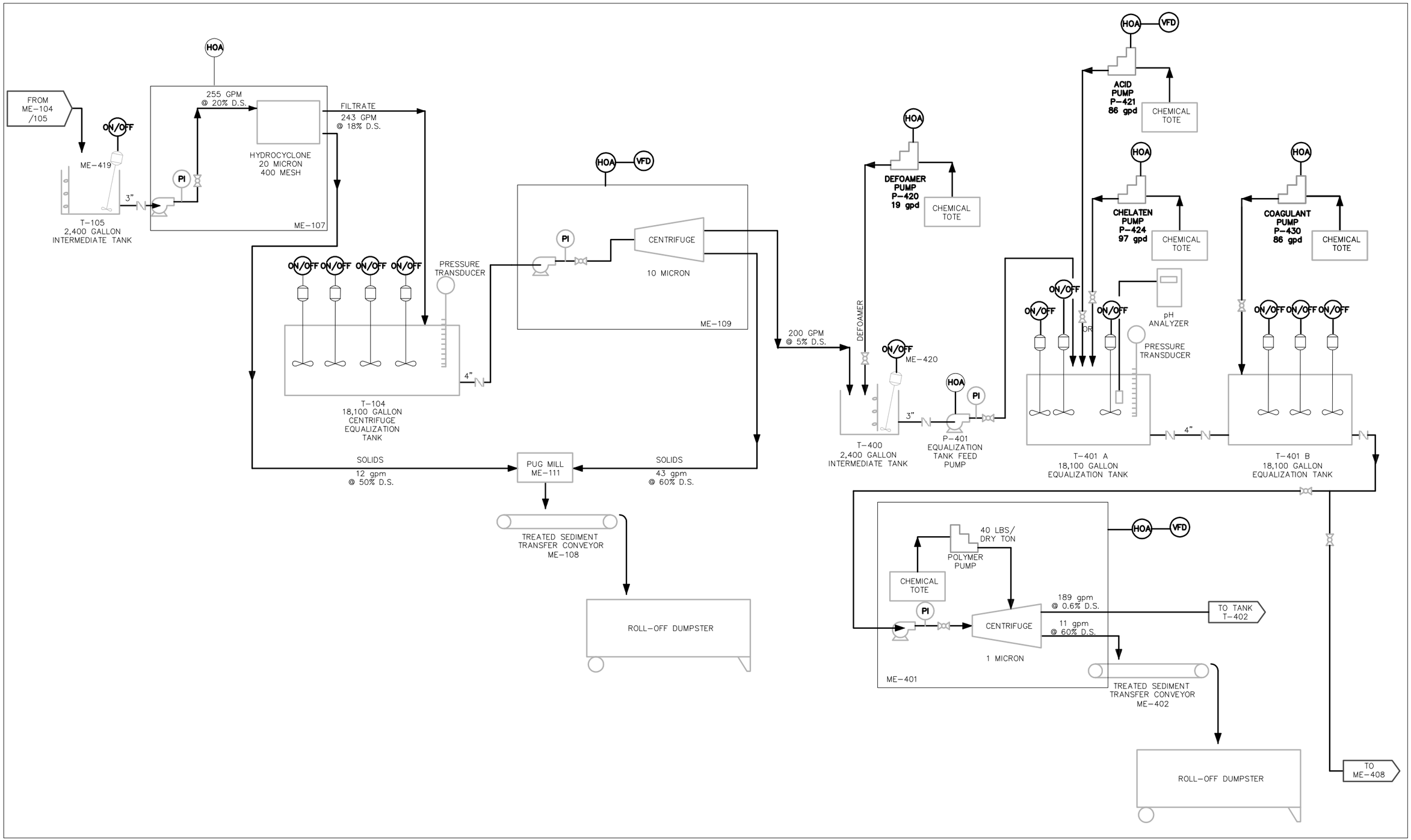
DESIGNED S. MANDAVA 9-13-05
DRAWN S. SOLLIE 9-13-05
CHECKED

