Five-Year Review Report

Fourth Five-Year Review Report for Dixie Oil Processors Superfund Site Harris County, Texas

September 2013

PREPARED BY:

United States Environmental Protection Agency Region 6 Dallas, Texas



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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 Liquid
DOP	Dixie Oil Processors
DOPSTF	Dixie Oil Processors Site Task Force
EA	Endangerment Assessment
EPA	United States Environmental Protection Agency
FFSZ	Fifty-Foot Sand Zone
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
NPL	National Priorities List
NSCZ	Numerous Sand Channel Zone
O&M	Operation and Maintenance
PEC	Probable Effects Concentration
RA	Remedial Action
RAO	Remedial Action Objective

RD	Remedial Design
RfD	«Reference Dose»
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
UAO	Unilateral Administrative Order
VOC	Volatile Organic Compound

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Executive Summary

The Dixie Oil Processors (DOP) Site (Site) is a former industrial site that is located approximately 20 miles southeast of Houston, Texas, in Harris County. The Site occupies approximately 26.6 acres and is positioned north and south of Dixie Farm Road, designated as DOP North and DOP South, respectively. DOP North covers 19.0 acres, and DOP South covers 7.6 acres. Mud Gully, a flood control ditch and tributary of Clear Creek, runs along the eastern boundary of DOP North and the western boundary of DOP South. The Brio Refining site (Brio) borders DOP to the northeast.

DOP North was operated as a copper recovery and hydrocarbon washing facility from 1969 through 1978. A total of six surface pits were used to store and treat wastewater containing copper prior to recovery and discharge. The pits were closed and decommissioned during 1975 and 1977. Several operations occurred at DOP South from 1978 through 1986. These included hydrocarbon washing to produce various chemicals, oil recovery, and blending and distilling residues from local chemical plants and refineries to produce various petroleum products including fuel oil, creosote extender, and a molybdenum concentrate catalyst. Active operations at the site stopped in 1986. Approximately 6,000 cubic yards of contaminated soils were removed in 1984 as part of an EPA emergency action and disposed off-site. There were 107,351 cubic yards of contaminated soils and sub-soils on the site associated with six different pits. Site contaminants included ethylbenzene, hexachlorobenzene, 1,1,2-trichloroethane, methylene chloride, toluene, and chlorobenzene.

A Record of Decision (ROD) was issued for the DOP Site by the United States Environmental Protection Agency (EPA) on March 31, 1988. On July 10, 1991, the EPA issued a Unilateral Administrative Order (UAO) to the DOP Task Force for implementation of the remedial action (RA).

The chemical concentrations of the 107,351 cubic yards of contaminated soils and sub-soils were found to be below cleanup standards and were left in place as specified in the ROD; however, affected surface soils were removed. The DOP Site Task Force (DOPSTF) notified the EPA that remedial activities were completed on March 27, 1993. A Final Closeout Report was issued by the EPA on January 18, 1996. The deletion of the DOP Superfund Site from the National Priorities List became effective on December 28, 2006.

The trigger for this Fourth Five-Year Review was the September 4, 2008, signature date of the Third Five-Year Review report.

The assessment of this Fourth Five-Year Review found that the remedy was constructed in accordance with the requirements of the ROD and remains protective, consistent with the Remedial Action Objectives (RAOs) of this response action. Continued implementation of Site controls is necessary to ensure the protectiveness of the remedy.

Five Year Review Summary Form

EPA ID: TX	KD089793046	
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Region: o	State. 1A	
	SITE STATUS	
NPL Status: Deleted		
Multiple OUs?	Has the site achieved construc	tion completion?
No		
Lead agency: EPA		
Author name (Federal or S	State Project Manager): Gary G. Miller,	Region 6
Author affiliation: Remedial Project Manager		
Author affiliation: Remedi	ial Project Manager	
Author affiliation: Remedi Review period: 9/04/2008	ial Project Manager 	
Author affiliation: Remedi Review period: 9/04/2008 Date of site inspection: 12	ial Project Manager 9/04/2013 2/13/2012 (DOP South); 3/21/2013 (DOP	North)
Author affiliation: Remedi Review period: 9/04/2008 Date of site inspection: 12 Type of review: Statutory	ial Project Manager 9/04/2013 2/13/2012 (DOP South); 3/21/2013 (DOP	North)
Author affiliation: Remedi Review period: 9/04/2008 Date of site inspection: 12 Type of review: Statutory Review number: 4	ial Project Manager 9/04/2013 2/13/2012 (DOP South); 3/21/2013 (DOP	North)

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:

None

Issues and Recommendations Identified in the Five-Year Review:						
OU(s): #1	Issue Category: Monitoring					
	Issue: Annual monitoring has shown increasing concentrations of chlorinated organics in one DOP Site Numerous Sand Channel Zone (NSCZ) monitoring well during the five-year review period. The origin of the contaminated groundwater is the adjacent Brio Refining Superfund Sit South Plume and does not impact the protectiveness of the DOP Site remedy.					
	Recommendation Gully sampling prog groundwater. The E recovery system und time, the South Plun should be evaluated	n: Continue annual grou gram captures any impa Brio Site is in the proces ler the oversight of the ne does not impact Muc to see if changes to the	andwater sampling to e cts to the stream from s of reviewing the perf Brio Site EPA Remedi I Gully or Clear Creek, recovery system are n	ensure that the Brio Site Mud discharge of NSCZ formance of the South Plume al Project Manager. At this but the results of the review ecessary.		
Affect Current Protectiveness	it Affect Future Implementing Oversight Milestone Date ss Protectiveness Party Party					
No	No	PRP	EPA	Annual Reports		

Protectiveness Statement(s)					
Operable Unit:Protectiveness Determination:Addendum Due Date#1Short-term Protective(if applicable):None					
Protectiveness Statement: As part of the Fourth Five-Year Review, the EPA and Texas Commission on Environmental Quality (TCEQ) conducted inspections of the Site on December 13, 2012 (DOP South), and March 21, 2013 (DOP North) and determined that the implemented remedial action (RA) is functioning as intended and remains protective of human health and the environment in the short-term. The RA has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated air, soils or groundwater. Long-term protectiveness of the RA will be verified by continued monitoring of groundwater to assess the effectiveness of the Site controls.					
Site-wide Protectiveness Statement (if applicable)					
Protectiveness Determination:Addendum Due Date (if applicable):Short-term ProtectiveNone					
Protectiveness Statement:					

As part of the Fourth Five-Year Review, the EPA and Texas Commission on Environmental Quality conducted an inspection of the site on December 13, 2012 (DOP South), and March 21, 2013 (DOP North) and determined that the implemented RA is functioning as intended and remains protective of human health and the environment in the short-term. The RA has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated air, soils or groundwater. Long-term protectiveness of the RA will be verified by continued monitoring of groundwater to assess the effectiveness of the Site controls.

As part of the Fourth Five-Year Review, the EPA and Texas Commission on Environmental Quality (TCEQ) conducted inspections of the Site on December 13, 2012 (DOP South), and March 21, 2013 (DOP North) and determined that the implemented RA is functioning as intended and remains protective of human health and the environment in the short-term. The RA has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated air, soils or groundwater.

Long-term protectiveness of the RA will be achieved by continued monitoring of groundwater to assess the effectiveness of the Site controls.

