Third Five-Year Review Report
for
JFD Electronics/Channel Master
EPA ID NCD122263825

Oxford
Granville County, North Carolina

September 2015

United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by:

Franklin E. Hill
Director, Superfund Division

Date: 9/24/15

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for
JFD Electronics/Channel Master
620 West Industry Drive
Oxford
Granville County, North Carolina

Tables

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DCE	1,2-dichloroethylene
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
IC	Institutional Control
MCLs	Maximum Contaminant Levels
mg/kg	Milligrams per Kilogram
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
NCDENR	North Carolina Department of Environment Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCE	Tetrachloroethylene
POTW	Publicly-owned Treatment Works
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level
TBC	To-Be-Considered
TCE	Trichloroethylene
VOC	Volatile Organic Compound

Executive Summary

The 13-acre JFD Electronics/Channel Master site (the Site) is located in Oxford, Granville County, North Carolina. A former antenna, amplifier and booster manufacturing facility operated at the Site from 1961 to 1984. Site investigations in 1987 confirmed the presence of metals and cyanide in soil and sludge on site, as well as volatile organic compounds (VOCs) and cyanide in the groundwater. The EPA added the Site to the National Priorities List (NPL) in October 1989. The triggering action for this Five-Year Review (FYR) was the signing of the previous FYR on September 22, 2010.

The Site's Record of Decision (ROD) was signed on September 10, 1992. The EPA modified the ROD three times, through a 1996 Explanation of Significant Differences (ESD) for groundwater, a 1999 ROD Amendment for soil and sludge, and a 2000 ESD for soils and sludge. The current remedy calls for a groundwater pump-and-treat system to address VOCs and cyanide in the groundwater and for the excavation and off-site transportation, treatment and disposal of metals- and cyanide-contaminated sludge and soil.

The remedy currently protects human health and the environment in the short term because no complete exposure pathways exist. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: implement institutional controls; characterize source areas; modify the remedy to accelerate remediation; and assess the presence of 1,4-dioxane in groundwater.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: JFD Electronics/Channel Master		
EPA ID: NCD122263825		
Region: 4	**State:** NC	**City/County:** Oxford/Granville County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Ryan Burdge and Amanda Goyne (Reviewed by the EPA)		
Author affiliation: Skeo Solutions		
Review period: 01/15/2014 – 9/22/2015		
Date of site inspection: 01/27/2015		
Type of review: Statutory		
Review number: 3		
Triggering action date: 9/22/2010		
Due date *(five years after triggering action date)*: 9/22/2015		

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s): OU1	Issue Category: Institutional Controls			
	Issue: Institutional controls are not called for in the decision documents and are not implemented.			
	Recommendation: Modify the remedy to require institutional controls and implement appropriate groundwater and land use restrictions.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016

OU(s): OU1	Issue Category: Remedy Performance			
	Issue: Source areas remain on site.			
	Recommendation: Characterize remaining on-site source areas and possible off-site sources that may impact the groundwater plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016

OU(s): OU1	Issue Category: Remedy Performance			
	Issue: The current groundwater remedy is not expected to achieve the intended RAOs.			
	Recommendation: Complete site assessment investigations and modify the remedy as needed to accelerate remediation.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016
OU(s): OU1	**Issue Category: Monitoring**			
	Issue: The presence of 1,4-dioxane has not been evaluated in site groundwater.			
	Recommendation: Analyze groundwater to determine if 1,4-dioxane should be a COC at the Site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/1/2016

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy currently protects human health and the environment in the short term because no complete exposure pathways exist. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: implement institutional controls; characterize source areas; modify the remedy to accelerate remediation; and assess the presence of 1,4-dioxane in groundwater.

Five-Year Review Summary Form (continued)

Environmental Indicators
- Current human exposures at the Site are under control. *- Current groundwater migration is under control.*

Are Necessary Institutional Controls in Place?
☐ All ☐ Some ☒ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No

Has the Site Been Put into Reuse?
☐ Yes ☒ No

Third Five-Year Review Report
for
JFD Electronics/Channel Master Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 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 5 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 EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which 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 initiation of the selected remedial action.

Skeo Solutions, an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the JFD Electronics/Channel Master Superfund site (the Site) in Oxford, Granville County, North Carolina. The EPA's contractor conducted this FYR from January 2015 to September 2015. The EPA is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. North Carolina Department of Environment and Natural Resources (NCDENR), as the support agency representing the State of North Carolina, has reviewed all supporting documentation and provided input to the EPA during the FYR process.

This is the third FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one operable unit.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
JFD Electronics purchased the property, constructed a facility on site, and operated and manufactured television antennas	1961-1979
JFD Electronics constructed an unlined lagoon on site and used it for wastewater treatment. JFD Electronics used sludge pits for disposal of sludge from the lagoon. JFD Electronics released solvents and other organic chemicals at the Site.	1964-1979
Channel Master Satellite Systems, Inc. (Channel Master) took over ownership of operations on site and began manufacturing satellite systems	1980
Channel Master discontinued all manufacturing operations at the Site	1984
Contamination was initially discovered	September 1986
North Carolina Department of Human Resources conducted site assessment	February 23, 1987
The EPA performed preliminary assessment	May 1987
The EPA proposed the Site to the National Priorities List	June 1988
Channel Master excavated and disposed of two fuel oil tanks and one concrete waste oil tank	July 1988
PRPs initiated the remedial investigation/feasibility study (RI/FS)	September 1989
The EPA finalized the Site on the National Priorities List (NPL)	October 4, 1989
PRPs performed phase I groundwater assessment	Jan. – Feb. 1991
PRPs performed phase II groundwater assessment	Sept. – Nov. 1991
PRPs completed RI/FS The EPA signed Record of Decision (ROD)	September 1992
PRPs initiated remedial design	August 1993
The EPA signed an Explanation of Significant Differences (ESD), which eliminated chlorination, precipitation/filtration and carbon adsorption treatments; added six extraction wells and treatment of volatile organic compounds via air stripping; and added discharge of treated groundwater to surface water or the publicly-owned treatment works	January 24, 1996
PRPs submitted a supplemental feasibility study and final design report	July 1996
PRPs started remedial action	September 1996
The groundwater treatment system constructed completed	August 1998
The EPA signed a ROD Amendment for soil remediation	May 13, 1999
The groundwater treatment system becomes fully operational under an effluent discharge permit from the City of Oxford	April 2000
PRPs completed the remedial design	June 2000
The EPA signed an ESD to specify that if metals or cyanide concentrations were greater than remedial goals, they would be excavated and transported off site for treatment and disposal	July 19, 2000
PRPs excavated and transported cyanide-contaminated sludges and soils for off-site treatment and disposal	August 2000
The EPA declared the site remedy construction complete and approved the preliminary close-out report	September 29, 2000
The EPA approved the final construction report – groundwater remediation complete	December 2000
PRPs completed the field test report for enhanced reductive dechlorination	January 2001
PRPs completed the soil and sludge remedial action	February 2001
The EPA signed the first FYR	September 30, 2005
PRPs performed sampling for vapor intrusion assessment	August 2006
The EPA signed the second FYR	September 2010
PRPs completed the private well survey	February 28, 2012
PRPs conducted direct push sampling to delineate shallow groundwater plume	April 30, 2012

Event	Date
PRPs conducted membrane interface probe sampling	July 14, 2012
The EPA adds Cristex Drum to the NPL	December 11, 2013
PRPs conducted vapor intrusion assessment at Oak Ridge apartments	December 31, 2013
PRPs conducted a geomagnetic investigation to determine the presence of diabase dikes near the Oak Ridge apartments	July 17, 2014
PRPs collected soil samples in the source area to delineate the vertical and horizontal extent	July 28, 2014
PRPs performed a qualitative survey of streambed conditions to characterize areas that are more and less likely to recharge and discharge groundwater to surface water PRPs installed eight piezometers in or near the intermittent stream	September 4, 2014
PRPs installed 13 additional groundwater wells	September 26, 2014
PRPs conducted first groundwater sampling including the new wells	December 5, 2014
PRPs conducted a seismic investigation to evaluate the depth to bedrock	December 17, 2014
PRPs conducted testing to characterize the hydraulic conductivity in the saprolitic overburden	December 28, 2014

3.0 Background

3.1 Physical Characteristics

The Site is located at 620 West Industry Drive, at the intersection of West Industry Drive and Pine Tree Road in Oxford, Granville County, North Carolina (Figure 1). The Site consists of about 13 acres and is about 2 miles southwest of downtown Oxford. The Site is bordered to the north by Pine Tree Road, to the west by West Industry Drive, to the south by a railroad line owned by Norfolk Southern Railroad and to the east by the Oak Ridge Apartments (Figure 2).

The originally-reported sources of contamination at the Site include a sludge lagoon, sludge drying beds, underground storage tanks, soils contaminated with volatile organic compounds (VOCs) associated with a leaking waste oil tank, and several areas associated with solvent disposal practices.

Groundwater at the Site occurs in an unconfined to semi-confined aquifer consisting of overburden hydraulically interconnected with underlying bedrock. Groundwater generally flows southeast from the Site, then turns eastward near the railroad right-of-way (see Figure 2). Runoff from the Site drains to an unnamed tributary of Fishing Creek, which is used for recreational fishing within 3 miles downstream of the Site. No environmentally-sensitive areas are located near the Site.

3.2 Land and Resource Use

The Site property is no longer in use and the two buildings formerly located on site were demolished in early 2008; only the concrete slabs and foundations remain. Land to the west, northwest and southwest of the Site is zoned for general industrial use. Residential areas are located east and southeast of the property. The Site is projected to remain zoned for light industrial use. As of the 2010 census, the population of the City of Oxford was 8,461.

The groundwater aquifer at the Site is classified for use as a drinking water source, but is not connected to the public water supply. About 2,500 people get drinking water from private wells within 3 miles of the Site, the closest of which was about 2,000 feet southeast of the Site as of 2013 (Appendix G).

In 2013, the EPA added the adjacent Cristex Drum property to the National Priorities List (NPL). The Cristex Drum site includes VOC-contaminated groundwater that commingles with the Site plume. It is currently unclear how the contaminant plumes from the Site and the former Cristex facility merge.

3.3 History of Contamination

From 1961 to 1984, operators made and assembled antennas on site. The process involved copper and nickel electroplating and chrome-conversion coating of antenna parts. Operators built an unlined lagoon from 1964 to 1965 to dispose of wastewater generated during the electroplating and chrome conversion processes. Operators disposed of treatment process sludge in 11 sludge drying beds along the southern property boundary. The lagoon held from 800,000 to 1,000,000 gallons of sludge during its operation. From 1980 to 1984, operators reportedly used organic solvents on site for cleaning tools and antenna elements; operators then sent antenna elements off site for electroplating. Manufacturing and assembly operations ceased in 1984.

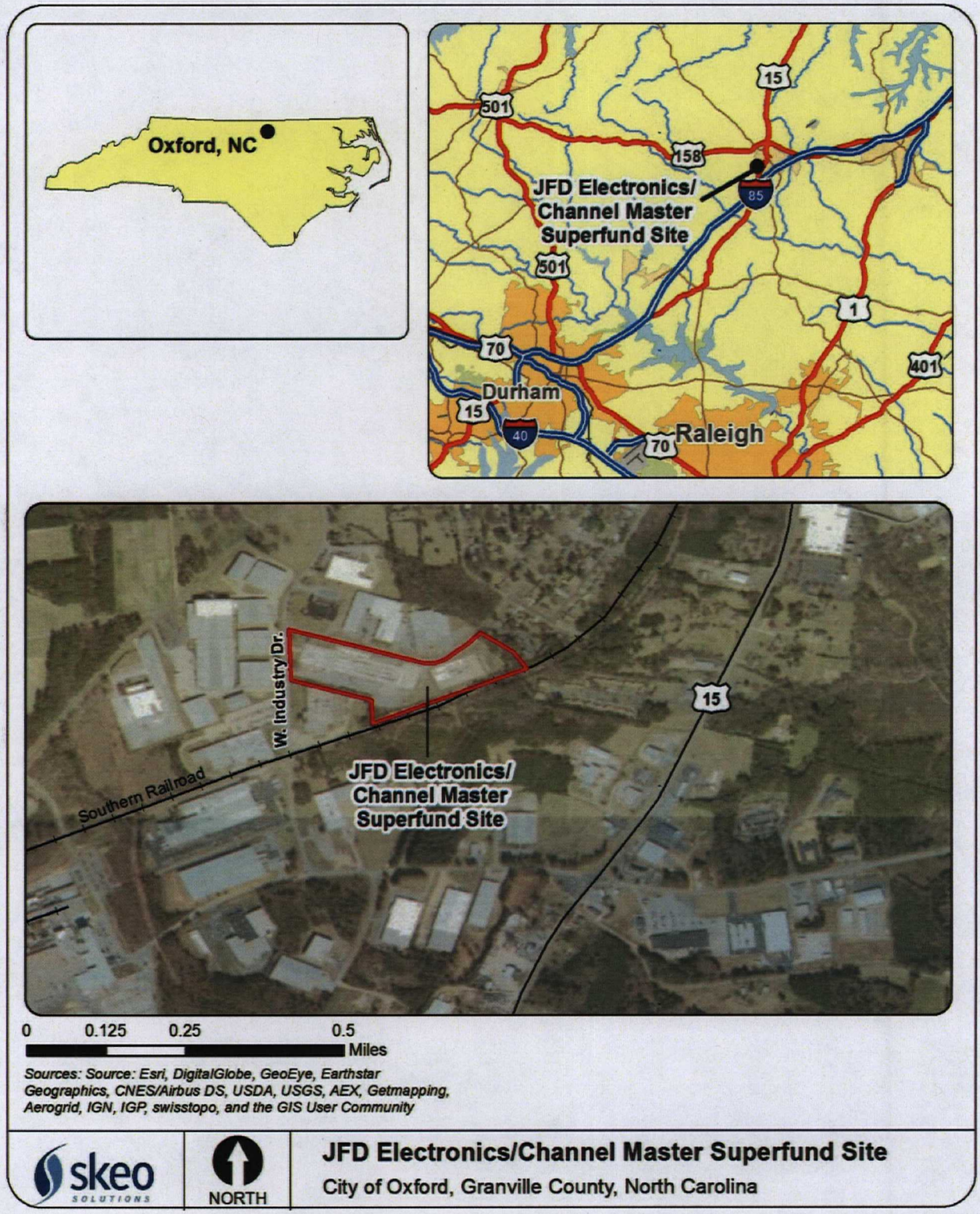
3.4 Initial Response

The North Carolina Department of Human Resources (now called the North Carolina Department of Environment Health, and Natural Resources) conducted a site inspection on February 23, 1987. Lagoon sludge and adjacent soils contained chromium, lead, arsenic, cyanide and VOCs. Groundwater samples contained VOCs.

Channel Master started cleanup activities at the Site in June 1987. These activities included digging up about 17,000 cubic yards of contaminated sludge/soil and disposing of it in a permitted waste disposal facility. About 2,000 cubic yards of VOC-contaminated soil were also dug up and thermally treated. In July 1988, Channel Master dug up and disposed of two fuel oil tanks and one concrete waste oil tank.

