Five-Year Review Report

Third Five-Year Review Report
for
Brio Refining Superfund Site
Harris County, Texas

April 2008

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List of Acronyms

AER	Annual Effectiveness Report
ARAR	Applicable or Relevant and Appropriate Requirement
BSTF	Brio Site Task Force
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
1,2-DCA	1,2-Dichloroethane
DNAPL	dense non-aqueous phase liquids
DOP	Dixie Oil Processors
EA	Endangerment Assessment
EPA	United States Environmental Protection Agency
FFSZ	Fifty Foot Sand Zone
FML	Flexible Geomembrane Liner
ICP	Institutional Control Plan
LNAPL	light non-aqueous phase liquid
MCL	Maximum Contaminant Level
MCU	Middle Clay Unit
MGI	Mud Gully Improvements
MOM	Maintenance, Operations, and Monitoring
NCP	National Contingency Plan
NSCZ	Numerous Sand Channel Zone
NPL	National Priorities List
O&M	Operation and Maintenance
RA	Remedial Action
RAO	Remedial Action Objective
RfD	Reference Dose

RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SOP	Standard Operating Procedure
1,1,2-TCA	1,1,2-Trichloroethane
TRRP	Texas Risk Reduction Program
TCEQ	Texas Commission on Environmental Quality
VOC	Volatile Organic Compound

Executive Summary

Located in Harris County, Texas, the Brio Refining Site was used as a chemical re-processing and refining facility from the 1950's to 1982. In general, processing activities consisted of reclamation of petrochemicals from various source materials, most of which were residues, tank bottoms, and tars of other processes performed at off-site locations. The site was placed on the National Priorities List on March 31, 1989.

Following numerous investigations, studies and site activities, a Record of Decision (ROD) was issued on March 31, 1988 which selected incineration of pit residuals, removal of surface contamination, channel improvements to Mud Gully, demobilization of remaining process equipment and removal of debris on the site, removal of dense non-aqueous phase liquids, and pump and treat for groundwater in the Numerous Sand Channel Zone. A consent decree was entered in April 1991 between the EPA and the Brio Site Task Force for implementation of the ROD. Major site contaminants identified included styrene tars, vinyl chloride, chlorinated solvent residues, metallic catalyst and fuel oil residues

After the remedial design was performed and approved by the EPA in July 1993, exceedances of fenceline air quality standards during excavation led to work stoppage. An amended ROD was signed by the EPA on July 2, 1997, which selected a containment remedy to replace on-site incineration. The elements of the amended remedy included a vertical barrier wall, site cover system, groundwater flow control, air monitoring, long term groundwater monitoring and channel improvements to Mud Gully. Construction of the amended remedy began in July 2000 and was completed in April 2004.

Following successful demonstrations of the remedy effectiveness, deletion of the Brio Refining Superfund Site from the National Priorities List became effective December 28, 2006.

The trigger for this review was the May 13, 2003, signature date of the second five-year review.

The assessment of this third five-year review found that the remedy was constructed in accordance with the requirements of the Record of Decision and remains protective, consistent with the remedial action objectives of this response action. Groundwater analysis, air monitoring and groundwater elevation monitoring have shown that the implemented remedy is meeting the Remedial Action Objectives of the Record of Decision. Continued monitoring will be necessary to evaluate the effectiveness of the remedy.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Brio Refining Superfund Site		
EPA ID *(from WasteLAN)*: TXD980625453		
Region: 6	**State:** TX	**City/County:** Harris County
SITE STATUS		
NPL status: ☐ Final ☒ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete		
Multiple OUs?* ☐ YES ☒ NO	**Construction completion date:** 04 /28/04	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: John Meyer		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA, Region 6	
Review period:** 5 / 13 / 2003 to 5 / 13 / 2008		
Date(s) of site inspection: 1 / 16 / 2008		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)		
Review number: ☐1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA On-site Construction at OU #__ ☐ Actual RA Start at OU# NA ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 5 / 13 / 2003		
Due date *(five years after triggering action date)*: 5 / 13 / 2008		

Five-Year Review Summary Form, cont'd.

Issues:

As stated in the Second Five-Year Review, the state surface water quality standards for three of the contaminants of concern at the site have been changed since the Amended Record of Decision. The table below shows those changes relative to Clear Creek. The revised values for Mud Gully are ten (10) times the revised Clear Creek values.

Chemical	**1997 ROD Clear Creek Criteria** (Table 2-Revised Surface Water Criteria) ((µg/l)	**Revised Texas Water Quality Standard** [Table 3 30 TAC 307.6(d)(1)] ((µg/l)
1,2 Dichloroethane	1,794	73.9
1,1 Dichloroethylene	87.4	5.84
1,1,2 Trichlorothane	41.8	
Vinyl Chloride	94.5	415

Recommendations and Follow-up Actions:

The revised Texas surface water quality standards have been incorporated into the evaluation of the site data as the Brio Site Task Force (BSTF) Surface Water Quality Goals [Section 5.2.4 and Table 4 of the Maintenance, Operations, and Monitoring (MOM) Plan]. Surface water monitoring results are compared to these levels for informational purposes. Surface water monitoring results have shown the original performance standards to have consistently been met. The BSTF Surface Water Quality Goals have been met with a few exceptions for 1,2 dichloroethane and 1,1,2 trichloroethane at the confluence of Mud Gully and Clear Creek (sampling point SW-21). EPA recommends continued comparison of surface water results to both ROD performance standards and the BSTF Surface Water Quality Goals.

Protectiveness Statement(s):

Installation of the remedial alternative has been completed. The action has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated soils or groundwater. The implemented actions are functioning as intended and remain protective of human health and the environment.

Long-term Protectiveness:

Long-term protectiveness of the remedial action is being verified by monitoring implemented by the MOM Plan (quarterly surface water sampling, semi-annual air monitoring, annual groundwater monitoring, and weekly gradient monitoring) to confirm the effectiveness of the site controls.

Other Comments:

The ROD requires that site control be maintained through the use of fencing and the imposition of deed notices and restrictions. The BSTF currently controls the site, and a fence has been maintained around the perimeter of the site. The Institutional Control Plan, dated February 2, 2006, documents that deed notices and deed restrictions were executed on the site. The expected long term maintenance and operations at the site will involve a continual site presence.

Brio Refining Superfund Site
Harris County, Texas
Third Five-Year Review Report

I. Introduction

The purpose of a five-year review is to evaluate the implementation and performance of the selected remedy in order to determine if the remedy is or will be protective of human health and the environment. Since this will be the third five-year review, it will determine if the remedy continues to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERCLA § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Tulsa District of the United States Army Corps of Engineers under the direction of the United States Environmental Protection Agency (EPA), Region 6, conducted the third five-year review of the remedy implemented at the Brio Refining Superfund Site in Harris County, Texas. This review was conducted for the site from January 2008 through May 2008. This report documents the results of the review.

This is the third five-year review for the Brio Site. The triggering action for this statutory review is the completion of the second five-year review on May 13, 2003. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site

above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 - Chronology of Site Events

Event	Date
Chemical reprocessing and refining activities at the site	1950's - 1982
Removal activities – placement of pit cover	1985
Final listing on EPA National Priorities List	3/1989
Remedial Investigation/Feasibility Study (RI/FS) complete	3/1988
Record of Decision signed	3/31/1988
Start of on-site construction for building/structures demolition and decontamination (1st phase of site Remedial Action and date that triggers a five-year review).	6/29/1989
Consent Decree finalizing settlement for responsible party performance of remedy entered by Federal Court	4/04/1991
ROD Amendment issued by EPA, changing from on-site incineration to containment	7/2/1997
First Five-Year Review (Type Ia)	1/8/1998
Consent Decree amended to include modified remedy	3/5/1999
Start of on-site construction for modified remedy	7/11/2000
Completion of Brio North soil bentonite barrier wall	11/2/2000
Completion of Brio South soil bentonite barrier wall	12/6/2000
Completion of sheet pile wall on Brio North	10/10/2001
Completion of Brio South cover system	2/21/2002
Second Five-Year Review	5/13/2003
Completion of sheet pile wall crossing Dixie Farm Road	5/5/2002
Completion of Mud Gully Improvements	6/13/2003
Completion of Brio North cover system	10/2003
Completion of groundwater/DNAPL collection system	4/9/2004
Remedial Action Completion Report	12/16/2004
First Annual Effectiveness Report	9/1/2005
Completion of gas treatment system	11/16/2005
Final Inspection (EPA & TCEQ)	4/20/2006
Final Close Out Report (signed)	5/26/2006
Maintenance, Operations, and Monitoring Plan, February 2004 with revisions through September 2006 (Rev. 3)	9/2006
Second Annual Effectiveness Report	11/8/2006
Deletion from National Priorities List	12/28/2006
Third Annual Effectiveness Report	7/18/2007

III. Background

Physical Characteristics

The Brio Site is located almost 20 miles south of Houston, Texas, and occupies approximately 58 acres. The site is divided by Dixie Farm Road, with Brio North being historically used for storage purposes and Brio South being primarily used for processing activities. A neighboring residential subdivision (Southbend, now abandoned) was located along and north of the northern boundary of Brio North. Mud Gully, a flood control ditch and local tributary of Clear Creek, runs along the western boundary of the Brio site. Figure 1 in Attachment 1 shows the general location of the Brio site. Figure 2 in Attachment 1 illustrates the site layout.

The Brio Site is located within the Pleistocene Deltaic Plain of the Brazos River, known as the Alameda Delta. The site is underlain with Pleistocene and Pliocene deposits to a depth of approximately 2400 feet.

The Numerous Sand Channel Zone (NSCZ) and the Fifty-Foot Sand are the two water bearing units investigated at the Brio Site. The upper water zone, the NSCZ, lies below the Upper Clay and is comprised of interbedded sands and silty clays. The NSCZ is encountered from 14 to 32 feet below ground surface and has a low well yield. The thickness of the NSCZ varies from less than 10 feet to over 20 feet thick. The groundwater in the NSCZ typically flows toward and discharges to Mud Gully to the west.

The Fifty-Foot Sand is separated from the NSCZ by the Middle Clay Unit, a confining layer ranging in thickness from 8 to 20 feet. Ranging in thickness from 35 to 45 feet, the Fifty-Foot Sand is encountered between 52 and 61 feet below ground surface and has a reasonably high well yield. Groundwater in this zone flows in a south-southeastern direction.

Land and Resource Use

In general, processing activities consisted of reclamation of petrochemicals from various source materials, most of which were residues, tank bottoms, and tars of other processes performed at off-site locations. Spanning the period of 1957 to 1982, processing operations included regeneration of copper catalysts; recovery of ethylbenzene from styrene tars, chemicals from vinyl chloride bottoms, phenol heavy ends, chlorinated hydrocarbons, cresylic acid and ethylene glycol; and the production of ethylbenzene, toluene, aromatic solvents, styrene pitch, cresylic acid, sodium sulfide, sodium cresyllite, fuel oil, cumene, diesel fuel, residual oil, naphtha, kerosene and jet fuel. Most of the feedstock materials for processing at Brio were stored in on-site pits, many of which were located on Brio North. However, the disposal areas were on both the Brio North and South sites. All of the pits were closed during site operations, which ceased in December 1982. EPA finalized the site on the National Priorities List on March 31, 1989.

The current land use of the surrounding area is residential development to the northeast, across

Beamer Road. A buffer of undeveloped properties exists to the north, west and south of the site. The property to the south has been used for the establishment of a wetland habitat and preservation of forest habitat as part of a Natural Resource Restoration Project implemented by the BSTF in conjunction with several state and federal agencies. Residential development is evident approximately 0.75 miles to the west of the site.

History of Contamination

Numerous investigations, studies, and site activities have been performed at the Brio Site in efforts to determine the location of the former storage pits and the nature and extent of contamination. The investigations found that the majority of the contamination at the site is found within the location of the former storage pit areas. The pits were constructed within the uppermost geologic unit designated the Upper Clay. This unit occurs across the entire site and ranges in depth from 14 to 32 feet.

Following the site investigations, EPA issued a Record of Decision on March 31, 1988, that selected on-site incineration of pit residuals, removal of surface contamination, channel improvements to Mud Gully, demobilization of remaining process equipment and removal of debris on the site, removal of dense non-aqueous phase liquids (DNAPL), and pump and treat for groundwater in the numerous sand channel zone (NSCZ). The ROD addressed all the threats at the site as a single operable unit, including groundwater contamination. A consent decree was entered in April 1991 between EPA and the Brio Site Task Force (BSTF) for implementation of the ROD.

A remedial design was performed by the BSTF and approved by EPA in July 1993. Demolition of the majority of the remaining process equipment was completed prior to mobilization of the incinerator.

A rotary kiln incinerator and support equipment were mobilized to the site following the demolition work. Temporary enclosures were erected over the pits requiring remediation in order to contain emissions during excavation. The incinerator began clean burn operations with imported material. Excavation began at Pit R on Brio South for shakedown operations and to stockpile material for the trial burn. Emission problems during excavation led to a “stop work” order until appropriate emission control equipment could be installed. Before additional controls could be installed, a force majeure claim by the BSTF was submitted, which eventually resulted in the decision by EPA to allow the dismantling of the incinerator. The incinerator and support equipment were demobilized by December 1994.

An amended Record of Decision was signed by the EPA on July 2, 1997. As the preferred alternative to incineration, the amended ROD selected containment with elements including vertical barrier wall, site cover, groundwater flow control, air monitoring, long term groundwater monitoring, and channel improvements to Mud Gully. Construction of the amended remedy began in July 2000 and was completed in April 2004.

Following successful demonstrations of the remedy's effectiveness, deletion of the Brio Refining Superfund Site from the National Priorities List became effective December 28, 2006.

Basis for Taking Action

The three primary affected media at the site include groundwater, surface soils, and subsurface soils. The extent of affected soils and groundwater has been defined through previous investigations and studies. The principle contaminants of concern at the site are organic compounds and chlorinated solvent compounds. Some of the notable contaminants include the following:

1,1,2-Trichloroethane (1,2,2-TCA)	1,2-Dichloroethane (1,2-DCA)
1,2-Dichloroethene	1,1-Dichloroethene
1,1-Dichloroethane	Vinyl Chloride
bis-(2-chloroethyl) ether	Phenanthrene

An Endangerment Assessment (EA) was performed shortly after the RI was completed. The EA estimated the potential for adverse effects on human health and the environment from exposure to contaminants at the site. The actual contaminant concentrations found on the site were compared to the exposure from a concentration known to have an adverse impact. From the EA, it was determined that the site potentially posed four major risks to human health and the environment. The pathways are:

- Direct (dermal) contact and ingestion of contaminated surface soils and sediments on the site.
- Inhalation of contaminated dust and volatile organic compound (VOC) emissions from the site.
- Ingestion of contaminated groundwater from the fifty-foot sand zone (FFSZ) beneath the site.
- Exposure of aquatic biota to NSCZ discharges of contaminated groundwater to Mud Gully.

IV. Remedial Actions

Remedy Selection

The original Record of Decision in 1988 included the following major elements in order to address this objective:

> Affected materials and soils - Affected materials and soils shall be treated using either incineration or biological treatment. This media is defined as all contaminated sludges and liquids and waste material found to exist above the action levels defined in the Endangerment Assessment. This media is largely found in the on site pits

Storage tanks, drums and process equipment - Remove tank contents, decontaminate tanks, and transport the tanks to an EPA approved off-site disposal facility.

Monitoring and control of migration pathways - Control exposure pathways through ambient air, surface water, and groundwater. Specifically, the ambient air should be monitored on a semi-annual basis and emissions should be controlled from treatment processes. Discharges to Mud Gully should be controlled and monitored. Groundwater pathways in the Numerous Sand Channel Zone (NSCZ) and the Fifty-Foot Sand Zone (FFSZ) should be monitored and action taken if the action levels are exceeded.

Summary of Work Performed during First Five Year Review Period

In June 1989, an Administrative Order on Consent was signed with a group of companies, referred to as the Brio Site Task Force (BSTF), to begin dismantlement of the process equipment on the site. The facility dismantlement was completed in December 1989. Material present in the process equipment and tanks was consolidated into remaining tanks. Approximately 30 tanks were left on the site that could potentially be used in the implementation of the bioremediation remedy. The process equipment and tanks were decontaminated and sent to an off-site smelter for reclamation.

A consent decree with a scope of work to implement the remainder of the ROD was entered by the federal district court on April 4, 1991. The BSTF began implementation of a remedial design (RD) to address the scope of work. The BSTF chose to implement the incineration alternative in the ROD due to lack of competitive bids for the biological alternative.

A remedial design was completed in July, 1993, that addressed installation and operation of an incinerator to treat contaminated soils, sludges, and liquids above the action levels specified in the ROD. In addition, the RD addressed installation of a barrier well system to control groundwater migration in the NSCZ.

In May 1993, surface water discharges were found to be occurring in Mud Gully. Characterization of the water and sediments in Mud Gully and Clear Creek found that chlorinated volatile organics were discharging from the Brio site into the streams. A groundwater barrier system was installed on the Brio site in the area of Pit B in order to control the discharges of contaminated groundwater to Mud Gully. The surface water in Mud Gully and Clear Creek are sampled quarterly to ensure compliance with the standards evaluated in the ROD. Over 12 million gallons of groundwater have been extracted and treated since the system began operating in late 1993. In addition, the collection system had removed more than 157,000 gallons of dense non-aqueous phase liquid (DNAPL) from the NSCZ which had been sent off-site for disposal.

