THIRD FIVE-YEAR REVIEW REPORT FOR LINEMASTER SWITCH CORPORATION SUPERFUND SITE WOODSTOCK, CONNECTICUT

Prepared by

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Date

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ACRONYMS

1,2-DCA	1,2-dichloroethane
AOC	Administrative Order by Consent
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
CAA	Clean Air Act
CD	Consent Decree
Cis-1,2-DCE	1,2-Dichloroethylene
COC	Contaminant of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSFs	cancer slope factors
CT DPH	Connecticut Department of Public Health
CTRSRs	Connecticut Remediation Standards Regulations
CTDEEP	Connecticut Department of Energy and Environmental Protection
DEC	Direct Exposure Criteria (CT)
DVE	dual vapor extraction
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
ft	feet
FYR	Five-Year Review
gpm	gallons per minute
GAC	Granular Activated Carbon
GWPC	Groundwater Protection Criteria
GWVC	Groundwater Volatilization Criteria
HHRA	human health risk assessment
IC	Institutional Controls
lbs/hr	pounds per hour
LSC	Linemaster Switch Corporation
LTM	Long-Term Monitoring
LTMP	long-term monitoring program
IRTS	interim removal treatment system
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
$\mu g/m^3$	micrograms per cubic meter
µg/L	micrograms per liter
mg/L	milligrams per liter
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
ppb	parts per billion
PMC	Pollutant Mobility Criteria (CT)
ppm	parts per million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfCs	Reference Concentrations
RfDs	Risk Reference Doses
RI/FS	Remedial Investigation/Feasibility Study

ACRONYMS (Cont'd)

ROD	Record of Decision
RSL	Regional Screening Level
SDWA	Safe Drinking Water Act
SGVC	soil vapor volatilization criteria
SWPC	Surface Water Protection Criteria
TBC	To Be Considered
TCE	Trichloroethylene
URFs	Unit Risk Factors
VISL	Vapor Intrusion Screening Level Calculator values
VOC	Volatile Organic Compound
W&C	Woodard & Curran

EXECUTIVE SUMMARY

This is the third Five-Year Review (FYR) for the Linemaster Switch Corporation (LSC) Superfund Site located in Woodstock, Windham County, Connecticut (Site). The purpose of this FYR is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory FYR was the signing of the previous FYR on September 29, 2009.

The Site encompasses a 45-acre parcel that is bordered by Connecticut State Route 171 to the south, Plaine Hill Road to the west, and a mix of residential and undeveloped properties to the north and east. The LSC manufacturing facility is located near the center of the parcel on a topographic high with approximately 160 feet (ft) of vertical relief between high and low points (See Figure 1).

Prior to 1952, the Site was used for residential purposes and small-scale farming. Beginning in 1952, LSC began manufacturing foot operated switches at the Site. Currently, LSC occupies a 45,525-square foot facility, where electrical power switches, air valves, electrical cord sets, and metal nameplates are manufactured at the LSC property. In addition to the manufacturing facility, several residential buildings and a restaurant are also located on the Site.

The Site is located in a GA groundwater classification zone as assigned by the Connecticut Department of Energy and Environmental Protection (CTDEEP). The GA designation requires that the groundwater should be suitable for drinking without treatment. The Site supply well, GW08DB, is treated using an air stripper and granulated activated carbon filter prior to use within the manufacturing facility for both industrial and potable uses.

The remedy specified in the July 21, 1993 Record of Decision (ROD) included in situ vacuum extraction of contaminated soil to remove volatile organic compounds (VOC). Carbon air emission controls were included to prevent transfer of soil VOCs to the atmosphere. It was estimated that cleanup levels in soil would be reached in 3 to 10 years. If the soil cleanup levels were not achieved in the estimated timeframe, enhancement of the soil vapor extraction system (e.g., with air sparging) was provided to achieve the goals. Subsequently, the United States Environmental Protection Agency (EPA) determined that the vapor extraction component of the dual vapor extraction (DVE) system was not going to be successful due, in part, to the inability of the source area dewatering system to lower the groundwater table enough to allow the DVE to operate effectively. It was determined that further remediation via vapor extraction should not be pursued. This determination is documented in a December 2004 Explanation of Significant Differences (ESD) to the ROD which did not change the Remedial Action Objectives (RAOs) or cleanup levels.

Currently the treatment system is properly maintained and is operating as originally designed. It demonstrates that the remedy has reduced the risks to human health and the environment through the removal of a significant quantity of VOCs in the groundwater and a reduction in contaminant concentrations in the majority of the plume. Additionally, there are protective institutional controls (IC) in the form of deed restrictions, which prohibit both groundwater use as a potable supply and prohibit soil excavation and construction activities that include dewatering without EPA's prior approval. The only exception to this is the allowance for use of an existing water supply well on-site which provides treated water to the facility and an Inn/restaurant, which has limited water usage. Surface water sampling conducted during the past 5 years has indicated no detections of a release of hazardous substances to the Site. Additionally the vapor

intrusion pathway was evaluated and, while there is a known vapor intrusion exposure pathway at residences on-Site, EPA's risk assessment supports a determination that there are no unacceptable human health risks.

The remedy currently protects human health and the environment because there are no unacceptable exposure risks to Site contaminants. However, in order for the remedy to be protective in the long-term the following actions need to be taken to ensure protectiveness.

- Recent increases in groundwater VOC concentrations in on-Site monitoring wells and detections of Site contaminants in one off-Site residential well (currently installed with a drinking water treatment system) will require additional investigatory measures to adequately define the nature and extent of contamination.
- Current Site conditions indicate that the groundwater extraction and treatment system may not be adequately capturing the contaminated plume, thereby affecting the ability of the remedy to achieve the cleanup goals and meet projected cleanup times.
- Additional evaluation of the extraction and treatment system is warranted to identify alternative measures and/or modifications, which will ensure that the Remedial Action Objectives identified in the ROD, will be attained.
- Despite the documented absence of vapor intrusion exposure risk at the Site, this exposure pathway has been identified and could pose a future concern should groundwater conditions change. Therefore it is recommended that groundwater data be routinely compared to appropriate vapor intrusion screening criteria to ensure continued protectiveness. These analyses should be included in the Site Long Term Monitoring Program.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Linemaster Switch Corporation Superfund		
EPA ID: CTD001153923		
Region: 1	**State:** CT	**City/County:** Woodstock / Windham

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the Site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Leslie McVickar
Author affiliation: U.S. Environmental Protection Agency
Review period: 1/8/2014 – 9/30/2014
Date of Site inspection: 7/11/2014
Type of review: Statutory
Review number: 3
Triggering action date: 9/29/2009
Due date *(five years after triggering action date)*: 9/29/2014

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

Issues and Recommendations Identified in the Five-Year Review:

OU(s): *1*	**Issue Category: Monitoring**			
	Issue: Vapor Intrusion			
	Recommendation: Evaluate all groundwater data to monitor for future potential vapor intrusion issues.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	6/30/2015

OU(s): *1*	**Issue Category: Changed Site Conditions**			
	Issue: Increases in groundwater TCE concentrations at MW28, GW08, MW21DB, MW17, MW10, MW15, and MW01.			
	Recommendation: Re-evaluate the effectiveness of the groundwater extraction system in meeting the remedial objectives and investigate the nature and extent of the plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/30/2015
OU(s): *1*	**Issue Category: Changed Site Conditions**			
	Issue: TCE and 1,2-DCE were detected in residential well GW-14.			
	Recommendation: Add additional residential well locations beyond GW-14 to the long-term monitoring program (LTMP) to ensure adequate monitoring and evaluation. Install sentinel monitoring well(s) in the vicinity of GW-14 to allow for early detection of future plume migration.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/30/2015
OU(s): *1*	**Issue Category: Monitoring**			
	Issue: Analysis for 1,4-dioxane in the groundwater.			
	Recommendation: Continue monitoring for 1,4-dioxane at all Site wells and residential wells included in the LTMP and evaluate data trends.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/30/2019
OU(s): *1*	**Issue Category: Monitoring**			
	Issue: Source control measures would accelerate groundwater remediation.			
	Recommendation: Evaluate source control options to determine how additional remedial measures could reduce cleanup times.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	12/31/2015

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy currently protects human health and the environment because there are no unacceptable exposure risks to Site contaminants. Additionally, there are established Site institutional controls in place and off-Site residential groundwater treatment has been implemented where necessary. However, in order for the remedy to be protective in the long-term the following actions need to be taken to ensure protectiveness. Recent increases in groundwater VOC concentrations in on-Site monitoring wells and detections of Site contaminants in one off-Site residential well (currently installed with a drinking water treatment system) will require additional investigatory measures to adequately define the nature and extent of contamination. Current Site conditions indicate that the groundwater extraction and treatment system may not be adequately capturing the contaminated plume, thereby affecting the ability of the remedy to achieve the cleanup goals and meet projected cleanup times. Evaluation of all groundwater data is necessary to monitor for future potential vapor intrusion issues. This evaluation must be included in the LTMP. Lastly, additional evaluation of the extraction and treatment system is warranted to identify alternative measures and/or modifications to ensure that the Remedial Action Objectives identified in the ROD will be attained and the remedy will remain protective of human health and the environment.