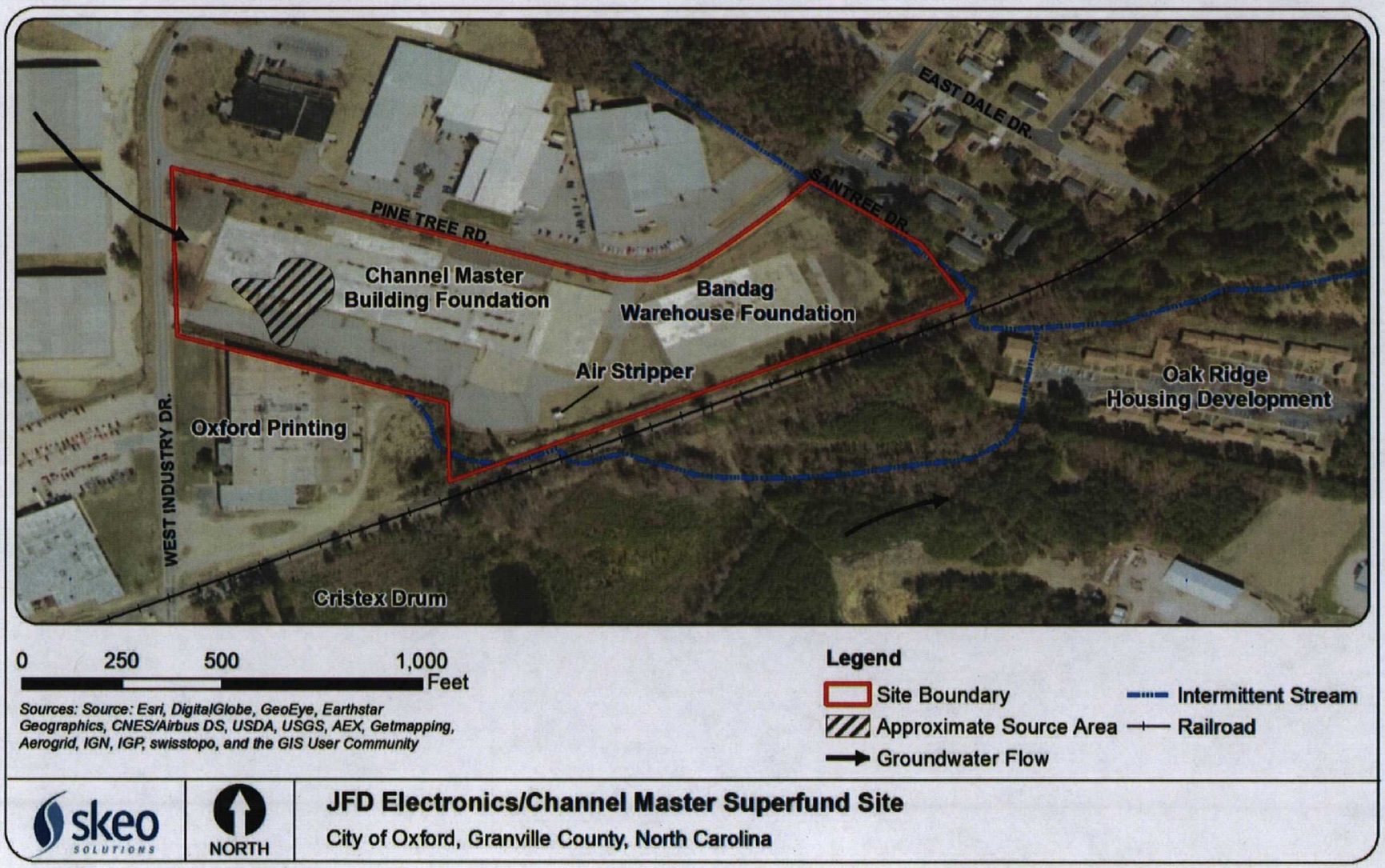
The EPA inspections in 1989 concluded that contamination remained at the Site. The EPA proposed the Site for listing on the NPL in June 1988 and finalized the Site on the NPL in October 1989.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

3.5 Basis for Taking Action

The EPA completed the Site's remedial investigation and feasibility study (RI/FS) in April 1992. The RI stated that industrial activities at the Site resulted in two potential contamination source areas: 1) release of VOCs in the south parking lot area, which extended to the subsurface, and 2) metal sludge drying beds parallel to the former warehouse and in the settlement lagoon. The estimated area of contamination was about 1,200 to 1,400 feet by 230 feet, and the contamination had migrated off site to the east.

The RI determined that the shallow and deep groundwater tables were contaminated with VOCs and the surficial and subsurface soils and sludge were contaminated with heavy metals and cyanide. The risk assessment identified the greatest concerns as noncarcinogenic effects from exposure to chromium in the sludge drying bed area and potential ingestion of contaminated groundwater.

During the RI, four off-site residential wells were located about a quarter mile east of the Site. The four residential wells were sampled and no VOCs were detected. Because no contamination was detected, these wells were not closed.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

The EPA signed the Site's Record of Decision (ROD) on September 10, 1992, and included a remedy for contaminated soil/sludge and groundwater. Although no specific remedial action objectives were stated in the ROD, the stated goal of the selected remedy is to restore the groundwater to beneficial use as a drinking water source.

The ROD has been modified three times through a 1999 ROD Amendment for soils and sludge, a 1996 Explanation of Significant Differences (ESD) for groundwater and a 2000 ESD for soils. Based on these decision documents, the current remedy includes a groundwater pump-and-treat system to address VOCs and cyanide and excavation and off-site transportation, treatment, and disposal of metal- and cyanide-contaminated sludge and soil.

ROD

The remedy outlined in the Site's 1992 ROD provides for remediation of contaminated soil and groundwater. The major components of the selected remedy include:

Soil and Sludge

- Excavation of on-site contaminated soils until the remaining soil achieves health-based levels.
- On-site treatment of contaminated sludge and soils using reduction-oxidation and stabilization until the treatability variance levels established for the metals of concern have been met.
- Placing a non-Resource Conservation and Recovery Act compliant cap over the treated sludge and soil.

The soil and sludge clean-up levels specified in the ROD are listed in Table 2.

Table 2. 1992 ROD Soil and Sludge Cleanup Goals

COC	Cleanup Goals (milligrams per kilogram [mg/kg])
Hexavalent Chromium	310
Nickel	1,100
Antimony	25

Groundwater

- Extraction of groundwater across the Site in the overburden/fractured bedrock aquifer that is contaminated above maximum contaminant levels (MCLs) or the North Carolina Ground Water 2L Standard, whichever is more protective. The contaminants of concern (COCs) and cleanup goals are listed in Table 3.
- On-site treatment of extracted groundwater via alkaline chlorination, precipitation/filtration, air stripping and carbon adsorption to remove contaminants to either MCLs or state groundwater standards, whichever are more protective.
- Discharge of treated groundwater to the local publicly-owned treatment works (POTW) or a nearby surface water pathway.
- Continued analytical monitoring for contaminants in groundwater, as well as sampling to determine the extent of the VOC and metal contamination.

Table 3: 1992 ROD Groundwater Cleanup Goals

COC	Cleanup Goals (micrograms per liter [µg/L])
Benzene	5
1,2,-Dichloroethane	0.38
1,1,-Dichloroethylene	7
1,2-dichloroethylene (DCE)	70
Tetrachloroethylene (PCE)	0.7

COC	Cleanup Goals (micrograms per liter [µg/L])
1,1,1,-Trichloroethane	200
Trichlorotheylene (TCE)	2.8
Vinyl Chloride	0.015
Barium	1,000
Chromium	50
Copper	1,000
Lead	20
Nickel	100
Zinc	500
Cyanide	154

1996 ESD

The EPA modified the ROD with an ESD, signed on January 24, 1996. The ESD included the following changes:

- Elimination of the alkaline chlorination, precipitation/filtration and carbon adsorption treatments.
- Removal of VOCs via air stripping.
- Installation of six additional extraction wells within and along the periphery of the plume.
- Passing of extracted groundwater through an equalization tank for pH and temperature adjustment and flow equalization.

1999 ROD Amendment

The EPA amended the Site's ROD on May 4, 1999. The major components of the modified remedy include:

- Excavation and off-site disposal of about 1,750 cubic yards of cyanide-contaminated sludge.
- Reducing any hexavalent chromium present in the sludge to trivalent chromium.
- Stabilization and off-site disposal of metal-contaminated sludge.

The contaminated soil that did not require treatment for cyanide but did require treatment for metals would remain on site for treatment and disposal.

2000 ESD

The EPA modified the Site's ROD with a second ESD, signed July 19, 2000. This ESD was issued to change the disposal remedy for metal-contaminated soils to excavation and transportation to a Subtitle C landfill. All wastes would be shipped off site and excavated areas would be backfilled with clean soil, graded and seeded.

4.2 Remedy Implementation

In 1993, PRPs JFD Electronics Corporation and Channel Master Satellite Systems, Inc. signed a consent decree agreeing to implement the Site's remedial design and remedial action.

Soil/Sludge

In August 2000, about 3,282 tons of cyanide-contaminated sludge and soils and 283 tons of metal-contaminated soil were removed, treated and disposed of at a permitted off-site facility. All soil and sludge contaminated above cleanup goals specified by the 1992 ROD have been removed and disposed off site. However, institutional controls are still required for soils to prevent unacceptable residential exposure to contaminated soils remaining on site since cleanup goals for hexavalent chromium specified by the 1992 ROD and achieved during remedial action activities exceed current acceptable cancer risk thresholds for both the residential adult and residential child exposure scenarios and the current hazard quotient for a residential child exposure scenario. Additionally, contaminated soils potentially remain beneath the remaining concrete slabs and foundations. The EPA is in the process of modifying the remedy to include appropriate institutional controls.

Groundwater

The design of the Site's groundwater remediation system began in early 1995 and was finalized in July 1996. The groundwater remediation system design included four recovery wells to capture groundwater from the unconsolidated zone at the Site and three shallow recovery wells in the "hot-spot" portion of the plume near the suspected source area. During the remedial design, a Pre-Design Data Acquisition Report indicated that metals and cyanide were not major contaminants at the Site. Based on these data, the EPA signed the Site's first ESD, which changed the Site's groundwater remedy, in January 1996.

Construction of the groundwater treatment system began in May 1998 and was completed by August 1998. Figure 3 includes the location of groundwater sampling wells. Due to cyanide concentrations above surface water discharge limits, the PRPs secured a permit with the local POTW to discharge the effluent to a nearby sewer connection. The system began full-time operation under the City of Oxford's General Sewer Users Permit G001 in April 2000 and is still active. The permit is renewed as needed.

In early 2000, the PRPs requested that the EPA evaluate the inorganics content of the groundwater and the need for inorganic groundwater treatment. Based on this request, 13 groundwater monitoring wells were sampled in July 2000 for metals. The results indicated that copper, chromium and nickel were below their respective remediation goals. In addition, the effluent results in 2000 indicated that chromium, lead, copper, nickel and zinc were below practical quantitation limits and barium was below the remediation goal. Therefore, the EPA no longer requires treatment for metals.

In response to issues raised in the 2010 FYR, the EPA and PRPs determined that additional investigation was needed to evaluate the effectiveness of the current pump-and-treat remedy. Additionally, the EPA required further delineation of the extent of source area impacts and to evaluate potential threats to downgradient receptors. The PRPs conducted a series of additional investigations to assess the extent of the VOC plume, the capture zone of the current system, under-slab soil contamination, the vapor intrusion pathway and potential remedial alternatives. Currently, the extent of the plume has been identified and the vapor intrusion investigation identified no unacceptable risk. See Table 1 and section 6.1 for additional details. Studies are ongoing and are expected to lead to a modification of the remedy.

4.3 Operation and Maintenance (O&M)

Groundwater

Table 4 includes annual O&M costs for the past five years. O&M costs include monthly site visits to collect effluent samples from the air stripper for analysis, general mechanical and electrical maintenance of the air stripper and recovery well systems, non-scheduled maintenance, utilities required for system operation, and semi-annual groundwater monitoring events, as scheduled by the EPA and NCDENR. Since the remediation system began pumping, more than 100 million gallons of water have been treated.

Table 4: Annual O&M Costs

Date Range	Total Cost
7/1/11 to 6/30/12	$158,000
7/1/12 to 6/30/13	$157,000
7/1/13 to 6/30/14	$144,000
7/1/13 to 6/30/14	$141,000
7/1/14 to 6/30/15	$137,000

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2010 FYR for the Site stated the following:

A protectiveness determination of the remedy cannot be made until additional information is obtained. Additional information will be obtained by taking the following actions: defining the extent of the contamination plume, evaluating the need for additional pumping wells to address the increasing concentrations of contaminants in downgradient wells, and completing a well survey to confirm that no one is drinking water from a well that is located within the contaminated ground water plume. It is expected that these actions will take approximately two years to complete, at which time, a protectiveness determination will be made.

The 2010 FYR included six issues and recommendations. Table 5 includes the current status.

Table 5: Progress on Recommendations from the 2010 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Issue ESD to include institutional controls not addressed in decision documents. Implement any institutional controls deemed necessary for protectiveness.	EPA/PRP	3/31/2011	Not complete. A modification to the remedy is anticipated for 2015.	Not Complete

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Define the nature of and lateral and vertical extent of the contaminated plume.	PRP	01/01/2012	Ongoing. VOCs are not present in the new downgradient well, beyond the leading edge of the plume. However, additional sampling is underway to better delineate other areas.	Not Complete
Evaluate the capture zone of the current pump-and-treat system. Make modifications to the remedy as necessary to achieve remedial action objectives.	PRP	9/30/2011	Ongoing.	Not Complete
Re-evaluate human health risk from indoor air vapor intrusion due to groundwater contamination.	PRP	9/30/2012	Completed. See below.	12/31/2013
Evaluate the need to revise cleanup goals to meet current North Carolina groundwater standards.	EPA/State	9/30/2011	Ongoing.	Not Complete
Conduct a well survey to determine if potential receptors are at risk of exposure.	PRP	9/30/2011	Completed. See below.	2/28/2012

Vapor Intrusion Investigations

In February 2012, the PRPs conducted sub-slab soil vapor sampling to assess potential soil vapor intrusion at the Oak Ridge Apartments (Oak Ridge). The PRPs installed sub-slab soil vapor monitoring points at the Oak Ridge apartments closest to the Site. No target compounds were detected in sub-slab soil vapor samples above method detection limits. However, the detection limits were above the EPA screening levels used in the vapor intrusion assessment, introducing uncertainty in the results. The EPA requested additional vapor intrusion investigation at Oak Ridge, including collection of sub-slab soil vapor, indoor air and outdoor air samples, to provide additional lines of evidence for determining if there is a complete vapor intrusion pathway.

The PRPs' follow-up vapor intrusion evaluation at Oak Ridge occurred between April and June 2013. The results of April 2013 indoor air, outdoor air, and sub-slab vapor sampling and June 2013 groundwater sampling indicate that there is not a complete groundwater to indoor air vapor intrusion pathway at Oak Ridge that creates a potential risk/hazard above NCDENR and/or EPA target levels. However, VOCs were detected in indoor air at Oak Ridge above NCDENR and/or EPA risk-based screening levels due to other indoor and/or outdoor sources of these VOCs. The EPA notified residents of Oak Ridge of the results of the VI investigation.

The PRPs submitted a Site Assessment Status Report summarizing the results of the assessment activities completed between July 2014 and March 2015. The assessment work was performed according to the Summary Report of Membrane Interface Probe and Direct-Push Technique Investigations and Work Plan – Revised January 2014, approved by the EPA on April 3, 2014 and the Addendum to the Summary Report of Membrane Interface Probe and Direct-Push Technique

Investigations and Work Plan – Revised January 2014, approved by the EPA on January 20, 2015. The results indicate that Well CMMW28 was sampled which is inside the Oxford Printing building. The well is located in the shallow, water table and reveals that no detects of either PCE or TCE exist. Therefore a vapor intrusion assessment is not required for the Oxford Printing build at this time.

Private Well Survey

In 2011, the PRPs conducted a receptor survey to identify public and/or private sources of drinking water, surface water features and land use for properties within a half-mile radius of the Site. Seventeen suspected private water supply wells were identified based on the visual reconnaissance survey, including wells immediately downgradient of the plume (Appendix G). Of the 17 properties with visually-identified wells, 16 have active municipal water accounts with the City of Oxford. The potential usage of the wells was not determined. However, these wells are not currently in the area of the contaminant plume.

The PRPs also contacted property owners who had wells sampled by NCDENR in December 2012. Thirty-one property owners were contacted by phone or certified mail. Four of these wells are currently used for drinking water, but are not currently affected by the delineated plume. Fifteen of the properties either have no well or have a well that is not used for drinking water. Potable well status for 12 of the properties could not be determined. One of these properties is immediately downgradient of the eastern extent of the plume. A monitoring well with no contamination lies between the plume and this private well.

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in July 2014 and scheduled its completion for September 2015. The EPA remedial project manager Beverly Stepter led the EPA site review team, which also included the EPA site attorney, Keith Weisinger, the EPA community involvement coordinator L'Tonya Spencer and contractor support provided to the EPA by Skeo Solutions. In January 2015, the EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In February 2015, the EPA published a public notice in the *Oxford Ledger* newspaper announcing the commencement of the FYR process for the Site, providing contact information for Beverly Stepter and L'Tonya Spencer and inviting community participation. The press notice is available in Appendix B. No one contacted the EPA as a result of the notice.

The EPA will make the final FYR Report available to the public. Upon completion of the FYR, the EPA will place copies of the document in the designated site repository: Richard H. Thornton Public Library 210 Main Street, Oxford, NC 27565. The Final 3rd FYR Report can also be accessed at the repository located at the EPA Region 4 office in Atlanta, Georgia or on-line through the EPA website.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the ROD, ESDs, remedial action reports and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate.

- Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location or other circumstance found at a CERCLA site.
- Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate.
- To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include MCLs under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Groundwater ARARs

Chemical-specific ARARs identified in the ROD for site groundwater are listed in Table 5. According to the Site's ROD, remediation goals for 15 groundwater contaminants of concern were based on the more stringent of federal MCLs and North Carolina groundwater standards. The remediation goals were compared to current federal MCLs and North Carolina Groundwater 2L Standards (Table 6).

ARARs for five COCs are unchanged from the remediation goals in the ROD: 1,1-dichloroethylene, DCE, 1,1,1,-trichloroethane, copper and nickel. ARARs for four COCs are less stringent than the remediation goals: 1,2,-dichloroethane, TCE, vinyl chloride and zinc. ARARs for the remaining six COCs are more stringent than the remediation goals: benzene, barium, chromium, lead and cyanide.

Table 6: Summary of Groundwater ARAR Changes

COC	1992 ROD Remediation Goals (µg/L)	Current ARARs (µg/L)	ARAR Changes
Benzene	5	1[a]	More Stringent
1,2,-Dichloroethane	0.38	0.4[a]	Less Stringent
1,1,-Dichloroethylene	7	7[b]	None
DCE	70	70[b]	None
PCE	0.7	0.7[a]	None
1,1,1,-Trichloroethane	200	200[b]	None
TCE	2.8	3[a]	Less Stringent
Vinyl Chloride	0.015	0.03[a]	Less Stringent
Barium	1,000	700[a]	More Stringent
Chromium	50	10[a]	More Stringent
Copper	1,000	1,000[a]	None
Lead	20	15[a]	More Stringent
Nickel	100	100[a]	None
Zinc	500	1,000[a]	Less Stringent
Cyanide	154	70[a]	More Stringent

a. Current ARAR is based on the North Carolina Ground Water Standard: North Carolina Administrative Code, Title 15A, Classifications and Water Quality Standards Applicable to the Ground Waters of North Carolina (http://portal.ncdenr.org/c/document_library/get_file?uuid=336fb0ce-0786-4164-8729-82c345065a18&groupId=38364) (accessed 5/11/2015).
b. Current ARAR is based on the federal MCL. National Primary and Secondary Drinking Water MCLs are available at: http://www.epa.gov/safewater/contaminants/index.html (accessed 5/11/2015).

Soil and Sludge ARARs

There are no promulgated Federal or State standards applicable to the contaminants in the sludge/soil at the Site. Cleanup levels are based on direct exposure residential assumptions for contamination identified in the sludge/soil. See section 7.2 for additional discussion.

Institutional Control Review

Contractor staff conducted research at the Granville County Public Records website and found the deed information pertaining to the Site listed in Table 7. Table 8 lists the institutional control status associated with areas of interest at the Site. The Site's property parcel number is 191207588264. The decision documents do not call for institutional controls, but restrictions are needed to prohibit groundwater use and land use. The EPA is in the process of modifying the remedy to include appropriate institutional controls.

Table 7: Deed Documents from Granville County Public Records

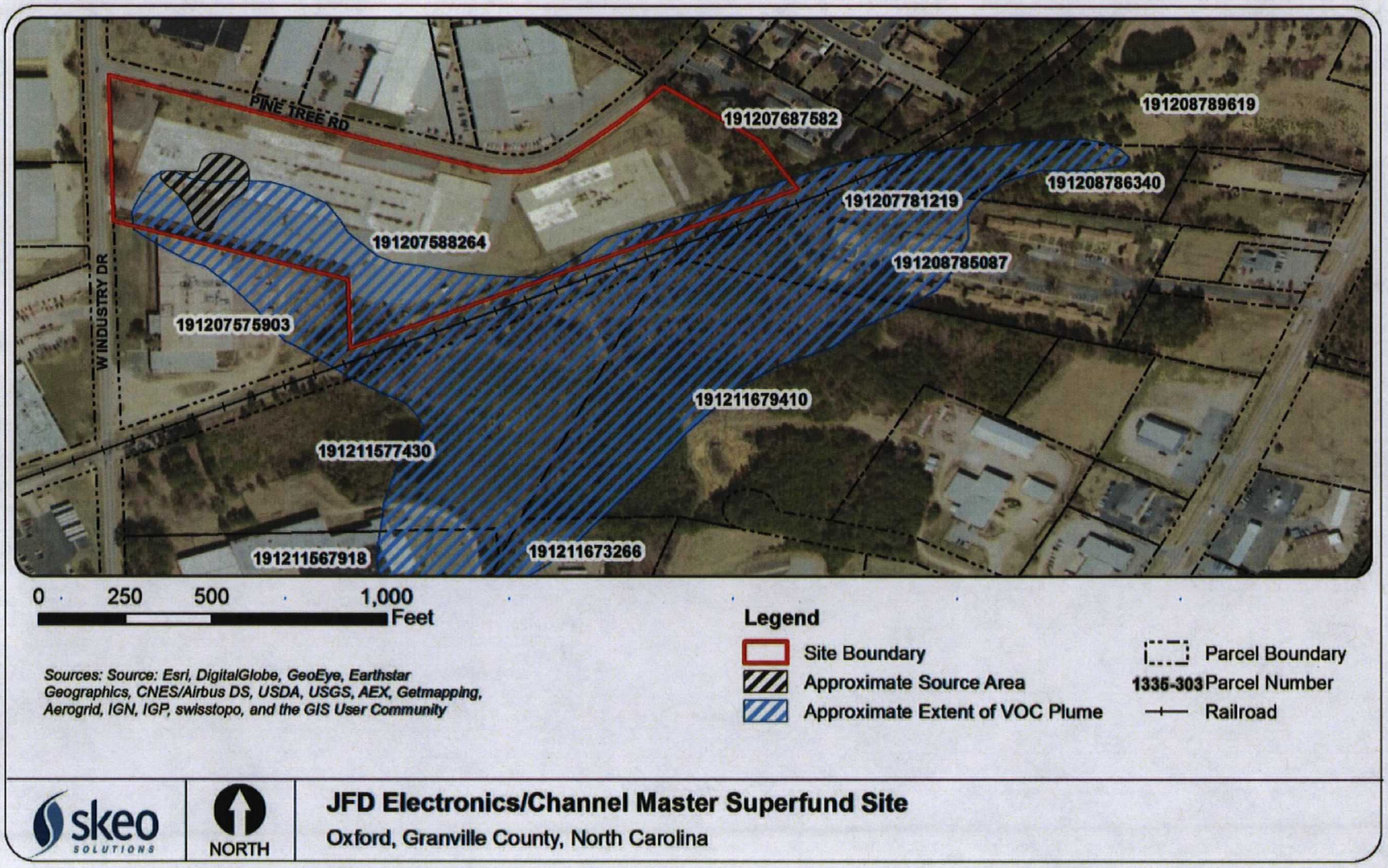
Document Date	Type of Document	Description	Book #	Page #
7/15/1980	Deed	Property deed	229	400
8/20/1993 (filed 02/15/1994)	Consent Decree	Consent decree between United States of America and JFD Electronics Corporation and Channel Master Satellite System	644	369
2/15/1994	Notice of Obligation	Notice of obligation to provide access to property	644	445
2/27/1997	Easement	Agreement to allow access to off-site monitoring wells	712	693
3/28/1997	Easement	Agreement to allow access to off-site monitoring wells	714	687
10/21/1997	Easement	Agreement to allow access to off-site monitoring wells	729	829

Table 8: Institutional Control (IC) Summary Table

Media	ICs Needed	Institutional Controls called for in the 1992 Decision Documents	Impacted Parcel(s)	IC Objective	Instrument in Place
Groundwater and Soil (on site)	Yes	No	191207588264	Prevent groundwater well installation and disturbance of on-site contaminated soil.	None
Groundwater (off site)	Yes	No	191207575903, 191211577430, 191211567918, 191211673266, 191211679410, 191207687582, 191207781219, 191208785087,	Prevent groundwater well installation.	None

Media	ICs Needed	Institutional Controls called for in the 1992 Decision Documents	Impacted Parcel(s)	IC Objective	Instrument in Place
			191208786340, and 191208789619		

Figure 3: Institutional Control Base Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

6.4 Data Review

Source Area Investigation

Soil samples to delineate the vertical and horizontal extent of VOCs in the source area unsaturated zone were collected on July 28, 2014. Twenty-six samples from 13 boring locations, with each boring advanced to 8 feet below ground surface (bgs), were analyzed for VOCs (Appendix F). The highest concentrations of TCE (33,000 µg/kg) and PCE (17,000 µg/kg) were detected at boring SB-10 at 6 to 8 feet bgs. During the December 2014 groundwater sampling event, groundwater elevation in shallow monitoring wells closest to the July 2014 soil borings was between 8 and 11 feet bgs. This suggests that vertically, the contaminated soil interval intersects the water table in areas where the highest VOC concentrations were found.

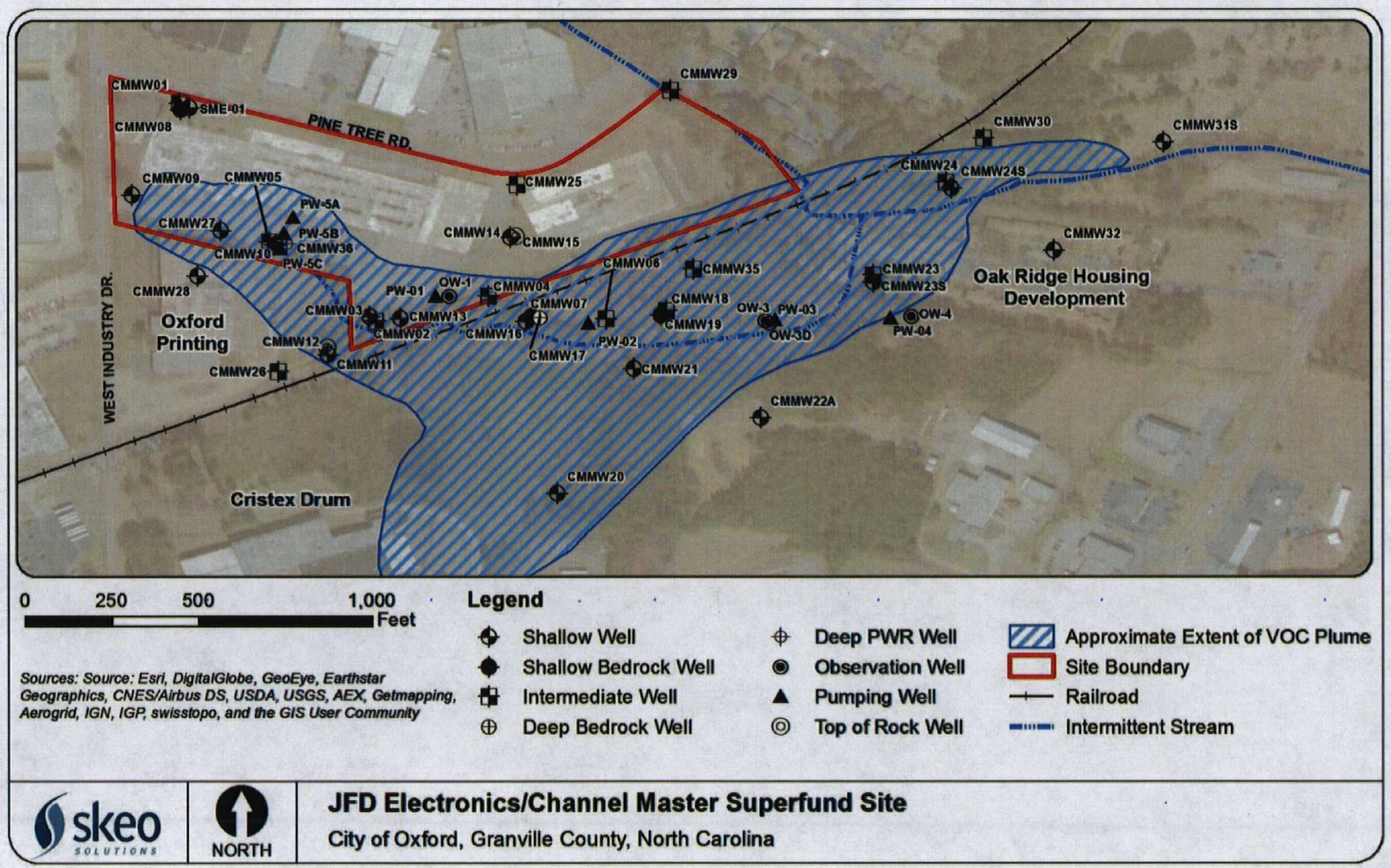
Groundwater

The PRPs installed an additional 13 groundwater monitoring wells at the Site in 2014. The first sampling occurred in December 2014. The extent of the VOC groundwater plume is consistent with previous results (Figure 4). Investigations are ongoing to further delineate the lateral extent of the plume.

Overall, VOC concentrations at the Site continue to show a gradual declining trend despite occasional short-term fluctuations (Appendix F). DCE, TCE, PCE and vinyl chloride concentrations in on-site wells remain significantly higher than cleanup goals. On-site monitoring wells generally exhibit slight anaerobic or oxygen-limited conditions (low dissolved oxygen and oxidation-reduction potential), along with detectable concentrations of daughter products, such as DCE and vinyl chloride, which are indicative of natural reductive dechlorination.

Downgradient off-site monitoring wells include: CMMW07, CMMW17, CMMW19, CMMW20, CMMW21, CMMW22a, CMMW23, CMMW24 and CMMW26. VOC concentrations in downgradient off-site wells CMMW23, CMMW24, and PW-04 have increased in recent years. Samples in recently-installed wells beyond CMMW24 did not exceed MCLs. Monitoring wells outside and south of the property boundaries (CMMW07, CMMW17, CMMW19, CMMW21, CMMW23 and CMMW24) also exhibit slightly anaerobic conditions and evidence of natural attenuation.

Figure 4. Approximate VOC Plume, December 2014



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

6.5 Site Inspection

On January 27, 2015, NCDENR Project Manager Dave Mattison, Amanda Goyne and Ryan Burdge of Skeo Solutions, and PRP Project Coordinator William Doucette performed the site inspection. The site inspection checklist and photos are included in Appendices D and E, respectively.

Participants met at the former warehouse area and observed the former source areas, groundwater wells, including newly installed wells and the air stripper system. No issues were noted during the inspection. The warehouses have been demolished and the site surface consists predominantly of flat pavement. The Site was enclosed by a gated and locked fence and was well maintained. The pump-and-treat system was secured and well maintained. Participants then drove to Oak Ridge and observed additional monitoring wells, surface water sampling areas and extraction wells. No issues were noted.

On January 27, 2015, Skeo Solutions staff visited the designated site repository, Richard H. Thornton Public Library, as part of the site inspection. Site documents were easily located.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including regulatory agencies involved in site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. The interviews are summarized below. Appendix C provides the complete interviews.

Dave Mattison, NCDENR: Mr. Mattison believes the remedy is adequate and that the ongoing investigations will inform decisions regarding modifications to provide complete hydraulic control and accelerate cleanup of the Site. He notes that institutional controls are needed.

7.0 Technical Assessment

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

No, the remedy is not functioning as intended. The main objectives of the remedy are to contain the VOC-contaminated groundwater, minimize its continued migration and restore groundwater to its former beneficial use. The treatment system is effective in treating the VOC-contaminated groundwater prior to discharge to the city wastewater treatment plant, but data indicate the system will not achieve cleanup goals by 2030 as previously expected. The PRPs are conducting additional site assessments to identify remaining source areas beneath building slabs, to better delineate the contaminated groundwater plume, and to better understand the contaminated groundwater transport mechanisms in the fractured bedrock. Modifications to the remedy may be implemented to accelerate groundwater remediation consistent with the remedial objective of containing the groundwater plume.

Data indicate that a portion of the groundwater plume is not being captured by the pump-and-treat system, particularly near well CMMW24. The original remedial design plan included a recovery well (PW-04) on the Oak Ridge property, near well CMMW23. However, Oak Ridge denied access, so the PRPs installed PW-04 southeast of well CMMW23. In addition, the extraction rates from the PW-05 cluster wells are very low due to low permeability.

Recent investigations indicate that additional remedial actions are needed to address the source area. Sampling found soil contamination above screening levels in the source area, below the remaining slabs. Potential options to address these soils will be evaluated and implemented as needed. Currently, the property is vacant and the source area is not expected to be disturbed.

The decision documents do not require institutional controls, but the ROD states that institutional controls may be provided and maintained to restrict access to those portions of the aquifer that remain above remediation levels. Both on- and off-site groundwater is contaminated, but no restrictions are in place to prohibit use or consumption of groundwater. The PRPs conducted a private well survey in 2012 and 2013 and confirmed no private well users are currently affected by the contaminant plume. Institutional controls will be addressed in the modification to the remedy.