In December 1993, site preparation work for the mobilization of the incinerator began. This work included removal of the majority of the remaining tanks from the initial dismantling operation. The tanks were cleaned and sent off-site for smelting. Residual materials from the tanks were

consolidated into Tank 402, the sole remaining tank on Brio South, or placed into roll-off boxes for subsequent treatment.

A rotary kiln incinerator and support equipment were mobilized to the site following the demolition work. Temporary enclosures were erected over the pits requiring remediation in order to contain emissions during excavation. The incinerator began clean burn operations with imported material and excavation began at Pit R on Brio South for shakedown operations and to stockpile material for the trial burn. Emission problems during excavation led to a "stop work" order until appropriate emission control equipment could be installed. Before additional controls could be installed a force majeure claim was submitted by the BSTF, which eventually resulted in the decision by EPA to allow the dismantling of the incinerator. The incinerator and support equipment were demobilized by December 1994. After demobilization, the groundwater treatment system continued to operate, the DNAPL remediation proceeded, and drums stockpiled since the inception of investigations, roll-off boxes containing affected material, and the contents of Tank 402 were sent off-site for disposal at licensed facilities.

Amended Record of Decision

A focused feasibility study was initiated to evaluate alternatives to the incineration remedy selected in 1988. An Amended Record of Decision was signed by EPA on July 2, 1997. The remedial action objectives developed for site response actions include:

- Protection of the health and safety of the community, workers, and the environment during implementation of the remedy;
- Minimization, to the extent practicable, of disruption and inconvenience to the community during implementation of the remedy;
- Long-term, effective control of migration of leachable organic liquids from the source area;
- Long-term, effective control of off-site migration of free-phase liquids or site constituents moving through the groundwater, surface water, soil, or air pathways;
- Long-term, effective reduction of potential future risk to the community and the environment resulting from off-site exposure to site constituents by maintaining or achieving:
    - Target levels of public exposure to air emissions,
    - Target levels of affected soil dermal contact and ingestion,
    - Control of off-site transport of affected soils to acceptable levels,
    - Protection of existing aquatic life in Mud Gully, and
    - Target levels of organic constituents in the Fifty-Foot Sand Zone within a reasonable time.

- Minimization of potential negative impact of natural disasters such as flooding, hurricanes, etc.; and

- Long-term, effective site control and aesthetics.

The Amended ROD selected containment as the preferred alternative. The elements of the containment remedy include:

Vertical Barrier Wall - A sub-grade barrier wall will be constructed to limit the potential for off-site migration of contaminated groundwater in the NSCZ. The wall will be designed to encompass the site and will be keyed to the Middle Clay Unit. The technique of construction will be established in the remedial design.

Site Cover - A composite cap will be constructed over the site, extending to the limits of the barrier wall. The cap will include a gas collection layer, a flexible membrane liner, compacted clay, and top soil to promote vegetative growth.

Groundwater Flow Control - A groundwater pumping system will be installed within the barrier wall to limit the migration of site contaminants. Recovered groundwater will be treated and discharged to Mud Gully.

Air Monitoring and Long Term Groundwater Monitoring - An air monitoring system will be maintained during the construction of the remedy to protect public health. The groundwater will be monitored in the FFSZ to ensure groundwater is below established Maximum Contaminant Levels (MCLs). The NSCZ groundwater outside the barrier wall will be monitored to demonstrate compliance with water quality criteria for Mud Gully.

Mud Gully - Similar to the original proposal, this option includes channel improvements to the gully, but also allows the option of relocation of the gully by Harris County.

Common Components - In addition, the containment remedy retains several components unmodified from the original remedy, which include addressing the following:

- Off-site soil contamination: Off-site contamination encountered during remedial investigation or remedial action will be removed to background levels;
- Debris and rubble: Inert debris and rubble from past operations to be consolidated and disposed;
- Wastewater treatment system: Capture and treatment of on-site wastewater;
- Storage tanks and drums: Empty, decontaminate, and dispose of existing storage tanks and drums;
- Process equipment: Dismantle remaining process facility; and
- Site control: Permanent site control and implementation of deed notices and restrictions.

Remedy Implementation

Summary of Work Performed during Second Five Year Review Period

Construction of the remedial action pursuant to the Amended ROD began in July 2000 and was implemented in phases. The primary components of the construction completed during the second five-year review period were:

- Soil bentonite barrier wall
- Sheet pile barrier wall
- Cover system on Brio South

Soil Bentonite Barrier Wall

Approximately 5900 lineal feet of slurry wall was constructed around the perimeter of the site from September to December 2000. The slurry wall was constructed by excavating a 30-inch wide trench to a depth that seals the wall into a low-permeable natural clay layer termed the "Middle Clay Unit" (MCU). The depth of the slurry wall ranged from approximately 35 to 50 feet. The stability of the excavation was maintained using a drilling mud fluid (slurry) that was prepared onsite. Once the excavation achieved the proper depth, a backfill material (consisting of thoroughly mixed native soils and fresh slurry) was placed in the excavation. Once installed, the backfill material became the barrier wall and was tested to confirm that the constructed barrier wall achieved the required permeability.

EPA provided oversight of the construction. An interim completion report was issued by the Brio Site Task Force to provide the construction quality assurance documentation. This report was incorporated by reference into the final completion report dated December 16, 2004.

Sheet Pile Barrier Wall

The sheet pile barrier wall was installed from July 2001 to December 2001. The wall is approximately 1,781 feet long and varies in depth from 35 to 50 feet below ground surface. The wall was installed to designed depths into the low-permeable natural clay layer. The sheet pile wall is composed of two sections:

- The main alignment is approximately 1,188 linear feet and was installed on the Brio Site.

- The cofferdam alignment is approximately 593 linear feet. The cofferdam was installed within the Mud Gully easement to contain an off-site groundwater plume.

EPA provided oversight of the construction. An interim completion report was issued by the Brio Site Task Force that provided the construction quality assurance documentation. This report was incorporated by reference into the Remedial Action Completion Report dated December 16, 2004.

Cover System (Brio South)

The construction of the cover system was divided into two components: Brio-North and Brio-South. The two areas are divided by Dixie Farm Road and separate borrow pit areas were developed in order to minimize truck traffic over the road. The Brio South cover was initiated first due to its smaller size. The Brio South cover system was constructed from May 2001 to February 2002. An additional compacted clay layer was extended over a segment of the Dixie Oil Processors (DOP) South Site to provide controlled surface water runoff.

The Brio-South cover system components are as follows:

- Bedding Layer (varies in thickness)
- Gas Collection Layer, and a Flexible Geomembrane Liner (FML),
- Compacted Clay Layer (eighteen inches), and
- Vegetative cover

The area of the Brio-South cover system is approximately 11.7 acres, and was constructed to the limits of the of the soil-bentonite barrier wall on the east and south sides, to Dixie Farm Road Right-of-Way on the north side, and to DOP-South on the west side.

The DOP-South cover system components consist of a compacted clay layer that varies in thickness, and a vegetative cover. The area of the DOP-South compacted clay cover is approximately 3.8 acres. The compacted clay cover was constructed to the limits of the soil bentonite barrier wall on the south and west sides, and was tied-in with the Brio-South compacted clay layer on the east side, and to the Right-of-Way of Dixie Farm Road on the north side. The vegetative cover was also installed over the DOP-South.

EPA provided oversight of the construction. An interim completion report was issued by the Brio Site Task Force that provided the construction quality assurance documentation. This report was incorporated by reference into the Remedial Action Completion Report dated December 16, 2004.

V. Progress Since the Last Five-Year Review

Construction of elements of the remedial actions were underway at the time of the last (second) five-year review. Components of the remedial action completed since the last five-year review (May 2003) include:

- The Brio North cover system
- Mud Gully improvements
- Groundwater control systems
- Recordation of deed restrictions and notices

Cover System (Brio North)

The Brio North cover system was constructed from December 2001 to September 2003. As with the Brio South cover system, the Brio-North cover system components are as follows:

- Bedding Layer (varies in thickness)
- Gas Collection Layer, and a FML,
- Compacted Clay Layer (eighteen inches), and
- Vegetative cover

The area of the Brio North cover system is approximately 50.5 acres, and was constructed to the limits of the of the soil-bentonite barrier wall on the east and north sides, to Dixie Farm Road Right-of-Way on the south side, and to the sheet pile barrier wall on the west side. As is visible on Figure 2 in Attachment 1, the Brio North cover system was designed with three compartments to provide for control of surface runoff and to facilitate gas collection. Prior to placement of the FML, one gas collection trench was excavated in the bedding layer of each compartment.

EPA provided oversight of the construction. An interim completion report was issued by the Brio Site Task Force that provided the construction quality assurance documentation. This report was incorporated by reference into the final completion report dated December 16, 2004.

Mud Gully Improvements

Under the jurisdiction of the Harris County Flood Control District, construction of Mud Gully Improvements (MGI) was performed from June 2002 to June 2003. The affected area of Mud Gully comprises a length of approximately 1,160 feet between Brio-North and DOP-North. The construction activity consisted of:

- Clearing of trees and brushes along and within the MGI area
- Reshaping channel surface to design elevation
- Install new drainage pipes, abandoning and retrofitting existing drainage pipes
- Installing Articulated Concrete Block
- Restoring the DOP-North property to its pre-construction condition
- Placing top soil layer and vegetative cover

An interim completion report was issued by the Brio Site Task Force that provided the construction quality assurance documentation. This report was incorporated by reference into the final completion report dated December 16, 2004.

Groundwater Control Systems

Construction on the groundwater control system began in February 2001 and was completed in February 2004. The Groundwater Control System, also referred to as the Groundwater/Dense Non-Aqueous Phase Liquid (DNAPL) Collection System, utilizes a pumping system to maintain an

inward hydraulic gradient within the Brio Site barrier wall using wells within the first transmissive unit termed the Numerous Sand Channels Zone. Component of the collection system include:

- A well system of seventeen (17) groundwater collection wells on the Brio North and Brio South sites
- A well system of thirteen (13) DNAPL recovery wells on Brio North
- Hub facilities to provide air pressure and separate groundwater, DNAPL and light non-aqueous phase liquid (LNAPL)
- Pipeline system for the collection and transfer of collected water to the treatment facility
- Vegetative cover

Recordation of Deed Restrictions and Notices

Dated February 2, 2006, the Institutional Control Plan (ICP) for the Brio Refining Superfund Site provides for institutional controls to reduce the risk to public health and the environment from potential hazards posed by the site. The plan implementation tasks are listed as recordation of institutional control documents and monitoring of site security. Deed restrictions and notices have been filed at the Harris County Clerk's office for the site. Site personnel inspect the perimeter fencing weekly, at a minimum, to evaluate compliance with Institutional Control Documents. The ICP was incorporated into the Maintenance, Operations, and Monitoring Plan with Revision 2 in April 2006.

Areas of Noncompliance

As in the Second Five-Year Review, no areas of noncompliance have been identified.

System Operation/Operation and Maintenance

The BSTF operates an on-site water treatment plant to treat water collected from the groundwater collection system. The water is treated in batches, held pending laboratory analysis for discharge parameters, then discharged after confirmation that the discharge criteria have not been exceeded. Discharge criteria are listed in Attachment 3. The treatment plant is staffed with two operators and one maintenance worker.

At the treatment plant, groundwater produced from the groundwater and DNAPL extraction wells is collected in Tank T212 prior to treatment in a batch process. The water treatment consists of pre-filtering, air stripping and final polishing using carbon filters. As stated earlier, after meeting discharge criteria, the treated water is discharged to Mud Gully via an on-site ditch. Exhaust gases produced from the air stripping process are passed through a resin filter system to scrub the gases of volatile components prior to release. Two parallel units of resin filters are available to permit regeneration of one unit while the other unit is in use and thus eliminate down time.

DNAPLs and LNAPLs collected from collection system separators are collected in Tank

T218 at the treatment plant. When sufficient volumes are collected in T218, the tank is emptied using a commercial tanker to transport the liquids to an approved disposal facility.

As presented in the three annual effectiveness reports (AERs), annual discharge volumes for the periods covered by those reports have been 850,000 gals, 728,554 gals and 1,215,363 gal. The large increase in discharged treated water reported in the Third AER was due to a reduction in collection system and treatment system down time. Improved maintenance and operating techniques increased the amount of time that the systems were operational.

In February 2004, an operations and maintenance plan, designated the Maintenance, Operations, and Monitoring (MOM) Plan, was developed by the BSTF. This plan was last updated as Revision 3 dated September 2006. Revision 1 dated December 2004 incorporated a new standard operating procedure (SOP) in Appendix C for Secondary Containment Fluid Handling (SOP-10). Dated April 2006, Revision 2 added Appendix I containing an Institutional Control Plan. Revision 3 added the Long Term Gas Collection System Operations Plan. The MOM Plan addresses inspection, maintenance, operations, and monitoring activities at the site. The MOM Plan also contains listings of requirements for the annual effectiveness report in Section 6.0. Section 7.0 of the MOM Plan incorporates by reference the Worker Health and Safety Plan, the Spill and Volatile Emissions Release Contingency Emergency Notification Plan, and the Community Relations Plan for the Site. The Community Relations Plan is also included as an appendix to the MOM Plan while the other two plans are separate documents.

The criteria used to evaluate treated water discharge, air, surface water and groundwater monitoring are summarized from the MOM Plan and presented in Attachment 3.

Operating costs, presented in the table below, represent all expenditures at the site. The costs for 2004 and 2005 include completion of the remedial action and testing and optimization of the operating systems. Costs for 2006 and 2007 have decreased due to completion of the remedial action and increasing efficiency of operating procedures.

Table 2 - Annual System Operations/O&M Costs

Dates		Total Annual Cost
From	To	
1/1/2004	12/31/2004	$1.6 M
1/1/2005	12/31/2005	$1.1 M
1/1/2006	12/31/2006	$0.9 M
1/1/2007	12/31/2007	$0.8 M

VI. Five-Year Review Process

Administrative Components

The Brio Site Task Force and the Texas Commission of Environmental Quality (TCEQ) were

notified of the initiation of the five-year review on December 6, 2007. The Brio Third Five-Year Review team was led by John Meyer of EPA, Remedial Project Manager (RPM) for the Brio Site, with the assistance of the Tulsa District of the U.S. Army Corps of Engineers.

Community Involvement

A notice was published in the Houston Chronicle on January 6, 2008 stating that a five-year review was to be conducted for the Brio Refining site. The same notice was published January 10, 2008 in the South Belt-Ellington Leader. No correspondence was received by the EPA as a result of these published notices.

Document Review

This five-year review consisted of a review of relevant documents including the Third Annual Effectiveness Report, Final Close Out Report, Remedial Action Completion Report, interim construction reports, the 1997 Amended Record of Decision, and groundwater and surface water data since the previous annual effectiveness report. See Attachment 2 for documents reviewed for this report.

Data Review

The data review focused on an evaluation of the current groundwater, surface water, and air monitoring data. Groundwater and surface water data contained in the AERs (First, Second and Third Annual Effectiveness Reports) for the period April 2004 to March 2007 were reviewed for this evaluation. More current data (May 2007 to December 2007) was provided by the BSTF to supplement the report. The Fourth Annual Effectiveness report is schedule for completion in June 2008. The sampling is conducted as outlined in the Maintenance, Operations, and Monitoring Plan.

<u>FFSZ Groundwater Evaluation</u>

The annual FFSZ groundwater data showed that the performance standards for that zone in the ROD are being met with one exceedance in 2007. The performance standards for the FFSZ groundwater are provided in a table in Attachment 3. FFSZ sampling locations are shown on Figure 2 of Attachment 1. At sampling locations BMW-3B and BMW-18B, slight increases in 1,2-DCA, 1,1-DCE and vinyl chloride were seen from the October 2006 sampling event to the October 2007 sampling event. Only the concentration of 1,2-DCA at 5.7 ppb in BMW-3B from the October 2007 sampling event exceeded the MCL of 5 ppb. With the limited amount of data at this time, a trend is not apparent. Continued sampling will be required to determine a trend at this horizon.

In the Second Five-Year Review, a concern was raised regarding the detection limits of the analytical method being used for the groundwater analysis because the detection limit of 10 ppb was above the MCL for vinyl chloride (MCL 2 ppb), 1,1,2-TCA (MCL 5 ppb), or 1,2-DCA (MCL 5

ppb). This is no longer an issue since analytical methods are now being used that have detection limits less than the MCLs of these compounds. The detection limit used in the two latest sampling rounds (2006 & 2007) is 0.5 ppb.

NSCZ Gradient Evaluation

A review of the gradient data based on the piezometers in the NSCZ indicated that the groundwater control system is meeting the performance standard of the ROD. The ROD requires that "an inward gradient shall be maintained within the barrier wall in areas of plume concentration". To monitor the gradient, piezometers have been installed in the NSCZ in eight (8) arrays parallel to the desired gradient direction as shown on Figures 3 and 4 in Attachment 1. To evaluate the gradient control performance of the groundwater collection system, the Brio Site Gradients maps in the AERs were reviewed. For the gradient maps in the first, second and third AERs, several piezometer arrays were represented by more than one direction arrow per array. That is, a gradient arrow was used to represent the gradient between individual piezometers. Where three piezometers are present for an array, two arrows are presented. For the more current data (6 April 2007 to 1 February 2008), each array is represented with one arrow. Therefore, for this evaluation only this more recent data was used for the evaluation. The evaluation was performed by counting the number of arrows for each map that indicate an inward gradient. These values were then plotted against the date the measurements were taken as shown in Figure 5 of Attachment 1. From September 14, 2007 to February 1, 2008, the data indicates that gradients were inward on seven or eight of the arrays, with two exceptions. For the majority of that time, the NSCZ was shown to have an inward gradient on all eight arrays. Testing of the collection system and collection and treatment equipment problems resulted in the lower number of inward arrays shown in the May to September 2007 timeframe. The sheet pile wall, soil-bentonite barrier wall and groundwater control system are performing as designed to control migration of groundwater to Mud Gully.