MWH
MONTGOMERY WATSON HARZA

BIOGENESIS SEDIMENT WASHING FACILITY
PASSAIC RIVER TESTING
KEASBEY, NEW JERSEY

PROCESS FLOW DIAGRAM
SHEET 1 of 4

SHEET
Fig 2-3
1 OF 4



REV	DATE	BY	DESCRIPTION

SCALE: NTS

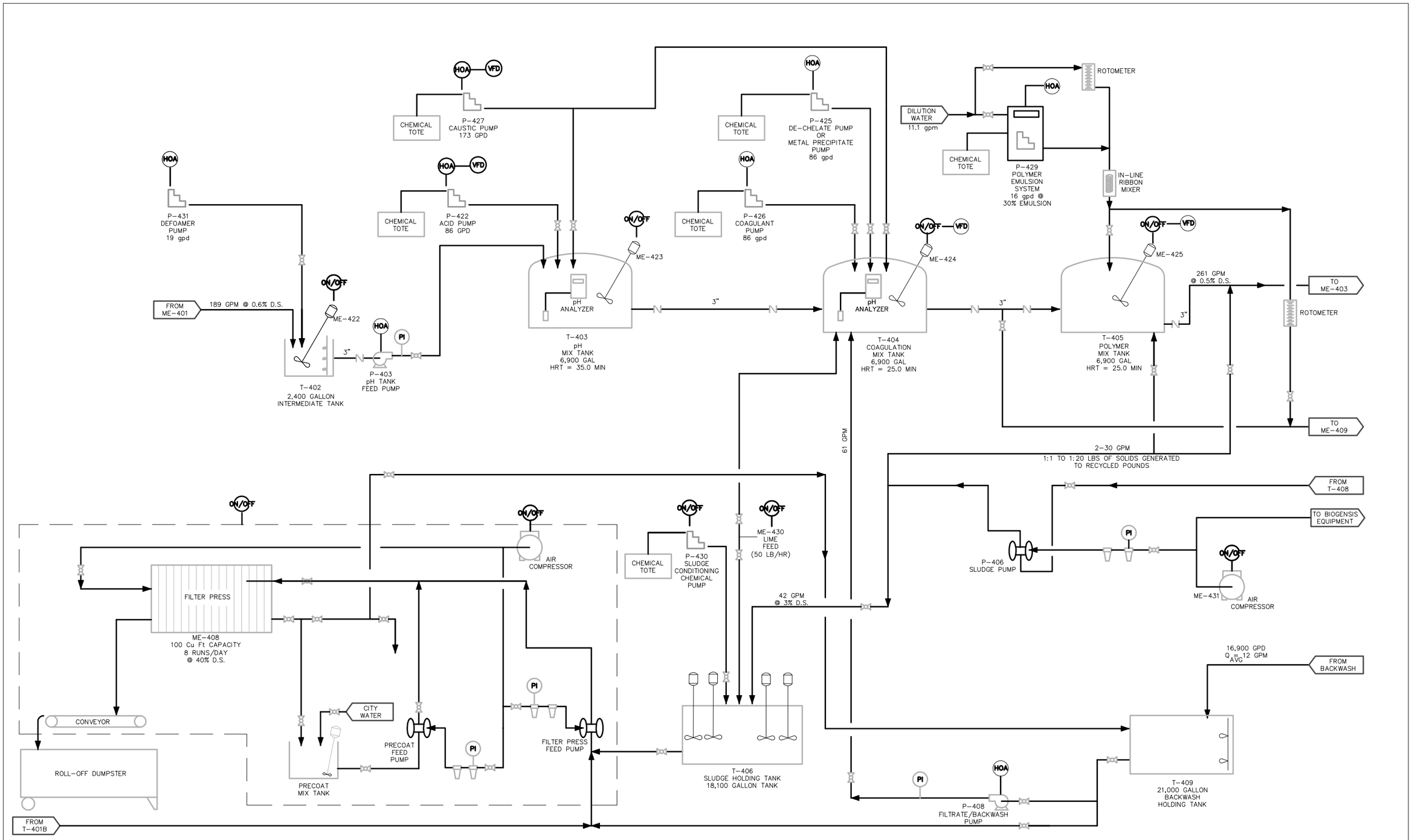
DESIGNED C. DURRANT 9–13–05
DRAWN S. SOLLIE 9–13–05
CHECKED