Issues:

The ROD requires that Site controls be maintained through the use of fencing and the imposition of deed notices and restrictions. The DOPSTF currently controls the Site with perimeter fencing and locked gates. The expected long-term maintenance and operations at the Site will involve an ongoing Site presence.

Full implementation of the required institutional controls is necessary to ensure long-term protectiveness. The Institutional Control Plan (ICP), dated February 2, 2006, documents that deed notices and deed restrictions were executed on the Site. During this review period, certified copies of the filed deed notices and restrictions were obtained from the Harris County Clerk's Office.

Annual monitoring has shown elevated concentrations of chlorinated organics in one site monitoring well during the five-year review period. The origin of the contaminated ground water is the adjacent Brio Refining site and does not impact the protectiveness of the site remedy.

Recommendations and Follow-up Actions:

Continue monitoring of the groundwater to assess the effectiveness of the Site controls.

Protectiveness Determination:

Based on the information available during this fourth five-year review, the remedy for the site currently protects human health and the environment. Installation of the remedial alternative has been completed. The implemented RA is functioning as intended and remains protective of human health and the environment in the short-term. The RA has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated air, soils or groundwater. Long-term protectiveness of the RA will be verified by continued monitoring of groundwater to assess the effectiveness of the Site controls. The implemented actions are functioning as intended and remain protective of human health and the environment.

Approved by Hullis, acting

Carl Edlund / Director Superfund Division U.S. EPA, Region 6

Date: 9/20/13

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 fourth 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 EPA (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 DOPSTF, under the direction of the EPA, Region 6, conducted actions supporting this Fourth Five-Year Review of the remedy implemented at the DOP Superfund Site in Harris County, Texas. This review was conducted from December 2012 through June 2013. This report documents the results of the review.

The triggering action for this statutory review is the completion of the Third Five-Year Review on September 4, 2008. 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

Event	Date
Copper recovery and hydrocarbon washing activities conducted at the Site	1969-1986
Remedial Investigation/Feasibility Study (RI/FS) complete	1/1988
Record of Decision Signed	3/31/1988
Final Listing on EPA National Priorities List	10/1989
Unilateral Administrative Order	7/10/1991
Start of On-Site Construction	3/25/1992
EPA approval of Remedial Design/Remedial Action Work Plan-Phase I	3/25/1992
EPA approval of Remedial Design/Remedial Action Work Plan-Phase II	8/17/1992
DOPSTF Notification to EPA of Completion of Phase I/II Activities	3/27/1993
Preliminary Closeout Report	6/09/1993
DOP Maintenance, Operations, and Monitoring Plan Submitted to EPA	7/1993
EPA Approved Remedial Action Report	8/6/1993
Final Closeout Report	1/18/1996
DOP Maintenance, Operations, and Monitoring Plan Rev. 1 Submitted to EPA	1/1997
First Five-Year Review	9/24/1998
DOP Maintenance, Operations, and Monitoring Plan Rev. 2 Submitted to EPA	1/1999
Second Five-Year Review	9/04/2003
Institutional Control Plan Finalized	2/2/2006
DOP Maintenance, Operations, and Monitoring Plan Rev. 3 Submitted to EPA	5/2006
Deletion from National Priorities List	8/21/2006
Third Five-Year Review Report	9/9/2008

Table 1 - Chronology of Site Events

III. Background

Physical Characteristics

The DOP Site is a former industrial site that is located approximately 20 miles southeast of Houston, Texas, in Harris County. The site occupies approximately 26.6 acres and is positioned both north and south of Dixie Farm Road, designated as DOP North and DOP South. DOP North covers approximately 19.0 acres, and DOP South covers approximately 7.6 acres, respectively (see Attachment 1, Figure 1).

Attachment 1, Figure 2, shows the layout of the DOP Site. Mud Gully, a Harris County flood control ditch and local tributary of Clear Creek, runs along the eastern boundary of DOP North and the western boundary of DOP South. The Brio Refining site (Brio) borders DOP to the northeast and a former athletic field borders DOP North to the southwest. Due north of DOP North is the former Southbend residential subdivision. The Friendswood Oil Field borders the remaining areas.

Land and Resource Use

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 Brio Site Task Force (BSTF) in conjunction with several state and federal agencies. Residential development is evident approximately 0.25 miles to the west of the Site.

History of Contamination

DOP North was operated as a copper recovery and hydrocarbon washing facility from 1969 through 1978. A total of six surface impoundments (pits) were used to store and treat wastewater containing copper prior to recovery and discharge. The pits were closed and decommissioned during 1975 and 1977. Several operations occurred at DOP South from 1978 through 1986. These include the following:

- hydrocarbon washing to produce ethylbenzene, toluene, aromatic solvents, and styrene pitch;
- oil recovery; and
- blending and distilling residues from local chemical plants and refineries (mainly phenolic tank bottom tars and glycol cutter stock) to produce various petroleum products including fuel oil, creosote extender, and a molybdenum concentrate catalyst.

Active operations at the site stopped in 1986. Previously closed pits that were located on DOP North were not utilized during DOP South operations. Approximately 6,000 cubic yards (cu yds.) of contaminated soils were excavated in 1984 and disposed of off-site.

Basis for Taking Action

There are approximately 107,351 cu yds. of contaminated soils and sub-soils on the site associated with six different pits. For the pit samples, ethylbenzene had the highest concentration at 6.40 milligrams/kilograms (mg/kg) of the volatile organic compounds; hexachlorobenzene had the highest concentration at 674 mg/kg of the base neutral organic compounds; and copper had the highest concentration at 72,860 mg/kg of the inorganic compounds. No organic compounds were found in any of the sub-soil samples.

The EPA concluded that potential exposures of the on-site contaminated soils can pose a major risk to human health and the environment through four major pathways. The pathways include the following:

- ingestion of on-site soils;
- direct contact with on-site soils;
- inhalation of dust from the site; and,
- ingestion of shallow groundwater from the site.

Many of the chemicals found on the Site are carcinogens (1,1,2-trichloroethane and methylene chloride) or are toxic to the central nervous system, liver, or respiratory system (toluene and chlorobenzene).

IV. Remedial Actions

Remedy Selection

A ROD was issued for the DOP Site by the EPA on March 31, 1988. In accordance with the requirements of the UAO, Docket Number 6-23-91, signed by the EPA on July 10, 1991, the DOP Task Force was directed to design and implement the RA as specified in the ROD.

Summary of Record of Decision

a) Affected Materials and Soils – The DOP Endangerment Assessment (EA) identified target cleanup levels based on human exposure to site contaminants. However, the site investigation did not identify any contaminated soils on the DOP site that exceeded the action levels discussed in the EA.

b) Mud Gully – The ROD requires widening the flood control ditch to remove the "bottle neck" that exists as it passes the DOP site.

c) Storage Tanks and Drums – Demolish any remaining surface tanks or vessels and dispose of their contents.

d) Site Management – Re-grade and vegetate the DOP site to promote drainage and minimize surface water run-off. Closure cover all re-graded areas with six inches of top-soil, if necessary, to promote vegetative growth.

e) Site Control - Use permanent site control, impose necessary deed notices and restrictions (if possible), and restrict access to the site by use of a fence or similar barrier.