Surface Water Evaluation

The review of the quarterly surface water data concluded that the performance standards for Mud Gully and Clear Creek are currently being met, and in fact, had not been exceeded for many years. Graphs of those results are shown in Figures 6 through 9 of Attachment 1.

Air Monitoring Evaluation

A review of the semi-annual air data generated by the fence line air monitoring network indicates that the performance standard for air monitoring system is being met. Results of the semi-annual fence line air samples compared to the fence line ambient air quality standards (FLAAQS) show no exceedances.

Site Inspection

A site visit was conducted on January 16, 2008, to acquaint the participants with site conditions. Site visit participants included John Meyer (EPA, Region VI), John Danna (Brio Site Task Force), Lawrence Engle, (URS Corporation), Cliff Murray and Frank Roepke (U.S. Army Corps of Engineers, Tulsa District). Photo documentation of the visit is included in this report (See

Attachment 5). The site inspection checklist completed during the site visit is included as Attachment 4.

Overall, the team noted that the site appeared to be well maintained with no maintenance or operational problems apparent.

Interviews

Interviews were conducted with key citizens who have the possibility of being impacted by the site. Mr. Travis Green is an administrator of the adjacent hospital (Memorial Hermann Southeast Hospital). Mrs. Marie Flickenger is an area resident, the publisher of the local newspaper and sits on the Board of Regents for the nearby community college. Ms. Terri Cadoree is a sales representative for a home builder in a housing development less than a mile from the site. Ms. Fay Duke is the TCEQ representative with responsibility for this site. Details of these interviews are provided in Attachment 7. No problems regarding the site were identified during the interviews.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, sampling results, ARARs, risk assumptions, and the results of the site inspection indicate that the remedy is functioning as intended by the amended ROD. Following the implementation of the remedy, all measures appear to be functioning as designed to control groundwater discharges and air emissions.

Maintenance activities (i.e. groundwater and DNAPL extraction, monitoring slurry walls and sheet piles, cap inspection and mowing cap) will maintain the effectiveness of the remedy.

Monitoring activities are being conducted and are adequate to determine the protectiveness and effectiveness of the remedy. Laboratory analytical methods have been changed to lower the detection limits and quantitation limits of chemicals of interest.

Since the last five-year review, deed restrictions and notices have been implemented to compliment the existing site control (fencing and signs). The Institutional Control Plan has been added to the MOM Plan to document these control measures. Chains and locks on gates and outbuildings have been improved to resist tampering and access by trespassers.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Since the development of the exposure assumptions, the area surrounding the Brio site has changed dramatically. At the time of the RI, the Southbend Subdivision was located immediately adjacent to the north portion of the site. The subdivision has since been abandoned and demolished,

substantially reducing the potential receptors. Also, a new subdivision is currently being developed east of the site. The cleanup levels used to establish the extent of the remedy are still valid, however, since they were based predominantly on a trespasser scenario.

Changes in Standards and To Be Considered

As stated in the previous five year review, subsequent to the 1997 ROD amendment, the Texas surface water quality standards for three of the chemicals have been revised under 30 TAC §307. Specifically, the standard for 1,2-dichlorethane changed from 1794 μg/L to 73.94 μg/L, the 1,1 dichlorethylene standard changed from 87.4 μg/L to 5.84 μg/L and the vinyl chloride standard increased from 94.5 μg/L to 415 μg/L. These numbers would apply to Clear Creek. For Mud Gully, considered an incidental fishery, the TCEQ surface water quality standards would be ten (10) times these revised values.

Since 1993, sampling has been conducted in Mud Gully and Clear Creek to measure the effectiveness of the interim groundwater recovery system, and more recently, the effectiveness of the barrier wall and groundwater collection system. A review of the surface water data since 1999 shows that the controls implemented for the groundwater have reduced the loading to the surface water to below the ARARs established in the amended ROD and below the revised Texas water quality standards. Because the remedy is currently achieving the new standards, there is no concern about the protectiveness of the remedy. The revised water quality standards have been incorporated into the MOM plan (Section 5.2.5 and Table 4) and designated as the BSTF Surface Water Quality Goals. They are used to compare sample results for informational purposes. The Surface Water Performance Standard remains the sole criteria used for compliance. However, if the BSTF Surface Water Quality Goals are exceeded in the future, further evaluation of the surface water standards may be required.

The toxicity values used by TCEQ for their Texas Risk Reduction Program (TRRP) have changed for two compounds since the ROD was approved. The Reference Dose (RfD) for chronic oral exposure for 1,1-Dichloroethane was increased from 0.1 mg/kg-day to 0.2 mg/kg-day on March 30, 2007. On March 27, 2003, the RfD for 1,1-Dichloroethene was increased from 0.009 mg/kg-day to 0.05 mg/kg-day, along with the removal of the Oral Slope Factor and Inhalation Unit Risk Factors and the addition of an Inhalation Reference Concentration (0.2 mg/m^3). The changes for 1,1-Dichloroethene were all made based on toxicity changes made by the EPA in June 2002; however, the same increase in the RfD for 1,1-Dichloroethane has not been made by the EPA. These RfD changes were increases in the toxicity values; therefore, the remedy from the ROD is still more protective than the effects of the RfD changes on risk for these two compounds.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The amended ROD requires that site control be maintained through the use of fencing and

the imposition of deed notices or restrictions (if possible). Deed notices or restrictions have been implemented on the property, further increasing the effectiveness of the remedy. The Brio Site Task Force currently controls the site, and a fence has been maintained around the perimeter of the site. The expected long term maintenance and operations at the site will involve a continual site presence.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the amended ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

VIII. Issues

Table 3 - Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Possibly increasing trend of contaminants in FFSZ. Detections reported from October 2006 and 2007 in wells BMW-3B and BMW-18B represent too few data points at the current time to determine if a trend in exists. As required by the ROD, two consecutives detections above the applicable MCL will trigger the generation of a report within 60 days. The report will evaluate the likely cause for the presence of the compound and propose relevant response actions. Since the MCL for 1,2-DCA of 5 ug/l was exceeded in BMW-3B (5.7 ug/l) in Octber 2007, the next result from this well will determine whether a report will be necessary.	N	Y

IX. Recommendations and Follow-Up Actions

Table 4 - Recommendations and Follow-Up Actions

Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Possibly increasing trend of contaminants in FFSZ	Continued annual groundwater sampling will establish whether a trend exists and whether a report for exceedance is necessary. Increased frequency of sampling may be necessary to establish trend.	BSTF	EPA	Annual Effectiveness Report	N	N

X. Protectiveness Statement

Since the Second Five Year Review, the EPA and TCEQ "conducted a final inspection on April 20, 2006 and determined that the remedial action had been successfully executed" (Final Close Out Report, December 25, 2006). Installation of the remedial alternative has been completed. The action has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated soils or groundwater. The implemented actions are functioning as intended and remain protective of human health and the environment.

Long-term protectiveness of the remedial action will be verified by continuing to obtain monitor air, groundwater, and surface water to assess the effectiveness of the site controls.

XI. Next Review

The next five-year review for the Brio Refining Superfund Site is required by May 2013, five years from the date of this review.

ATTACHMENTS

ATTACHMENT 1

Figures

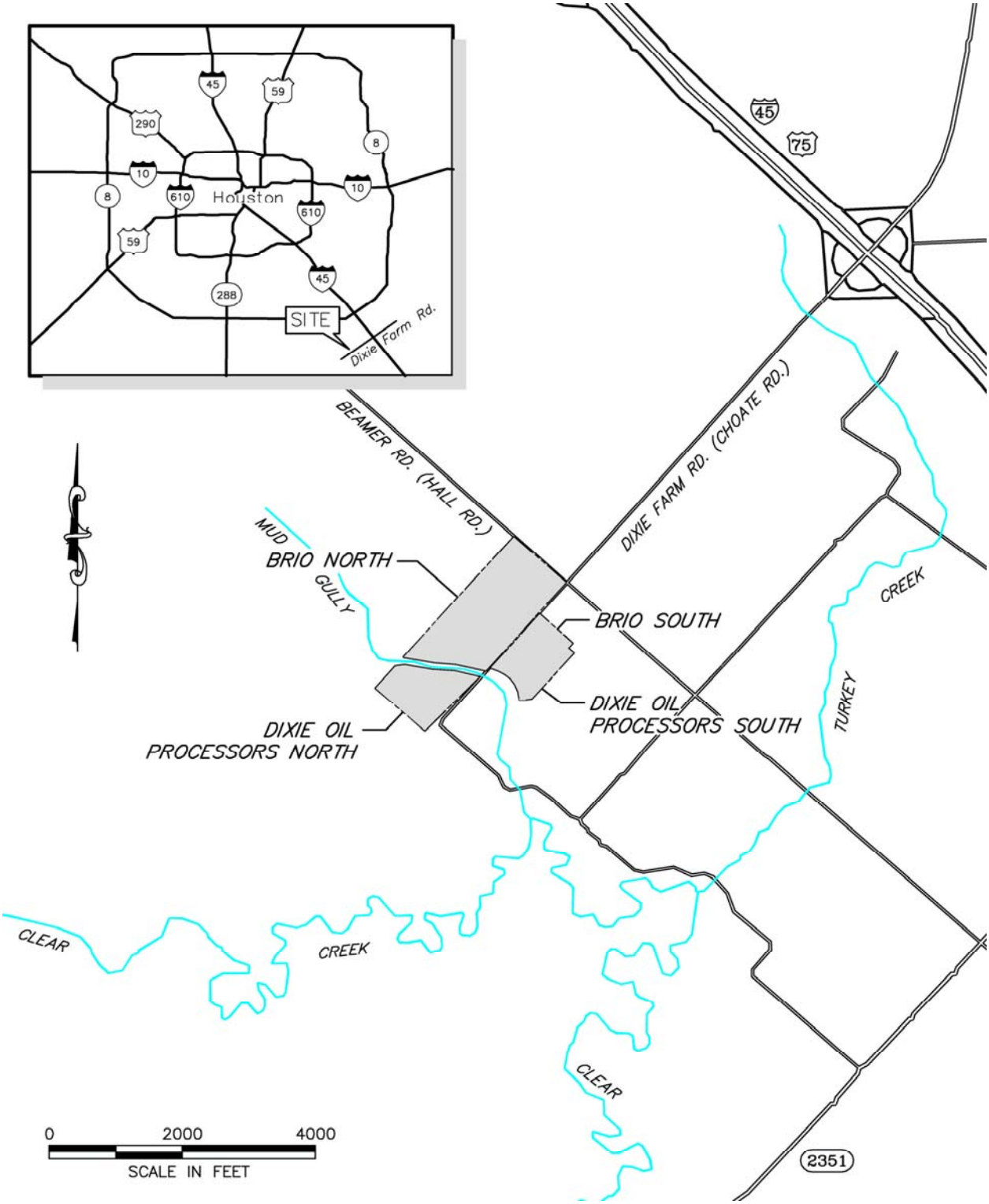

Houston
SITE
Dixie Farm Rd.
BEAMER RD. (HALL RD.)
DIXIE FARM RD. (CHOATE RD.)
MUD GULLY
BRIO NORTH
BRIO SOUTH
DIXIE OIL PROCESSORS NORTH
DIXIE OIL PROCESSORS SOUTH
TURKEY CREEK
CLEAR CREEK
CLEAR
0 2000 4000
SCALE IN FEET

Figure 1

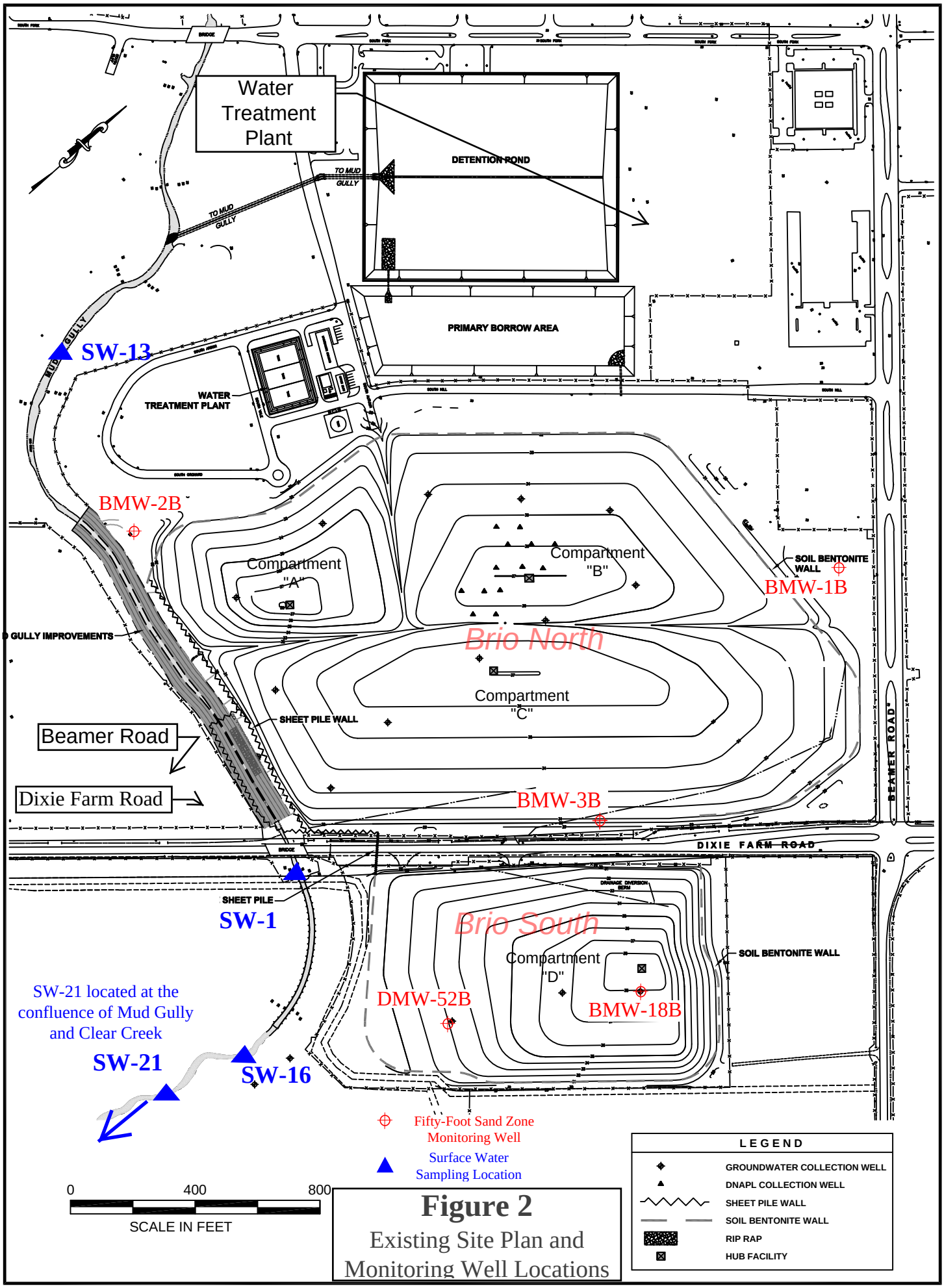
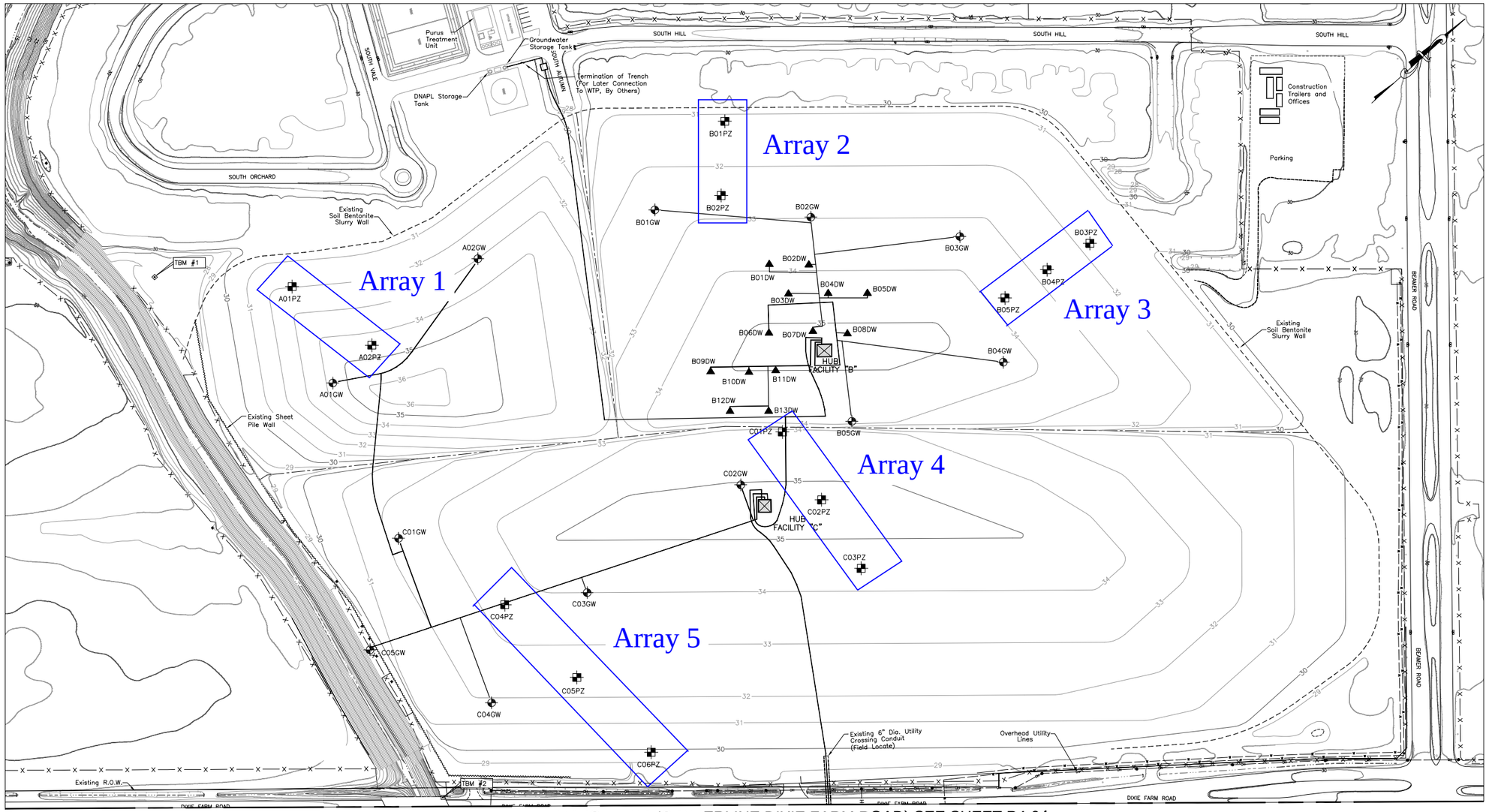