The metals and cyanide contaminated soils remain beneath the remaining building slab. Although all accessible soil and sludge contaminated above cleanup goals specified by the 1992 ROD have been removed and disposed off site, institutional controls are still required for soils to prevent unacceptable residential exposure to contaminated soils remaining onsite since cleanup goals for hexavalent chromium specified by the 1992 ROD and achieved during remedial action activities exceed current acceptable cancer risk thresholds for both the residential adult and residential child exposure scenarios and the current hazard quotient for a residential child exposure scenario. The EPA is in the process of modifying the remedy to include appropriate institutional controls.

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

Groundwater standards for six COCs are more stringent than the cleanup goals established in the ROD: benzene, barium, chromium, lead and cyanide. These changes will be assessed and included in the upcoming modification to the remedy, as needed.

The source area investigation found soil contamination above screening levels in the source area, below the remaining slabs. Additional remedial actions will be considered to address this area. Currently, there are no complete exposure pathways.

The EPA has issued updated default exposure assumptions, changing some of the values for residents and workers. The overall net effect of the guidance results in a slight decrease of cancer risk and noncancer hazard; these changes are not significant enough to change the risk conclusions. The methodology used in the original risk assessment omitted the inhalation pathway from soil exposure. The incorporation of the inhalation pathway would not affect the overall risk conclusions of the 1992 risk assessment.

The ROD established health-based soil cleanup goals. To evaluate whether any toxicity value changes since the 1992 ROD could affect the cleanup goals, cleanup goals were compared to the EPA's current regional screening levels (RSLs), which incorporate current toxicity data and default exposure assumptions. A comparison of the soil cleanup goals to the EPA's soil RSLs demonstrates that the cleanup goal for hexavalent chromium is no longer valid under a residential land use scenario (Table 9). The EPA is in the process of modifying the remedy to restrict residential land use.

Table 9. Risk Evaluation of Human Health-based Soil Cleanup Goals

COC	1992 ROD Cleanup Goal (mg/kg)	EPA Commercial RSL[a]		Commercial Land Use Scenario		EPA Residential RSL[a]		Residential Land Use Scenario	
		1×10^{-6} Risk	HQ=1	Risk[b]	Noncancer HQ[c]	1×10^{-6} Risk	HQ=1	Risk[b]	Noncancer HQ[c]
Hexavalent Chromium	310	6.3	3,500	4.9×10^{-5}	0.09	0.3	230	**1.0×10^{-3}**	**1.3**
Nickel	1,100	64,000	22,000	1.7×10^{-8}	0.05	15,000	1,500	7.3×10^{-8}	0.7
Antimony	25	NA	470	NA	0.05	NA	31	NA	0.8

a. The current RSLs, dated June 2015, are available at http://www.epa.gov/reg3hscd/risk/human/rb-concentration_table/Generic_Tables/index.htm.
b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1×10^{-6} risk:
Cancer risk = (1995 ROD RG ÷ Soil Cancer RSL) × 10^{-6}
c. The noncancer hazard index was calculated using the following equation:
Hazard index = (1995 ROD RG ÷ Soil Noncancer RSL)
d. HQ = noncancer hazard quotient

The PRPs completed a vapor intrusion assessment in 2013, evaluating several lines of evidence. The indoor air, outdoor air, sub-slab vapor and groundwater sampling indicate that there is not a complete groundwater to indoor air vapor intrusion pathway at Oak Ridge that creates a potential risk/hazard above NCDENR or EPA target levels. Additional investigations at the apartments may be needed if site conditions change.

Due to the presence of 1,1,1-trichloroethane as a groundwater COC, there is a potential that 1,4-dioxane may also exist because it often is added to these solvents as a stabilizer and corrosion inhibitor. The chemical 1,4-dioxane is a suspected carcinogen and is highly miscible in water it can be found in groundwater plumes far in advance of other solvents with which it might have entered the subsurface originally. The presence or absence of 1,4-dioxane should be evaluated to ensure the protectiveness of the groundwater remedy.

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

No other issues have come to light that could call into questions the protectiveness of the remedy.

7.4 Technical Assessment Summary

No, the remedy is not functioning as intended. The treatment system is effective in treating the VOC-contaminated groundwater, but data indicate the system will not achieve cleanup goals by 2030 as previously expected. The PRPs are conducting additional site assessments to identify additional source areas beneath remaining building slabs to better delineate the contaminated groundwater plume and to better understand the contaminated groundwater transport mechanisms in the fractured bedrock. Modifications to the remedy may be implemented to accelerate groundwater remediation consistent with the remedial objective of containing the groundwater plume. Institutional controls are not called for in decision documents and are not yet in place, but they are needed for long-term protectiveness of the

remedy. A 2013 assessment of the indoor air, outdoor air, sub-slab vapor and groundwater sampling indicate that there is no unacceptable risk from vapor intrusion at Oak Ridge apartments. It is unknown if and to what extent 1,4-dioxane is present at the Site.

8.0 Issues, Recommendations and Follow-up Actions

Table 10: Issues and Recommendations Identified in the Five-Year Review

OU(s): OU1	Issue Category: Institutional Controls			
	Issue: Institutional controls are not called for in the decision documents and are not implemented.			
	Recommendation: Modify the remedy to require institutional controls and implement appropriate groundwater and land use restrictions.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016

OU(s): OU1	Issue Category: Remedy Performance			
	Issue: Source areas remain on site.			
	Recommendation: Characterize remaining on-site source areas and possible off-site sources that may impact the groundwater plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016

OU(s): OU1	Issue Category: Remedy Performance			
	Issue: The current groundwater remedy is not expected to achieve the intended RAOs.			
	Recommendation: Complete site assessment investigations and modify the remedy as needed to accelerate remediation.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016

OU(s): OU1	Issue Category: Monitoring
	Issue: The presence of 1,4-dioxane has not been evaluated in site groundwater.
	Recommendation: Analyze groundwater to determine if 1,4-dioxane should be a COC at the Site.

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	PRP	EPA/State	9/1/2016

The following additional items, though not expected to affect protectiveness, warrant additional follow-up:

- Labels have fallen off some monitoring wells.

9.0 Protectiveness Statement

Table 11: Protectiveness Statement

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy currently protects human health and the environment in the short term because no complete exposure pathways exist. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: implement institutional controls; characterize source areas; modify the remedy to accelerate remediation; and assess the presence of 1,4-dioxane in groundwater.	

10.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

AECOM. March 2012. Semiannual Ground water Remediation Report – May 2011 through October 2011, JFD Electronics/Channel Master Site, Oxford, North Carolina.

AECOM. December 2012. Summary Report of Membrane Interface Probe and Direct-Push Technique Investigations and Work Plan, JFD Electronics/Channel Master Site, Oxford, North Carolina.

AECOM. July 2013. Vapor Intrusion Investigation Report – Oak Ridge Apartments, JFD Electronics/Channel Master Site, Oxford, North Carolina.

AECOM. August 2014. Semiannual Ground water Remediation Report – October 2013 through April 2014, JFD Electronics/Channel Master Site, Oxford, North Carolina.

AECOM. December 2014. Site Assessment Interim Report, JFD Electronics/Channel Master Site, Oxford, North Carolina.

AECOM. March 2015. Vapor Intrusion Investigation Report – Oak Ridge Apartments, JFD Electronics/Channel Master Site, Oxford, North Carolina.

JFD Electronics/Channel Master Site, Oxford, North Carolina. Geraghty & Miller, Inc., July 30, 1996. Supplemental Feasibility Study, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. September 10, 1992. Record of Decision, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. January 24, 1996. Explanation of Significant Differences, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. May 4, 1999. Amendment to the 1992 Record Of Decision, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. July 19, 2000. Explanation of Significant Differences, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. September 29, 2000. Preliminary Close-Out Report, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. September 30, 2005. Five-Year Review Report, JFD Electronics/Channel Master Site, Oxford, North Carolina.

U.S. Environmental Protection Agency, Region 4. September 30, 2010. Five-Year Review Report, JFD Electronics/Channel Master Site, Oxford, North Carolina.

Appendix B: Press Notice

The U.S. Environmental Protection Agency, Region 4
Announces a Five-Year Review for
The JFD Electronics/Channel Master Superfund Site,
Oxford, Granville County, North Carolina

Purpose/Objective: EPA is conducting a Five-Year Review of the remedy for the JFD Electronics/Channel Master Superfund site (the Site) in Oxford, North Carolina. The purpose of the Five-Year Review is to make sure the selected cleanup actions effectively protect human health and the environment.

Site Background: The 13-acre Site is located in Oxford, Granville County, North Carolina at 620 West Industry Drive. From 1961 to 1984, an antenna, amplifier and booster manufacturing facility operated on site. Manufacturing activities included copper/nickel electroplating and chrome conversion coating of manufactured parts. Site operators disposed of sludge and wastewater into an on-site lagoon. In 1983, half of the lagoon was filled and used as a truck parking lot. Additionally, from 1984 to 2003, an electronics packaging and distribution facility operated on site. As a result of waste handling practices, area groundwater, sludge and soil became contaminated with volatile organic compounds (VOCs) and metals. Following investigations by the State of North Carolina, EPA proposed the Site to the Superfund program's National Priorities List (NPL) on June 24, 1988. EPA finalized the Site for the NPL on October 4, 1989.

Cleanup Actions: Between 1987 and 1988, the responsible party excavated and removed contaminated sludge and soils, and removed on-site waste and fuel tanks. EPA then signed a Record of Decision (ROD) in September 1992 outlining the cleanup plan for remaining contaminants and groundwater. EPA updated the 1992 ROD three times with a 1999 ROD Amendment, a 2000 Explanation of Significant Differences (ESD) for groundwater and a 2000 ESD for soils. The overall remedy includes a groundwater pump-and-treat system as well as excavation, and off-site treatment and disposal of contaminated soil and sludge. In 2008, buildings on site were demolished. The Site is currently not in use, except for ongoing groundwater treatment activities. Zoning limits the site to industrial land use. In addition, the North Carolina well permitting statute prohibits access to groundwater within the plume of contamination.
JFD Electronics Corporation and Channel Master Satellite Systems, Inc., the responsible parties, lead site investigation and cleanup activities, with oversight provided by EPA and North Carolina Department of Environment and Natural Resources.

Five-Year Review Schedule: The National Contingency Plan requires review of remedial actions that result in any hazardous substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure every five years to ensure the protection of human

health and the environment. The third of the Five-Year Reviews for the Site will be completed by September 2015.

EPA Invites Community Participation in the Five-Year Review Process: EPA is conducting this Five-Year Review to evaluate the effectiveness of the Site's remedy and to ensure that the remedy remains protective of human health and the environment. As part of the Five-Year Review process, EPA staff is available to answer any questions about the Site. Community members who have questions about the Site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Beverly Stepter, EPA Remedial Project Manager
Phone: (404) 562-8816
Email: stepter.beverly@epa.gov

L'Tonya Spencer, EPA Community Involvement Coordinator
Phone: (404) 562-8463
Email: spencer.latonya@epa.gov

Mailing Address: U.S. EPA Region 4, 61 Forsyth Street, S.W., 11th Floor, Atlanta, GA 30303-8960

Additional information is available at the Site's local document repository, located at Richard H. Thornton Public Library, 210 Main Street, Oxford, NC 27565, and online at: http://www.epa.gov/region4/superfund/sites/npl/northcarolina/jfdchmasnc.html.

Appendix C: Interview Forms **Five-Year Review Interview Form**

JFD Electronics/Channel Master Superfund Site **EPA ID No.: NCD122263825**

Site Name: JFD Electronics/Channel Master

Interviewer Name: Amanda Govne **Affiliation:** Skeo Solutions
Subject Name: David Mattison **Affiliation:** NCDENR
Subject Contact Information: david.mattison@ncdenr.gov
Time: 8:00 a.m. **Date:** 01/27/2015
Interview Location: Email

Interview Format (circle one): In Person Phone Mail Other: Email

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The soil remedy (excavation and off-site disposal) was completed in accordance with the Record of Decision (ROD) and Amendment to the ROD. The groundwater remedy (extraction, treatment and discharge) was likewise completed according to the ROD and continues to successfully operate. The investigation to ascertain the presence of additional source material and refine the delineation of the contaminated groundwater plume, better understand the contaminated groundwater transport mechanisms in the fractured bedrock, and develop an appropriate remedial strategy to accelerate the remediation of the site is ongoing.

   The consultant (AECOM) retained by the Potential Responsible Parties (PRPs) has been unsuccessful in gaining the appropriate access agreements and owner signatures required to install additional soil borings and/or groundwater monitoring wells on the adjacent Cristex National Priorities List (NPL) site, the contaminated groundwater plume from which commingles with the contaminated groundwater plume from the JFD Electronics/Channel Master NPL site. AECOM has requested the assistance of the US EPA in this matter but has committed to providing an interim summary report for the purposes of this 5 Year Review.

   A Vapor Intrusion Investigation was conducted at the Oak Ridge Apartment complex downgradient from the site from 2012 through 2013. The investigation concluded that currently the contaminated groundwater beneath the Oak Ridge Apartment community does not present an excess adverse health risk to the community via vapor intrusion exposure.

   Institutional controls are not in place at the JFD Electronics/Channel Master NPL Site. Upon execution of the Amendment to the Record of Decision, the US EPA, NC DENR and the PRPs will determine those areas subject to the proposed institutional controls and develop the language for the Declaration of Perpetual Land Use Restrictions (DPLUR) for the affected landowners to implement.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy in place at the Site is adequate in the short-term because there are currently no receptors at risk but will require additional measures to remain protective in the long term. Upon completion of the ongoing delineation of the contaminated groundwater plume, the groundwater extraction system will require modification to provide complete hydraulic control and accelerate the cleanup of the site. Additionally, institutional controls in the form of land use restrictions remain to be implemented across the site.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   Yes. Received interest from Oak Ridge Apartment community during Vapor Intrusion Investigation conducted at the apartment complex from 2012 through 2013. The investigation concluded that currently the contaminated groundwater beneath the Oak Ridge Apartment community does not present an excess adverse health risk to the community via vapor intrusion exposure.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   Yes. Assisted with public meetings, public outreach activities, as well as oversight of field activities conducted for the Vapor Intrusion Investigation.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   No. Institutional controls are not in place at the JFD Electronics/Channel Master NPL Site. Upon execution of the Amendment to the Record of Decision, the US EPA, NC DENR and the PRPs will determine those areas subject to the proposed institutional controls and develop the language for the Declaration of Perpetual Land Use Restrictions for the affected landowners to implement.

7. Are you aware of any changes in projected land use(s) at the Site?

   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Continue the investigation to delineate and refine the contaminated groundwater plumes from both the JFD Electronics/Channel Master NPL site and the Cristex NPL site. Develop remedial measures to provide hydraulic containment and treatment of the contaminated groundwater plumes and accelerate site-wide remediation. Develop and implement institutional controls in the form of deed restrictions across the site.

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: JFD Electronics/Channel Master	**Date of Inspection: 01/27/2015**
Location and Region: Oxford, NC – Region 4	**EPA ID: NCD991278540**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Sunny and 35° F**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ Name _____ Title mm/dd/yyyy Date
   Interviewed ☐ at site ☐ by email ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ Name _____ Title mm/dd/yyyy Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   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). Fill in all that apply.

Agency North Carolina Department of Environment and Natural Resources
Contact Dave Mattison (Name) | Environmental Engineer (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: Interview questions sent via email.

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: _____

III. ON-SITE DOCUMENTS AND 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: _____

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: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

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. **Ground Water 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: _____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

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
☐ _____	

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	

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

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: All remedy-related fencing appeared to be in good condition.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs displaying remedy-related information and warnings are posted throughout the Site and are in good condition.

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): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ mm/dd/yyyy _____

Name Title Date 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: Institutional controls required by the Site's decision documents have not been implemented.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☒ N/A

Remarks: _____

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: _____

2. **Cracks**	☐ Location shown on site map	☐ Cracking not evident
Lengths: _____	Widths: _____	Depths: _____
Remarks: _____		
3. **Erosion**	☐ Location shown on site map	☐ Erosion not evident
Arial extent: _____		Depth: _____
Remarks: _____		
4. **Holes**	☐ Location shown on site map	☐ Holes not evident
Arial 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** (e.g., armored rock, concrete)		☐ N/A
Remarks: _____		
7. **Bulges**	☐ Location shown on site map	☐ Bulges not evident
Arial extent: _____		Height: _____
Remarks: _____		
8. **Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
☐ Wet areas	☐ Location shown on site map	Arial extent: _____
☐ Ponding	☐ Location shown on site map	Arial extent: _____
☐ Seeps	☐ Location shown on site map	Arial extent: _____
☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
Remarks: _____		
9. **Slope Instability**	☐ Slides	☐ Location shown on site map
☐ No evidence of slope instability		
Arial 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

(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** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
Arial extent: _____ Depth: _____
Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type:_____ Arial extent: _____
Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Arial extent: _____ Depth: _____
Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Arial extent: _____ Depth: _____
Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
☐ Location shown on site map Arial 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 Arial 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: _____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
Remarks: _____

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: _____

4. **Extraction Wells Leachate**

☐ 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: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

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** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

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

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring: _____

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water 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: _____

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 ☐ Bioremediation

☒ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ 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 ground water treated annually: _____

☐ 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 ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs maintenance

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 ☒ Good condition

☒ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: Labels have fallen off of some wells.