MWH
MONTGOMERY WATSON HARZA

BIOGENESIS SEDIMENT WASHING FACILITY
PASSAIC RIVER TESTING
KEASBEY, NEW JERSEY

PROCESS FLOW DIAGRAM
SHEET 2 of 4

SHEET
FIG 2–3
2 OF 4



REV	DATE	BY	DESCRIPTION

SCALE: NTS

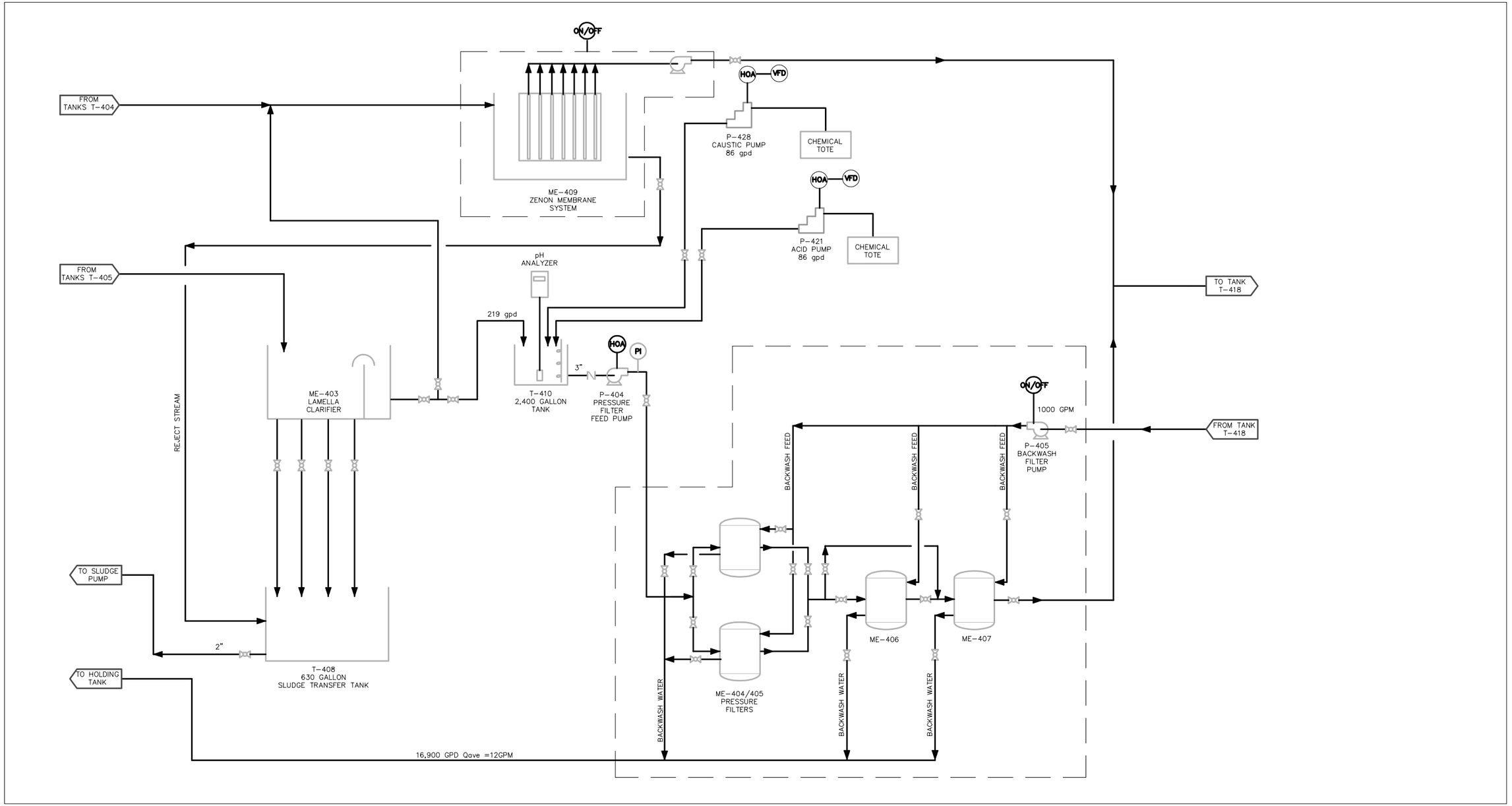
DESIGNED C. DURRANT 9-13-05
DRAWN S. SOLLIE 9-13-05
CHECKED