Figure 2

Existing Site Plan and Monitoring Well Locations



MATCH LINE (CENTERLINE DIXIE FARM ROAD) SEE SHEET P4-04

NOTES

1. SEE DRAWING P4-01 FOR TEMPORARY BENCHMARK (TBM) DESCRIPTIONS.
2. WELL AND PIEZOMETER INSTALLATION WILL TAKE PLACE BETWEEN THE ROUGH GRADING AND FINAL GRADING PHASES OF THE COVER CONSTRUCTION (BY OTHERS). WELL COMPLETION, PIPING RUNS AND HUB FACILITY CONSTRUCTION WILL OCCUR AFTER COVER PLACEMENT.
3. GROUND SURFACE CONTOURS REFLECT THE ROUGH GRADING ELEVATIONS AT THE TIME OF WELL INSTALLATION. GEOSYNTHETIC MATERIAL AND FINAL GRADING SOILS WILL BE PLACED (BY OTHERS) PRIOR TO TRENCHING AND PIPING INSTALLATION.
4. COLLECTION/TRANSFER TRENCHES SHOWN REPRESENT THE GENERAL ALIGNMENT RELATED TO THE WELLS, HUB FACILITIES AND THE WTP PLANT. DETAILED TRENCH PIPING IS INCLUDED ON DRAWINGS P4-13 TO P4-15.
5. DRILL CUTTINGS SHALL BE COLLECTED AND STABILIZED WITH FLYASH OR PORTLAND CEMENT UNTIL A FIRM TO STIFF CONSISTENCY IS REACHED. THE BSTF WILL IDENTIFY ONSITE STOCKPILE AREAS (WITHIN THE VERTICAL BARRIER WALL) FOR PLACEMENT OF STABILIZED DRILL CUTTINGS.
6. CAP WELLS AT COMPLETION OF INSTALLATION AND WELL DEVELOPMENT ACTIVITIES. WELLS SHALL REMAIN CAPPED UNTIL COLLECTION PUMPS ARE INSTALLED.

LEGEND

- ELEVATION CONTOUR
- DEPRESSION
- FENCE
- EASEMENTS
- EXISTING SOIL BENTONITE SLURRY WALL
- EXISTING SHEET PILE WALL
- OVERHEAD UTILITY LINES
- SWBT FIBER TRANSMISSION LINE
- WATER LINE
- COLLECTION/TRANSFER PIPING TRENCH
- UNDERGROUND CONDUIT
- STRUCTURES
- PIEZOMETERS
- GROUNDWATER COLLECTION WELLS
- DNAPL COLLECTION WELLS
- HUB FACILITY

HUB A			
ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB A	NOT INSTALLED	--	--
HUB A	NOT INSTALLED	--	--
A01GW	GW WELL	651,153.28	3,206,457.53
A02GW	GW WELL	651,518.18	3,206,466.45
A01PZ	PIEZOMETER	651,218.71	3,206,268.66
A02PZ	PIEZOMETER	651,257.00	3,206,453.82

HUB B			
ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB B	NE CORNER OF BLDG	651,911.28	3,207,040.21
HUB B	SW CORNER OF BLDG	651,874.41	3,207,039.55
B01GW	GW WELL	651,831.75	3,206,623.47
B02GW	GW WELL	652,043.95	3,206,833.31
B03GW	GW WELL	652,230.88	3,207,051.28
B04GW	GW WELL	652,131.90	3,207,285.10
B05GW	GW WELL	651,841.38	3,207,175.51
B01PZ	PIEZOMETER	652,044.26	3,206,587.20
B02PZ	PIEZOMETER	651,944.23	3,206,687.84
B03PZ	PIEZOMETER	652,406.69	3,207,227.16
B04PZ	PIEZOMETER	652,312.10	3,207,209.84
B05PZ	PIEZOMETER	652,216.25	3,207,196.10
B01DW	DNAPL WELL	651,925.14	3,20,6846.76
B02DW	DNAPL WELL	651,980.67	3,206,898.00

HUB B (CONT'D)			
ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
B03DW	DNAPL WELL	651914.59	3206913.28
B04DW	DNAPL WELL	651971.60	3206963.25
B05DW	DNAPL WELL	652027.43	3207013.38
B06DW	DNAPL WELL	651836.83	3206943.91
B07DW	DNAPL WELL	651901.42	3206997.56
B08DW	DNAPL WELL	651947.37	3207045.18
B09DW	DNAPL WELL	651704.50	3206942.32
B10DW	DNAPL WELL	651758.26	3206974.10
B11DW	DNAPL WELL	651798.24	3207005.81
B12DW	DNAPL WELL	651681.51	3207005.14
B13DW	DNAPL WELL	651736.50	3207054.41

HUB C			
ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB C	NE CORNER OF BLDG	651,626.34	3,207,183.13
HUB C	SW CORNER OF BLDG	651,592.46	3,207,185.13
C01GW	GW WELL	651,048.18	3,206,761.89
C02GW	GW WELL	651,602.47	3,207,123.65
C03GW	GW WELL	651,246.54	3,207,080.20
C04GW	GW WELL	650,970.08	3,207,114.35
C05GW	GW WELL	650,865.13	3,206,883.82
C01PZ	PIEZOMETER	651,729.17	3,207,101.85
C02PZ	PIEZOMETER	651,698.00	3,207,248.01
C03PZ	PIEZOMETER	651,666.89	3,207,396.33
C04PZ	PIEZOMETER	651,114.30	3,206,992.16
C05PZ	PIEZOMETER	651,123.49	3,207,187.37
C06PZ	PIEZOMETER	651,133.76	3,207,388.84

* EXISTING WELL. ALIGNMENT OF COLLECTION PIPING TO BE FIELD DETERMINED.

0 100 200
SCALE IN FEET

REV	DESCRIPTION OF REVISION	BY	DATE
4	AS-BUILT	DH	08/06/04
3	AS-BUILT	RH	05/19/04
2	ISSUED FOR BID	TAB	05/30/01
1	FOR EPA REVIEW	TER	10/20/00

BRIO SITE TASK FORCE

2501 DIXIE FARM ROAD
HOUSTON, TEXAS 77089

Brio North
Groundwater, DNAPL and
Piezometer Locations

WARNING
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

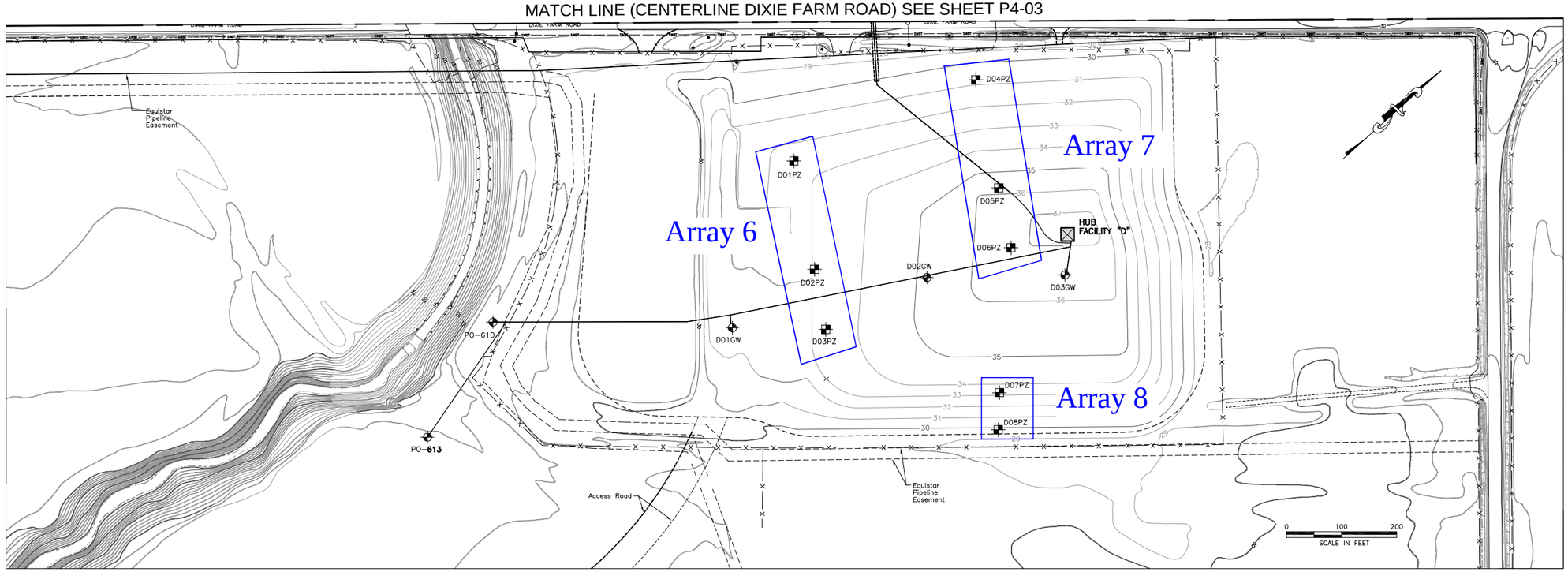
DESIGNED BY: TER
DRAWN BY: SAF/WCL
CHECKED BY: TAB
PEER REVIEWER: MAA
PROJ MANAGER: TER
DATE: 02/15/01

Figure 3

REVISION: 4
PROJECT 4600000010
DRAWING P4-03
SHEET 4 OF 22

FILENAME: P4-03 (WELL LOCATION - NORTH).dwg
PATH: K:\4600000010\0\Drawings\Design Package 4 (Groundwater Recovery-Phase 1 Only)\
DATE: 05/23/01
TIME: 8:16:00

MATCH LINE (CENTERLINE DIXIE FARM ROAD) SEE SHEET P4-03



HUB D			
ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB D	NE CORNER OF BLDG	651,340.73	3,208,210.35
HUB D	SW CORNER OF BLDG	651,306.85	3,208,212.35
D01GW	GW WELL	650,758.74	3,207,930.21
D02GW	GW WELL	651,082.25	3,208,098.90
D03GW	GW WELL	651,271.12	3,208,262.94
D01PZ	PIEZOMETER	651,044.39	3,207,780.60
D02PZ	PIEZOMETER	650,940.74	3,207,951.66
D03PZ	PIEZOMETER	650,882.89	3,208,046.04
D04PZ	PIEZOMETER	651,387.84	3,207,892.07
D05PZ	PIEZOMETER	651,287.71	3,208,065.40
D06PZ	PIEZOMETER	651,231.67	3,208,160.82
D07PZ	PIEZOMETER	651,040.22	3,208,341.90
D08PZ	PIEZOMETER	650,993.72	3,208,390.65

NOTES

1. SEE DRAWING P4-01 FOR TEMPORARY BENCHMARK (TBM) DESCRIPTIONS.
2. WELL AND PIEZOMETER INSTALLATION WILL TAKE PLACE BETWEEN THE ROUGH GRADING AND FINAL GRADING PHASES OF THE COVER CONSTRUCTION (BY OTHERS). WELL COMPLETION, PIPING RUNS AND HUB FACILITY CONSTRUCTION WILL OCCUR AFTER COVER PLACEMENT.
3. GROUND SURFACE CONTOURS REFLECT THE ROUGH GRADING ELEVATIONS AT THE TIME OF WELL INSTALLATION. GEOSYNTHETIC MATERIAL AND FINAL GRADING SOILS WILL BE PLACED (BY OTHERS) PRIOR TO TRENCHING AND PIPING INSTALLATION.
4. COLLECTION/TRANSFER TRENCHES SHOWN REPRESENT THE GENERAL ALIGNMENT RELATED TO THE WELLS, HUB FACILITIES AND THE WTP PLANT. DETAILED TRENCH PIPING IS INCLUDED ON DRAWING P4-16.
5. DRILL CUTTINGS SHALL BE COLLECTED AND STABILIZED WITH FLYASH OR PORTLAND CEMENT UNTIL A FIRM TO STIFF CONSISTENCY IS REACHED. THE BSTF WILL IDENTIFY ONSITE STOCKPILE AREAS (WITHIN THE VERTICAL BARRIER WALL) FOR PLACEMENT OF STABILIZED DRILL CUTTINGS.
6. CAP WELLS AT COMPLETION OF INSTALLATION AND WELL DEVELOPMENT ACTIVITIES. WELLS SHALL REMAIN CAPPED UNTIL COLLECTION PUMPS ARE INSTALLED.

LEGEND

- ELEVATION CONTOUR
- DEPRESSION
- FENCE
- EASEMENTS
- EXISTING SOIL BENTONITE SLURRY WALL
- EXISTING SHEET PILE WALL
- OVERHEAD UTILITY LINES
- SWBT FIBER TRANSMISSION LINE
- WATER LINE
- COLLECTION/TRANSFER PIPING TRENCH
- UNDERGROUND CONDUIT
- STRUCTURES
- PIEZOMETERS
- GROUNDWATER COLLECTION WELLS
- HUB FACILITY

REV	DESCRIPTION OF REVISION	BY	DATE
4			
3			
2	AS-BUILT	DH	08/06/04
1	AS-BUILT	RH	05/19/04
0	ISSUED FOR BID	TAB	05/30/01
A	FOR EPA REVIEW	TER	10/20/00

BRIO SITE TASK FORCE

2501 DIXIE FARM ROAD
HOUSTON, TEXAS

Brio South
Groundwater, DNAPL and
Piezometer Locations

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED BY: TER
DRAWN BY: SAF/WCL
CHECKED BY: TAB
PEER REVIEWER: MAA
PROJ MANAGER: TER
DATE: 10/20/00

Figure 4

REVISION: 4
PROJECT 4600000010
DRAWING P4-04
SHEET 5 OF 22

DATE: 05/23/01
TIME: 14:00:00
FILENAME: P4-04_WELL LOCATION PLAN - SOUTH.dwg
PATH: M:\0001\0010\01\Drawings\Design Package 4 (Groundwater Recovery-Phase 1 Only)\