Remedy Implementation

A ROD was issued for the DOP Site by the EPA on March 31, 1988, selecting limited action and monitoring including a site closure cover with institutional controls. In accordance with the requirements of the UAO, Docket Number 6-23-91, signed by the EPA on July 10, 1991, the DOP Task Force was directed to design and implement the RA as specified in the ROD.

The EPA issued the UAO to 12 respondents in July 1991. The UAO contained a detailed Scope of Work for the implementation of the RD/RA. The Monsanto Corporation assumed the lead for implementation of the RA by managing the DOP Task Force.

The DOPSTF prepared an RD/RA work plan for the implementation of the UAO and Scope of Work. The EPA approved the Phase I Work Plan on March 25, 1992. The Phase I activities included the following:

- removal of surface contamination;
- improvement of surface water controls;
- reconstruction of Mud Gully; and
- vegetation and installation of security fencing.

The Phase II Work Plan was approved by the EPA on August 17, 1992. The Phase II activities included the following:

- removal and off-site disposal of tank residuals;
- dismantlement of the process tanks and drums; and
- disposal of process equipment.

The DOP Task Force notified the EPA that Phase I and Phase II activities were completed on March 27, 1993. A pre-certification inspection was conducted by EPA on April 20, 1993. The EPA noted minor items that required additional work, such as new staining of surface soils. The DOP Task Force corrected these items and in a letter dated April 27, 1993, certified that the RA was complete. The EPA completed the Preliminary Closeout Report on June 9, 1993.

The DOP Task Force completed a RA Report, which included a certification by a Registered Texas Professional Engineer that all the requirements of the Remedial Design were met. The EPA approved the report on August 6, 1993, and issued a Final Closeout Report on January 18, 1996.

Institutional Controls

The Institutional Control Plan (ICP), dated February 2, 2006, provides for institutional controls to reduce the risk of potential hazards posed by the Site to public health and the environment. The ICP was incorporated into the Maintenance, Operations, and Monitoring Plan (MOM) as Revision 3 in May 2006. The plan implementation tasks are listed as recordation of institutional control documents and monitoring of the Site's security.

The deed restrictions and notices for the Site are filed at the Harris County Clerk's Office. During this review period, certified copies of each of the deed restriction and notices were obtained from the Harris County Clerk's Office. The certified copies are maintained at the DOP Site office located at 11810 South Hill Drive, Houston, Texas.

The DOP Site is inspected on a regular basis to evaluate compliance with institutional control documents.

Operation and Maintenance

In July 1993, the DOP Task Force submitted a MOM Plan for the DOP site. The Plan was revised in January 1999 and in May 2006. The purpose of the MOM Plan is to document the procedures used to assess the long-term success of the site remedy while minimizing adverse natural or man-made impacts on the DOP Site. The Plan requires monthly inspections and maintenance, a five-year review as required by the EPA, and monitoring of the groundwater.

Monthly Site Inspections

The DOP Task Force conducts monthly site inspections to identify any damage to the site facilities, and monitors the general health and integrity of the soil closure cover and vegetation. In general, the DOP Task Force conducts the following actions at the site:

- inspect the Site closure cover for potentially detrimental, localized settlements, presence of burrowing animals, erosion, and evidence of closure cover failures such as discolored soil or debris;
- maintain healthy vegetation in the capped areas;
- clear obstructions from the drainage swales and surface discharge structures to promote free drainage;
- inspect the banks of Mud Gully for incipient erosion;
- landscape with trees;
- monitor integrity of the fence line for any damages;
- clear vines out of fence line fabric;
- monitor any trespassing at the property;
- clear trash/debris that accumulates with time;
- fix missing and/or unreadable signs;
- inspect well protective casings and protective pipes for rust; and
- straighten pipeline markers as required.

Since monitoring began in May 1993, the DOP Task Force has kept records of site activities and submitted them to the EPA on an annual basis. The DOP Task Force completes and submits annual reports to the EPA that includes specific maintenance activities completed during the past year, dates that maintenance activities were performed, names of people and companies performing the maintenance activities, and any replacements or redesigns of deficient materials or equipment. Table 2 presents the annual operations and O&M costs incurred during the Fourth Five-Year Review period.

Da	Total Annual Cost		
From	То	k = thousand	
1/1/2008	12/31/2008	\$8.3k	
1/1/2009	12/31/2009	\$3.0k	
1/1/2010	12/31/2010	\$8.1k	
1/1/2011	12/31/2011	\$9.7k	
1/1/2012	12/31/2012	\$11.7k	

Table 2 - Annual System Operations/O&M Costs

V. Progress since the Last Five-Year Review

This section reviews the protectiveness statement, issues, and recommendations from the last five-year review (i.e., the Third Five-Year Review for the DOP Site). The status of the recommendations made in that report are also reviewed and discussed.

Protectiveness Statement from the Last Review

"The assessment of this Third Five Year Review found that the remedy was constructed in accordance with the requirements of the ROD and remains protective, consistent with the RAOs of this response action. Continued implementation of site controls is necessary to ensure the protectiveness of the remedy."

Status of Recommendations

The previous five-year review report stated that the remedy continues to be protective for the long-term. One issue regarding the adjacent Brio Site was identified and potentially requires further evaluation. A summary of this issue and the actions taken at the Brio Site since the previous five-year review are given below:

Issue- "Annual monitoring has shown an increasing concentration of chlorinated organics in DMW-35A during the five year review period. The level of 1,1,2-TCA exceeds the Numerous Sand Channel Zone (NSCZ) groundwater standard for the site. The origin of the groundwater contamination is from the adjacent Brio Refining Superfund site and does not impact the protectiveness of the remedy at the DOP site."

Action- "Continue annual groundwater sampling. Ensure that the Brio Site Mud Gully sampling program captures any impacts to the stream from discharge of NSCZ groundwater."

The affected groundwater in this area is a remnant of the Brio Site South Plume, and that portion of the plume which is located outside of the Brio Site slurry wall. The BSTF has continued to recover groundwater from this area and has continued to monitor Mud Gully and Clear Creek surface water quality on a quarterly basis. The results of this monitoring indicate that contaminated groundwater is not impacting these streams. The Brio Site is in the process of reviewing the South plume recovery system. The results of this review will be evaluated to see if changes to the recovery system are needed.

VI. Five-Year Review Process

Administrative Components

The DOPSTF and the Texas Commission of Environmental Quality were notified of the initiation of the five-year review on October 24, 2012. The DOP Fourth Five-Year Review team was led by Gary Miller of the EPA, Region 6, Remedial Project Manager for the Site, with the assistance of DOPSTF.

Community Involvement

A notice was published in the Houston Chronicle and the South Belt-Ellington Leader newspapers on November 25, 2012, stating that a five-year review was to be conducted for the DOP site. 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 Final Close Out Report, Remedial Action Completion Report, the 1988 ROD, prior five year review reports, and annual groundwater monitoring reports. See Attachment 2 for documents reviewed for this report.

Data Review

The data review focused on an evaluation of the current groundwater monitoring data collected as part of the MOM operations. The groundwater monitoring data collected annually during the five year review period (2008-2013) was reviewed as part of the current five year review. Figure 3 in Attachment 1 provides the annual groundwater monitoring data from 1993 to 2013 for the affected DOP well DMW-35A.

The action levels for the groundwater at DOP were adopted from the Brio Refining site per the DOP MOM Plan. The standards for the NSCZ and Fifty-Foot Sand Zone (FFSZ) groundwater are listed in Attachment 3.