MWH
MONTGOMERY WATSON HARZA

BIOGENESIS SEDIMENT WASHING FACILITY
PASSAIC RIVER TESTING
KEASBEY, NEW JERSEY

PROCESS FLOW DIAGRAM
SHEET 3 of 4

SHEET
FIG 2-3
3 OF 4



REV	DATE	BY	DESCRIPTION

SCALE: NTS

DESIGNED C. DURRANT 9-13-05
DRAWN S. SOLLIE 9-13-05
CHECKED

MWH
MONTGOMERY WATSON HARZA

BIOGENESIS SEDIMENT WASHING FACILITY
PASSAIC RIVER TESTING
KEASBEY, NEW JERSEY

PROCESS FLOW DIAGRAM
SHEET 4 of 4

SHEET
FIG 2-3
4 OF 4

3.0 SOURCES AND QUANTITIES OF SEDIMENT TO BE PROCESSED

3.1 SOURCES OF SEDIMENT

Sediment for the demonstration project will be obtained from a reach of the Lower Passaic River. The dredging project is a goal of the Passaic River Restoration Program.

3.2 PRE-DREDGING CHARACTERIZATION

The proposed dredging area has been fully characterized and sampled prior to dredging. Various studies and reports have been compiled and have been archived on the Lower Passaic River Project website: www.ourpassaic.org. These documents include a detailed sediment characterization study.

4.0 DESCRIPTION OF WORK TO BE PERFORMED

This work will be performed as part of an ongoing treatment test being conducted under a separate scope of work through the NJDOT OMR. The lower Passaic River sediment will be delivered to the site by an independently contracted dredger and work will be conducted and sampled separately from the other sediment being tested in the treatment facility. The same equipment, operators, managers, and facilities will used to conduct the test, but the results will be sampled, analyzed and documented through the EPA Superfund Innovative Technology Evaluation (SITE) program.

4.1 PROJECT MANAGEMENT

Figure 4-1 shows the organization and responsibilities of the various organizations and individuals comprising the team. BioGenesis Washing (BGW), LLC has overall responsibility for assembling and coordinating the necessary resources to execute the work included in this plan. The demonstration test will be conducted at the Recycling Technology Development LLC site located at 75 Crows Mill Road in Keasbey, New Jersey within the Woodbridge Township adjacent to the Raritan River.

Montgomery Watson Harza (MWH) has been retained by BioGenesis to support the demonstration project. This will include design, permitting, assembly, and operations services.

4.2 PREPARATION OF PLANS

In conjunction with the overall site operations permitting and planning a project Health and Safety Plan has been prepared and submitted for approval by NJDOT. This plan will be used as a reference during treatment of the sediment from the lower Passaic River since the procedures, operations and facilities will be the same.