Figure 5

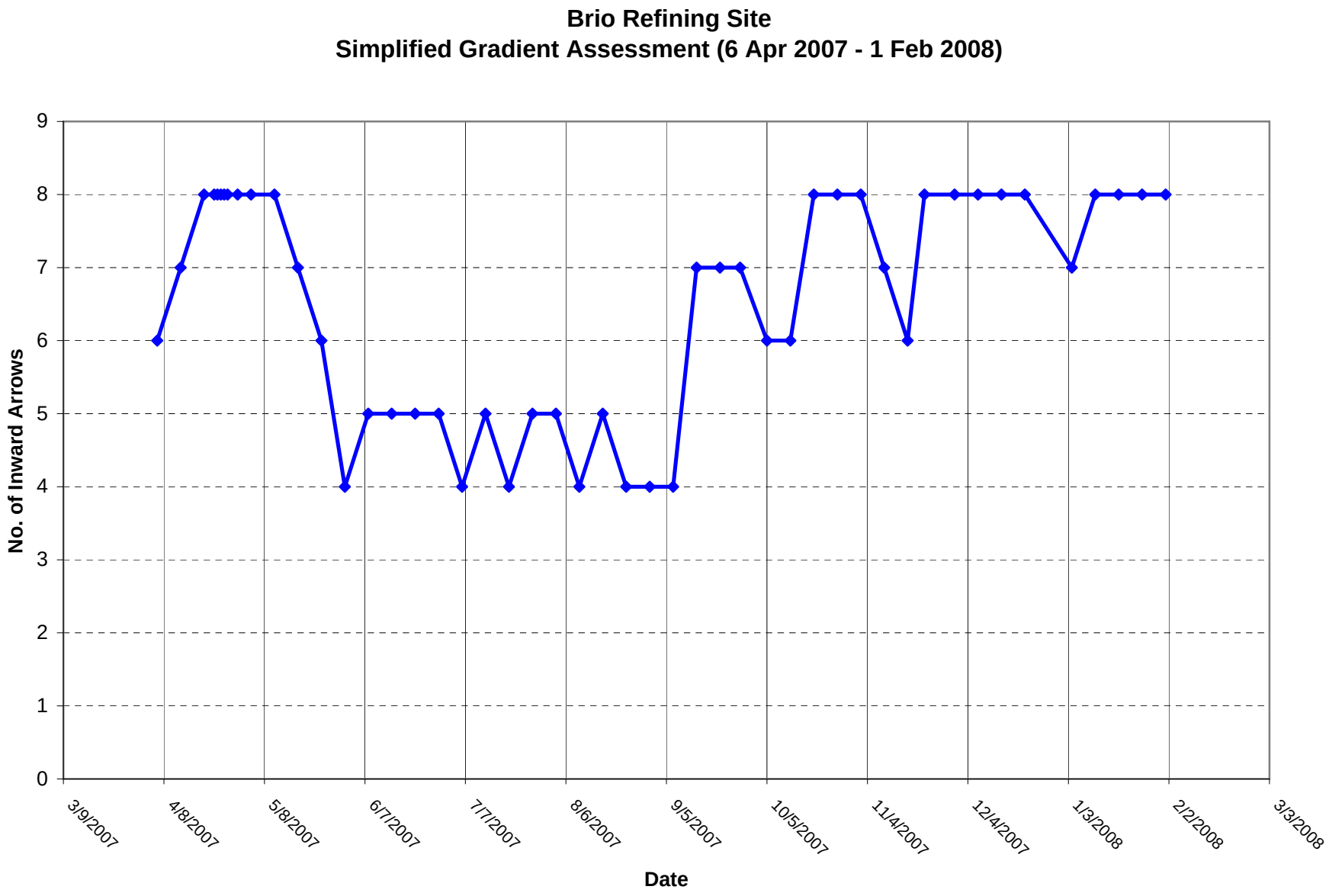

Brio Refining Site
Simplified Gradient Assessment (6 Apr 2007 - 1 Feb 2008)
No. of Inward Arrows
0
1
2
3
4
5
6
7
8
9
3/9/2007
4/8/2007
5/8/2007
6/7/2007
7/7/2007
8/6/2007
9/5/2007
10/5/2007
11/4/2007
12/4/2007
1/3/2008
2/2/2008
3/3/2008
Date

Figure 6

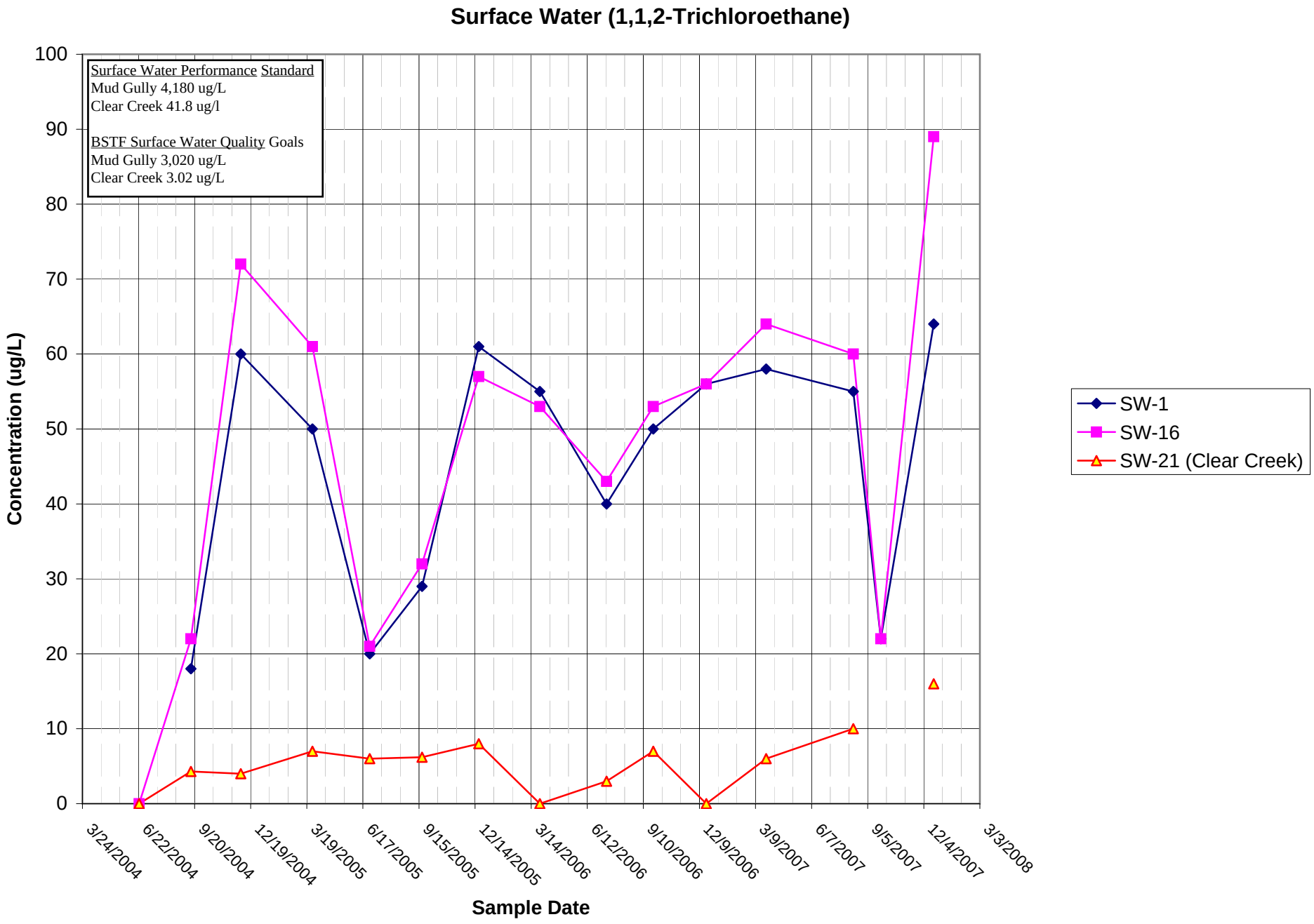

Surface Water (1,1,2-Trichloroethane)
Surface Water Performance Standard
Mud Gully 4,180 ug/L
Clear Creek 41.8 ug/l
BSTF Surface Water Quality Goals
Mud Gully 3,020 ug/L
Clear Creek 3.02 ug/L
Concentration (ug/L)
100
90
80
70
60
50
40
30
20
10
0
3/24/2004
6/22/2004
9/20/2004
12/19/2004
3/19/2005
6/17/2005
9/15/2005
12/14/2005
3/14/2006
6/12/2006
9/10/2006
12/9/2006
3/9/2007
6/7/2007
9/5/2007
12/4/2007
3/3/2008
Sample Date
SW-1
SW-16
SW-21 (Clear Creek)

Figure 7

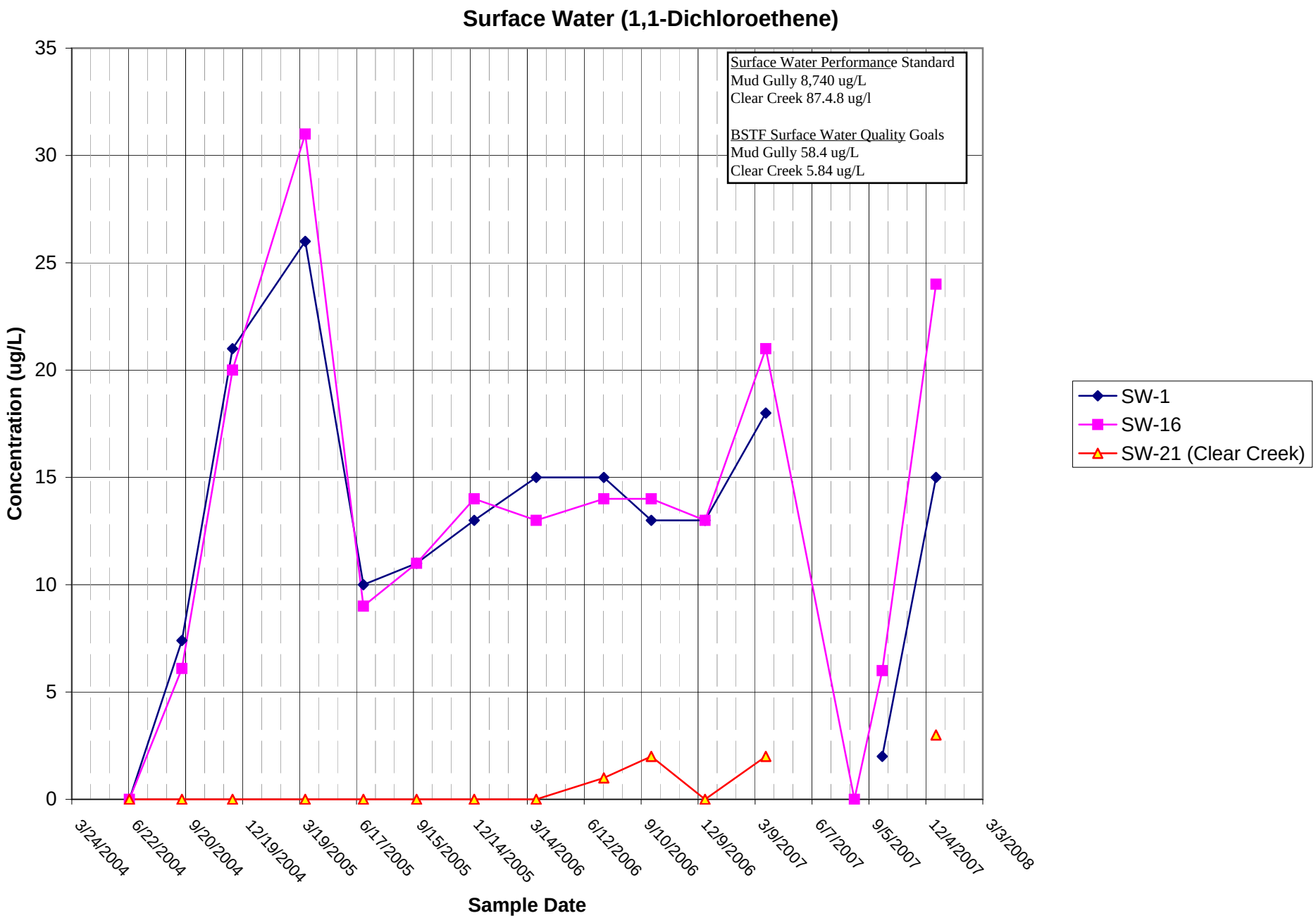

Surface Water (1,1-Dichloroethene)
Surface Water Performance Standard
Mud Gully 8,740 ug/L
Clear Creek 87.4.8 ug/l
BSTF Surface Water Quality Goals
Mud Gully 58.4 ug/L
Clear Creek 5.84 ug/L
Concentration (ug/L)
35
30
25
20
15
10
5
0
3/24/2004
6/22/2004
9/20/2004
12/19/2004
3/19/2005
6/17/2005
9/15/2005
12/14/2005
3/14/2006
6/12/2006
9/10/2006
12/9/2006
3/9/2007
6/7/2007
9/5/2007
12/4/2007
3/3/2008
Sample Date
SW-1
SW-16
SW-21 (Clear Creek)

Figure 8

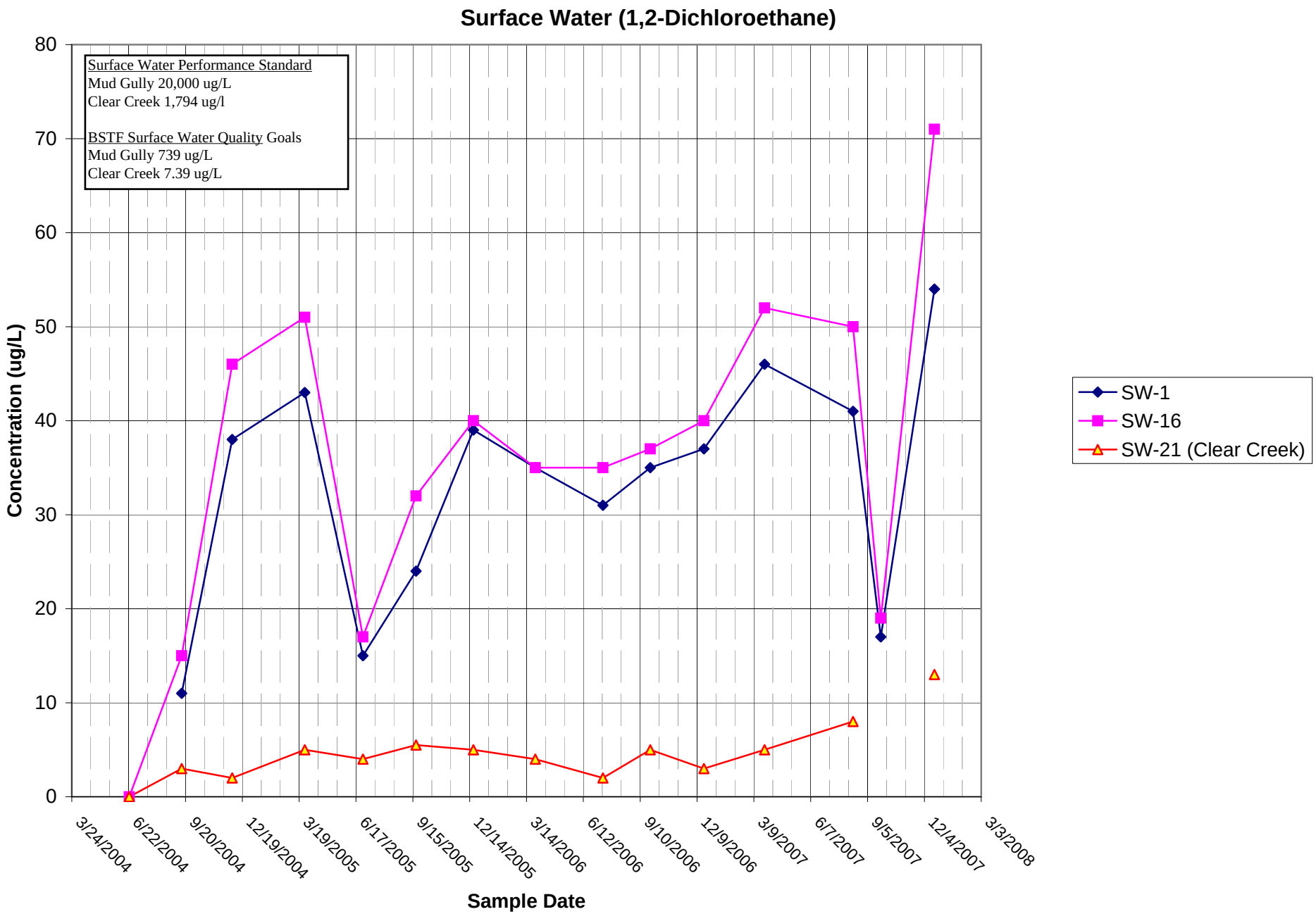
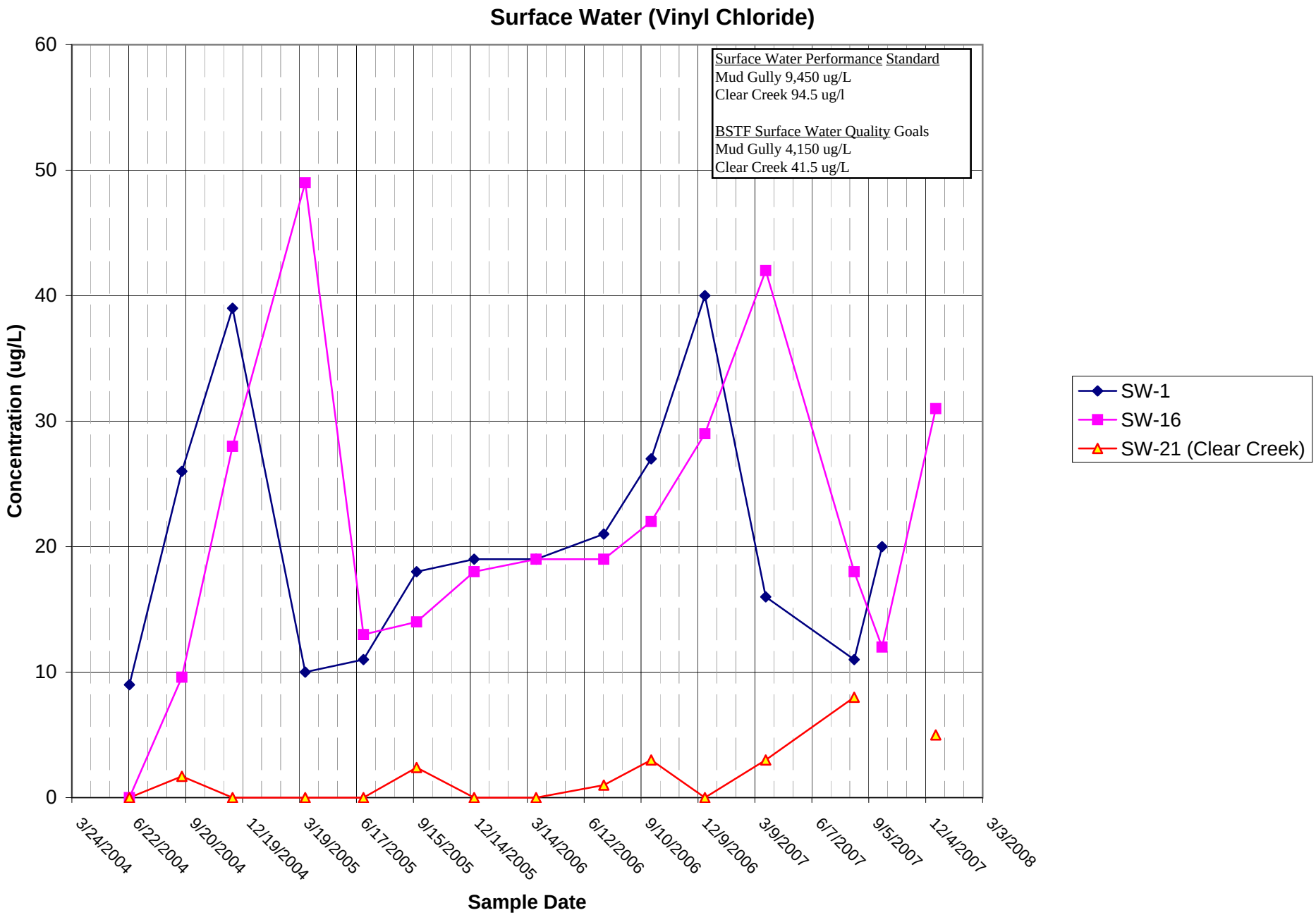