The groundwater data shows that the levels of chemicals detected in the NSCZ and FFSZ have been within groundwater standards over the monitoring period, with the exception of MW35A, screened in the NSCZ. MW35A is located on DOP South and lies outside the soil bentonite slurry wall installed as part of the Brio Refining Site remedy. The

concentrations of 1,1,2-TCA exceeded the NSCZ groundwater standards during the fiveyear review period. The concentrations of 1,2-dichloroethane exceeded the NSCZ groundwater standard for the 2008 through 2012 annual sample events, but was within the NSCZ groundwater standard for the 2013 sample event. The concentrations of vinyl chloride exceeded the NSCZ groundwater standard for the 2009 annual sample event. The concentrations of 1,1-dichloroethene (1,1-DCE) remained within the groundwater standards during the five-year review period. The Brio Mud Gully and Clear Creek quarterly sample events showed that the NSCZ exceedances did not cause any exceedances of the surface water performance standards. Previous assessments of contamination in DMW35A have attributed the source of contamination to a groundwater plume that originates on the Brio Site and has migrated toward Mud Gully across the DOP Site. Therefore, the impacted wells on DOP South reflect the groundwater contamination originating from the Brio Site.

The Brio Site remedy addresses groundwater contamination outside the soil bentonite slurry wall through the active recovery of ground water from two extraction wells (P0-610 and P0-613). The performance standard for these wells is based on a capture zone to ensure that affected groundwater is hydraulically contained and does not discharge to Mud Gully. A review of the quarterly surface water data collected as part of the Brio Site's monitoring program concluded that the performance standards for Mud Gully and Clear Creek were met during this five-year review period.

Site Inspection

DOP South was inspected on December 13, 2012 by Gary Miller (Region 6, EPA), Fay Duke (TCEQ), Sherell Heidt (TCEQ), John Danna (DOPSTF), Matthew Foresman (Monsanto), Lawrence Engle, (DOPSTF), and Roger Pokluda (GSI). DOP North was inspected on March 21, 2013 by Sherell Heidt, John Danna, and Roger Pokluda.

The site inspection checklist completed during the site visits is included as Attachment 4. Photo documentation of the visit is included in this report as Attachment 5. Overall, the team noted that the site appeared to be well maintained with no maintenance or operational problems apparent.

Applicable or Relevant and Appropriate Requirements Review

A review of applicable or relevant and appropriate requirements (ARARs) was conducted and the results are presented in Attachment 6.

Interviews

Interviews were conducted with key citizens who have the possibility of being impacted by the DOP Site. Mrs. Marie Flickinger is an area resident, the publisher of the South Belt Ellington Leader (a local newspaper), Chairperson for the Brio Site Community Advisory Group, and sits on the Board of Trustees for the nearby community college. Mr. Chris Clark is the general manager of the Clear Brook City Municipal Utility District, which provides water, sewer, garbage, parks, police, emergency medical services, and fire protection to the residents near the DOP Site. Ms. Sherell Heidt is the TCEQ representative with responsibility for this Site. Details of these interviews are provided in Attachment 7. No major issues 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 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. site inspections) will maintain the effectiveness of the remedy.

Monitoring activities are being conducted and are adequate to determine the protectiveness and effectiveness of the remedy. Site groundwater monitor wells are sampled on an annual basis.

The ROD did not specify discrete actions to address ecological risks, however, the implementation of the remedy has removed or minimized potential exposures to aquatic or terrestrial receptors. A review of the sediment data collected during the RI/FS was conducted to assess the magnitude of aquatic risk that existed prior to implementation of the remedy using current ecological screening values. Specifically, the level of copper found during the RVFS was compared to the Probable Effect Concentration (PEC). The highest level of copper found in the sediments immediately adjacent to the site was 424 mg/kg which exceeds the probable effects concentration of 149 mg/kg. Completion of the Mud Gully improvements has removed this pathway of exposure to aquatic receptors through concrete lining of the channel. Site monitoring has verified that no new contaminated sediments are being transported from the site to the gully.

The implementation of the site-wide closure cover has minimized the potential for exposure to terrestrial receptors. Site inspections look for the presence of burrowing animals and none have been noted to date. Deed restrictions and notices have been implemented to complement the existing site controls (fencing and signs). The Institutional Control Plan, incorporated in the MOM Plan, documents these control measures. Chains and locks on gates are used to resist tampering and access by trespassers.

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

Since the development of the exposure assumptions, the area surrounding the DOP 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. New subdivisions are currently being developed to the west, approximately 0.25 miles from the site. The cleanup levels used to establish the extent of the remedy remain valid and were based predominantly on a trespasser scenario.

Changes in Standards to be Considered

The toxicity values used by the TCEQ for their Texas Risk Reduction Program have changed for two compounds since the ROD was approved. The Reference Dose (RfD) for chronic oral exposure of 1,1-Dichloroethane (1,1-DCA) 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-DCE 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/m³). The changes for 1,1-DCE were all made based on toxicity changes made by the EPA in June 2002; however, the same increase in the RfD for 1,1-DCA 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?

There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

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

VIII. Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Annual monitoring has shown increasing concentrations of chlorinated organics in one DOP Site Numerous Sand Channel Zone (NSCZ) monitoring well DMW-35A during the five-year review period. The origin of the contaminated groundwater is the adjacent Brio Refining Superfund Site and does not impact the protectiveness of the DOP Site remedy. Historical chemistry for this well is presented in Figure 3.	N	N

Table 3 - Issues

IX. Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Increasing level of contaminants in NSCZ at DMW-35A	Continue annual groundwater sampling. Ensure that the Brio Site Mud Gully sampling program captures any impacts to the stream from discharge of NSCZ groundwater. Evaluate the Brio Site South Plume recovery system to see if changes are necessary to mitigate the impact of the plume on the DOP Site.	PRP	EPA	Annual Reports	N	N

Table 4 - Recommendations and Follow-Up Actions

X. Protectiveness Statement(s)

As part of the Fourth Five-Year Review, the EPA and TCEQ conducted inspections on December 13, 2012, and March 21, 2013 and determined that the implemented RA is protective of human health and the environment in the short-term. The RA has removed exposure pathways that could have resulted in unacceptable risks by preventing exposure of human receptor populations to contaminated air, soils, and groundwater.

Long-term protectiveness of the RA will be achieved by continued monitoring of the groundwater to assess the effectiveness of the Site controls and by institutional controls.

XI. Next Review

The next five-year review for the DOP Superfund Site is required by September 2018, five years from the date of this review.