I. 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. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

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

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 actions no less often than every five years after the initiation of the selected remedial action*."

EPA has conducted this FYR on the remedy implemented at the Linemaster Switch (LSC) Superfund Site in Woodstock, Windham County, Connecticut (Site). EPA is the lead agency for overseeing the development and implementation of the Site remedy being performed by the Settling Parties. The CTDEEP is the support agency representing the State of Connecticut, which has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the third FYR for the Site. The triggering action for this statutory review is signature of the second FYR, which was on September 29, 2009. This FYR is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

II. PROGRESS SINCE THE LAST REVIEW

The second FYR was signed on September 29, 2009. A protectiveness statement was deferred in the 2009 review due to the need to complete a vapor intrusion study and include sampling/analysis and evaluation of 1,4-dioxane and manganese in both groundwater and residential supply wells. These additional studies were completed between 2010 and 2013. Within the current 5YR period of time, an August 2012 FYR Addendum was issued stating that

the remedy was currently protective. Despite the determination of acceptable indoor air risk within two residences at the Site, a precautionary vapor mitigation system was installed in one of the two homes on-Site (building #105) for long-term protectiveness.

Tables 1 and 2 below provide the protectiveness statement and recommendations from the 2009 FYR and the 2012 Addendum to the 2009 FYR.

Table 1
Protectiveness Determinations/Statements from the 2009 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Site-wide	Protectiveness Deferred	Based on the review and evaluation of data and information to date, EPA is deferring its determination of whether the remedy is currently protective of human health and the environment until the updated vapor intrusion study is completed and there is an investigation of 1,4-dioxane and manganese in the groundwater and residential supply wells. This determination will be made by September 2012. There are currently institutional controls in place to prohibit use of the currently known contaminated soil and groundwater.

Protectiveness Determinations/Statements from the 2012 Addendum to the Second FYR

OU #	Protectiveness Determination	Protectiveness Statement
Site-wide	Short-term Protective	The remedy at the Linemaster Switch Site currently protects human health and the environment, because there is currently no exposure to unacceptable concentrations of contaminated Site groundwater, soil, and indoor air. However, in order for the remedy to be protective in the long-term, groundwater cleanup goals must be achieved and the vapor intrusion pathway in one on-Site home must be periodically monitored to ensure that there are no unacceptable risks from this pathway in the future. In lieu of periodic vapor intrusion monitoring, a vapor mitigation system could be installed in the home.

Table 2
Status of Recommendations from the 2009 FYR and 2012 Addendum to the Second FYR

OU #	Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
Site-wide	Increasing VOC concentration trends in MW-28DB	Continue to evaluate groundwater monitoring data in this area for trends. Additional monitoring wells may be necessary if warranted based on data.	PRP	EPA/State	Semi-annually	Ongoing	N/A
Site-wide	Vapor intrusion exposure pathway has not been fully evaluated.	Continued periodic indoor air/soil vapor sampling or install a mitigation system in one on-Site residence.	PRP	EPA/State	6/1/2013	Completed	6/1/2013
Site-wide	Add 1,4-dioxane and manganese sampling in groundwater and drinking water	Continue to evaluate annual data.	PRP	EPA/State	Semi-annually	Completed for manganese & sampling is ongoing for 1,4-dioxane	June 17, 2012
Site-wide	Interim soil & groundwater cleanup goals do not account for CTRSRs and revised MCLs.	Include CTRSRs in LTMP data tables. Prior to Compliance Monitoring EPA will determine if CTRSRs and revised MCLs are ARARs for the Site.	EPA	EPA/State	October 2010	Current RSR's are included in the LTMP tables and are being tracked and evaluated. This will continue until such time that a decision document is modified to include them formally.	N/A
Site-wide	Established IC's on-Site need to be transferred to CT, as the grantee.	Transfer restrictions from the EPA to the State of Connecticut in accordance with CERCLA Section 104(j).	EPA/State	EPA/State	September 2014	Ongoing	N/A

OU #	Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
Site-wide	Adequacy of ICs to protect against the removal of the cover over contaminated source area soils.	Perform an evaluation of IC's to determine whether protection of the source area soils cover needs to be added to the existing ICs.	PRP	EPA/State	April 2011	Risk analysis completed, indicating no unacceptable dermal contact risk to soils under the cover.	8/11/2009

Recommendation 1

There continue to be increasing concentration trends in groundwater downgradient in the vicinity of MW-28DB. Additionally, recent sampling data at an off-Site residential location has identified detections of Site contaminants. While a protective water treatment system was installed at this one location, this occurrence is a further indication that the contaminated groundwater plume has expanded beyond the existing treatment systems capture zone. Therefore, it is recommended that additional investigatory measures and evaluation be initiated to adequately define the current nature and extent of the groundwater contamination and to re-evaluate the adequacy of the treatment system to attain the Site Remedial Action Objectives (RAOs), with consideration given to how the contaminated source area soils impact plume migration.

Recommendation 3

In May 2010, 1,4-Dioxane was added to the Long-Term Monitoring Plan (LTMP) for sampling and analysis at both on-Site monitoring wells and at off-Site residential wells. Between 2010 and 2013, 1,4-dioxane was detected at levels exceeding the Connecticut enforceable Action Level of 3 micrograms per liter (µg/L) and the CTDEEP Groundwater Protection Criteria (GWPC) of 21 µg/L in monitoring wells MW-17SB (21.1 to 125 µg/L) and MW-17TD (58.8 to 118 µg/L). Table 3 provides a summary of the 1,4-Dioxane results in 2010 and 2011 from these wells. In 2012, the Connecticut Department of Public Health (CT DPH) established a new drinking water action level for 1,4-dioxane of 3 µg/L, noted above. Subsequently, in April 2012,an updated data analysis Method, 8260C, was introduced which has a reporting limit low enough to achieve the new CT enforceable Action Level for potable water. 1,4-dioxane has not been detected in residential drinking water supplies since testing began in 2010.

In 2004, a Drinking Water Health Advisory for manganese of 0.3 milligrams per liter (mg/L) was issued. As a result, in November 2010, samples were collected from both groundwater monitoring wells and domestic supply wells and analyzed for the presence or absence of manganese. Manganese was detected in 33 groundwater monitoring wells at concentrations ranging between 0.002 mg/L and 2.2 mg/L. Manganese was not detected in domestic water supplies. It was determine that manganese was not a prevalent contaminant at the Site and does not pose a current unacceptable risk. It is most likely a naturally occurring background mineral; therefore, it was unnecessary to include manganese in the LTMP, unless there was a change in groundwater conditions. It was also stipulated that manganese would be included in the analysis parameters during the Completion Monitoring program. Manganese results are summarized in Table 4 (Table 3-3h from the Woodard and Curran (W&C) July to December

2010 Semi-Annual Monitoring Report). No further action pertaining to this issue is recommended.

Recommendation 5

While land use restrictions have been recorded to prevent the use of untreated groundwater - on-Site, EPA determined that the most appropriate course of action is to transfer the IC easement to the State of Connecticut. CTDEEP has concurred with this transaction. To date this action has not occurred and still needs to be implemented.