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Ground water 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 and 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 designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). The remedy is not functioning as intended. The PRPs are conducting additional site assessments to identify source areas beneath remaining building slabs to better delineate the contaminated groundwater plume and to better understand the contaminated groundwater transport mechanisms in the fractured bedrock. Modifications to the remedy may be implemented to accelerate groundwater remediation consistent with the remedial objective of containing the groundwater plume.
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 Site seems to be well maintained.
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. The PRP is conducting a capture analysis.
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization have been identified.

Appendix E: Photographs from Site Inspection Visit

Signage at locked entrance gate.

Recently installed monitoring well.

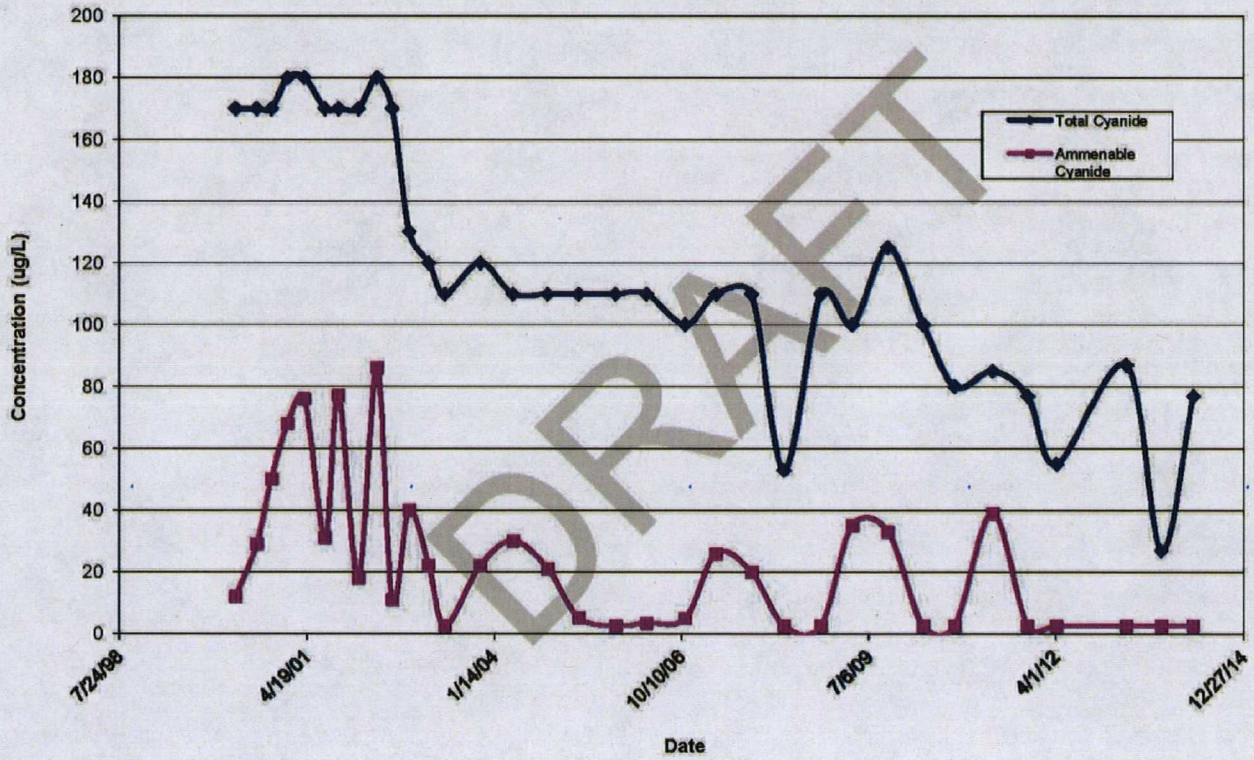
Pump-and-treat system.

On-site building slab.

Entrance to the Site.

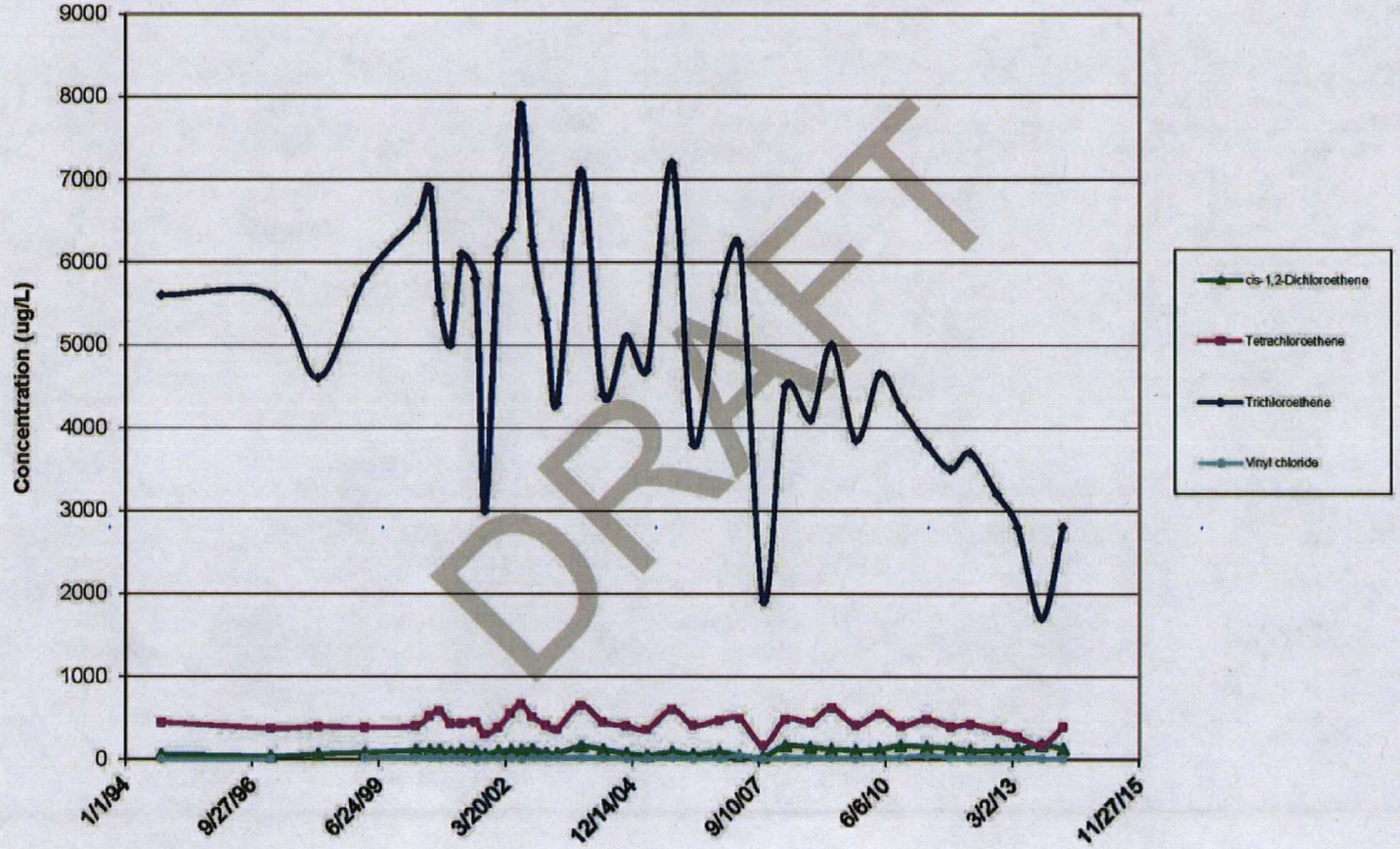
Appendix F. Source Area and Groundwater Monitoring Results

Concentration of Total and Amenable Cyanide in CMMW04
JFD Electronics/Channel Master Site



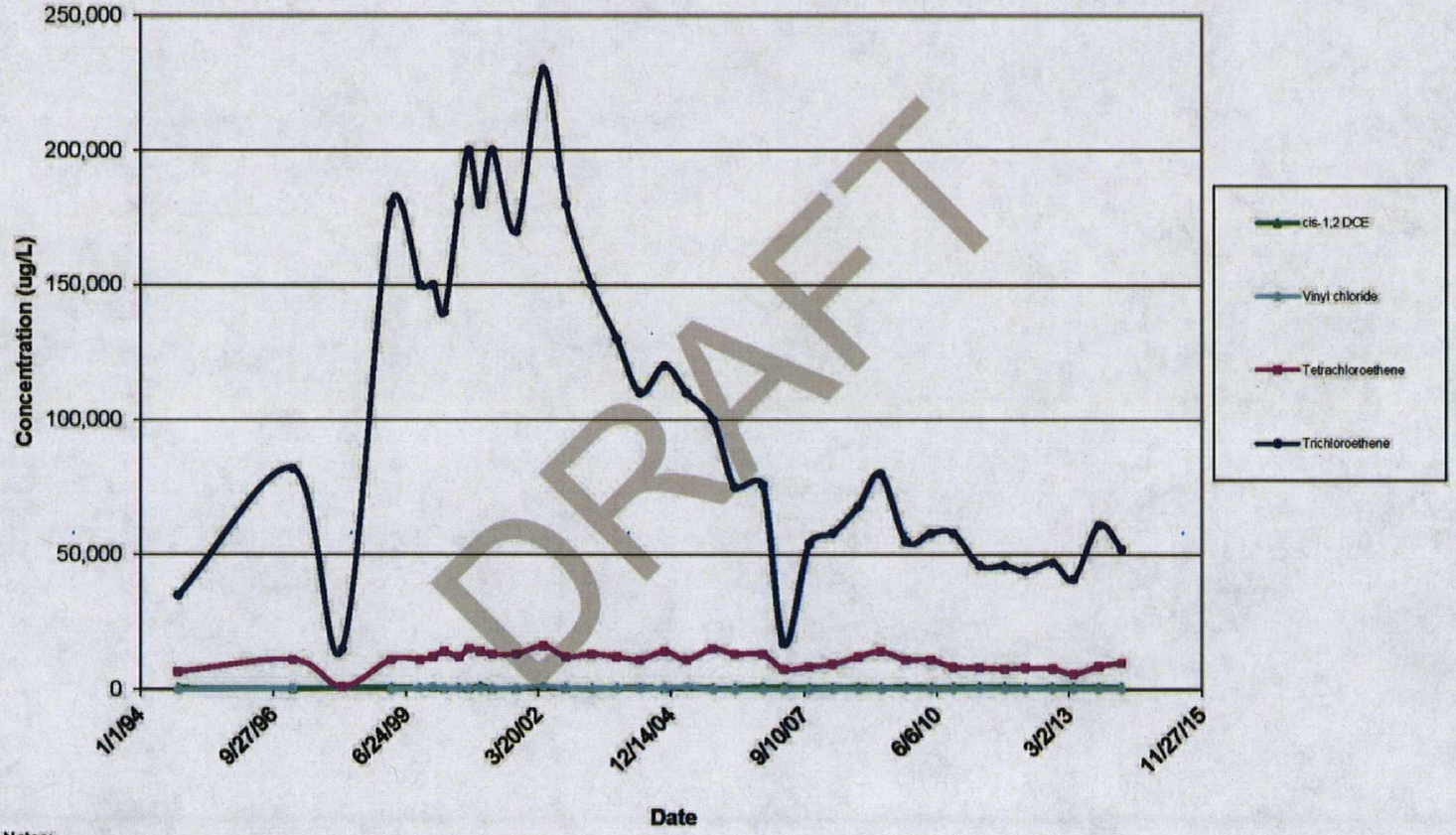
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.

Key VOCs in Well CMMW04
JFD Electronics/Channel Master Site



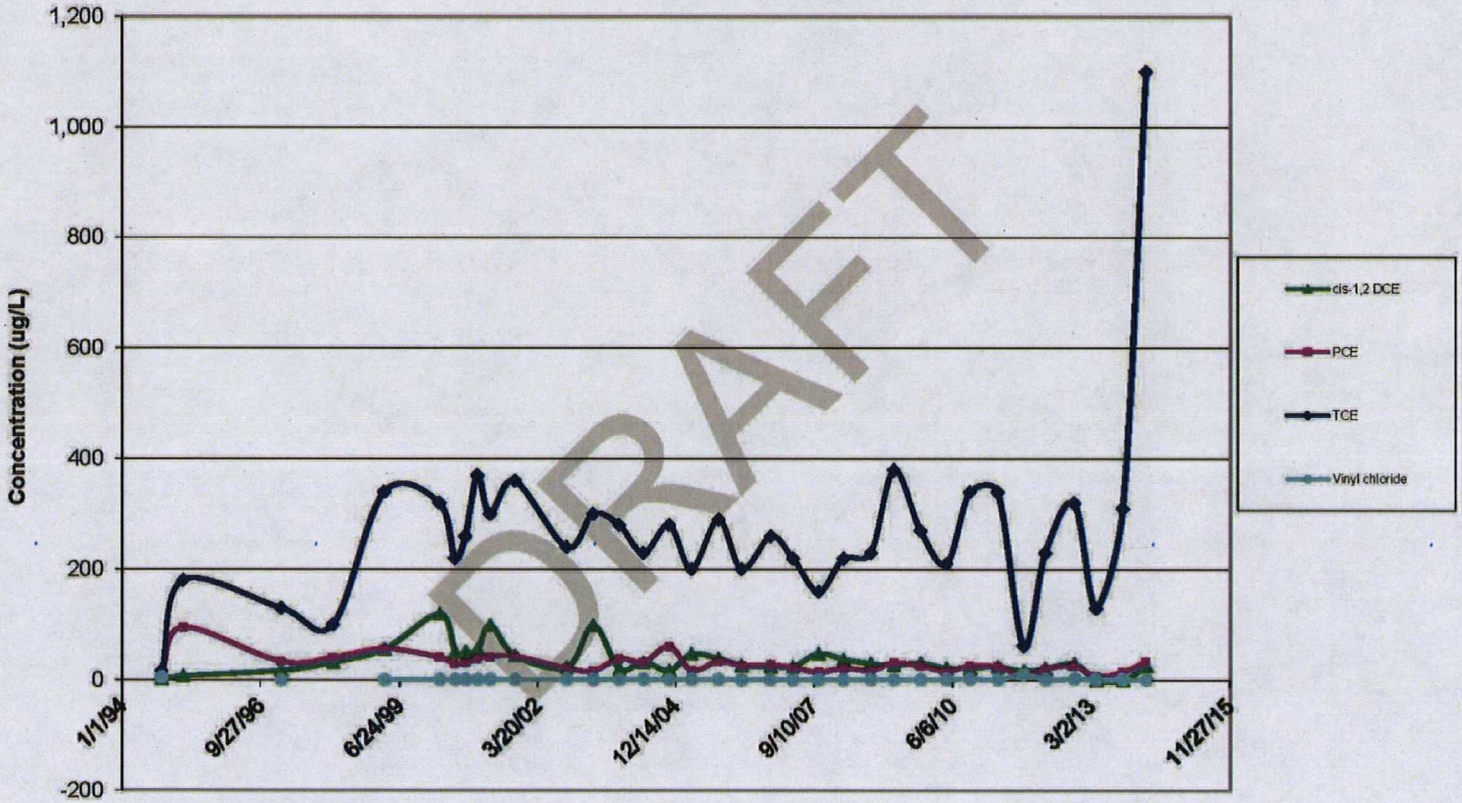
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene

Key VOCs in Well CMMW05
JFD Electronics/Channel Master Site



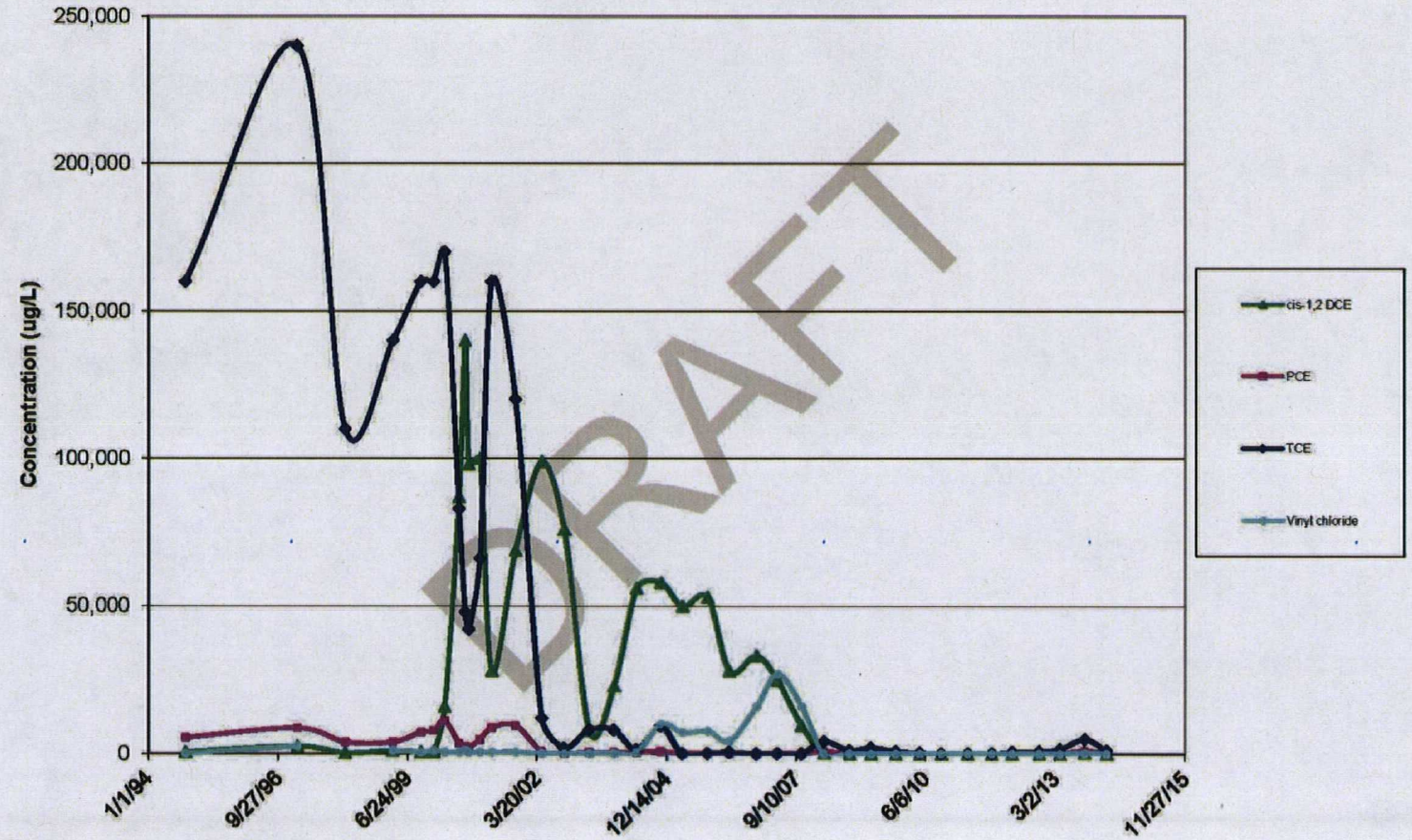
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene concentration.

Key VOCs in Well CMMW07
JFD Electronics/Channel Master Site

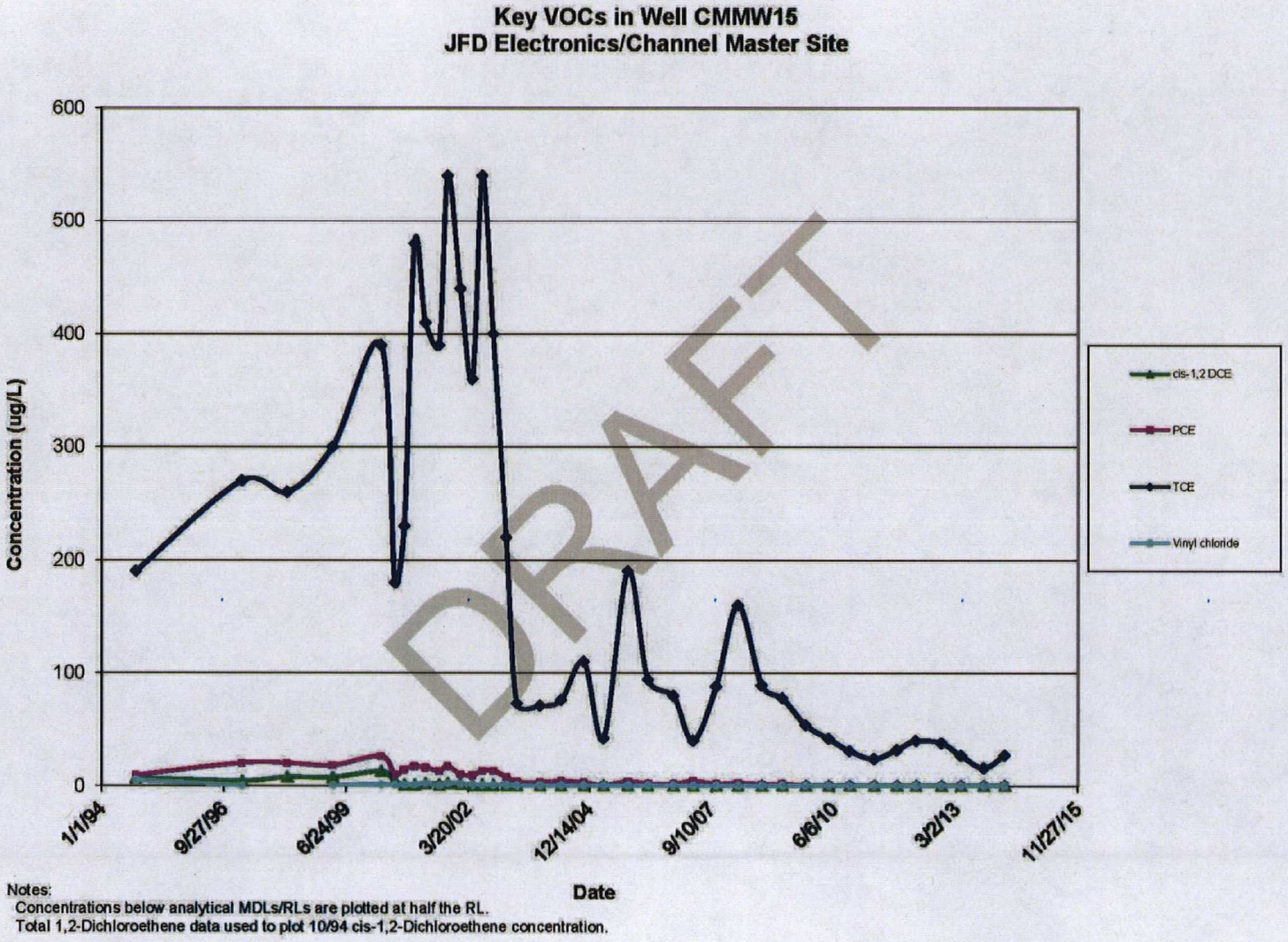


Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene concentration.

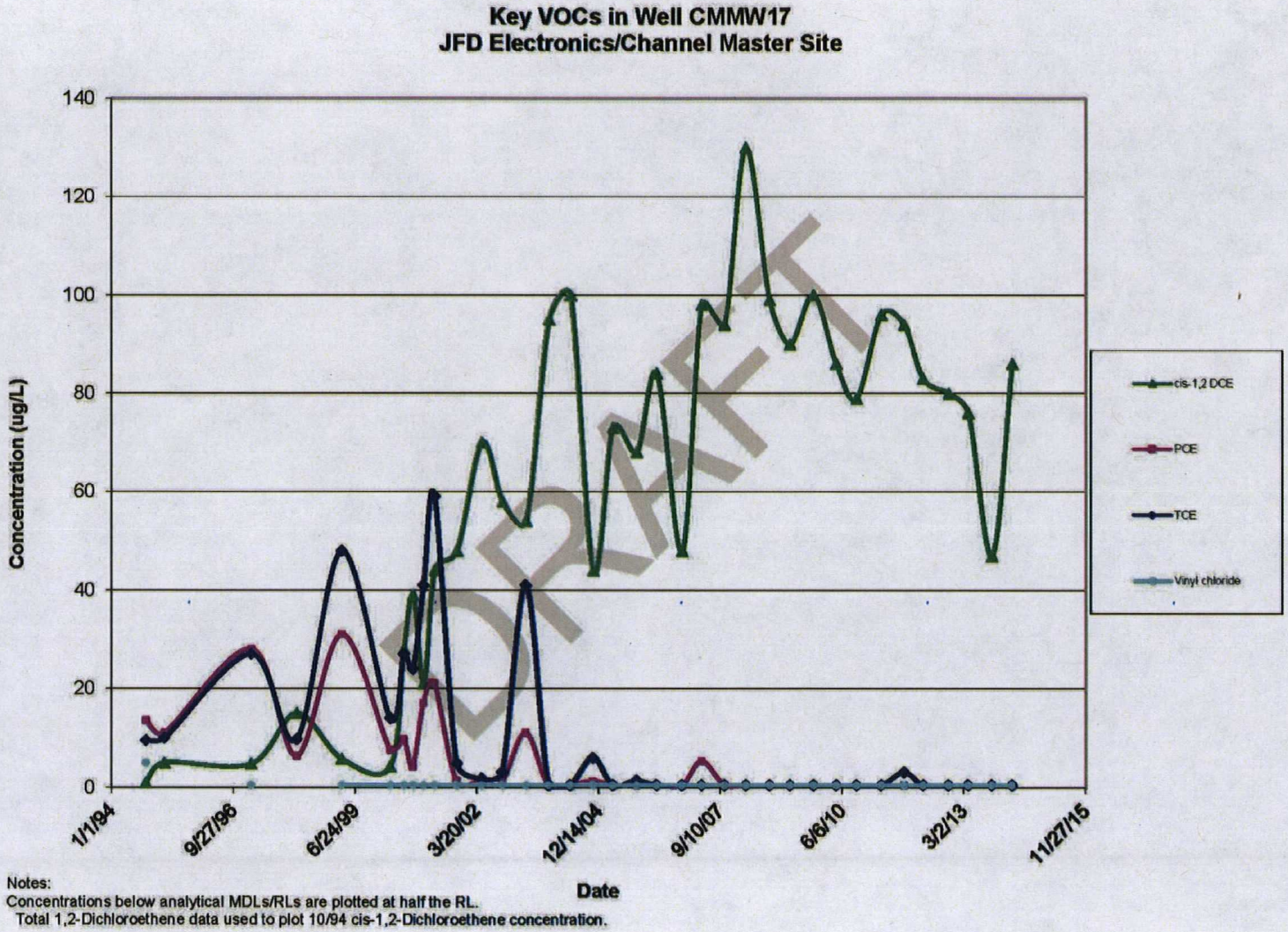
Key VOCs in Well CMMW10
JFD Electronics/Channel Master Site



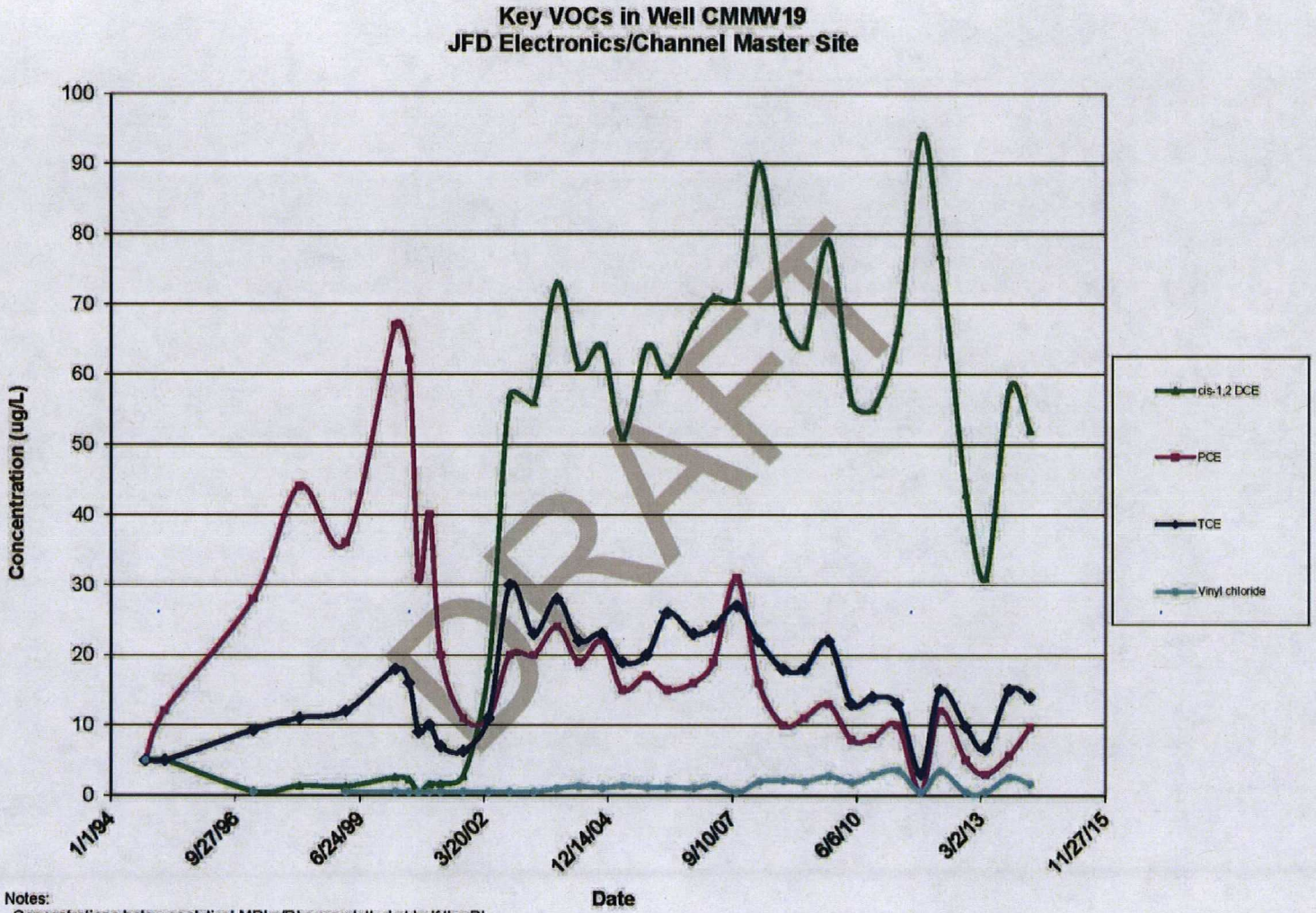
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-dichloroethene data used to plot 10/94 cis-1,2-dichloroethene concentration.