Figures



Figure 1 Site Location

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

List of Documents Reviewed

Attachment 2

List of Documents Reviewed

Dixie Oil Processors Site

Dixie Oil Processors Site Record of Decision, March 31, 1988

Dixie Oil Processors Site Post Closure Monitoring, Operations and Maintenance Plan, May 2006

Dixie Oil Processors Site Final Closeout Report, January 1996

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

DOP Superfund Site Third Five Year Review, September 2008

DOP Annual Groundwater Analytical Reports 2008-2013

Remedial Action Completion Report

Brio Refining Superfund Site

Brio Refining Site Mud Gully and Clear Creek Surface Water Analytical Reports 2008-2013

Brio Refining Site Fourth Five Year Review, April 2013

Site Monitoring Criteria

NSCZ GROUNDWATER PERFORMANCE STANDARDS

PARAMETER	CRITERIA (mg/1)
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 LEVEL (MCL) STANDARDS

DRINKING WATER	MCL
VOLATILE LIST	(µg/ l)
Benzene	5
Carbon Tetrachloride	5
Chlorobenzene	100
1, 2-Dichlorobenzene (o-dichlorobenzene)	600
1, 4-Dichlorobenzene (p-dichlorobenzene)	75
1, 2-Dichloroethane	5
1, 1-Dichloroethene	7
cis-1, 2-Dichloroethene	70
trans-1, 2-Dichloroethene	100
Methylene Chloride (Dichloromethane)	5
1, 2-Dichloropropane	5
Ethylbenzene	700
Styrene	100
Tetrachloroethene	5
Toluene	1,000
1, 2, 4-Trichlorobenzene	70
1, 1, 1-Trichloroethane	200
1, 1, 2-Trichloroethane	5
Trichloroethene	5
Vinyl Chloride	2
Xylenes (Total)	10,000
Total trihalomethanes (TTHMs) *	100

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

Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Dixie Oil Processors Superfund Site	Date of inspection: December 13, 2012 (DOP South) March 21, 2013 (DOP North)
Location and Region: Harris Co., TX; Region 6	EPA ID: TXD089793046
Agency, office, or company leading the five-year review: BSTF for the U.S. Environmental Protection Agency	Weather/temperature: December 13, 2012 (DOP South): Temperature in the mid 60's, sunny, no rain. March 21, 2013 (DOP North) Temperature in the low 70's, overcast, no rain.
Remedy Includes: (Check all that apply) Image: Im	 Monitored natural attenuation Groundwater containment Vertical barrier walls
Attachments: Inspection team roster attached (Image: Site map attached (See Figure 2 of Attach	Section 4 of this checklist) ment 1 of main report)
II. INTERVIEWS	S (Check all that apply)
 O&M site manager John Danna Name Title Interviewed □ at site □ at office □ by pho Problems, suggestions; □ Report attached 	Site Manager <u>12/13/12 and 3/21/13</u> Date one Phone no. <u>281-922-1054</u>
2. O&M staff	
Name Interviewed □ at site□ at office □ by pho Problems, suggestions; □ Report attached	Title Date one Phone no.

office, police department, office of public he deeds, or other city and county offices, etc.)	ealth or environmental hea Fill in all that apply.	alth, zoning office, recorder of
Agency <u>TCEQ</u> Contact <u>Sherell Heidt</u> Project Manager Name Title	July 25, 2013	(713) 767-3708 Phone no.
Problems; suggestions; 🖾 Report attached		
Agency Contact Name	Title	Date Phone no.
Agency		
Name Problems; suggestions;	Title	Date Phone no.
Agency Contact Name Problems; suggestions;	Title	Date Phone no.
4. Other interviews (optional) 🖾 Report attached.		
Chris Clark – Clear Brook City Municipal Utility E	District	
Marie Flickinger - South Belt-Ellington Lead Community Advisory Group (CAG)	der News, San Jacinto Co	llege Board of Regents, Brio Site
Participants in site visit (DOP South 12/13/12)	Participants in site visi	t (DOP North 3/21/13)
Gary Miller – Region 6, EPA	John Danna – BSTF	
John Danna – BSTF	Sherell Heidt – TCE	Q
Lawrence Engle – BSTF	Roger Poklud (DOP Consul	a – GSI Environmental tant)
Roger Pokluda – GSI Environmental (DOP Consultant)		
Fay Duke – TCEQ		
Sherell Heidt – TCEQ		
Matthew Foresman – Monsanto (BSTF PRP Site Coordinator)		
Paul Clark BSTF		

III. ON-SITE DOCUME	NTS & RECORDS VER	UFIED (Check a	ll that apply)
1. O&M Documents I. O&M manual I Rea I O&M manual I Rea I As-built drawings I Rea I Maintenance logs I Rea Remarks Maintenance activities a	ndily available 区 U ndily available 区 U ndily available 区 U ndily available 区 U ne noted on monthly site i	p to date p to date p to date nspections.	□ N/A □ N/A □ N/A	
2. Site-Specific Health and Safety Plan Contingency plan/emergency in Remarks The Brio Site health and at the DOP Site due to the overlap	IX Readily aver response plan IX Readil ad safety plan and conting pping remedial activities a	ailable 🔀 U y available 🗷 U ency plan/emerge nd common work	p to date p to date ncy response ers at the tw	□ N/A □ N/A e plan are used o adjacent sites.
3. O&M and OSHA Training Records Remarks	🗵 Readily available	🛛 Up to date	□ N/A	
 4. Permits and Service Agreements Air discharge permit Effluent discharge Waste disposal, POTW Other permits Remarks_Actions performed under the second second	 Readily available Readily available Readily available Readily available Readily available r CERCLA and ARARs 1 	Up to date Up to date Up to date Up to date Up to date isted in Attachme	X N/A X N/A X N/A X N/A nt 6 of the n	nain report.
5. Gas Generation Records Remarks	🗖 Readily ava	nilable 🗆 U	p to date	X N/A
6. Settlement Monument Records Remarks	□ Readily available	Up to date	X N/A	
7. Groundwater Monitoring Records Remarks	🛛 Readily available	☑ Up to date	□ N/A	
8. Leachate Extraction Records Remarks	□ Readily available	Up to date	X N/A	
9. Discharge Compliance Records Air Water (effluent) Remarks	□ Readily ava □ Readily ava	nilable 🔲 U nilable 🔲 U	p to date p to date	X N/A X N/A
10. Daily Access/Security Logs Remarks The DOP Site does no	□ Readily ava	ilable □ U resence or dailv a	p to date ctivities.	X N/A

	IV. O&M COSTS		
1. O&M Organization			
□ State in-house	□ Contractor for State		
PRP in-house	X Contractor for PRP		
□ Federal Facility in-house □ Other	LI Contractor for Feder	al Facility	
2. O&M Cost Records			
🖾 Readily available 🛛 🖾 Up to) date		
Funding mechanism/agreement	in place (PRP Trust Agr	reement)	
Original O&M cost estimate		□ Breakdown attached	
Total annual co	ost by year for review pe	eriod if available	
From 1/1/2008 To 12/31/2008	\$8,276,49	Breakdown attached	
From 1/1/2009 To 12/31/2009	\$3,027.66	Breakdown attached	
From <u>1/1/2010</u> To <u>12/31/2010</u>	\$8,101.59	Breakdown attached	i
From <u>1/1/2011</u> To <u>12/31/2011</u>	\$9,710.50	Breakdown attached	
From <u>1/1/2012</u> To <u>12/31/2012</u>	<u>\$11,749.61</u>	Breakdown attached	
Total co	st for review period		
From <u>1/1/2008</u> To <u>12/31/2012</u>	<u>\$40,865.85</u>		
3. Unanticipated or Unusually High O&M Describe costs and reasons: <u>None.</u>	Costs During Review	Period	
V. ACCESS AND INSTI	TUTIONAL CONTR	OL 🖾 Applicable 🗆 N/A	
A. Fencing			
 Fencing damaged Location show Remarks Fences well maintained. 	n on site map 🖾 Gates Gates secured and locke	secured II N/A ed.	
B. Other Access Restrictions			
1. Signs and other security measures	Location shown on s	site man \Box N/A	