Remedy Implementation Activities

Additional sampling for 1,4-Dioxane and manganese in groundwater and drinking water was initiated in 2010, with 1,4-dioxane sampling still being performed. A vapor intrusion study was also completed. From this study, it was determined by EPA that there was no unacceptable risk at both building's #105 and #111 (see Appendix B, which provides two memoranda discussing cancer and non-cancer indoor air risks based upon the vapor intrusion study); nevertheless, a mitigation system was voluntarily installed at #105 to ensure long-term protectiveness at this location. Groundwater conditions of the deep bedrock portion of the aquifer were further evaluated and it was recently determined that additional evaluation is required, based on recent contaminant trends in groundwater. The aforementioned tasks are detailed in the 2012 FYR Addendum. Additional discussion of these measures and outstanding issues are further discussed in this FYR.

System Operation/Operation and Maintenance Activities

Operation of the groundwater extraction and treatment system to control contaminant migration began in June 1992. Construction of the DVE system was completed in November 1998. EPA authorized deactivation of the vacuum extraction portion of the dual vapor extraction (DVE) system in November 1993 and the system has been operated as a groundwater extraction system only since that time.

Long-term monitoring of groundwater, drinking water, and surface water has continued during the period covered by this review (Fall 2009 to Summer 2014). Operation and maintenance (O&M) activities have included routine maintenance of the extraction wells and the two treatment systems for contaminated groundwater and potable water supply treatment. These activities include inspection of transfer pump motors, air stripper blower, and fluid levels in equipment. Corrective measures are taken as needed. Motors and valves are lubricated and maintained on a routine schedule. Air compressor condensate is drained once per week and sediment is cleaned from filters once per month to prevent fouling. Groundwater extraction pumps are cleaned as needed to prevent fouling. Several motors, pumps and other spare equipment are kept on-Site to facilitate timely replacement. All wells in the extraction well network continue to be operated as originally intended.

III. FIVE-YEAR REVIEW PROCESS

Administrative Components

The Potentially Responsible Party (PRP) was notified of the initiation of the FYR on 5/20/2014. The Site FYR was led by Ms. Leslie McVickar, EPA Remedial Project Manager for the Site. Mike Senyk for the CTDEEP, assisted in the review as the representative for the support agency.

The review, which began on January 8, 2014, consisted of the following components:

- Community Notification and Involvement
- Document Review
- Data Review
- Site Inspection
- FYR Report Development and Review

Community Notification and Involvement

Activities to involve the community in the FYR process were initiated with a news release dated February 13, 2014 from EPA stating that a FYR of the Site would be conducted. This news release is included in Appendix C. The results of this FYR report will be made available at the Site information repository located at:

Bracken Memorial Library
57 Academy Road
Woodstock, Connecticut 06281

U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Document Review

This FYR consisted of a review of relevant documents including O&M records and monitoring data. Applicable soil and groundwater cleanup standards (identified in the July 1993 ROD and December 2004 ESD), the 2012 Addendum to the 2009 FYR, annual and semi-annual monitoring reports, the Soil Vapor Intrusion Investigation Report dated 2011, and the subsequent 2012 Soil Vapor Intrusion Report (completion) were also reviewed.

Data Review

As part of this 5YR, the data collected by LSC and W&C were evaluated to assess whether groundwater contaminants are being controlled by the groundwater collection system, and whether the soil and groundwater contaminant concentrations have achieved ROD cleanup goals. A summary of the data review is provided below.

(a) Soil Monitoring

There has been no monitoring of soil VOC concentrations in the source area since the last DVE pilot test in November 1995 and shutdown of the vacuum extraction portion of the DVE system in 2004/2005. EPA believes that soil contamination concentrations continue to decrease through the flushing of contaminants via the continued operation of the groundwater extraction component of the treatment system. However, there appears to still be a significant untreated source of contamination, which is feeding the plume. Evidence of this can be seen in increases of TCE concentrations in some wells and an off-Site detection of VOCs at one location (discussed in other sections below). Additional soil sampling in the source area and remedial measures at this location should be considered and evaluated. Soil samples will also be required during the compliance monitoring phase of the project to determine attainment of final cleanup levels for both soil and groundwater.

(b) Groundwater Monitoring

Groundwater monitoring is used to assess whether the groundwater extraction system maintains control of the migration of contaminated groundwater from the Site, and whether concentrations of detected constituents are increasing or decreasing. Monitoring wells were installed to monitor three portions of the interconnected overburden-bedrock aquifer beneath the Site: 32 completed in overburden, 16 completed in shallow bedrock, and 18 completed in deep bedrock. The current monitoring program includes 51 monitoring wells in total (26 overburden wells, 14 shallow bedrock wells, and 11 deep bedrock) that are monitored on a monthly, semi-annual, or annual basis, for both groundwater elevation and chemical analysis for. In addition, 30 domestic supply water wells, primarily completed in deep bedrock, are monitored on a monthly, semi-annual, or annual basis, for chemical analysis of VOCs.

1. **Groundwater Migration Control -** Semi-annually through 2011 and annually since, W&C plots groundwater elevations in the three portions of the interconnected overburden-bedrock aquifer, to demonstrate that the groundwater recovery system is controlling groundwater migration off-Site from the source area. Copies of the most recent maps of these data are attached to this report as Figures 2, 3, and 4 (Figures 3-1, 3-3, and 3-5 from the 2013 Annual Monitoring Report by W&C which show deep bedrock, shallow bedrock, and overburden potentiometric surfaces, respectively). With certain exceptions (including certain data gaps), the groundwater data between 2010 and 2013 generally indicate that the migration of groundwater from the source area has been mostly controlled, primarily by the groundwater extraction from deep bedrock wells MW01DB, MW06DB, MW15DB, and MW17DB. These wells are part of the Interim Removal Treatment System (IRTS) constructed in 1992 (under State order) and each of these wells contains an extraction pump which pumps groundwater to the air stripping and granular activated carbon (GAC) treatment system (see Appendix A for more details regarding the system).

   The TCE plume (see Figures 5, 6, and 7 for deep bedrock, shallow bedrock and overburden TCE in groundwater isopleth maps) does not extend to the Site boundary for either overburden or shallow bedrock groundwater (see Figures 6 and 7); however, there are a number of exceptions for deep bedrock groundwater based on 2013 TCE data (see Figure 5). In addition, current potentiometric maps do not show complete capture based upon horizontal flow directions at some locations for overburden and shallow bedrock groundwater. The exceptions include:

- Overburden and shallow bedrock groundwater analytical results from wells MW06T, MW18T, and MW18SB indicate that contaminated groundwater is not present at these locations; however, the potentiometric surfaces (see Figure 4) show overburden and shallow bedrock groundwater flowing eastward from the source area at this area.

- Similarly, overburden groundwater analytical results from well MW27T indicate that contaminated groundwater is not present in overburden at the northwestern border of the Site; however, based upon the potentiometric surface (see Figure 4) there appears to be a horizontal gradient to the north from the source area. In addition, given the close proximity of MW15SB with over 500 µg/L TCE in shallow bedrock, this well should continue to be evaluated over time.

- Based on an increasing trend of TCE concentrations at extraction well MW01DB, and recent (May 2012) detections of TCE and cis-1,2-DCE of 2.35 and 2.21 µg/L, respectively, at overburden well MW01T, it appears that migration control to the north is not adequate. Although the potentiometric surface shown in this area for deep bedrock groundwater (see Figure 2) suggests capture at wells GW17DB and GW40DB (Town Hall well) to the north, no TCE contamination was found in these wells along the Norwich Worcester Turnpike. There are no deep bedrock potentiometric or TCE data north of these two wells on the property to confirm complete capture. Additional measures may be necessary in this area.

- There are several locations where strong downward gradients are present (see Figure 2), including MW27SB to MW27DB in the vicinity of the MWEPA triplet, and the MW17 set, among others. At these locations, contaminated groundwater may be drawn downward from the overburden and shallow bedrock into the deeper bedrock. It is not clear if this is effectively controlling horizontal movement of contamination. In addition, the time to achieve cleanup goals may be extended (see below under "Chemical Trends" regarding increasing TCE concentrations) if contamination is drawn downward from the overburden or shallow bedrock units to the deeper bedrock. A better understanding of the horizontal and vertical flow directions and connections between units is needed to assess the effectiveness of these vertical gradients on plume capture.