Surface Water (1,2-Dichloroethane)
Surface Water Performance Standard
Mud Gully 20,000 ug/L
Clear Creek 1,794 ug/l
BSTF Surface Water Quality Goals
Mud Gully 739 ug/L
Clear Creek 7.39 ug/L
Concentration (ug/L)
0
10
20
30
40
50
60
70
80
3/24/2004
6/22/2004
9/20/2004
12/19/2004
3/19/2005
6/17/2005
9/15/2005
12/14/2005
3/14/2006
6/12/2006
9/10/2006
12/9/2006
3/9/2007
6/7/2007
9/5/2007
12/4/2007
3/3/2008
Sample Date
SW-1
SW-16
SW-21 (Clear Creek)

Figure 9


Surface Water (Vinyl Chloride)
Surface Water Performance Standard
Mud Gully 9,450 ug/L
Clear Creek 94.5 ug/l
BSTF Surface Water Quality Goals
Mud Gully 4,150 ug/L
Clear Creek 41.5 ug/L
Concentration (ug/L)
0
10
20
30
40
50
60
3/24/2004
6/22/2004
9/20/2004
12/19/2004
3/19/2005
6/17/2005
9/15/2005
12/14/2005
3/14/2006
6/12/2006
9/10/2006
12/9/2006
3/9/2007
6/7/2007
9/5/2007
12/4/2007
3/3/2008
Sample Date
SW-1
SW-16
SW-21 (Clear Creek)

ATTACHMENT 2

List of Documents Reviewed

Brio Refining Site Amended Record of Decision, July 2, 1997

Brio Refining Site Five Year Review, January 8, 1998

Completion Report for the Mud Gully Improvements Construction, June 2003

Completion Report for the Brio-North Cover System Construction, February 2004

Brio Superfund Site Construction Completion Report for the Groundwater/DNAPL Collection System, August 2004

Brio Site Task Force First Annual Effectiveness Report, May 2005

Gas Treatment System Design and Completion Report for the Brio Superfund Site, November 16, 2005

Institutional Control Plan for the Brio Refining Superfund Site, February 2, 2006

Brio Refining Site Maintenance, Operations, and Monitoring Plan, Feb 2004, Revision 2, March 2006

Brio Site Task Force Second Annual Effectiveness Report, May 2006

Brio Site Task Force Third Annual Effectiveness Report, June 2007

ATTACHMENT 3

Site Monitoring Criteria

Treated Water Discharge Criteria (Table 2 of MOM Plan)

PARAMETER	DISCHARGE LIMIT (mg/l)	PQL (mg/l)
General Chemistry		
pH	6.0-9.0	n/a
BOD	81	5
COD	568	20
Sulfur (Sulfide)	0.6	0.2
Phosphorus	4	0.1
Ammonia as N	23	4
Oil and Grease	31	10
Phenolics	0.7	0.2
TSS	62	5
Semivolatiles		
Bis(2-chloroethyl)ether	0.757	0.020
Total Carcinogenic PNAs[1]	0.350 (total)	0.020 (each)
Total Noncarcinogenic PNAs[2]	0.470 (total)	0.020 (each)

PARAMETER	DISCHARGE LIMIT (mg/l)	PQL (mg/l)
Metals		
Copper	0.093	0.010
Volatiles		
1, 1, 2-Trichloroethane	0.054	0.010
1, 2-Dichloroethane	0.211	0.010
Vinyl Chloride	0.268	0.010
Methylene Chloride	0.089	0.010

1. Benzo(a)anthracene
   Benzo(b)fluoranthene
   Benzo(k)fluoranthene
   Benzo(a)pyrene
   Dibenzo(a,h)anthracene
   Indeno(1,2,3,c,d)pyrene
   Chrysene

2. Acenaphthene
   Anthracene
   Pyrene
   Fluoranthene
   Fluorene
   Naphthalene
   Phenanthrene

Surface Water Performance Standards and Quality Goals (Table 4 of MOM Plan)

	Surface Water Performance Standards (ug/l)		BSTF Surface Water Quality Goals* (ug/l)	
Compound	**Mud Gully**	**Clear Creek**	**Mud Gully**	**Clear Creek**
1, 1, 2-Trichloroethane	4,180	41.8	3020	302
1, 2-Dichloroethane	20,000	1,794	739	73.9
1, 1-Dichloroethene	8,740	87.4	58.4	5.84
Vinyl Chloride	9,450	94.5	4150	415

*These levels are based on the Texas Commission on Environmental Quality (TCEQ) surface water quality standards as adopted in August 2002, and based on calculations presented in the Texas Total Maximum Daily Load (TMDL) Program.

Fenceline Ambient Air Quality Standards(FLAAQS)
(Table 3C of MOM Plan)

COMPOUND	FLAAQS - 24-Hour Average (ppb)
Benzene	50
1, 2-Dichloroethane (Ethylene Dichloride)	200
Methylene Chloride	1100
1, 1, 2-Trichloroethane	656
Vinyl Chloride	690

NSCZ Groundwater Performance Standards
(Table 5 of MOM Plan)

PARAMETER	CRITERIA (mg/ l)
1, 1, 2-Trichloroethane	4.18
1, 2-Dichloroethane	20.00
1, 1-Dichloroethene	8.74
Vinyl Chloride	9.45

FFSZ Groundwater Drinking Water List and Maximum Contaminant List (MCL)
(Table 6 of MOM Plan)

	MCL (ug/l)		MCL (ug/l)
Volatile			
Benzene	5	Ethylbenzene	700
Carbon Tetrachloride	5	Styrene	100
Chlorobenzene	100	Tetrachloroethene	5
1, 2-Dichlorobenzene (o-dichlorobenzene)	600	Toluene	1000
1, 4-Dichlorobenzene (p-dichlorobenzene)	75	1, 2, 4-Trichlorobenzene	70
1, 2-Dichloroethane	5	1, 1, 1-Trichloroethane	200
1, 1-Dichloroethene	7	1, 1, 2-Trichloroethane	5
cis-1, 2-Dichloroethene	70	Trichloroethene	5
trans-1, 2-Dichloroethene	100	Vinyl Chloride	2
Methylene Chloride (Dichloromethane)	5	Xylenes (Total)	10000
1, 2-Dichloropropane	5	Total trihalomethanes (TTHMs)*	100
Semivolatile (excluding pesticides, herbicides and PCBs)			
Benzo(a)pyrene (PAHs)	0.2	Hexachlorocyclopentadiene	50
bis(2-Ethylhexyl)phthalate 2	6	Pentachlorophenol	1
Hexachlorobenzene	1		

* Total trihalomethanes = Chloroform, Bromodichloromethane, Bromoform, and Dibromochloromethane

ATTACHMENT 4

Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION	
Site name: **Brio Refining Superfund Site**	Date of inspection: **16 January 2008**
Location and Region: **Houston, Texas**	EPA ID: **TXD980625453**
Agency, office, or company leading the five-year review: **Environmental Protection Agency**	Weather/temperature: **Overcast , rain prior to visit (> 1 in in last 12 hours), temperature in low 50's.**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ■ Surface water collection and treatment
- ■ Monitored natural attenuation
- ☒ Groundwater containment
- ☒ Vertical barrier walls
- ■ Other: DNAPL collection system, Air monitoring; Long term groundwater monitoring

Attachments: ■ Inspection team roster attached ■ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** John Danna (Name) Site Manager (Title) 1/16/08 (Date)
   Interviewed ■ at site ■ at office ■ by phone Phone no. _____
   Problems, suggestions; ☒ Report attached _ _____
   Participated in Site Visit Interview form included in the 5-year review report (Attachment 6)

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ■ at office ■ by phone Phone no. _____
   Problems, suggestions; ■ Report attached _____
   _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ■ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ■ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ■ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ■ Report attached _____
_____

4. **Other interviews** (optional) ■ Report attached.

Participants in Site Visit (1/16/08):

John Meyer - EPA

John Danna – Phenix Services, Inc.

Lawrence Engle – URS Corporation

Cliff Murray – U.S. Army Corps of Engineers, Tulsa District

Frank Roepke - U.S. Army Corps of Engineers, Tulsa District

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	■ O&M manual	☒ Readily available	☒ Up to date	■ N/A
	■ As-built drawings	☒ Readily available	■ Up to date	■ N/A
	■ Maintenance logs	☒ Readily available	☒ Up to date	■ N/A
	Remarks These O&M documents are in the Mantenance, Operations and Monitoring Plan and the completion reports of each phase.			
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	■ Up to date	■ N/A
	■ Contingency plan/emergency response plan	☒ Readily available	■ Up to date	■ N/A
	Remarks			
3.	**O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	■ N/A
	Remarks			
4.	**Permits and Service Agreements**			
	■ Air discharge permit	■ Readily available	■ Up to date	☒ N/A
	■ Effluent discharge	■ Readily available	■ Up to date	☒ N/A
	■ Waste disposal, POTW	■ Readily available	■ Up to date	☒ N/A
	■ Other permits None	■ Readily available	■ Up to date	■ N/A
	Remarks Actions performed under CERCLA. No permits necessary			
5.	**Gas Generation Records**	■ Readily available	■ Up to date	☒ N/A
	Remarks			
6.	**Settlement Monument Records**	■ Readily available	■ Up to date	☒ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	■ N/A
	Remarks			
8.	**Leachate Extraction Records**	■ Readily available	■ Up to date	☒ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	■ Air	☒ Readily available	☒ Up to date	■ N/A
	■ Water (effluent)	☒ Readily available	☒ Up to date	■ N/A
	Remarks Compiled in Annual Effectiveness Report			
10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	■ N/A
	Remarks Visitor Sign-in Log			

IV. O&M COSTS

1. **O&M Organization**

■ State in-house ■ Contractor for State
■ PRP in-house ☒ Contractor for PRP
■ Federal Facility in-house ■ Contractor for Federal Facility
■ Other_____

2. **O&M Cost Records** Not applicable to PRP

■ Readily available ■ Up to date
■ Funding mechanism/agreement in place
Original O&M cost estimate_____ ■ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ■ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ■ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ■ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ■ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ■ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____
None noted. Operating and maintenance costs are normal and reasonable.

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ■ N/A

A. Fencing

Reference Appendix I of the Maintenance, Operations and Monitoring Plan for the Institutional Control Plan.

1. **Fencing damaged** ■ Location shown on site map ☒ Gates secured ■ N/A

Remarks Fences are well maintained. Gates secured and locked.

B. Other Access Restrictions

1. **Signs and other security measures** ■ Location shown on site map ■ N/A

Remarks Signs posted on main entrances and most other access points. Additional measures implemented for security and deterrence of trespassers.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ■ Yes ☒ No ■ N/A
Site conditions imply ICs not being fully enforced ■ Yes ☒ No ■ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self reporting
Frequency daily
Responsible party/agency Brio Site Task Force
Contact John Danna (Name) Site Manager (Title) 1/16/08 (Date) 281-922-1054 (Phone no.)

Reporting is up-to-date ☒ Yes ■ No ■ N/A
Reports are verified by the lead agency ☒ Yes ■ No ■ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ■ No ■ N/A
Violations have been reported ☒ Yes ■ No ■ N/A
Other problems or suggestions: ■ Report attached

2. **Adequacy** ☒ ICs are adequate ■ ICs are inadequate ■ N/A

Remarks: Deed restriction or deed notices have been executed for entire

D. General

1. **Vandalism/trespassing** ■ Location shown on site map ■ No vandalism evident

Remarks: Lock on South Brio site cut and a support vehicle (mule) stolen. Lock and chains have been replaced with more tamper-resistant models.

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ■ N/A

Remarks: Continued residential development east of site (NE corner of Dixie Farm Rd and Beamer Rd). Dixie Farm Rd from Beamer Rd past Mud Gully undergoing improvement. Bridge over Mud Gully replaced and raised. Conservation easement south of site finalized in Dec 2005.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ■ N/A

1. **Roads damaged** ■ Location shown on site map ☒ Roads adequate ■ N/A

Remarks Concrete roads serve dual purpose as vehicle access and surface water drainage routes.

B. Other Site Conditions

Remarks _____
_____Day of site visit Mud Gully was flowing higher than normal due to rainfall in previous 12 hour period. Surface water runoff on and from site was evident._____
_____
_____
_____
_____

VII. LANDFILL COVERS ■ Applicable ■ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ■ Location shown on site map ☒ Settlement not evident
Areal extent_____ Depth_____
Remarks__Settlement, cracks, erosion, etc observed during routine inspections are documented in _Annual Effectiveness Report. _____

2. **Cracks** ■ Location shown on site map ☒ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks____Cracking has been observed during routine inspections. Capping was not designed to prevent cracking, however presence of HDPE liner prevents the protectiveness of the cap from being compromised by cracking._____

3. **Erosion** ■ Location shown on site map ☒ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Holes** ■ Location shown on site map ☒ Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
■ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks_____
_____

7. **Bulges** ■ Location shown on site map ☒ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
■ Wet areas ■ Location shown on site map Areal extent_____
■ Ponding ■ Location shown on site map Areal extent_____
■ Seeps ■ Location shown on site map Areal extent_____
■ Soft subgrade ■ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ■ Slides ■ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ■ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ■ Location shown on site map ■ N/A or okay
Remarks_____
_____

2. **Bench Breached** ■ Location shown on site map ■ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ■ Location shown on site map ■ N/A or okay
Remarks_____
_____

C. Letdown Channels ☒ Applicable ■ N/A Roads provide runoff pathway from cover area.
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ■ Location shown on site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ■ Location shown on site map ☒ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ■ Location shown on site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ■ Location shown on site map ☒ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☒ No obstructions
■ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☒ No evidence of excessive growth
■ Vegetation in channels does not obstruct flow
■ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☒ Applicable ■ N/A

1. **Gas Vents** ■ Active ☒ Passive
■ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
■ Evidence of leakage at penetration ■ Needs Maintenance
■ N/A
Remarks_Four penetrations – three on North Brio; one on South Brio. Each equipped with carbon canister for scrubbing of organic compounds._____

2. **Gas Monitoring Probes**
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
■ Evidence of leakage at penetration ■ Needs Maintenance ☒ N/A
Remarks__Gases (pre- and post-carbon canister) routinely monitored with handheld PID._____
_____

3. **Monitoring Wells** (within surface area of landfill)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
■ Evidence of leakage at penetration ■ Needs Maintenance ■ N/A
Remarks___Sampled annually_____
_____

4. **Leachate Extraction Wells**
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
■ Evidence of leakage at penetration ■ Needs Maintenance ☒ N/A
Remarks_____
_____

5. **Settlement Monuments** ■ Located ■ Routinely surveyed ☒ N/A
Remarks_____
_____

E. Gas Collection and Treatment ☒ Applicable ■ N/A

1. **Gas Treatment Facilities**
■ Flaring ■ Thermal destruction ■ Collection for reuse
☒ Good condition ■ Needs Maintenance
Remarks Passive with carbon canister

2. **Gas Collection Wells, Manifolds and Piping**
■ Good condition ■ Needs Maintenance
Remarks N/A. Single point of collection at each of three collection points

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
■ Good condition ■ Needs Maintenance ☒ N/A
Remarks

F. Cover Drainage Layer ■ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ■ Functioning ■ N/A
Remarks

2. **Outlet Rock Inspected** ■ Functioning ■ N/A
Remarks

G. Detention/Sedimentation Ponds ☒ Applicable ■ N/A Ponds are adjacent to site; No longer owned or maintained by facility.