C. msutut	ional Control (ICS)		·····					
1. Impleme Sit Sit	ntation and enforcent e conditions imply IC e conditions imply IC	nent s not properly imple s not being fully enf	emented Forced	C] Yes] Yes	X No X No	□ N/A □ N/A	
Ty Fro Re	pe of monitoring (<i>e.g.</i> equency <u>Daily inform</u> sponsible party/agenc	, self-reporting, driv al and monthly form y DOPSTF	re by) <u>Self repo</u> nal inspections	erting	0/10/10		000 105	4
	ntact <u>John L</u> Nam	e	<u>Site Manager</u> Title	1 	<u>2/13/1</u> 2 Date	2 28 Phone	no.	ŧ
Re Re	porting is up-to-date ports are verified by t	he lead agency		2	⊠ Yes ⊠ Yes	□ No □ No	□ N/A □ N/A	
Spo Vid Otl	ecific requirements in blations have been rep her problems or sugge pection and analytica	deed or decision do orted stions:	cuments have b rt attached le on-site and ar	een met D E re discussed v	☑ Yes ☑ Yes vith the	□ No □ No EPA pr	□ N/A ☑ N/A oject mana	ger.
2. Adequac Re <u>Ce</u> 111	y X ICs marks <u>Deed restriction</u> rtified copies were ob 810 South Hill Drive,	are adequate ns and deed notices l tained from the Harr Houston, Texas.	☐ ICs are have been exec ris County Cler	inadequate uted for the e k's Office and	ntire Su d are m	□ N/A uperfund aintained	properties 1 on-site at	<u>.</u>
2. Adequac Re <u>Ce</u> 111 D. General	y X ICs marks <u>Deed restriction</u> rtified copies were ob 310 South Hill Drive,	are adequate ns and deed notices l tained from the Harr Houston, Texas.	☐ ICs are have been exec ris County Cler	inadequate uted for the e k's Office and	ntire Su d are m	□ N/A iperfund aintained	properties 1 on-site at	<u>},</u>
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2. Adequacy Re <u>Ce</u> 113 D. General 1. Vandalis Re 2. Land use Re	y X ICs marks <u>Deed restriction</u> rtified copies were ob 810 South Hill Drive, m/trespassing C Loc marks changes on site marks	are adequate ns and deed notices t tained from the Harr Houston, Texas. ation shown on site	☐ ICs are have been exec ris County Cler map ⊠ No van	inadequate uted for the e k's Office and dalism evider	ntire Su d are m nt	□ N/A uperfund aintained	properties 1 on-site at	<u>},</u>
2. Adequacy Re <u>Ce</u> 113 D. General 1. Vandalis: Re 2. Land use Res 3. Land use Res	y ⊠ 1Cs marks <u>Deed restriction</u> rtified copies were ob 810 South Hill Drive, m/trespassing □ Loc marks changes on site marks changes off site marks	are adequate ns and deed notices 1 tained from the Harr Houston, Texas. ation shown on site IXI N/A	☐ ICs are have been exec ris County Cler map ⊠ No van	inadequate uted for the e k's Office and dalism evider	ntire Su d are m nt	D N/A uperfund aintained	properties	
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2. Adequacy Re <u>Ce</u> 113 D. General 1. Vandalisy Re 2. Land use Re 3. Land use Re	y ⊠ 1Cs marks <u>Deed restriction</u> rtified copies were ob 810 South Hill Drive, m/trespassing □ Loc marks changes on site marks changes off site marks	are adequate ns and deed notices 1 tained from the Harr Houston, Texas. ation shown on site ⊠ N/A ∑ N/A VI. GENERAL □ N/A	□ ICs are have been exec ris County Cler map ☑ No van	inadequate uted for the e k's Office and dalism evider	ntire Su d are m nt	□ N/A uperfund aintained	properties 1 on-site at	

	/II. LANDFILL COVERS ⊠ Applicable □ N/A
A. Landfill Surface	
I. Settlement (Low spots) Areal extent Remarks	□ Location shown on site map
2. Cracks Lengths Remarks	Location shown on site map SI Cracking not evident Widths Depths
3. Erosion Areal extent Remarks	□ Location shown on site map II Erosion not evident Depth
4. Holes Areal extent Remarks	Location shown on site map Holes not evident Depth
5. Vegetative Cover 🖾 🗹	Grass IX Cover properly established IX No signs of stress dicate size and locations on a diagram)
Remarks The MOM 6. Alternative Cover (armore Remarks	Plan allows for trees and other ground cover.
Remarks The MOM 6. Alternative Cover (armore Remarks	Plan allows for trees and other ground cover.
Remarks The MOM 6. Alternative Cover (armore Remarks 7. Bulges Areal extent Remarks 8. Wet Areas/Water Damage Wet areas Ponding Seeps Soft subgrade Remarks	Plan allows for trees and other ground cover. ed rock, concrete, etc.) Image: N/A Image: Decation shown on site map Height Image: Decation shown on site map Height Image: Decation shown on site map Height Image: Decation shown on site map Height Image: Decation shown on site map Image: Decation shown on site
Remarks The MOM 6. Alternative Cover (armore Remarks 7. Bulges Areal extent Remarks 8. Wet Areas/Water Damage Wet areas Ponding Seeps Soft subgrade Remarks	Plan allows for trees and other ground cover. ed rock, concrete, etc.) Image: N/A Image: Description of the location shown on site map in the location shown on site map is the location shown on site
Remarks The MOM 6. Alternative Cover (armore Remarks	Plan allows for trees and other ground cover. ed rock, concrete, etc.) ⊠ N/A □ Location shown on site map △ Areal extent △ Location shown on site map

2. Bench Breached Remarks	Location shown on site map	X N/A or okay
3. Bench Overtopped Remarks	□ Location shown on site map	
C. Letdown Channels (Channel lined w slope of the cove cover without cr	\square Applicable \square N/A with erosion control mats, riprap, grout bags, or gabio er and will allow the runoff water collected by the ben eating erosion gullies.)	ns that descend down the steep side nches to move off of the landfill
1. Settlement Areal extent Remarks	Location shown on site map 🛛 No evidence of s Depth	ettlement
2. Material Degradation Material type Remarks	Location shown on site map 🖾 No evidence of c	legradation
3. Erosion Areal extent Remarks	□ Location shown on site map II No Depth	evidence of erosion
4. Undercutting Areal extent Remarks	□ Location shown on site map 🖾 No evidence of u Depth	indercutting

5. Obstructions Type Location shown on site map Size Remarks	X	No obstructions eal extent	
 6. Excessive Vegetative Growth ☑ No evidence of excessive grow ☑ Vegetation in channels does no □ Location shown on site map Remarks 	Type vth ot obstruct flow Ar	eal extent	
D. Cover Penetrations Applicable	X N/A		
1. Gas Vents	. □ Pass □ Functioning tion	ive □ Routinely sampled □ Needs Maintenance	Good condition
2. Gas Monitoring Probes Properly secured/locked Evidence of leakage at penetra Remarks	□ Functioning tion	 Routinely sampled Needs Maintenance 	☐ Good condition ☑ N/A
 3. Monitoring Wells (within surface area of	of landfill) IXI Functioning tion	⊠ Routinely sampled □ Needs Maintenance	⊠ Good condition □ N/A
4. Leachate Extraction Wells ☐ Properly secured/locked ☐ Evidence of leakage at penetra Remarks	☐ Functioning tion	 Routinely sampled Needs Maintenance 	□ Good condition ⊠ N/A
5. Settlement Monuments Remarks	□ Located	□ Routinely surveyed	X N/A