4.3 SEDIMENT UNLOADING, SCREENING, AND STORAGE

In coordination with NJDOT, sediment from the sources identified earlier will be delivered to the site in barges once the waterfront access is complete and storage space is available. All sediment will be unloaded and processed through the screening facility and then transferred to the storage facility. BioGenesis will subcontract Bayshore Recycling Corp. to provide the necessary labor and equipment to unload the barges.

4.4 STARTUP, OPERATION, AND TESTING

4.4.1 Interim Testing

BioGenesis will conduct several batches of test runs on the sediment from the Lower Passaic River initially to help calibrate the equipment and chemical doses. The interim testing will take place over the course of a few days. Once the data is available, final adjustments will be made to the process equipment and full-scale testing will commence.

4.4.2 Full Scale Testing

For the demonstration testing phase, approximately 2,200 cubic yards of sediment from the Lower Passaic River site will be treated. In order to determine the effectiveness of the treatment process, sampling of the raw and treated sediment will be conducted by the SITE program under direction of the EPA. Process operating parameters such as chemical feed dosages, processing times of individual unit operations, slurry flow rates, etc., will be adjusted throughout this phase to optimize process performance for full-scale continuous operations.

A Testing Report documenting the full scale testing phase and its performance will be prepared and submitted after completion of the work. The report will discuss the performance of the decontamination process, the ultimate disposition of all of the sediment, any lessons learned or suggested modifications, and an account of the project expenditures.

4.5 SAMPLING AND ANALYSIS

Some sampling and analysis will be conducted to manage and control the Biogenesis system and the wastewater discharge. Specific information about facility related sampling can be found in the operations and maintenance plan. All process analytical sampling will be performed by personnel representing the EPA SITE program.

4.6 TRANSPORT AND REUSE

Treated sediment from the test will be stockpiled on site in a controlled area and tested. The sediment will then be transported to a facility for use as a construction material in the building of the EnCap golf course in New Jersey. Further stabilization of the material may or may not be needed depending on the results of the treatment.

4.7 WASTEWATER TREATMENT, STORAGE, AND DISPOSAL

The wastewater generated from the sediment decontamination processes will be treated on site in the wastewater treatment plant located within the existing building. The design of the wastewater treatment, storage, and disposal facilities will proceed as described in Section 4.4.

Wastewater from the demonstration will be discharges to the Woodbridge Township collection system through an existing lift station located on the property.

4.8 DISPOSAL OF RESIDUALS

BioGenesis will properly dispose of all residuals generated during the demonstration testing and full-scale operations phases. Anticipated residuals include oversized debris from the screening facility, sludge and possibly spent activated carbon from the wastewater treatment process, possibly activated carbon from an emissions control system, miscellaneous laboratory wastes from on-site analyses, personnel protective equipment (PPE), and miscellaneous trash and solid wastes.

Oversized debris will be stored in roll-off containers and transported to a solid waste landfill for disposal. Sludge from the wastewater treatment plant will be sampled and analyzed to determine whether or not it is a characteristic hazardous waste. Based on the results, it will be transported and disposed of at an industrial waste landfill (Subtitle D) or a RCRA permitted hazardous waste landfill (Subtitle C). If the sludge needs to be pretreated prior to disposal (to meet land ban restrictions), this will be performed by the disposal facility. Spent activated carbon will be returned to the supplier (at a cost) for regeneration. Laboratory wastes will be segregated and managed appropriately. Most of the material will likely be disposed of as solid waste. PPE and miscellaneous trash will be disposed of off site as municipal solid wastes.

Any wastes sent off site as hazardous wastes will be properly manifested, and proper documentation regarding the type and quantities of all wastes shipped off site will be maintained.

Portable restrooms will be used to service on-site personnel during testing. Wash water from cleaning equipment at the site will be pumped either to the front-end storage tanks or directly to the wastewater treatment plant depending on the amount of solids present.