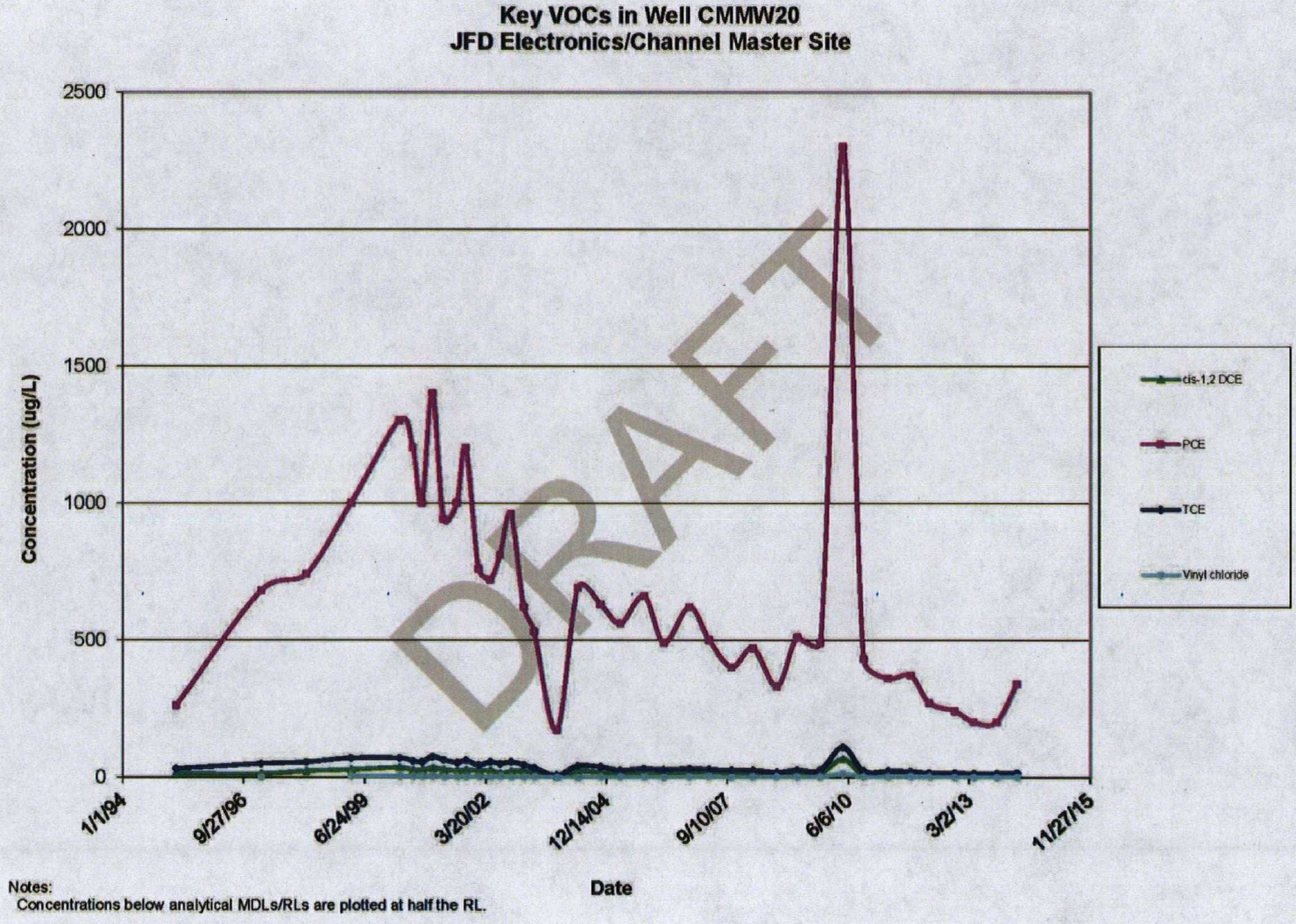
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene concentration.



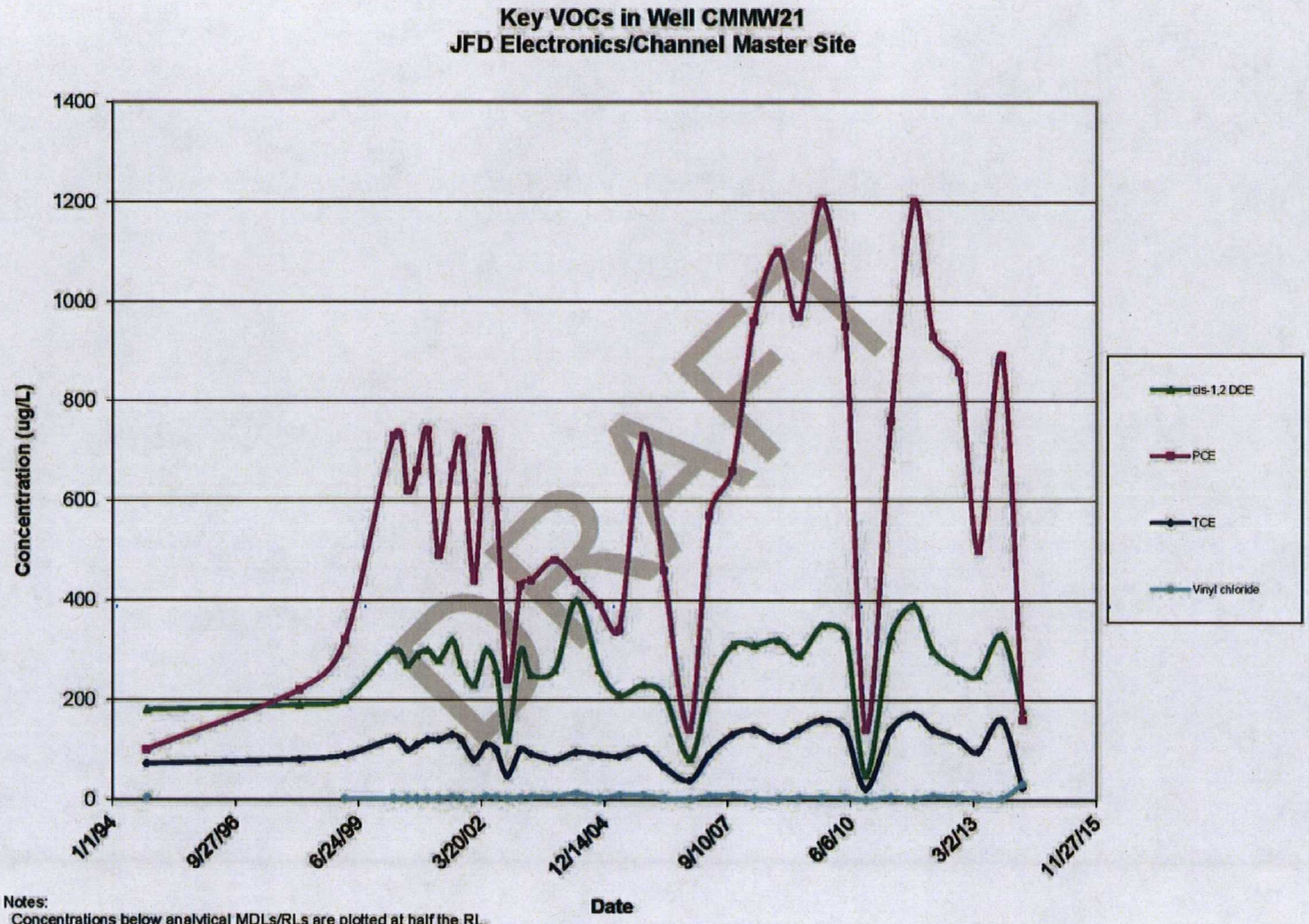
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene concentration.



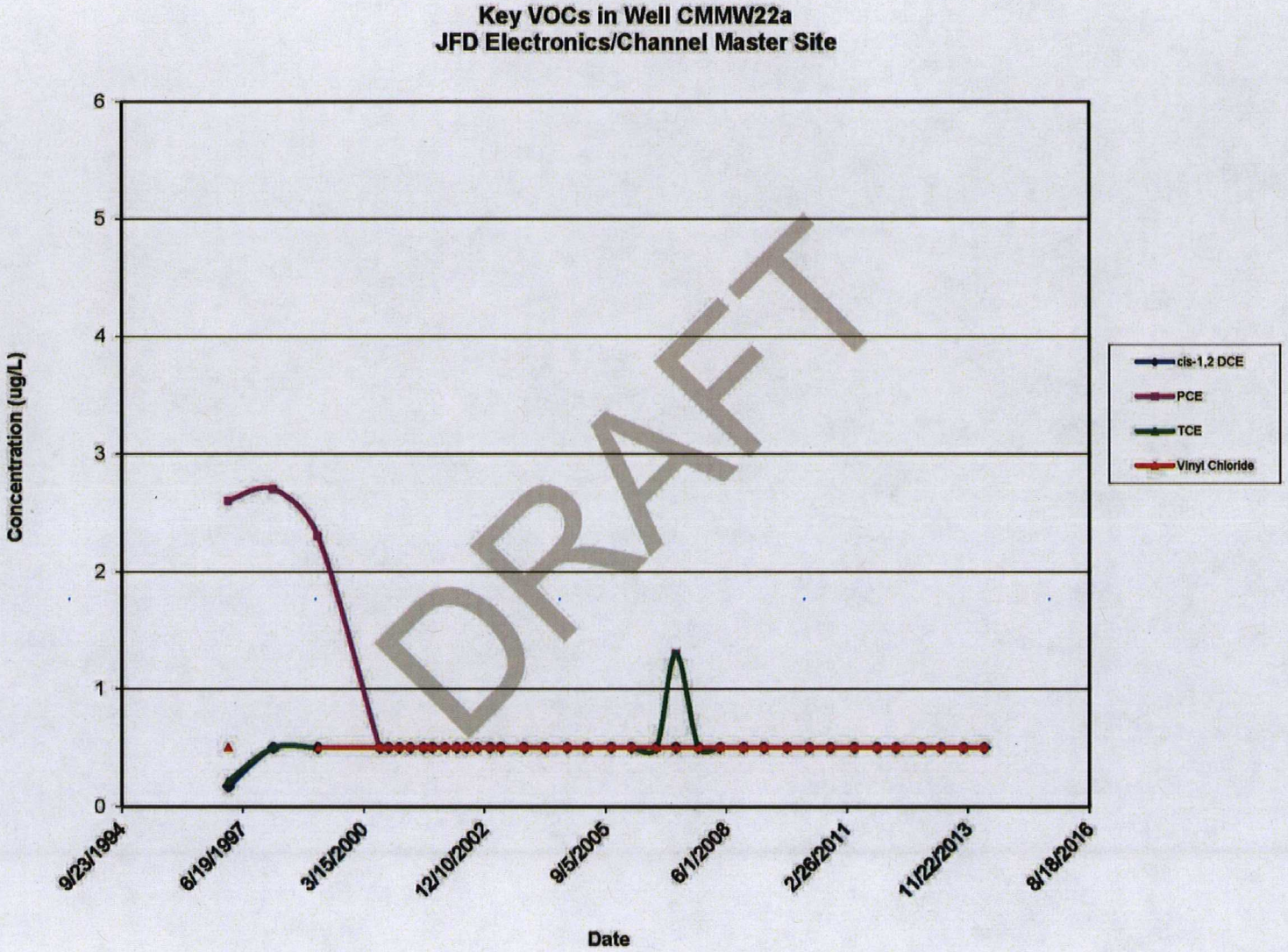
Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene concentration.

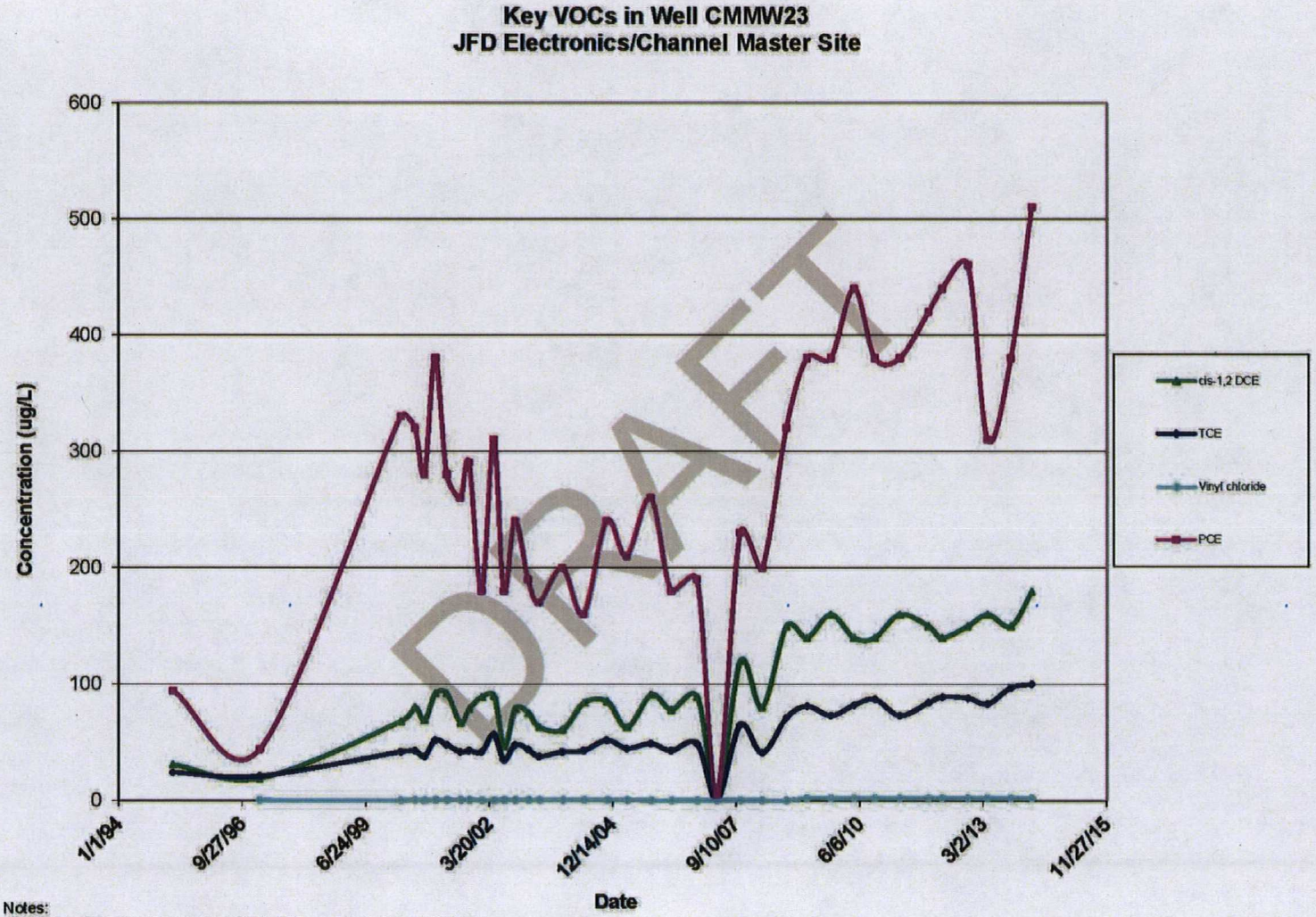


Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.

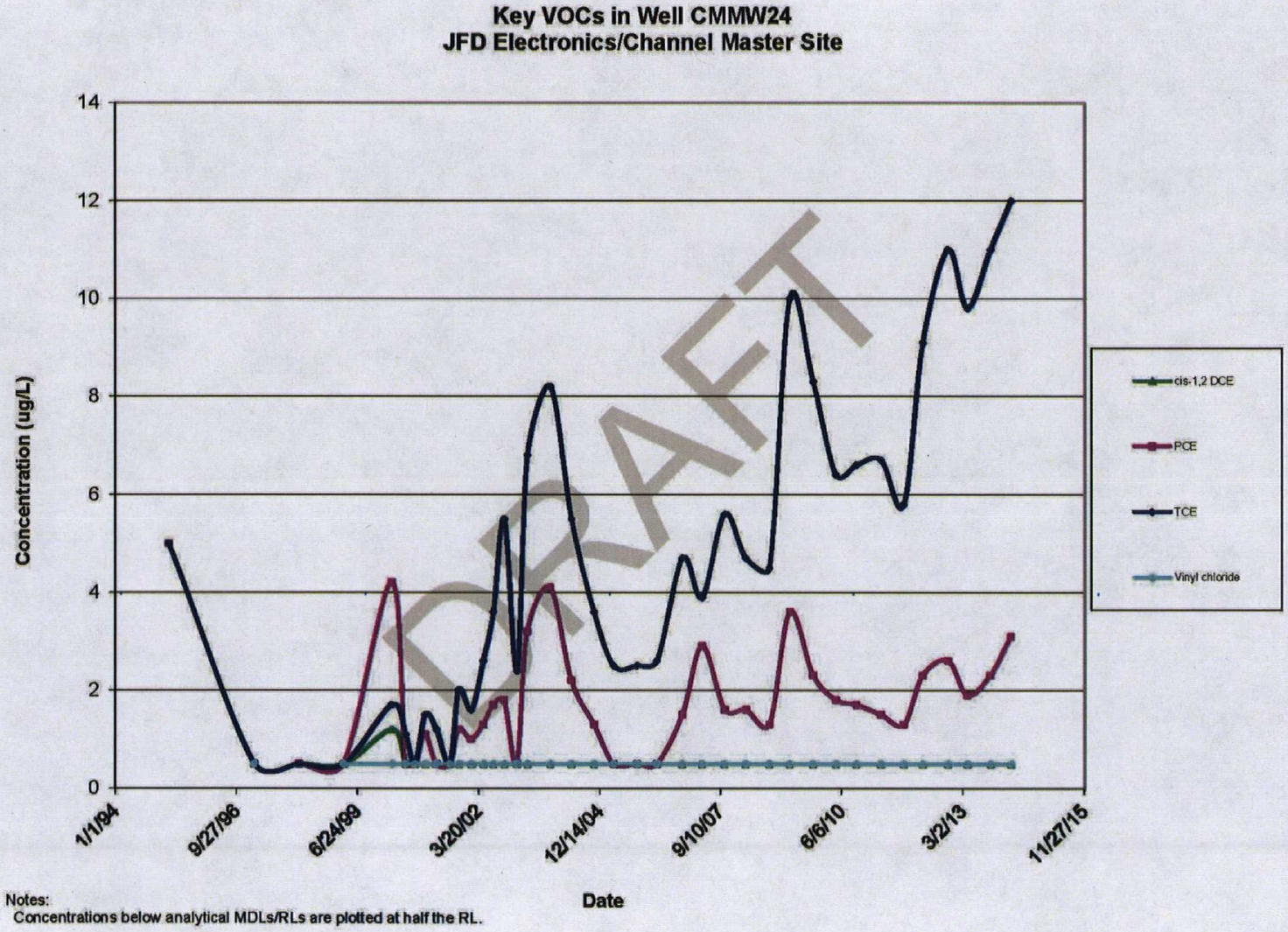


Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.
Total 1,2-Dichloroethene data used to plot 10/94 cis-1,2-Dichloroethene concentration.