2. **Chemical Trends –** The following discussion focuses primarily upon data trends within the last five years (i.e., since the last FYR) so that recent data trends are more apparent than if the entire data set since 1990 was analyzed. W&C plots groundwater concentrations of TCE in the three portions of the interconnected overburden-bedrock aquifer semi-annually, to demonstrate that the groundwater recovery system is controlling off-Site TCE migration in groundwater from the source area. Copies of the most recent maps of these data, Figures 5, 6, and 7 (adapted from figures 3-7, 3-9, and 3-11 of the 2013 Annual Monitoring report by W&C), are attached to this report. Table 5 provides a summary of the cis-1,2-DCE, TCE, and total VOC concentrations in key wells over the 2009 to 2013 period. With certain exceptions (including data gaps), the groundwater sample analytical results between 2009 and 2013 generally indicate that the migration of TCE in groundwater from the source area is mostly controlled, primarily by the groundwater extraction from deep bedrock wells MW01DB, MW06DB, MW15DB, and MW17DB, and that the system continues to reduce the concentration of

groundwater contaminants at some locations. The exceptions, which primarily focus on recent data trends occurring within the past five years, include:

- Deep bedrock groundwater north of the source area in the vicinity of extraction well MW01DB contained TCE at concentrations of 5.05 µg/L (see Figure 5, May 2013) and 6 µg/L (November 2013), and ranged from a minimum of 2.05 µg/L (November 2012) to a maximum of 6.8 µg/L (February 2009); however, groundwater potentiometric elevation data in this area suggest that contaminated groundwater may be captured by this extraction well, although as noted above, there are no deep bedrock potentiometric data north of this extraction well to confirm this condition. Total VOCs and TCE in this well have not decreased significantly over the current 5YR period, and show an increasing trend over the past 2 years (see Figure 8). A manually inserted trend line on Figure 8 predicts compliance by year 2040 but the groundwater data in this area should be monitored closely.

- Deep bedrock groundwater southwest of the source area in the vicinity of monitoring well MW28DB (see Figure 5) contained TCE at concentrations of 175 µg/L (May 2013, see Figure 5) and 82.6 µg/L (November 2013), and ranged from a minimum of 37.7 µg/L (August 2012) to a maximum of 188 µg/L (August 2009), and there are no deep bedrock monitoring data west or south of this well to confirm TCE concentrations beyond this location. Although groundwater potentiometric elevation data in this area (see Figure 2) suggests that contaminated groundwater may be captured by extraction well MW17DB, the high concentrations at well MW28DB warrant further evaluation. Over the past five years, there is no decreasing concentration trend at this location, and data collected within the past two years show an increasing trend (see Figure 9). [Note that from 2002 to 2007, there was also an increasing trend of TCE in this well, and from 2007 to 2012, TCE concentrations were relatively stable.] Based upon these trends, compliance with the Maximum Contaminant Level (MCL) for TCE is unlikely by 2040 without changes to the remedial systems at the Site.

- Shallow bedrock groundwater northeast of the source area in the vicinity of extraction well MW10SB has shown fluctuating TCE concentrations but no real decreasing trend since 2009 (Figure 10). The latest concentrations from the May 2013 and November 2013 sampling rounds are 60,600 µg/L (see Figure 6) and 25,300 µg/L, respectively. Between 2009 and 2013, concentrations of TCE in this well have ranged from a minimum of 5,060 µg/L (August 2011) to a maximum of 77,900 µg/L (May 2011). A manually inserted trend line shows compliance by the year 2040. However, given that much of the data lies above this line, compliance by 2040 appears to be unlikely.

- Deep bedrock groundwater south of the source area at GW08DB contains TCE at concentrations exceeding 5 µg/L and shows an increasing concentration trend (Figure 11). This well is used as an extraction well to contain the migration of contaminated groundwater just southwest of the Site, and is used as a supply well (after wellhead treatment) for the LSC property. Between 1988 and 2004, TCE concentrations at this location declined until approximately 2005, when there has been a fluctuating but steady increase in concentrations. These results and a recent off-Site detection of VOCs further south of the facility call into question the effectiveness of capture to the south of the Site.

Based on the increasing levels of TCE cited above, further evaluation is needed of the overall effectiveness of capture of the extraction well network for deep bedrock groundwater in the vicinity of MW28DB and GW08DB.

(c) Surface Water Monitoring

The analytical data for surface water samples collected from the Site and surrounding area have not identified detectable contaminants of concern since the first FYR prepared in 2004.

(d) Air Monitoring

Two types of potential air monitoring issues were considered in this review: monitoring of VOC emissions from the air stripper component of the IRTS, and monitoring of indoor air or soil vapor to evaluate potential human health risks due to vapor intrusion from the groundwater plume. The extraction rates and contaminant loading of groundwater treated by the air stripper over the 12-month period from January through December 2013 were used to calculate air stripper emissions and compare them to the emission limits cited in the air permit issued by the State of Connecticut in 1998. A review of the air stripper emission data shows compliance with the limits specified in the 1998 permit. Table 6 provides a summary of the air emissions calculations and shows a 12-month average of 0.00356 pounds per hour (lbs/hr) of total VOCs emitted as compared with a permit limit of 1.11 lbs/hr. In addition, the actual stack concentration of 261 micrograms per cubic meter ($\mu g/m^3$) is less than the maximum allowable stack concentration of 756,540 $\mu g/m^3$.

A vapor intrusion study was completed June 17, 2011 (Woodard & Curran) at two on-Site buildings. Trichloroethene and 1,2-DCA were detected in both sub-slab soil vapor and indoor air in Building #105 and #111 at concentrations within EPA's acceptable risk range. Although the results of a risk assessment concluded that there are no unacceptable human health risks pertaining to this exposure pathway, it was recommended that either periodic vapor intrusion monitoring occur or that a preventative ventilation system be installed to mitigate the potential long-term risk. As a result, a mitigation system was installed in Building #105 voluntarily by the Settling Parties. In addition, for future construction on the Site, it is strongly recommended that engineered mitigation measures be installed during <u>any</u> building construction to allow easy and cost effective mitigation should VOC concentrations later become a concern in indoor air.

Site Inspection

The inspection of the Site was conducted on July 11, 2014. In attendance were Tony Delano and Fred Symmes of Weston Solutions, Inc. (EPA's contractor), as well as Steve Radcliffe who is the on-Site maintenance manager for LSC. The purpose of the inspection was to assess the operational functionality and integrity of the implemented remedial components.

During the Site inspection, no problems were noted. The system was operating properly and is well maintained. However, no changes have been made to system operating parameters to respond to recent data trends (see prior sections of this FYR for discussions). Appendix D includes the Site inspection form and Appendix A includes a description of the treatment systems operated as part of the remedy.

Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including the current LSC owner, CTDEEP, EPA, and Town officials involved in Site activities and/or those aware of current Site conditions. The purpose of the interviews was to document any perceived problems or successes with the remedy implemented to date. Interviews were conducted between May 19, 2014 and June 11, 2014. Completed interviews are included in Appendix D.

IV. TECHNICAL ASSESSMENT

Question A: Is the Remedy Functioning as Intended by the Decision Documents?

Yes.

Remedial Action Performance

- The groundwater extraction system continues to operate as originally designed. TCE and other VOCs in groundwater continue to be removed and treated by the system prior to discharge of the treated groundwater back to on-Site surface water. Treated groundwater meets discharge criteria and groundwater used on-Site for drinking water and other purposes meets all applicable standards or current risk-based RSLs for tapwater.

- However, the system may not be capturing all contaminated groundwater for treatment. There are several wells on-Site with increased TCE concentrations in recent years. This trend jeopardizes meeting cleanup goals within the EPA projected timeframes. This is further evidenced by the detections of TCE in GW14, a domestic water supply well south of the Site, which recently had TCE near the MCL of 5 ppb but has also been retrofitted with a drinking water treatment system in 2013. In addition, several extraction wells on-Site have experienced increases in TCE concentrations in the last few years, most notably MW28DB and GW08DB.