E. Gas Collection and Treatment]
1. Gas Treatment Facilities □ Flaring □ Thermal destruction □ Good condition □ Needs Maintenance Remarks Passive with carbon canisters	
2. Gas Collection Wells, Manifolds and Piping Good condition Remarks	
 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 Image: Functioning Image: N/A Remarks Image: Second s	
2. Outlet Rock Inspected Functioning N/A Remarks	-
G. Detention/Sedimentation Ponds Applicable N/A	-
1. Siltation Areal extent Depth ☑ N/A □ Siltation not evident Remarks □	
2. Erosion Areal extent Depth	
3. Outlet Works Remarks N/A	
4. Dam Diffunctioning X N/A	

H. Retaining Walls	\Box Applicable \blacksquare N/A	
1. Deformations Horizontal displ Rotational displa Remarks	□ Location shown on site map □ Deformation not evident accement Vertical displacement cement	ee valleessa alkantaisistaataa
2. Degradation Remarks	□ Location shown on site map □ Degradation not evident	-
I. Perimeter Ditches/Of	f-Site Discharge 🖾 Applicable 🗆 N/A	-
1. Siltation Areal extent Remarks	Location shown on site map Siltation not evident Depth	
2. Vegetative Growth X Vegetation de Areal extent Remarks	□ Location shown on site map □ N/A bes not impede flow Type	
3. Erosion Areal extent Remarks	Location shown on site map Depth	
4. Discharge Structure Remarks	⊠ Functioning □ N/A	
VII	I. VERTICAL BARRIER WALLS	
1. Settlement Areal extent Remarks	□ Location shown on site map □ Settlement not evident Depth	
2. Performance Monitor Performance Frequency Head differentia Remarks	ing Type of monitoring not monitored Evidence of breaching	

FER/SURFACE WA	FER REMEDIES	6 🛛 Applicab	le 🖾 N/A
ells, Pumps, and Pipe	lines 🗆	Applicable	X N/A
and Electrical J-All-required-wells-pr	operly operating		intenance and a N/A second
Valves, Valve Boxes, Needs M	and Other Appur laintenance	tenances	
Good condition	□ Requires upg	grade 🗆 Need	s to be provided
ructures, Pumps, and	Pipelines 🛛	Applicable	X N/A
, and Electrical			
□ Needs Maintenan	ce		
tem Pipelines, Valves	, Valve Boxes, an ce	d Other Appu	rtenances
Good condition	🗆 Requires upg	grade 🗖 Need	s to be provided
	TER/SURFACE WA ells, Pumps, and Pipe and Electrical l-All-required-wells-pr Valves, Valve Boxes, □ Needs M □ Good condition ructures, Pumps, and and Electrical □ Needs Maintenan tem Pipelines, Valves □ Needs Maintenan	FER/SURFACE WATER REMEDIES ells, Pumps, and Pipelines and Electrical l-All-required-wells-properly-operating Walves, Valve Boxes, and Other Appun D Needs Maintenance Good condition Requires upg ructures, Pumps, and Pipelines and Electrical D Needs Maintenance	TER/SURFACE WATER REMEDIES Applicable ells, Pumps, and Pipelines Applicable and Electrical Needs Maintenance Walves, Valve Boxes, and Other Appurtenances Needs Maintenance Good condition Requires upgrade Needs and Electrical Needs Maintenance Applicable ructures, Pumps, and Pipelines Applicable and Electrical Needs Maintenance b Needs Maintenance Applicable and Electrical Needs Maintenance b Needs Maintenance Needs Maintenance c Good condition Requires upgrade Needs

.

	C. Treatment System	
simpos,	1. Treatment Train (Check components that apply) Image: Metals removal Image: Oil/water separation Image: Air stripping Image: Carbon adsorbers Image: Filters Image: Carbon adsorbers	DN
	 Additive (e.g., chelation agent, flocculent) 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 <u>3-million gallons average per year</u> Quantity of surface water treated annually 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 □ Need Remarks	ds Maintenance
	4. Discharge Structure and Appurtenances □ N/A □ Good condition Remarks	
	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 □ Goo □ All required wells located □ Needs Maintenance □ N/A Remarks □	d condition
	D. Monitoring Data	
	1. Monitoring Data □ Is routinely submitted on time ☑ Is of acceptable quality	
	Monitoring data is provided and discussed with the EPA and TCEQ during quarterly monotified immediately by email and phone for any issues requiring a regulatory or comm Annual effectiveness reports are being brought up to date.	eetings. EPA is unity response.
	2. Monitoring data suggests: IXI Groundwater plume is effectively contained □ Contaminant concentrations are dec	lining
	Remarks The shallow NSCZ groundwater plume on DOP South is being controlled by groundwater recovery system. There have been no FFSZ plumes detected on the DOP S	the Brio Site Site.

D . 1	Monitored Natural Attenuation
1. M	onitoring Wells (natural attenuation remedy) Properly secured/locked Functioning Required wells located Needs Maintenance Remarks
Х.	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.
	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 selected remedy for the DOP Site is No Action/Limited Action. The remedy relies heavily on site control limits to limit exposure and meet the RAOs. The completion of the RA, including engineering controls to prevent exposure, appears to be functioning as designed. The implementation of institutional control should ensure the long-term effectiveness of the engineering controls.
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.
	The required operation and maintenance of the remedy is minimal and is addressed in the EPA approved Maintenance, Operations, and Monitoring Plan. The current plan is being complied with and is ensuring the long-term protectiveness of the remedy.
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.
	None.
D.	Opportunities for Optimization

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Photos

DOP South Looking West

Brio South Plume Recovery Well PO-610 near DOP South Looking South

Photos taken December 13, 2013 by John Danna

Brio South Plume Recovery Well PO-613 near DOP South Looking West

Brio South Plume Recovery Pipeline on DOP South Looking West

Photos taken December 13, 2013 by John Danna

Brio Barrier Wall Alignment on DOP South Looking North

Brio Barrier Wall Alignment on DOP South at Dixie Farm Road Looking North

Photos taken December 13, 2013 by John Danna

Main Gate on DOP North Looking North

DOP North Fence Line along Dixie Farm Road Looking West

DOP North Mowed Pipeline Right of Way Looking North

DOP North Monitoring Well DMW-47B Slab Replacement Looking Northeast

DOP North Monitoring Well DMW-47A Looking East

DOP North Outfall to Mud Gully Looking East

DOP North Central East-West Drainage Swale with Small Amounts of Cover Soil Looking West Photos taken March 21, 2013 by John Danna

DOP North Monitoring Well DMW-44A Looking East

DOP North Eastern Fence Line Looking North

DOP North Northern Drainage Swale and Outfall to Mud Gully Looking East

DOP North Northern Drainage Swale Looking West

DOP North Western Fence Line Looking North

DOP North Western Fence Line and Central Concrete Drainage Swale Looking South

DOP North Central Area Looking North

DOP North Central Area Looking North

DOP North Central Area Looking Northeast

DOP North Monitoring Well DMW-51A Photos taken March 21, 2013 By John Danna

Applicable, Relevant and Appropriate Regulations (ARARs)