4.9 MANAGEMENT OF OFF-SPEC SEDIMENT

In the event that some treated sediment does not meet the New Jersey Soil Cleanup Standards listed in Table 2-1, BioGenesis will contract to have the material transported and disposed of at an industrial waste landfill (Subtitle D) or a RCRA permitted hazardous waste landfill (Subtitle C) depending on the characteristics of the off-spec material. If the sludge needs to be pretreated prior to disposal (to meet land ban restrictions), this will be performed by the disposal facility.

4.10 TREATMENT COST EVALUATION

Full-scale treatment cost for a unit (cubic yard or ton) of raw sediment undergoing the BioGenesis^{SM} Sediment Washing Technology will be estimated by quantifying mass

flows of process influent and effluent streams and tracking total operational costs on a daily or weekly basis.

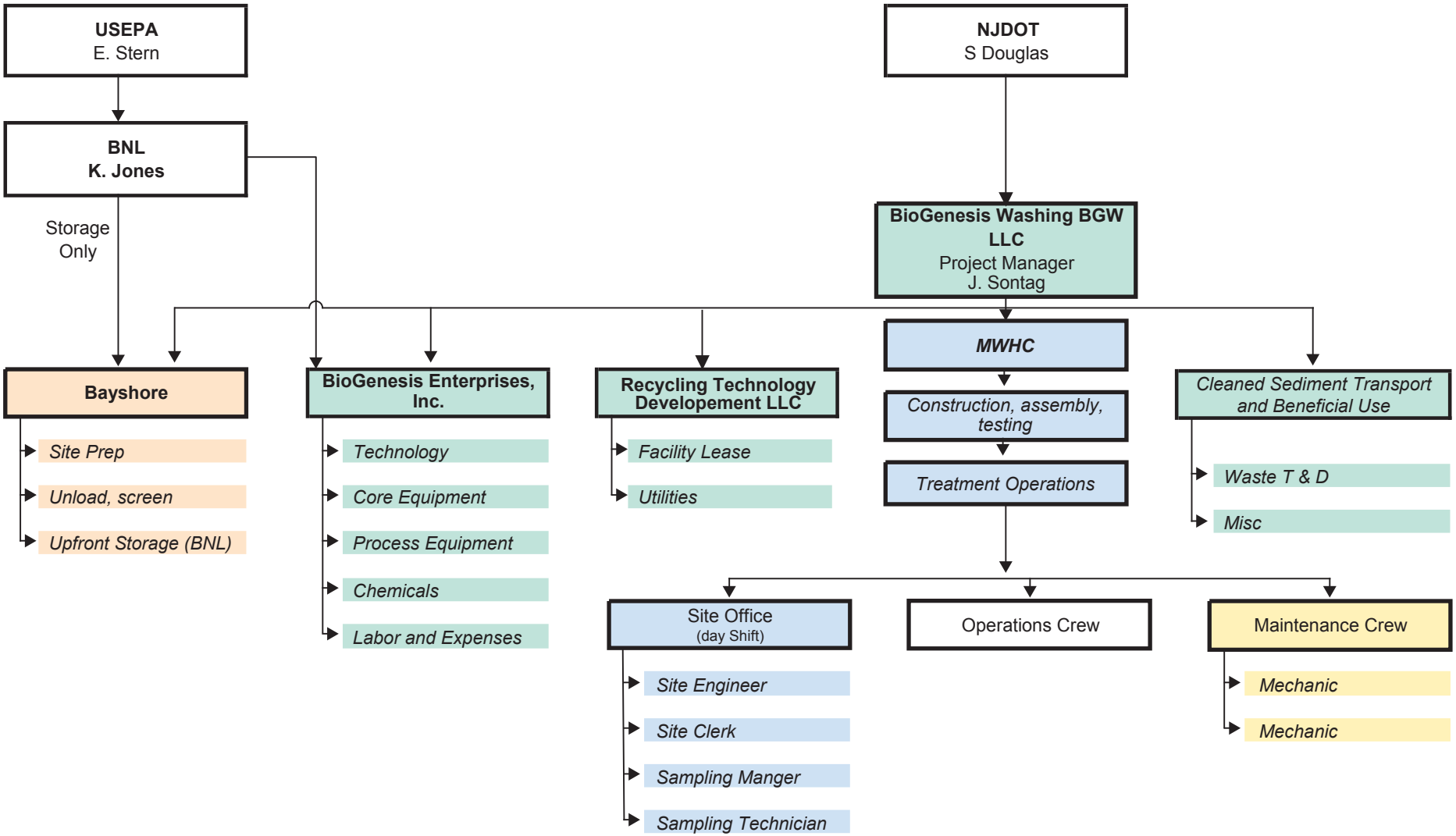
A process mass balance will be developed for sediment solids in terms of process influent and effluent streams by tracking their mass flow rates, total solids and/or moisture content, specific gravity, etc. This will facilitate in determining the percent of incoming sediment solids exiting as either treated sediment or a process residual such as oversize debris, wastewater, sludge, etc.