System Operations/O&M

- Current operating practices will maintain the effectiveness of the remedy as originally designed; however, as noted above, it appears the system is not being adequately evaluated in response to changes or increasing trends in VOC data in the extraction and monitoring well network. In the long term, this could compromise the effectiveness of the remedy.

- Detailed costs for O&M have not been made available; however, based upon statements made by the Site owner, current O&M costs are reasonably stable. Therefore, there are no indications that large variances in O&M costs are occurring.

Opportunities for Optimization

- There are several opportunities to optimize the extraction and treatment system, including reducing or increasing flow rates of extraction wells, eliminating extraction wells, or the addition of new extraction wells at more strategic locations within the TCE

plume to improve capture. These steps could be taken based, in part, on available data. For example, MW14DB is an extraction well that operates at a high flow rate with little or no TCE present, resulting in very low contribution to mass removal. In addition, pumping of this well at this rate may cause undesirable contaminant migration. This well should be considered for optimization, along with the potential for additional well(s) or the conversion of existing well locations to better control contaminant migration.

- In addition, additional source removal should be evaluated because it has the potential to reduce the time to achieve cleanup goals with a corresponding lowering of overall extraction and treatment costs. This evaluation has been informally initiated by the Settling Party. However, there have been no document submittals to EPA and CTDEEP pertaining to this matter at this time.

Early Indicators of Potential Issues

- There are no indications of equipment breakdowns; however, the results in GW14 and other contaminant concentration increases call into question the long-term protectiveness of the remedy. A drinking water treatment system was installed in the fall of 2013 at the residence where GW14 is located.

Implementation of Institutional Controls and Other Measures

- Required fencing and warning signs are in place and effective.
- Institutional controls are in place to limit or prohibit the use of untreated groundwater on the Site and prohibit exposure to contaminated soils.
- Based on the data review, Site inspection, and interviews, no immediate threats have been identified.

Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?

No.

Not all the exposure assumptions and toxicity data used at the time of the remedy selection are currently valid. Some toxicity values, exposure assumptions, exposure pathways to be considered, and methods of evaluating risk have changed since the time of the remedy selection, however these changes do not affect the current protectiveness of the remedy.

An indoor inhalation exposure was not evaluated in the ROD. The inhalation of VOCs during household water use and through vapor intrusion was subsequently evaluated. A vapor intrusion investigation and evaluation was conducted in 2011, which showed that, while there is a vapor intrusion exposure pathway present at two residences within the Site boundary, EPA determined that this exposure pathway does not present an unacceptable risk; nevertheless, a vapor mitigation system was voluntarily installed by LMS in one home to ensure long-term protectiveness at this location.

Changes in Standards and TBCs

Applicable or Relevant and Appropriate Requirements (ARARs) and non-promulgated standards as To Be Considered (TBCs) for the selected remedial action in the ROD in 1993.

In December 2004, EPA issued an ESD to the ROD, which altered the remedy by eliminating the continued operation of the vapor extraction of soils component of the remedy. The ESD did not change the clean-up objectives or the clean-up levels established in the 1993 ROD. The following paragraphs discuss only those ARARs (including any newly promulgated standards) or TBCs that have changed since issuance of the ROD.

Safe Drinking Water Act (SDWA): The Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) are updated periodically. Among the contaminants of concern identified in the ROD, the MCL for arsenic has been reduced from 50 µg/L to 10 µg/L, as noted in the 2004 FYR, and the MCLG for chloroform is currently 70 µg/L, rather than the 100 µg/L listed in the ROD. No additional changes to existing MCLs or newly developed MCLs or MCLGs for the contaminants of concern have occurred (see Table 7).

Environmental Protection Agency To Be Considered Toxicity Values: EPA toxicity values, including reference doses (RfDs), reference concentrations (RfCs), cancer slope factors (CSFs), Inhalation Unit Risk Factors (URFs), and health advisories, are routinely re-evaluated and updated. Most of the groundwater clean-up goals for the Site are based on MCLs, which are not impacted by changes to toxicity values.

For groundwater contaminants without MCLs, Site-specific risk-based values were developed as clean-up goals in the 1993 ROD. Changes in toxicity values for these contaminants may impact the protectiveness of these clean-up goals (see below for further discussion of changes in toxicity values under “Changes in Toxicity and Other Contaminant Characteristics”).

In 2004, EPA issued a drinking water health advisory for manganese of 0.3 mg/L due to health concerns from chronic exposure to high doses of manganese. Following the 2009 FYR, manganese was included in the November 2010 sampling. There were no detections in residential wells at a detection limit of 0.0020 mg/L. The most recent EPA Regional Screening Level (RSL) for manganese in residential tap water is 0.043 mg/L; therefore, the Site is currently protective. Sampling and analysis of manganese in on-Site groundwater and residential wells was discontinued following the November 2010 sampling event based upon those results and conclusions.

As noted in the previous section, the 2009 FYR noted potential concern for vapor intrusion. Because groundwater clean-up values were not developed to address vapor intrusion at the time of the ROD, and the vapor intrusion pathway was not evaluated then, a vapor intrusion study and risk assessment were completed in 2011, which resulted in the identification of a vapor intrusion exposure pathway at two locations and the determination that there are no unacceptable inhalation risks at two locations within the Site. Nevertheless, a vapor mitigation system was installed subsequent to this study at one residence to ensure long-term protectiveness. However, vapor intrusion screening should be included in the regular evaluation of (shallow) groundwater data to determine whether changing groundwater conditions may present additional vapor intrusion concerns that would need to be addressed.

Ambient Water Quality Criteria (AWQC): Federal water quality criteria continue to be available, but are now referred to as National Recommended Water Quality Criteria (NRWQC). This change is in title only; the criteria remain the same and do not impact the remedy.

Connecticut Remediation Standard Regulations (Section 22a-133k-1 through 22a-133k-3 of the Regulations of Connecticut State Agencies): In addition to the ARARs and TBCs

listed in the 1993 ROD, the 2004 FYR recognized the Connecticut Remediation Standards Regulations (RSRs) as additional potential ARARs for the Site. The RSRs were promulgated in 1996 and were amended in June 2013. While RSR's were not included as an ARAR at the time of the ROD, they are currently being considered as such at LSC. The RSR criteria applicable to groundwater at this Site include the Groundwater Protection Criteria (GWPC), the Surface Water Protection Criteria (SWPC), and the Groundwater Volatilization Criteria (GWVC).

Table 7 presents a comparison of groundwater clean-up levels from the ROD to current RSRs. The GWPCs identify the numeric chemical concentrations to be attained for groundwater plume remediation in GA and GB aquifers. Groundwater clean-up goals for the Site were established in the ROD prior to the promulgation of the RSRs. For several Site groundwater contaminants, the GWPC is lower than the ROD's groundwater clean-up goal. For a groundwater plume that discharges to a surface water body, the plume needs to attain the numerical limits established under the SWPC. The current SWPC for arsenic is less than the ROD's groundwater clean-up goal of 50 ppb. All other ROD clean-up goals are less than the SWPCs. Extensive surface water sampling does not indicate that contaminated groundwater is discharging to nearby surface waters.

Table 8 presents a comparison of soil clean-up levels from the ROD to current RSRs for soil. The RSR criteria applicable to soil at this Site include the Direct Exposure Criteria (DEC) for residential soils and the Pollutant Mobility Criteria (PMC) for protection of potential migration from soil to groundwater. Each of the ROD clean-up goals for soil is less than the current soil RSRs for both DEC and PMC.

No ARARs for vapor intrusion were identified in the ROD. However, RSRs for protection of indoor air, including the GWVC and Soil Vapor Volatilization Criteria (SGVC), apply to the Site.

Groundwater containing VOCs within 30 feet of the ground surface or an occupied industrial or residential structure must comply with the GWVC, which are designed to be protective against vapor intrusion. The SGVC are used to remove the requirement to meet GWVC at Sites with soil vapor concentrations below the SGVC. The current residential GWVC for 1,1-dichloroethene is less than the ROD groundwater clean-up goal of 7 µg/L. All other ROD clean-up goals are less than the GWVCs.