Applicable or Relevant and Appropriate Requirements (ARARs)

Medium/Authority	ARAR	Status	Requirement Synopsis	Action to be Taken to Attain
Groundwater: NSCZ (State Authority)	Texas Surface Water Quality Standards (30 TAC § 307) and Texas Total Maximum Daily Load (TMDL) Program	Applicable	State surface water quality standards have been developed to be protective of an incidental fishery. Appendix C of the March 1988 DOP ROD states that "NSCZ groundwater quality will be maintained such that its discharge does not represent a threat to aquatic life in Mud Gully." Because Mud Gully is a discharge point for the NSCZ, Mud Gully surface water standards are being used for evaluation of NSCZ groundwater monitoring results.	Maintain closure cover in accordance with the MOM Plan. Conduct groundwater monitoring in the NSCZ. Per the January 2002 Addendum to the MOM Plan, monitoring is now conducted annually.
Groundwater: FFSZ (Federal Authority)	Federal SDWA – Maximum Contaminant Levels (MCLs; 40 CFR §141.61)	Relevant and Appropriate	Federal standards (MCLs) have been adopted as enforceable standards for public drinking water systems. Appendix C of the March1988 DOP ROD states that since 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 evaluation of FFSZ groundwater monitoring results.	Maintain closure cover in accordance with the MOM Plan. Conduct groundwater monitoring in the FFSZ. Per the January 2002 Addendum to the MOM Plan, monitoring is now conducted annually.

Notes:

1) DOP = Dixie Oil Processors.

2) SDWA = Safe Drinking Water Act; ROD = Record of Decision; MOM Plan = Post Closure Maintenance, Operations and Management Plan (originally issued July 1993).

3) FFSZ = Fifty-Foot Sand Zone; NSCZ = Numerous Sand Channel Zone; MCL = Maximum Contaminant Level.

4) Within the First Five-Year Review Report for the DOP Site (dated 9/24/98), the EPA terminated the requirement to sample air, surface water, and sediment media. Accordingly, groundwater is the only environmental media currently being monitored.

Interview Record

The following is a list of individuals interviewed for this five-year review. See the contact records in this attachment for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Mr. Chris Clark	General Manager	Clear Brook City MUD	7/24/13
Ms. Marie Flickinger	Publisher/Owner Chair Trustee	South Belt-Ellington Leader News Brio Community Advisory Group San Jacinto College South	7/25/13
Ms. Sherell Heidt	Project Manager	Texas Commission on Environmental Quality	7/25/13

Site N	Site Name: Dixie Oil Processors Superfund Site				FPA ID No : TXD980625453	
Subje	Subject: Fourth Five-Year Review			Time:	Date: 7/2	
Type: Locat	IXI Telephone	Visit Oth	ner	Incoming 🖾	Outgoing	
		Conta	ct Made By:			
Name	: Lawrence E. Engle	Title: Technical	Specialist	Organization: D	OPSTF	
		Individu	al Contacted:	1		
Name	: Mr. Chris Clark	Title: General M	lanager	Organization: C Municipal Utility	lear Brook District (ľ	
Telepi Fax N E-Ma	hone No: 281-484-1562 o: il Address:		Street Address: 1 State, Zip: Hous	1911 Blackhawk I ton, TX 77089	Blvd. City,	
		Summary	Of Conversation			
1	What is your overall impression of the project? (general sentiment) Site is cleaned up and well done.					
1.	Site is cleaned up and v	well done.				
2.	Site is cleaned up and v Have there been routine conducted by your office Not needed.	well done. e communications or ac e regarding the site? If	ctivities (site visits, so, please give purp	inspections, report ose and results.	ing activiti	
2.	 Site is cleaned up and v Have there been routine conducted by your office Not needed. Have there been any con your office? If so, pleas problems requiring res 	well done. e communications or ac e regarding the site? If mplaints, violations, or se give details of the ev sponses by TCEQ.	ctivities (site visits, so, please give purp other incidents rela rents and results of t	inspections, report ose and results. ted to the site requ the responses. I am	ing activiti iring a resp not aware	
2. 3. 4.	 Site is cleaned up and v Have there been routine conducted by your office Not needed. Have there been any cor your office? If so, pleas problems requiring res Do you feel well informe Yes. 	well done. e communications or ac e regarding the site? If mplaints, violations, or se give details of the ev sponses by TCEQ. ed about the site's activ	ctivities (site visits, so, please give purp other incidents rela rents and results of t ities and progress?	inspections, report ose and results. ted to the site requ the responses. 1 am	ing activition iring a response in not aware	

INTERVIEW RECORD EPA ID No.: TXD980625453 Site Name: Dixie Oil Processors Superfund Site Time: Date:7/25/13 Subject: Fourth Five-Year Review Type: I Telephone Visit Other ⊠Outgoing Incoming Location of Visit: **Contact Made Organization: DOPSTF** Title: Technical Specialist Name: Lawrence E. Engle Individual Contacted: Title: Publisher/Owner **Organization:** South Belt Name: Ms. Marie Flickinger **Ellington Leader Newspaper** Telephone No: (281) 481-5656 Street Address: 11555 Beamer Road Fax No: City, State, Zip: Houston, TX 77089 **E-Mail Address: Summary Of Conversation**

What is your overall impression of the project? (general sentiment) I think the site is being well maintained and appears to be secure with perimeter fencing.

I think the site is being well maintained and appears to be secure with perimeter fencing and no trespass signage.

Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.
 As the Community Advisory Group Chairperson for the Brio/DOP Superfund sites I generally get quarterly updates from either EPA or DOP management. In addition, they do a good job of quickly informing me of unanticipated events that occur at the DOP site (such as fence damage from a car accident or pipeline activities in the area).

- 3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses. No.
- Do you feel well informed about the site's activities and progress?
 Yes.
- 5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The DOP site should never be developed since it could compromise the integrity of the current remedy cover. A compromised remedy could detrimentally impact the health of the surrounding community. Institutional control for the DOP site should be strictly enforced.

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INTERVIEW RECORD								
Site Na	me: Dixie Oil Processors Su	EPA ID No.: TX	EPA ID No.: TXD980625453					
Subject	t: Fourth Five-Year Review	Time:	Date: 7/25/13					
Type: Locatio	Telephone V on of Visit:	Incoming 🛛 🖾	Incoming 🗵 Outgoing					
		Contact M	Aade By:					
Name:	ame: Lawrence E. Engle Title: Technical		Specialist	Organization: DOPSTF				
		Individual	Contacted:					
Name:	Ms. Sherell Heidt	Title: Project M	anager	TCEQ				
Telepho Fax No E-Mail	one No: (713) 767-3708 : Address:	s: 5425 Polk Street, p: Houston, Texas 7	Suite H 7023					
	Summary Of Conversation							
1.	 What is your overall impression of the project? (general sentiment) The remedy is functioning as designed and is protective of human health and the environment. 							
2.	 Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results. There are no routine activities performed by the TCEQ except for attending the EPA quarterly progress meetings. 							
 Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses. I am not aware of any issues needing responses by the TCEQ. 								
4.	 Do you feel well informed about the site's activities and progress? Yes. 							
 Do you have any comments, suggestions, or recommendations regarding the site's management or operation? No. 								

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