Operational expenditures to be tracked include, but not are limited to, chemical usage rates, utility usage rates, process residual disposal costs, operational labor costs, etc. Process residuals include treated wastewater, wastewater sludge, off-spec sediment, PPE, miscellaneous waste, etc.

4.11 PREPARATION OF PASSAIC RIVER DEMONSTRATION TESTING REPORT

Following the completion of the Lower Passaic River Demonstration project, BioGenesis will prepare a brief report describing the project activities and presenting the estimated full-scale life cycle costs. The report will be delivered to NJDOT no later than two (2) months following the completion of the project. No analytical data will be presented in the report since the USEPA-SITE program will prepare an independent report of the sampling results.

PROJECT NO. *1004464.010101 fig 2-1 Biogenesis org chart.ai 07/14/05 SLC*



BIOGENESIS FULL-SCALE DEMONSTRATION PROJECT

PROJECT ORGANIZATION

FIGURE 4-1

MWH

5.0 SCHEDULE

A draft of the overall project schedule for the sediment decontamination demonstration facility from inception to full-scale operations is presented in Figure 5-1. All major permitting is expected to complete by late July 2005. Equipment selection and facilities design will be completed mid-July. Equipment procurement will be initiated in July 2005 to be completed in early August 2005. Equipment assembly and all required mechanical and electrical connections will be completed by late August 2005. Equipment shakedown and operational training will be conducted during early late August/September 2005 in a week. Demonstration testing will start after equipment shakedown and will be completed in one month around mid October 2005. Upon completion of demonstration testing, the full-scale operations will be initiated in mid October 2005 and are expected to end in mid December 2005.

It is to be noted that the project schedule is a dynamic document that will be modified, as new information affecting different action items becomes evident. Presently, there is some uncertainty relating to the time of completion of all the permitting action items for the project. Since permitting is one of the critical action items affecting the overall construction and operation of the sediment decontamination facility, the project schedule will have to be updated once new information becomes available.

Figure 5-1
Project Schedule

ID	Task Name	Duration	Start	Finish
1	Equipment Procurement	67 days	Fri 7/1/05	Mon 10/3/05
2	Building Preparation	37 days	Thu 8/11/05	Fri 9/30/05
3	Equipment Assembly	26 days	Mon 9/19/05	Mon 10/24/05
4	Other Demonstration Testing	60 days	Mon 10/24/05	Fri 1/13/06
5	Passaic Dredging	5 days	Mon 10/24/05	Fri 10/28/05
6	Passaic Intermediate Testing	3 days	Mon 11/21/05	Wed 11/23/05
7	Analysis and data Review	14 days	Mon 11/28/05	Thu 12/15/05
8	Full Scale Operations	4 days	Fri 12/16/05	Wed 12/21/05
9	Final Report	60 days	Thu 12/22/05	Wed 3/15/06