Connecticut Department of Public Health Drinking Water Action Level. Following the 2009 FYR, 1,4-dioxane was added to the reporting list for VOC analyses for the annual monitoring events beginning in May 2010, using a reporting limit consistent with the then available RSR proposed GWPC of 21 µg/L. 1,4-dioxane was only detected in monitoring wells at the center of the Site, adjacent to the Linemaster facility and the groundwater treatment system, at levels ranging from 21.1 µg/L to 115 µg/L. The 2013 RSRs do not include a GWPC for 1,4-dioxane. In February 2012, CT DPH set a new drinking water Action Level of 3 µg/L for 1,4-dioxane. Because of this new standard, all of the residential wells were re-sampled in Apri1 2012 using a method detection limit of 3 µg/L. The results of this sampling indicated no detections above the action limit of 3 µg/L in the residential wells.

CT DPH also lowered its action level for TCE from 5 to 1 µg/L in February 2013 for private wells. There is currently one private well just off-Site that has TCE and 1,2-DCE concentrations between 1 and 5 µg/L. This standard applies to any well on the Site being used for private drinking water purposes. In addition, CT DPH is initiating a process for extending this standard to public drinking water supplies. This process could take 2 to 3 years; therefore, by the time of

the next FYR in 2019, a standard of 1 µg/L TCE drinking water standard may likely be in place for both private and public water supplies.

Changes in Exposure Pathways

The exposure pathways considered in the human health risk assessment (HHRA) performed during the Remedial Investigation (RI), upon which the decisions in the ROD were based, included:

1. Ingestion of groundwater
2. Ingestion of soil
3. Inhalation of vapors during excavation of soil within the Site

The following exposure pathways were not evaluated prior to the ROD:

- Potential dermal contact with groundwater used as a household water source,
- Inhalation of VOCs during household water use,
- Dermal contact with soil,
- Inhalation of dust,
- Inhalation of groundwater and soil contaminants volatilizing into indoor air spaces, and
- Exposures to surface water and sediment through incidental ingestion or dermal contact.

The majority of contaminants detected in Site media are VOCs. Dermal absorption of VOCs is generally low, thus dermal exposures to these contaminants are not a major concern.

Dermal exposures to metals, which were also included in the contaminants evaluated in the HHRA, may be of concern; however, the presence of metals is likely to be naturally occurring.

Inhalation of volatiles during household water use including showering, bathing, laundry, etc. may be of concern for VOCs. However, on-Site water supply wells and several water supply wells surrounding the Site utilize carbon filter treatment systems. These water supply wells are monitored regularly to assure that post-treatment concentrations are below MCLs.

While inhalation of dust could be a potential concern for metals, the only location for this to occur would be at the on-Site detention pond, where surface water and sediments are regularly tested. There have been no detections of any significance in either of these media since the remedy was implemented. Additionally, exposures to surface water and sediments are likely to be minimal given that the detention pond on-Site is an unlikely location for recreational activities.

A pathway of concern, which was not evaluated in the HHRA, is the potential inhalation of VOCs volatilized into indoor air spaces. In January 2004, groundwater monitoring results from shallow wells nearest to on-Site buildings, including residences and the facility, were evaluated following EPA's OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (EPA, 2002). The evaluation concluded that the potential for vapor intrusion risks needed further investigation. As a follow-up to this evaluation and the 2009 FYR, a vapor intrusion investigation was conducted for two on-Site residences in 2011/2012, which determined that while there is a vapor intrusion exposure pathway at both these locations, the detections do not trigger an unacceptable risk exposure (June 2011 Vapor Intrusion Report).

On February 6, 2014, EPA issued new guidance for updated standard default exposure factors (EPA OSWER Directive 9200.1-120. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors). In general, the assumptions in this guidance applicable to the Site HHRA serve to lower risks and, therefore, the assumptions used in the HHRA and the 2011/2012 vapor intrusion evaluation for those pathways evaluated are generally more protective.

No new contaminant sources have been identified since startup of the remedy. The contaminants detected at highest concentrations in groundwater samples are those identified in the ROD as contaminants of concern. 1,4-dioxane was added to the reporting list for VOC analyses for the annual monitoring events beginning in May 2010, and manganese was added to the reporting list for only the November 2010 sampling event. No other new contaminants of concern have been identified. No toxic byproducts of the remedy were identified during the review.

Changes in Toxicity and Other Contaminant Characteristics

Since the time of the HHRA performed as part of the RI, EPA has re-examined and updated toxicity factors, including RfDs, RfCs, CSFs, and Inhalation URFs for most of the contaminants evaluated. Currently, the primary source of toxicity values is the IRIS database. Carcinogen Assessment Group Potency Factors have been replaced with CSFs. RfCs and inhalation URFs are now available for evaluation of risks via the inhalation pathway. These toxicity values are used in the calculations of risk and the development of Site-specific and more generic risk-based screening values or clean-up goals.

Of particular note are the changes in toxicity values for TCE, the primary contaminant of concern (COC) for the Site. However, the groundwater clean-up goal for TCE for the Site is based on the MCL, and the MCL for TCE has not changed. For groundwater contaminants without MCLs, Site-specific risk-based values were developed as clean-up goals. Changes in toxicity values for these contaminants could impact the protectiveness of these clean-up goals. To address this concern, the clean-up goals for these contaminants were compared to 2014 EPA RSL for tap water. Of the few groundwater contaminants with clean-up goals based on calculated target risks rather than MCLs (acetone, chloromethane, 2-hexanone, and methyl ethyl ketone), only the clean-up goal for 2-hexanone is greater than the current EPA tapwater RSL, based on cancer risk of $1x10^{-6}$ or a hazard quotient of 1 (see Table 7).

A vapor intrusion investigation and evaluation was conducted for two on-Site residences in 2011/2012, which identified a vapor intrusion exposure pathway at the Site. The latest Vapor Intrusion Screening Level (VISL) calculator (May 2014) incorporates recent changes in toxicity values and recommended exposure assumptions, resulting in small changes in VISL values for most of the VOCs analyzed for in the 2011/2012 vapor intrusion evaluation for the Site. These changes do not impact the conclusions of the evaluation (see Table 9). Based on the conclusions of the 2011/2012 vapor intrusion evaluation, future groundwater data should be evaluated against approporiate vapor intrusion screening criteria to ensure continued protectiveness of indoor air.

Changes in Risk Assessment Methods

Since the HHRA performed during the RI and the 1993 ROD, changes have occurred in the formulas and standard exposure assumptions used to calculate risks from exposures to soil and groundwater and the methods for evaluating the vapor intrusion pathway. The 2011 vapor

intrusion investigation and evaluation followed current methodology and the changes that have occurred do not affect the current determination that there is no unacceptable vapor intrusion exposure risks.

Expected Progress towards Meeting RAOs

The groundwater extraction and treatment system is operating as designed and has reduced, but is not fully effective in preventing, the migration of contaminants in groundwater as well as reduced the extent of contamination in many areas of the Site. Monitoring of domestic water supply wells surrounding the Site confirm that groundwater contaminants are not impacting private wells off-Site; with the exception of GW14 (a residential water supply well) which showed TCE and cis-1,2-DCE in 2013. A granular activated carbon treatment unit is in place at this residence to remove contaminants prior to use. Monitoring of the on-Site potable production well (GW-08DB) confirms that groundwater is treated to meet safe drinking water standards and current risk-based RSLs for tapwater prior to use.

The 2004 ESD modified the remedy established in the 1993 ROD by discontinuing the vapor extraction component of the remedy. Soil remediation is no longer occurring, nor is there monitoring of soil concentrations. The presumption has been that contaminants in soil will be flushed out into groundwater (as the groundwater table is above the waste material) and be treated via the pump and treat system. With this continued slow leaching of contamination into the groundwater, the time to achieve Site cleanup levels is likely to be extended, as the groundwater extraction and treatment system is not fully effective in preventing migration of contaminants in this source area. A source removal evaluation should be evaluated to address this current condition.

Groundwater monitoring is conducted routinely but monitoring reports do not include or consider all of the appropriate State and Federal comparison values to aid in evaluating the progress of the remediation or reaching regulatory end points. However, those standards were utilized in this FYR evaluation. While there has been a significant removal of contaminants since the extraction and treatment system was constructed in 1992, contaminated groundwater on-Site has not been restored to drinking water standards and, in a number of cases, concentrations have either increased or remained constant.