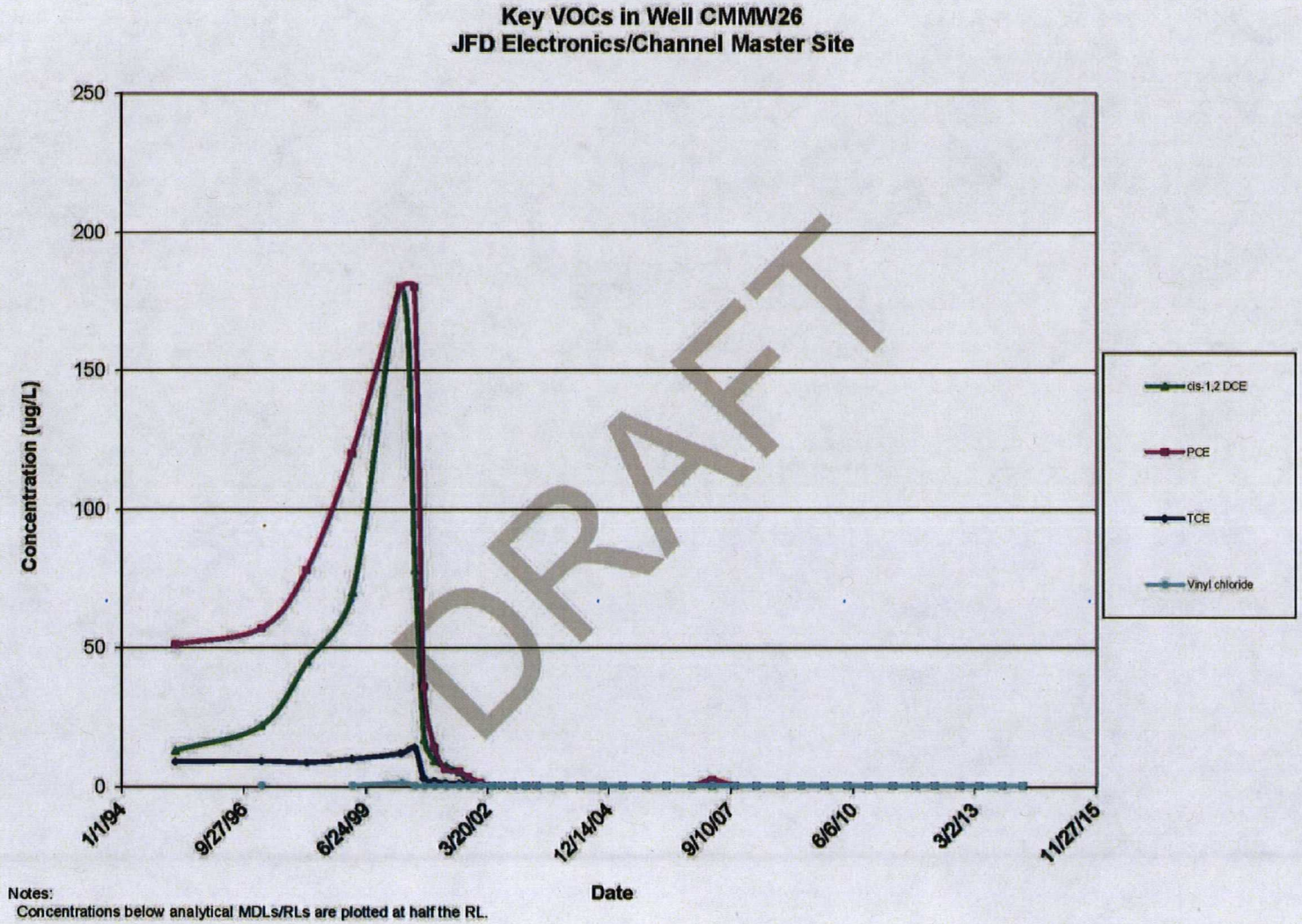

Key VOCs in Well CMMW22a
JFD Electronics/Channel Master Site
Concentration (ug/L)
0
1
2
3
4
5
6
9/23/1994
6/19/1997
3/15/2000
12/10/2002
9/5/2005
6/1/2008
2/26/2011
11/22/2013
8/18/2016
Date
cis-1,2 DCE
PCE
TCE
Vinyl Chloride
DRAFT



Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.



Notes:
Concentrations below analytical MDLs/RLs are plotted at half the RL.



Notes:
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Appendix G. 2013 Private Well Survey

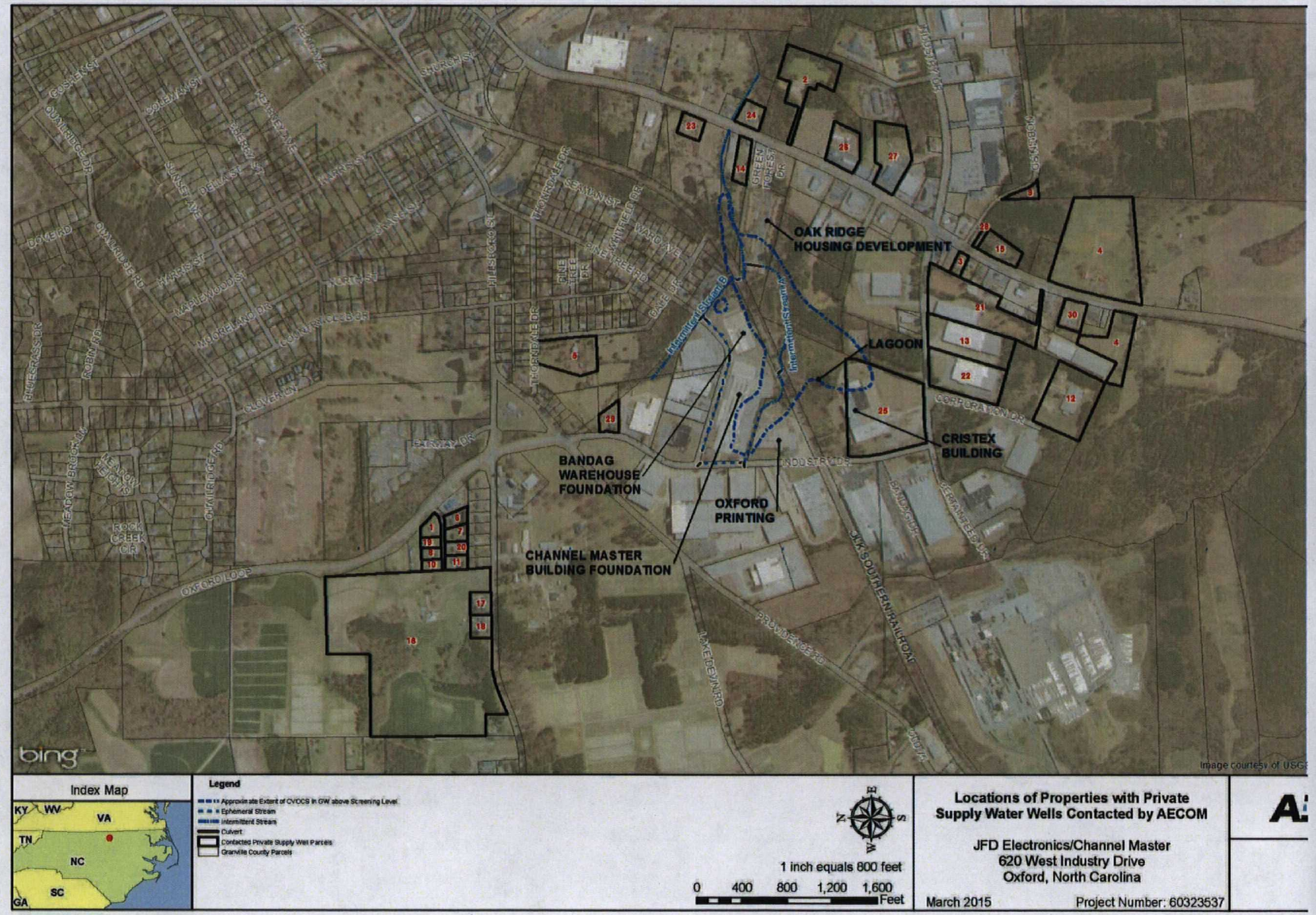
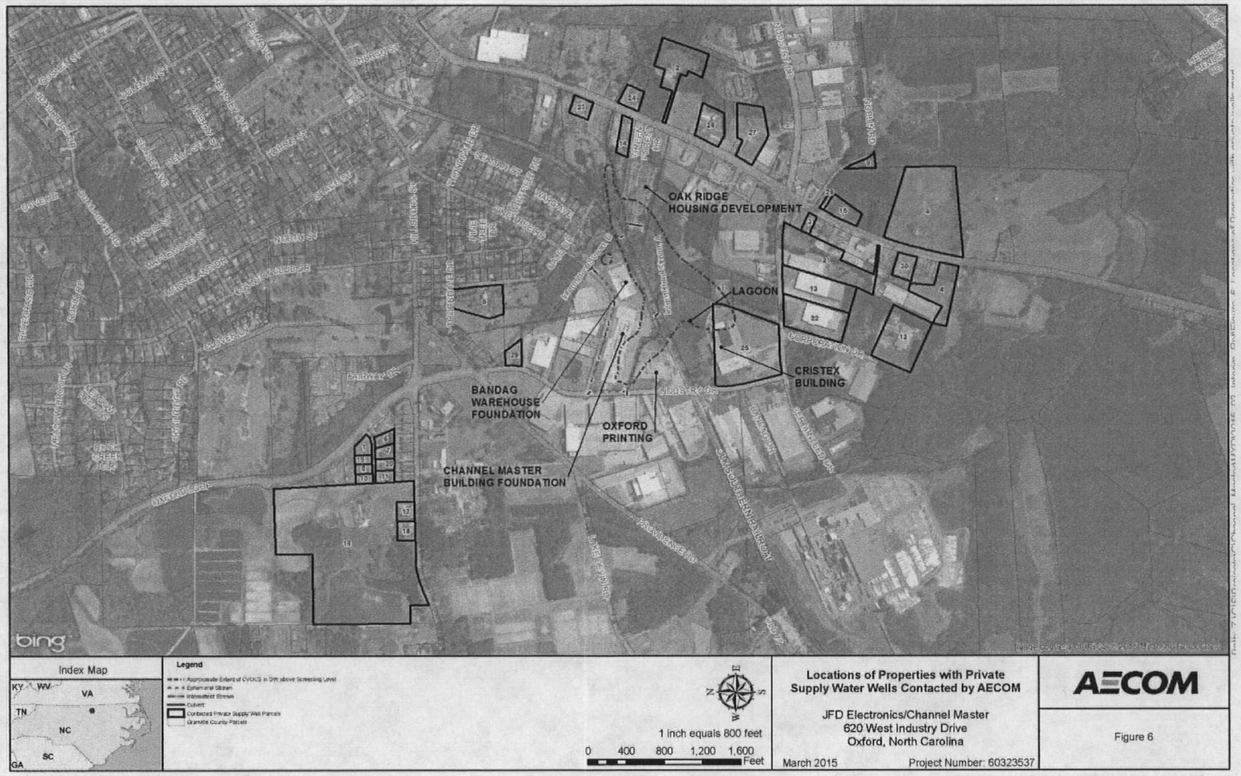


Table 8
Summary of Private Water Supply Well Survey
JFD Electornics/Channel Master Site
Oxford, North Carolina

Map ID	Parcel Address	Well?	Well Actively Used For Drinking Water?	Method of Contact	Comments
1	100 Clubview Pl	Yes	Yes	Certified Mail on 12/12/14	Completed & signed survey received; well used for drinking water and agriculture
2	503 Lewis St	Yes	Yes	Certified Mail on 12/12/14	Completed & signed survey received; well used for drinking water
3	708 Lewis St	Yes	Yes	Phone on 10/29/14	Well currently used for drinking water
4	812 Lewis St	Yes	Yes	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for drinking water and hc 12/2012 indicated manganese at 2600 ug/L
5	301 W Thorndale Dr	Unknown	Unknown	Certified Mail on 12/12/14	Completed & signed survey received; owner was not sure about existence of a well connection
6	103 Clubview Pl	Unknown	Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
7	107 Clubview Pl	Unknown	Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
8	110 Clubview Pl	Unknown	Unknown	Certified Mail on 12/12/14	Letter returned, could not be delivered.
9	110 Noblin Rd		Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
10	114 Clubview Pl		Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
11	115 Clubview Pl		Unknown	Certified Mail on 12/12/14	Letter returned, could not be delivered.
12	115 Corporation Dr		Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
13	211 W Industry Dr		Unknown	Certified Mail on 12/12/14	Letter returned, could not be delivered.
14	426 Lewis St		Unknown	Certified Mail on 12/12/14	Letter returned, could not be delivered.
15	719 Lewis St		Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
16	1000 Hillsboro St		No	Phone on 10/29/14	Well not used for drinking water
17	1002 Hillsboro St		No	Phone on 10/29/14	Well not used for drinking water
18	1004 Hillsboro St		No	Phone on 10/29/14	Well not used for drinking water
19	102 Clubview Pl		No	Certified Mail on 12/12/14	Completed & signed survey received; no well on property
20	111 Clubview Pl		No	Phone on 12/19/2014	No well on property; house is on city water
21	209 W Industry Dr		No	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for flushing toilets; indus
22	311 W Industry Dr		No	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for flushing toilets; indus
23	414 Lewis St		No	Phone on 10/29/14	House is abandoned and power disconnected; well not currently used
24	425 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; well is inactive and not used; city water conne
25	500 W Industry Dr		No	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back; NCDENR noted in 12/2012 that i
26	521 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for car wash and body sl
27	613 Lewis St		No	Phone on 10/29/14	Well used for carwash only, NCDENR sample results 12/2012 indicated chloroform
28	709 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; well is inactive and not used
29	730 W Industry Dr		No	Certified Mail on 12/12/14	Completed & signed survey received; no well on property
30	802 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; no well on property

Notes:
= Potential well identified by AECOM in 2012 and contacted upon EPA request
= Potential well identified by NCDENR or AECOM and contacted without EPA request

Appendix G. 2013 Private Well Survey



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4	812 Lewis St	Yes	Yes	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for drinking water and household use; NCDENR sample results 12/2012 indicated manganese at 2600 ug/L
5	301 W Thorndale Dr	Unknown	Unknown	Certified Mail on 12/12/14	Completed & signed survey received; owner was not sure about existence of a well on the property; property has city water connection
6	103 Clubview Pl	Unknown	Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
7	107 Clubview Pl	Unknown	Unknown	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back
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22	311 W Industry Dr		No	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for flushing toilets; industrial use
23	414 Lewis St		No	Phone on 10/29/14	House is abandoned and power disconnected; well not currently used
24	425 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; well is inactive and not used; city water connection
25	500 W Industry Dr		No	Certified Mail on 12/12/14	Letter was delivered but no survey was sent back; NCDENR noted in 12/2012 that no pump was in the well
26	521 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; well active and used for car wash and body shop
27	613 Lewis St		No	Phone on 10/29/14	Well used for carwash only, NCDENR sample results 12/2012 indicated chloroform at 0.80 ug/L
28	709 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; well is inactive and not used
29	730 W Industry Dr		No	Certified Mail on 12/12/14	Completed & signed survey received; no well on property
30	802 Lewis St		No	Certified Mail on 12/12/14	Completed & signed survey received; no well on property

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Potential well identified by AECOM in 2012 and contacted upon EPA request
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