1. **Siltation** Areal extent_____ Depth_____ ☒ N/A
■ Siltation not evident
Remarks

2. **Erosion** Areal extent_____ Depth_____
☒ Erosion not evident
Remarks

3. **Outlet Works** ☒ Functioning ■ N/A
Remarks 2 66” outlet pipes

4. **Dam** ■ Functioning ☒ N/A
Remarks

H. Retaining Walls ■ Applicable ☒ N/A

1. **Deformations** ■ Location shown on site map ■ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ■ Location shown on site map ■ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ■ N/A

1. **Siltation** ■ Location shown on site map ☒ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ■ Location shown on site map ■ N/A
☒ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ■ Location shown on site map ☒ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☒ Functioning ■ N/A
Remarks__Off site discharge from roads/drainage are concrete structures at fenceline._____

VIII. VERTICAL BARRIER WALLS ☒ Applicable ■ N/A

1. **Settlement** ■ Location shown on site map ☒ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☒ Performance not monitored
Frequency_____ ■ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ■ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ■ Applicable ■ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ■ Good condition ■ All required wells properly operating ■ Needs Maintenance ■ N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ■ Good condition ■ Needs Maintenance
   Remarks___Extraction system pipelines are buried from extraction wells to treatment plant._____

3. **Spare Parts and Equipment**
   ■ Readily available ■ Good condition ■ Requires upgrade ■ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ■ Applicable ■ N/A

1. **Collection Structures, Pumps, and Electrical**
   ■ Good condition ■ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ■ Good condition ■ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ■ Readily available ■ Good condition ■ Requires upgrade ■ Needs to be provided
   Remarks_____

C. Treatment System ☒ Applicable ■ N/A

1. **Treatment Train** (Check components that apply)
   ■ Metals removal ☒ Oil/water separation (field) ■ Bioremediation
   ☒ Air stripping ☒ Carbon adsorbers
   ☒ Filters Pre-filter, prior to air separator
   ☒ Additive (*e.g.*, chelation agent, flocculent) defoamer, anti-scaling additive (Dequest)
   ■ Others
   ☒ Good condition ■ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☒ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☒ Quantity of groundwater treated annually 1,200,000 gallons
   ■ Quantity of surface water treated annually N/A
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ■ N/A ☒ Good condition ■ Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   ■ N/A ☒ Good condition ■ Proper secondary containment ■ Needs Maintenance
   Remarks Post treatment storage tanks are three open topped structures.

4. **Discharge Structure and Appurtenances**
   ■ N/A ☒ Good condition ■ Needs Maintenance
   Remarks Discharge to on-site ditch

5. **Treatment Building(s)**
   ■ N/A ☒ Good condition (esp. roof and doorways) ■ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ■ All required wells located ■ Needs Maintenance ■ N/A
   Remarks

D. Monitoring Data

- 1. Monitoring Data
  ☒ Is routinely submitted on time ☒ Is of acceptable quality
- 2. Monitoring data suggests:
  ☒ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
■ All required wells located ■ Needs Maintenance ☒ N/A

Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

DNAPL recovery using extraction wells targeting areas of highest DNAPL concentrations has successfully removed a large quantity of high concentration liquid. Through March 2007, 176,404 gallons of recovered product have been sent offsite for thermal treatment (Table 3-5 of Third Annual Effectiveness Report).

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The overall goal of site operations is the containment of groundwater and air emissions from the site. The vertical barrier wall consisting of the soil/bentonite wall and sheet pile wall prevent the downgradient lateral movement of contaminated groundwater. The natural horizontal barrier provided by the Middle Clay combined with the groundwater extraction system prevents or greatly inhibits the downward movement of contaminants. The flexible membrane layer of the cap system prevents the infiltration of surface water and the escape of volatile gases from the contaminated soil.

The Annual Effectiveness Report covering the period of April 1 to March 31 documents the performance check of the implemented remedy.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Groundwater pumping and treatment is critical to the long term effectiveness of the remedy. Groundwater extraction controls the groundwater gradient at the site and provides support to the containment measures provided by the vertical barrier wall. Maintenance of the cap and perimeter surface provide

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. _____ _____ _____ _____ _____ _____ _____ _____ _____
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. _____ _____ _____ _____ _____ _____ _____ _____ _____

ATTACHMENT 5

Site Inspection Photos

Photo 1. Brio Refining Site Office looking southwest.

Photo 2. Facing southwest, groundwater collection tank (left) and DNAPL collection tank (right).

Photo 3. Facing west, DNAPL collection tank and southern ends of treatment plant and site office.

Photo 4. Facing north, southern end of treatment plant.

Photo 5. Facing west. DNAPL well B07DW in foreground. Collection tanks, treatment plant and site office in the background.

Photo 6. Facing southeast, DNAPL well B07DW in foreground; Hub Facility "C" in the background.

Photo 7. Northwest side of Hub Facility “B”.

Photo 8. DNAPL/LNAPL separator for groundwater extraction wells in Hub Facility “B”. Separator for DNAPL wells located to the right.

Photo 9. Gas Collection Vent on Compartment "B" located on southwest side of Hub Facility "B". Note the two carbon units used to scrub the vented gas.

Photo 10. Inside fence line, facing west, looking up road/drainage pathway. Drainage outlet to Mud Gully on left. Note top of sheet pilings on left along fence line..

Photo 11. Facing east, looking downstream on Mud Gully. Cofferdam groundwater wells are inside fence on left of photo. Dixie Farm Road bridge is visible in background.

Photo 12. Looking west, upstream on Mud Gully from the Dixie Road Bridge. Note cofferdam wells from Photo 10 in middle right of picture and bank slope creep on side of Brio-North site.

Photo 13. Looking east on Mud Gully, east of South Brio/South Dixie Oil Processor Site.

Photo 14. Facing southeast, Brio South plume wells, PO-610 and PO-613. Note Mud Gully on right side of photo.

Photo 15. Facing north from south corner of Brio-South. Hub Facility “D” is visible in middle right of photo.

Photo 16. Facing northeast, detention pond created from South Borrow Pit. Picture taken on bank between Mud Gully and pond. Note current from water flowing from Mud Gully into pond following previous night rains.

Photo 17. Piezometer A02PZ.

Photo 18. Fifty Foot Sand Zone monitoring well BMW-2B.

Photo 19. Looking into the treatment area. Blue tank is prefilter using carbon as filter material. Gray tank are carbon filters used to polish water after air stripper.

Photo 20. Air stripper with filters in Photo 19 to the photographer's back.

Photo 21. Post-stripper air treatment system. Units in background are solid resin bed adsorption units used to remove volatile contaminants removed by air stipper. Unit in foreground is vapor recovery system used for regeneration of resin beds.

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ATTACHMENT 6

Applicable or Relevant and Appropriate Requirements (ARARs)

Medium/ Authority	ARAR	Status	Requirement Synopsis	Action to be taken to Attain ARAR
Groundwater/ SDWA	Federal - SDWA - Maximum Contaminant Levels (MCLs) (40 CFR Part 141)	Relevant and Appropriate	Standards (MCLs) have been adopted as enforceable standards for public drinking water systems. Appendix C of the 1988 ROD states that since this the FFSZ is not likely to serve as a public water system, MCLs are not applicable but "may be considered relevant". MCLs are being used for comparison of monitoring results.	Groundwater monitoring will continue to take place in the FFSZ to ensure that contaminants are not migrating down from the upper zones. If contaminants are "detected above MCLs in a well in two consecutive monitoring periods, a report shall be (sic) within sixty days prepared evaluating the likely cause for the presence of the compound and proposing relevant responsive actions".
Surface Water/State	Texas Surface Water Quality Standards , TAC §307	Applicable	Water quality standards are developed to be protective of incidental fishery.	Containment of the contaminated groundwater within the barrier wall to eliminate the release to surface water.
Air/State	Standard Exemption 68 and 118, codified into 30 TAC §106.533 and 30 TAC §106.261	Applicable	Set allowable limits for air discharges from treatment units.	Water treatment facility designed to comply with standards.

ATTACHMENT 7

Inverview Record

INTERVIEW RECORD

Site Name: Brio Superfund Site	**EPA ID No.: TXD980625453**	
Subject: Third Five Year Review	**Time:3:30 pm**	**Date: 1/10/2008**
Type: ■ Telephone ■ Visit ■ Other **Location of Visit:**	■ Incoming ■ Outgoing	

Contact Made By:

Name: Cliff Murray	**Title: Environmental Engineer**	**Organization: Tulsa District, U.S. Army Corps of Engineers**

Individual Contacted:

Name: **Mr. Travis Green**	Title: **Manager, Engineering Services/Safety Officer**	Organization: **Memorial Hermann Southeast Hospital**

Telephone No: 281-929-4181 **Fax No:** **E-Mail Address:**	**Street Address: 11800 Astoria Blvd** **City, State, Zip: Houston, TX 77089**

Summary Of Conversation

The Memorial Hermann Southeast Hospital is approximately 0.6 miles north-northeast of the site.

Introduced myself and explained to Mr. Green that a 5 yr review was being conducted at the Brio site and that interviewing members of the community was part of the process.

When asked his impression of the site, Mr. Green explained that he didn't have a lot of history with the site since he'd only worked at the hospital for about 11 months. He had visited the site last spring after an invitation had been extended to area persons. He did not have any concerns or comments about the effectiveness of the remedy and he was not aware of any events, incidents, or activities that have occurred at the site that required emergency response from local authorities.

INTERVIEW RECORD

Site Name: Brio Superfund Site		**EPA ID No.: TXD980625453**
Subject: Third Five Year Review	**Time:9:30 am**	**Date: 1/16/2008**
Type: ■ Telephone ■ Visit ■ Other **Location of Visit: Brio Site Visit**	■ Incoming ■ Outgoing	

Contact Made By:

Name: John Meyer	**Title: RPM**	**Organization: EPA**
Name: Cliff Murray	**Title: Environmental Engineer**	**Organization: Tulsa District, U.S. Army Corps of Engineers**

Individual Contacted:

Name: **Mr. John Danna**	Title: **Site Manager**	Organization: **Brio Site Task Force**

Telephone No: 281-922-1054 **Fax No: 281-922-1551** **E-Mail Address: JDanna@phxservices.com**	**Street Address: 2501 Dixie Farm Road** **City, State, Zip: Houston, TX 77089**

Summary Of Conversation

Mr. Danna participated in the Site Visit. He has been the site manager since June 2004, shortly after the construction of the treatment plant. The information in this record was obtained during and following the site visit and contains photographs provided after the site visit.

Mr. Danna stated:

"Our objective at Brio is to comply with the EPA and state requirements while maintaining a safe workplace for our workers. We strive to operate in a manner that has no adverse impact on the local community or the environment.

We have maintained very good relations with the community and routinely meet with members of the community to update them on the status of the site and to listen to any concerns that they may have. I cannot recall any negative comments or concerns from the community over the last five years. We also meet regularly with the EPA and local emergency responders."

Construction of the treatment plant was completed in March 2004. The treatment plant and equipment associated with the collection and treatment of the groundwater and DNAPL have had many upgrades and changes to improve the operation of the facility and eliminate possible points for the release of untreated water or DNAPL to the environment. Following the site visit, Mr. Danna provided 22 pictures to document some of the changes that have been enacted since the plant's construction. The pictures and a description of the changes performed follows.

Figure No.

1. Installed cable tray and hard wiring to service vault pump – Replaced extension cord. The vault serves as the junction point for .wiring and pipe coming from hub buildings to the treatment plant. The vault pump prevents the vault from filling up with water from condensation and runoff.
2. Installed fixed gantry crane for lifting heavy emergency relief device and for personnel fall protection. Engineered to meet OSHA specs. The tank shown in the photograph is tank T-

218, the DNAPL collection tank.

3. Port (center of photo) on Tank T -218 was source of 2004 spill when PCV pipe connection failed. Replaced PVC with HDPE.
4. All site vehicles are secured with boots after hours to deter theft. A vehicle was stolen from the Brio South site in 2007 prior to the use of the boots.
5. Building doors are secured with heavy lockable bars to deter theft.
6. City water has been piped to the site. Prior to being connected to a municipal water supply, the site used bottle water for potable water and used collected rainwater for toilets and housekeeping requirements.
7. Fire protection valves and backflow preventer have been installed in preparation for the installation of a foam vapor and fire suppression system on the DNAPL tank (T-218).
8. Security lighting has been improved around the office complex and North/South main gates.
9. Bollards and railing have been installed at critical areas around the site.
10. Installed a mixing and pumping station for the addition of a foam suppression agent at the air stripper.
11. Installed a pre-filter upstream of the air stripper to remove particulates and the small amounts of free organics that are present in the recovered ground water.
12. Installed work platforms designed to meet OSHA specs in areas where workers have to routinely work above ground level.
13. Installed desiccant elements and weather shelters above sensitive outdoor pressure gauges.
14. Sealed off the secondary containment sump outlets to help avoid future environmental releases.
15. Replaced PVC pipe and fittings with HDPE (black). The HDPE pipes are less susceptible to degradation by sunlight and heat.
16. Replaced PVC pipe and fittings with HDPE (black).
17. Added heavy lockable bars to file storage containers.
18. Installed hardened chains and locks on gates to
19. Replaced sensitive and expensive rupture disks on separators with resetting conservation vents.
20. Installed gantry cranes in the 4 hub buildings to provide heavy lifting capability.
21. Installed sight glasses on DNAPL separators to view height of DNAPL in separators.

Installed viewing ports on DNAPL separators to allow height of liquid to be directly viewed.

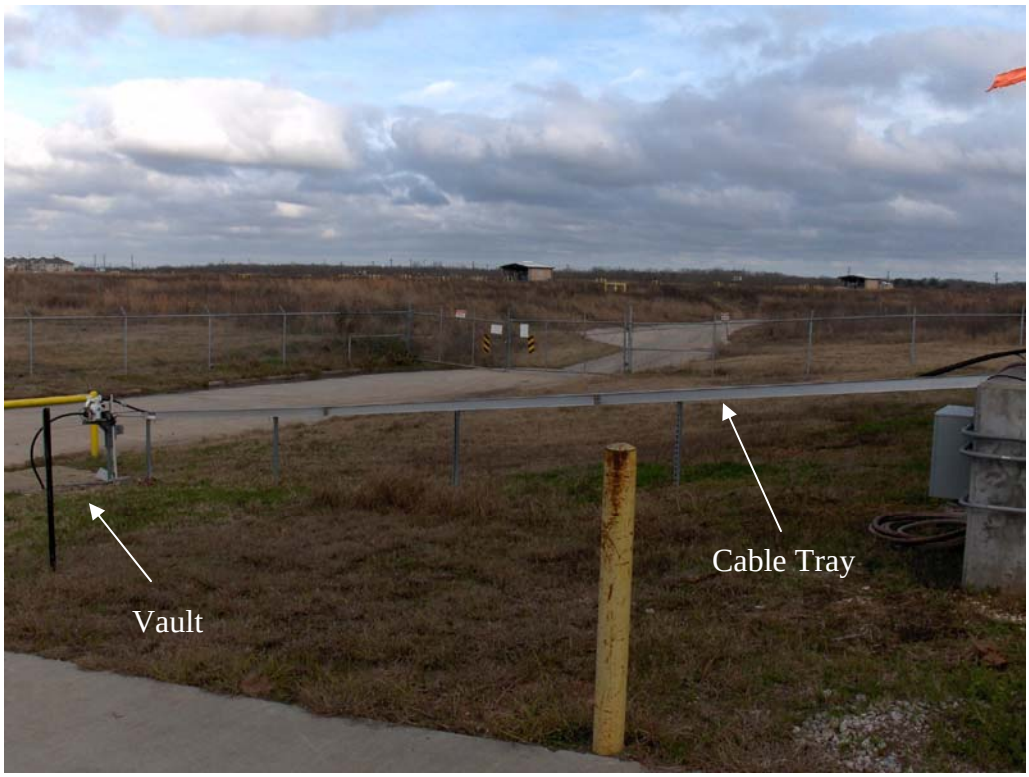

Figure 1.