Vapor intrusion has been identified as a concern at on-Site residences but the applicable groundwater volatilization criteria have not been routinely compared with the groundwater data generated. Shallow groundwater monitoring data should be routinely evaluated to determine if there are any future potential vapor intrusion issues. This evaluation needs to be included in the LTMP and reported annually.

Question C: Has Any Other Information Come to Light that Could Call Into Question the Protectiveness of the Remedy?

Yes, issues which could potentially result in a lack of long-term protectiveness of the remedy include the apparent migration of contamination to the south-west and the detections of TCE and 1,2-DCE in residential well GW14. The detections at this southern location and the increased TCE concentrations in MW28 and other on-Site groundwater monitoring well locations indicate the likelihood that capture of the TCE plume is incomplete.

Additionally, there is the potential for exposure to TCE via the inhalation route within buildings both on-Site and in off-Site locations should the plume continue to expand. As stated above, a

vapor intrusion exposure pathway has been identified on-Site. While the current risk analysis indicates that there is no unacceptable risk, changing conditions could affect that determination in the future. LSC has plans to expand their recreational function facilities on-Site to include construction of an additional adjacent catering/banquet facility (e.g. use for weddings and events). While an unacceptable vapor intrusion risk is unlikely due the short exposure durations anticipated for this building's use, the presence of the migrating TCE plume and its close proximity to the source area could present a potential short-term indoor air quality concern. Prior to construction, it is recommended that this concern be considered. Engineered measures such as a vapor barrier or installation of a venting system are preventative actions that would alleviate this concern.

Technical Assessment Summary

According to the data reviewed, the Site Inspection, and interviews with persons knowledgeable of the Site, the extraction and treatment system is operating properly and is functioning as originally designed. The remedy has in general significantly reduced the mass and concentrations of the COCs in the groundwater since construction completion.

However, available data indicate that groundwater contaminants on the LSC property remain above the interim groundwater cleanup goals and are increasing in some locations. Recent increases in concentrations in a number of wells on-Site, as well as new evidence of off-Site contaminant migration to the south (GW-14), warrant an investigation to adequately determine the current nature and extent of the source area and groundwater contamination. Additional sampling and analysis at residences south of GW-14 should be included in the LTMP and additional sentinel well(s) should be installed in this vicinity to allow for early detection of further plume migration.

The recent contaminant increases on-Site (generally to mean the LMS property) and detection of VOCs approaching the cleanup levels at a new off-Site residence, has put into question the long-term protectiveness of the remedy and its ability to attain the original cleanup timeframes. An integrated evaluation of the existing remedial action should be developed to (1) identify effective improvements/modifications to the current extraction and treatment system (e.g. which wells to pump, adjusting flow rates, and/or adding wells to the system to improve its effectiveness) and (2) evaluate alternative remedial measures that could potentially aid in the attainment of Site Remedial Action Objectives. This evaluation should also consider the effects of the contaminated source area soils on the Remedial Action.

Finally, due to the known vapor intrusion exposure pathway at the Site, groundwater data must be regularly reviewed against appropriate standards and criteria (i.e., VISLs, GWVC) to monitor for future potential vapor intrusion issues. These analyses must be included in the Site LTMP.

V. ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 10
Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
1	Vapor Intrusion	Evaluate all groundwater data to monitor for future potential vapor intrusion issues.	PRP	EPA and CTDEEP	6/30/2015	No	Yes
1	Increases in groundwater TCE concentrations at MW28, GW08, MW21DB, MW17, MW10, MW15, and MW01.	Re-evaluate the effectiveness of the groundwater extraction system in meeting remedial objectives and investigate the nature and extent of the plume.	PRP	EPA and CTDEEP	9/30/2015	No	Yes
1	TCE and 1,2-DCE were detected in residential well GW-14.	Add additional residential well locations beyond GW-14 to the LTMP to ensure adequate monitoring and evaluation. Install sentinel well(s) in the vicinity of GW-14 to allow for early detection of further plume migration.	PRP	EPA and CTDEEP	9/30/2015	No	Yes
1	Analysis of 1,4-dioxane in groundwater.	Continue monitoring for 1,4-dioxane at all Site wells and residential wells included in the LTMP and evaluate data trends.	PRP	EPA and CTDEEP	9/30/2019	No	Yes
1	Source control measures would accelerate groundwater remediation.	Evaluate source control options to determine how additional remedial measures could reduce cleanup times.	PRP	EPA and CTDEEP	12/31/2015	No	Yes

In addition, the FYR identified the following recommendations that could potentially improve effectiveness of the remedy, reduce costs, provide technical improvement, accelerate Site closeout, and improve energy conservation and sustainability but do not affect future protectiveness:

- Increase frequency of sampling at GW08DB – This well is used as a supply well for the facility water needs. The demand on this well will increase with the installation of the banquet facility. Because TCE concentrations have increased recently, more frequent sampling should be considered to ensure protectiveness.

- Use of MW14DB as an extraction well – As part of the overall recommendation to evaluate Site hydrogeology, use of this well as an extraction well should be re-evaluated.

There have been no detections of TCE in the past 5 years and this well has been pumped with the highest flow rate of all the extraction wells. Consideration should be given to using this well as a supply well for the facility, potentially reducing the treatment costs associated with GW08DB.

- Proposed Banquet Hall sub-slab depressurization system – A sub-slab depressurization system or other engineered controls such as a vapor barrier or venting system should be considered for installation during construction of this new building north of the mansion as a contingency should the vapor intrusion pathway be a concern.

- CT Air Pollution Regulations effective October 3, 2008 - A more comprehensive review of the potential compliance issues should be conducted.

- National Recommended Water Quality Criteria – Groundwater monitoring results should be compared to these criteria.

- CT Department of Public Health Drinking water action levels – These are enforceable drinking water standards and the level for TCE has been reduced from 5 µg/L to 1 µg/L for private water supplies and may apply to public water supplies within two to three years. Additionally the CT Action Level for 1,4-dioxane is now 3 µg/L. Results should be compared to these action levels.

- Soil Monitoring – Soil monitoring at the source should be conducted and results compared to RSRs to confirm that soils have not become recontaminated and that RSRs have been met. In addition, soil monitoring should be coordinated with any source removal activities, should they occur, to assess the effectiveness of source removal, which may require a second sampling event.

VI PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy currently protects human health and the environment because there are no unacceptable exposure risks to Site contaminants. Additionally, there are established Site institutional controls in place and off-Site residential groundwater treatment has been implemented where necessary. However, in order for the remedy to be protective in the long-term the following actions need to be taken to ensure protectiveness. Recent increases in groundwater VOC concentrations in on-Site monitoring wells and detections of Site contaminants in one off-Site residential well (currently installed with a drinking water treatment system) will require additional investigatory measures to adequately define the nature and extent of contamination. Current Site conditions indicate that the groundwater extraction and treatment system may not be adequately capturing the contaminated plume, thereby affecting the ability of the remedy to achieve the cleanup goals and meet projected cleanup times. Evaluation of all groundwater data is necessary to monitor for future potential vapor intrusion issues. This evaluation must be included in the LTMP. Lastly, additional evaluation of the extraction and treatment system is warranted to identify alternative measures and/or modifications to ensure that the Remedial Action Objectives identified in the ROD will be attained and the remedy will remain protective of human health and the environment.

VII NEXT REVIEW

The next FYR report for the Linemaster Switch Corporation Superfund Site will be completed by September 30, 2019.