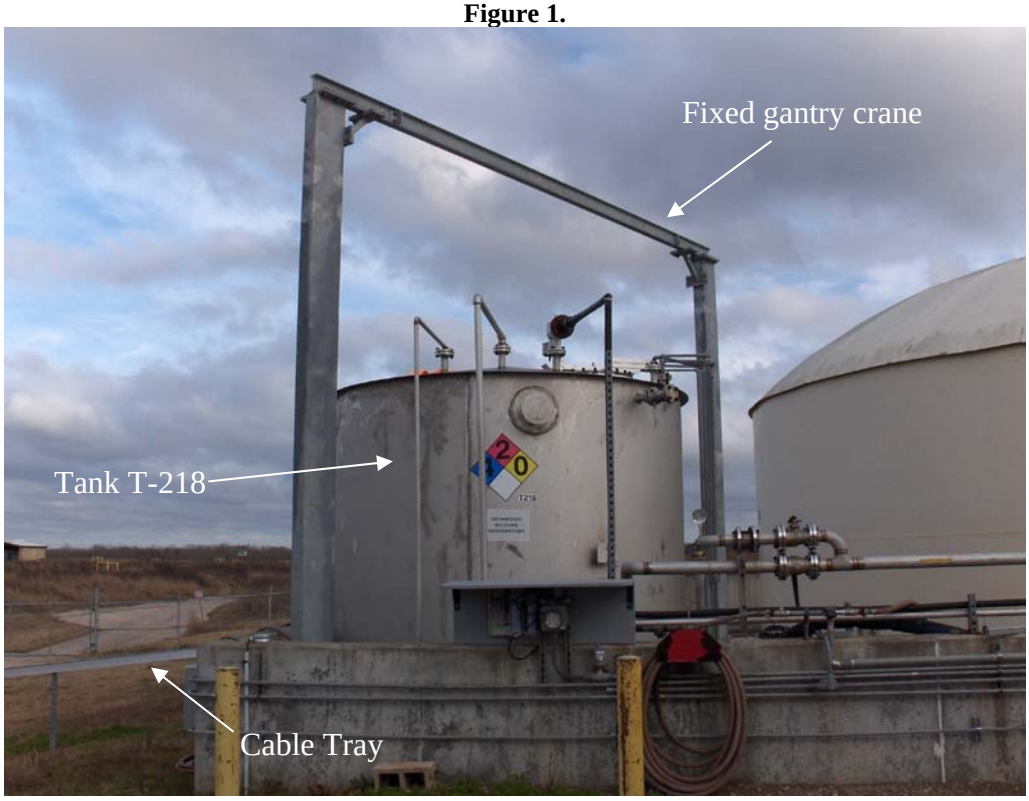

Figure 2

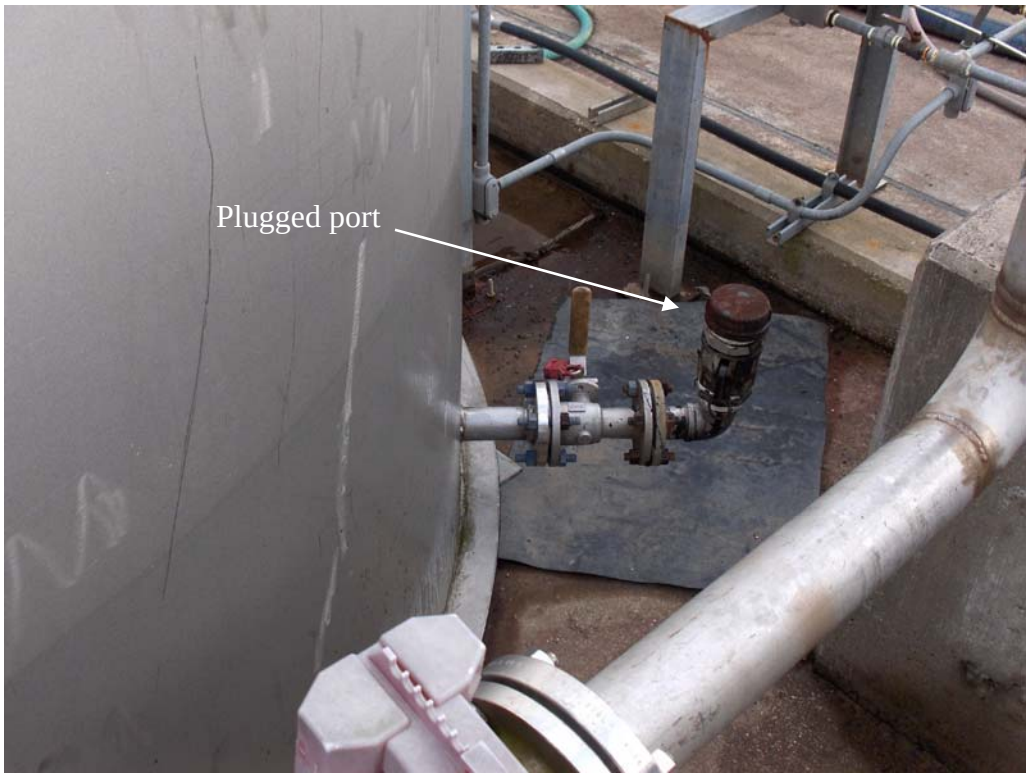

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

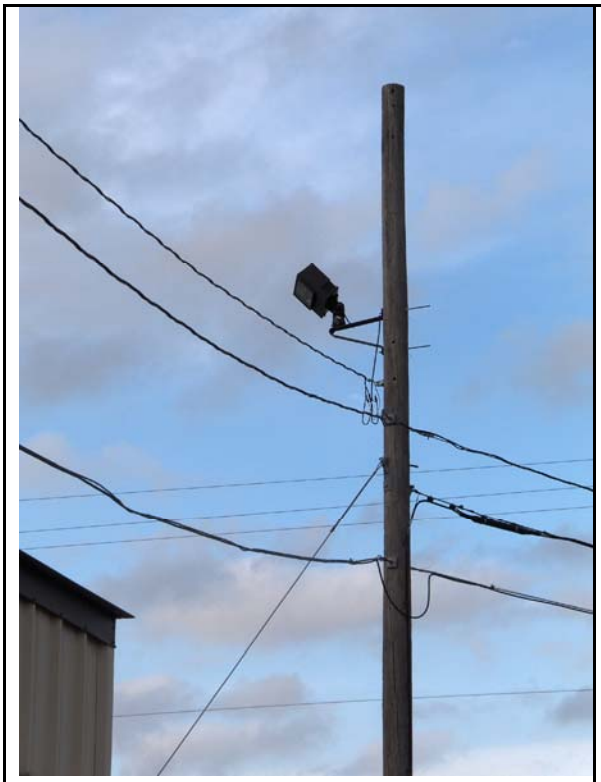

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

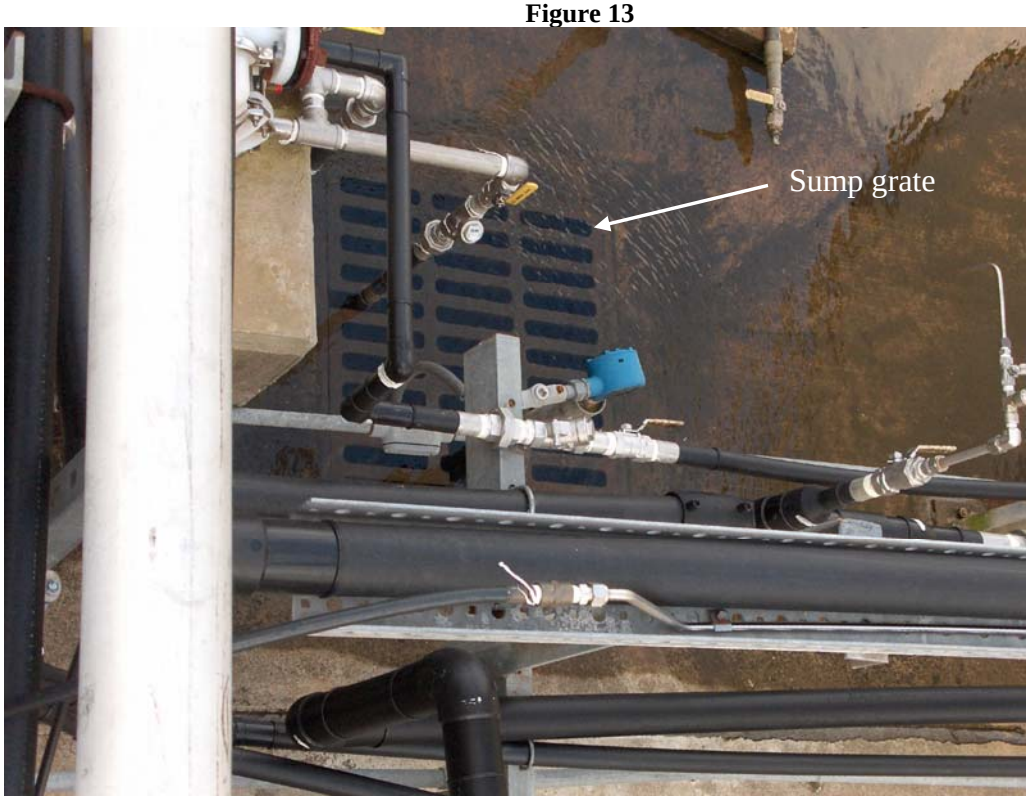

Figure 14

Figure 15

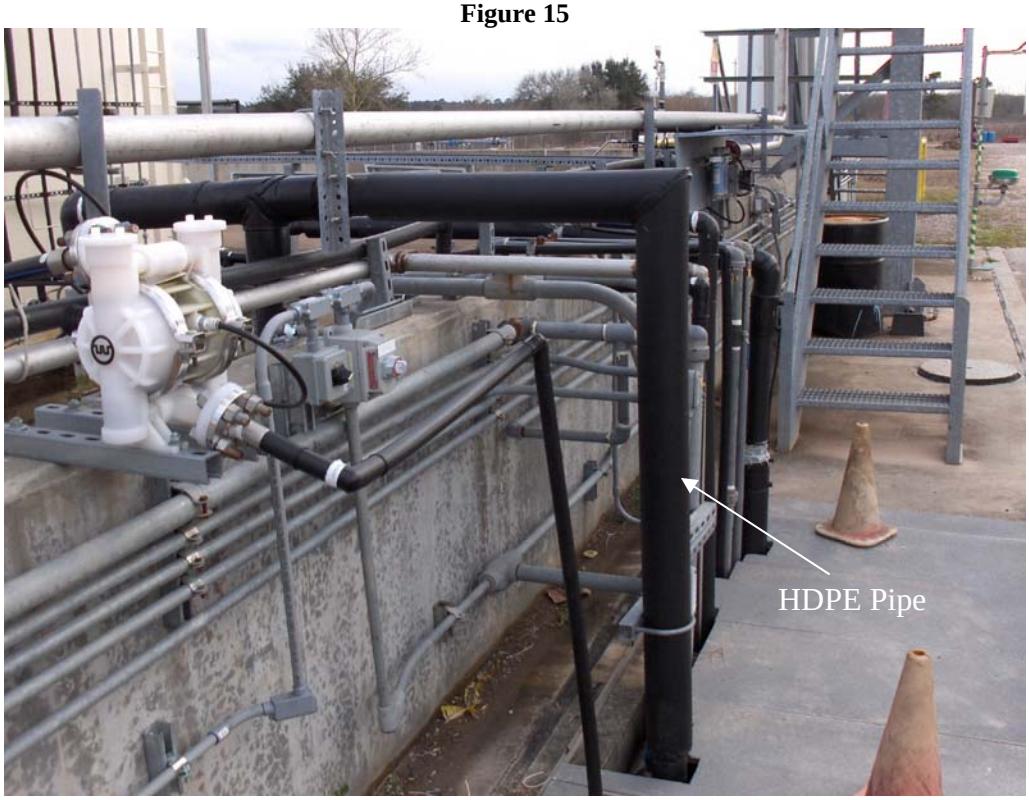

Figure 16

Figure 17

Figure 18

Figure 19

Figure 20

Figure 21

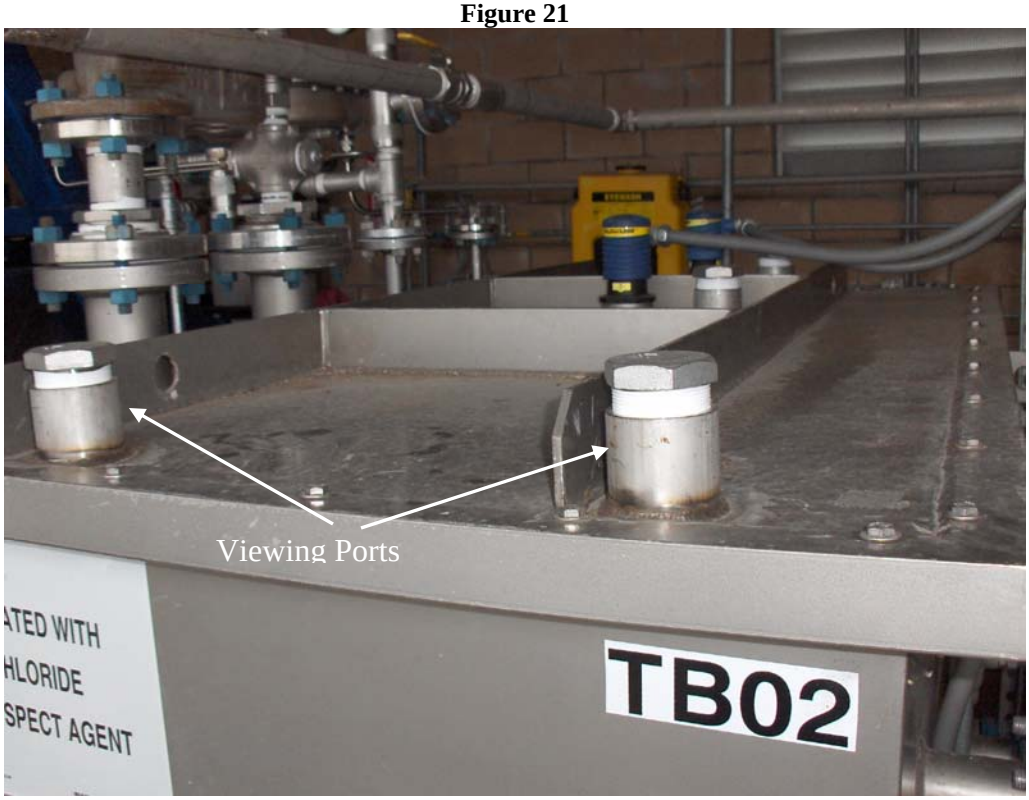

Figure 22

INTERVIEW RECORD

Site Name: Brio Superfund Site	**EPA ID No.: TXD980625453**	
Subject: Third Five Year Review	**Time:9:30 am**	**Date: 1/17/2008**
Type: ■ Telephone ■ Visit ■ Other **Location of Visit: South Belt**	■ Incoming ■ Outgoing	

Contact Made By:

Name: John Meyer	**Title: RPM**	**Organization: EPA**

Individual Contacted:

Name: **Ms. Marie Flickenger**	Title: **Owner/operator**	Organization: **South Belt-Ellington Leader**

Telephone No: 281-481-5656 **Fax No: 281-481-5730** **E-Mail Address:**	**Street Address:** **City, State, Zip:**

Summary Of Conversation

Introduced 5-yr review team (John Meyer/EPA; Cliff Murray, Frank Roepke/COE, Tulsa) and explained that a 5 yr review was being conducted at the Brio site and that interviewing members of the community was part of the process.

Ms Flickenger was asked if she receives inquiries regarding the Brio site. She said that she most often receives calls from people interested in buying homes in the area. The prospective buyers express concern over health issues related to the site. She said that she normally tells them that much work has been done at the site to prevent exposure to the gases from the site and that air monitoring around the site has shown that there is no detectable contamination leaving the site.

Ms. Flickenger expressed satisfaction that the final remedy was the best option for the site.

Ms. Flickenger asked if any green parakeets (Quaker Parakeets) had been seen at the site. They have been seen in the area of the newspaper office. It is assumed that this is an invasive species.

INTERVIEW RECORD

Site Name: Brio Superfund Site	**EPA ID No.: TXD980625453**	
Subject: Third Five Year Review	**Time: 10:30 am**	**Date: 1/17/2008**
Type: ■ Telephone ■ Visit ■ Other **Location of Visit: Perry Homes Ashley Pointe model home**	■ Incoming ■ Outgoing	

Contact Made By:

Name: John Meyer	**Title: RPM**	**Organization: EPA**

Individual Contacted:

Name: Ms. Terri Cadoree	**Title: Sales Representative**	**Organization: Perry Homes**

Telephone No: 281-481-1980 **Fax No: 281-481-1965** **E-Mail Address: cadoreet@perryhomes.net**	**Street Address:** **City, State, Zip:**

Summary Of Conversation

Introduced 5-yr review team (John Meyer/EPA; Cliff Murray, Frank Roepke/COE, Tulsa) and explained that a 5 yr review was being conducted at the Brio site and that interviewing members of the community was part of the process.

Ms. Cadoree is a sales representative for Perry Homes in the Ashley Pointe development. The meeting took place in the Perry Homes model home on Mt Andrew Dr at the intersection of Kimberly Loch and Mt Andrew Dr, immediately west of Blackhawk Boulevard in the Ashley Pointe development. The model home is approximately ¾ mile west of the Brio Site.

Ms. Cadoree often receives questions about the Brio Site from prospective home buyers. She refers interested parties to Ms. Marie Flickenger, the editor of South Belt-Ellington Leader, a local newspaper. She produced a laminated newspaper article written during the installation of the sheet pile wall. The final sentence of the article is highlighted and states that soil investigations have been conducted showing offsetting areas to be safe for development.

Ms. Cadoree provided copies of attachments to the Perry Homes sales contract. One attachment is a disclosure form for prospective home buyers. Attached to the disclosure form is a copy of the deletion notice from the Federal Register (12/28/06) and a press release from Toby Stark Public Relations dated 1/8/07 related to the deletion. Ms. Cadoree stated that this disclosure had been revised recently and was less severe than it had been previously. The contract attachments are attached to this interview form.

An extended discussion ensued regarding the amount of work that had been done at the site and possible results of failure of the containment system. Mr. Meyer explained that a breach in the barrier wall could result in a groundwater flow that would be intercepted by Mud Gully.

Ms. Cadoree produced the development plat and asked where Brio was in relation to the housing development. Her map did not include Brio or Mud Gully. Mr Meyer showed some aerial photos on his computer. Ms. Cadoree requested a map showing Brio and Mr. Meyer stated that he would provide a map or aerial photo at a later date.

Ms. Cadoree was very appreciative of the visit and the information that was provided. She appeared to be relieved to learn of the condition of the site and it's distance from the housing development.

INTERVIEW RECORD

Site Name: Brio Superfund Site		**EPA ID No.: TXD980625453**
Subject: Third Five Year Review		**Time:10:00 am** / **Date: 2/20/2008**
Type: ■ Telephone ■ Visit ■ Other **Location of Visit: TCEQ Office – Austin, TX**		■ Incoming ■ Outgoing
Contact Made By:		
Name: Cliff Murray	**Title: Environmental Engineer**	**Organization: Tulsa District, U.S. Army Corps of Engineers**
Individual Contacted:		
Name: **Ms. Fay Duke**	Title: **Project Manager**	Organization: **Texas Commission on Environmental Quality (TCEQ)**
Telephone No: (512) 239-2443 **Fax No:** **E-Mail Address:**	**Street Address: TCEQ Environmental Clean-up Section II, Team 2, (MC-221)** **City, State, Zip: Austin, TX 78753**	

Summary Of Conversation

Ms. Duke had participated in the previous Five Year Review. Her comments were brief. She has no concerns and feels like the implemented remedy is ample for the protection of the environment.