TABLES

Linemaster Switch Third Five-Year Review

Table 3
Summary of 1,4-Dioxane Detections

Location	Date	1,4-Dioxane (ug/l)
MW17SB	5/21/10	93.0
	8/26/10	88.4
	11/24/10	93.0
	3/25/11	97.8
	5/11/11	21.1
	5/11/11	103
	8/25/2011	108
	11/22/2011	110
MW17TD	5/24/10	93.9
	11/24/10	103
	5/11/11	60.4
	11/22/2011	115

Table 4
Summary of Manganese Results

Well Location	Date	Manganese (mg/l)
IRTS - System		
IRTS-INF	11/22/10	0.0548
IRTS-EFF	11/22/10	0.0279
IRTS-Final Discharge	11/22/10	0.0208
Reconfigured Phase 1A System - Extraction Wells		
FW-F35	11/24/10	0.0868
MW10SB	11/24/10	1.01
FW-E	11/24/10	0.0118
FW-H	11/24/10	0.421
FW-I	11/24/10	0.418
FW-J	11/24/10	0.0134
Deep Bedrock Extraction Wells		
GW10DB	11/22/10	1.18
MW01DB	11/22/10	0.0846
MW06DB	11/22/10	0.0907
MW14DB	11/22/10	0.0421
MW15DB	11/22/10	0.324
MW17DB	11/22/10	0.1
	11/22/10[1]	3.41
Deep Bedrock Monitoring Wells		
GW12DB	11/22/10	2.2
GW36DB	11/23/10	0.081
MW08DB	11/22/10	0.166
MW11DB	11/22/10	0.201
MW12DB	11/23/10	0.0517
MW13DB	11/24/10	0.0796
MW18DB	11/23/10	0.168
MW21DB	11/24/10	0.0768
MW22DB	11/22/10	0.0089
MW27DB	11/23/10	0.107
MW28DB	11/22/10	0.0038
MW29DB	11/22/10	0.0564
Shallow Bedrock Monitoring Wells		
MW17SB	11/24/10	0.049
Overburden Monitoring Wells		
MW04T	11/24/10	0.0028
MW06T	11/29/10	0.0059
MW11T	11/29/10	0.0051
MW17TD	11/24/10	0.0448
MW17TS	11/24/10	0.0186
MW23T	11/30/10	0.151
MW26T	11/30/10	0.0772
MW33T	11/29/10	0.218
MWEPAATS	11/30/10	0.0327
	11/30/10[1]	0.0322

Table 4 (cont'd)
Summary of Manganese Results

Well Location	Date	Manganese (mg/l)
Domestic Water Supply Wells		
GW06OB	12/1/10	0.112
GW08DB	11/24/10	0.0253
GW08TA	11/24/10	0.0074
GW08TB	11/24/10	<0.0020
GW08TC	11/24/10	<0.0020
GW17DB	12/1/10	0.145
GW24DB	12/28/10	0.002
GW25OB	12/28/10	<0.0020
GW40DB	11/22/10	<0.0020
GW40B	11/22/10	0.0026
GW40T	11/22/10	<0.0020
GW57	12/1/10	<0.0020
GW69DB	12/28/10	<0.0020
Surface Water		
SW04	11/29/10	0.248
SW07	11/29/10	0.0138
SW18	11/29/10	0.0064
SW18	11/29/10	0.007
CTDEP RSR Criteria(2)	**GWPC**	NE
	SWPC	NE

Notes:

< = Not detected above the laboratory detection limit indicated

J = Estimated concentration

ND = Not detected

mg/L = Miligrams per liter

VOCs = Volatile Organic Constituents

CTDEP = Connecticut Department of Environmental Protection

RSR = Remediation Standard Regulations (1996)

GWPC = Groundwater Protection Criteria

SWPC = Surface Water Protection Criteria

(1) Duplicate collected at indicated location on indicated date.

(2) There is no establishe RSR criteria for manganese; however, the CTDPH drinking water action level is 0.5 mg/L.

Table 5
Summary of Well Data for Key Wells

Well	Type	Date	cis-1,2-Dichloro-ethylene	Trichloro-ethylene	Total VOCs
MW01DB	Deep Bedrock Extraction	2/19/2009	4.5	6.8	11.3
		5/20/2009	4.2	5.9	10.1
		8/19/2009	4.8	6.3	11.1
		11/16/2009	3.7	5.3	9
		3/3/2010	4.1	6.1	10.2
		5/25/2010	4.6	4.1	8.7
		8/24/2010	4.4	5.5	9.9
		11/22/2010	4	3.5	7.5
		3/25/2011	4.4	6	10.4
		5/31/2011	4.8	5.2	10
		8/25/2011	4.6	3.6	8.2
		11/18/2011	4.5	5.7	10.2
		2/23/2012	2.4	2.6	5
		5/23/2012	2.99	3.12	6.11
		8/30/2012	3.13	3.04	6.17
		11/27/2012	2.83	2.05	4.88
		2/21/2013	2.7	3.1	5.8
		5/10/2013	2.86	5.05	7.91
		8/20/2013	3.7	4.08	7.78
		11/26/2013	4.5	6	10.5
MW10SB	DVE Extraction	2/19/2009	27,100	55,300	85,150
		5/19/2009	34,800	37,700	74,354
		8/19/2009	55,000	49,400	110,880
		11/21/2009	98,500	27,400	133,080
		3/3/2010	74,600	23,100	103,360
		5/25/2010	3,970	6,340	10,310
		5/25/2010	5,470	10,000	15,470
		8/24/2010	33,300	7,000	41,933
		11/24/2010	106,000	31,600	142,420
		3/25/2011	3,270	26,700	29,970
		5/21/2011	24,000	79,800	104,890
		5/21/2011	21,900	77,900	101,800
		8/26/2011	4,570	5,060	9,630
		11/18/2011	10,100	16,000	26,505
		2/23/2012	2,780	13,500	16,280
		5/25/2012	1,320	12,800	14,120
		5/25/2012	1,340	13,200	14,540
		8/30/2012	3,910	29,200	33,110
		11/27/2012	1,530	8,800	10,330
		2/21/2013	25,200	56,900	83,700
		5/10/2013	47,600	52,100	106,532
		5/10/2013	54,200	60,600	121,000
		8/20/2013	43,000	29,000	75,345
		11/26/2013	97,600	31,700	134,280
		11/26/2013	80,100	25,300	107,860

Table 5 (cont'd)
Summary of Well Data for Key Wells

Well	Type	Date	cis-1,2-Dichloro-ethylene	Trichloro-ethylene	Total VOCs
MW28DB	Deep Bedrock Monitoring	2/18/2009	51	148	199
		5/21/2009	55	150	205
		8/19/2009	69	188	260.1
		11/18/2009	65	172	237
		3/2/2010	57	141	199.3
		5/19/2010	90.2	161	265.5
		8/25/2010	72.4	162	234.4
		11/22/2010	53.2	90	143.2
		3/31/2011	90.1	123	213.1
		5/10/2011	58.7	131	189.7
		8/25/2011	68.6	125	193.6
		11/23/2011	72.9	159	231.9
		2/22/2012	43.3	124	167.3
		5/25/2012	51.3	123	174.3
		8/30/2012	24.2	37.7	61.9
		11/28/2012	24.9	41.8	66.7
		2/21/2013	43.8	101	144.8
		5/7/2013	98.5	175	276.94
		8/20/2013	90.6	180	270.6
		11/25/2013	56.6	82.6	139.2
MW11SB	Shallow Bedrock Monitoring	5/19/2009	<1	1.2	1.2
		5/17/2010	<1.0	1.2	1.2
		5/9/2011	<1.0	1	1
		5/21/2012	<1.00	<1.00	ND
		5/6/2013	<1.00	<1.00	ND

Table 5 (cont'd)
Summary of Well Data for Key Wells

Well	Type	Date	cis-1,2-Dichloro-ethylene	Trichloro-ethylene	Total VOCs
GW08DB	Drinking Water	2/19/2009	7.7	5	12.7
		5/20/2009	11	8.1	36.8
		8/19/2009	12	8.3	33.1
		11/17/2009	9.3	5.9	15.2
		3/3/2010	5.7	4.8	10.5
		5/25/2010	12.8	10.6	23.4
		8/24/2010	11.8	6.9	28.8
		11/24/2010	12.6	7.8	20.4
		3/25/2011	10.7	8.6	19.3
		5/21/2011	6.1	4.1	62.6
		8/26/2011	11.4	9.5	1111.6
		11/18/2011	10	8.7	18.7
		11/22/2011	<1.0	<1.0	ND
		2/23/2012	11.6	12.7	24.3
		4/19/2012	12.4	16.2	262
		8/30/2012	31.4	43.6	76.03
		11/27/2012	22.9	28.2	51.1
		2/21/2013	32.7	34	66.7
		5/10/2013	36.1	39.8	77.1
		8/20/2013	42.2	38.9	81.1
		11/26/2013	37.1	25.2	62.3

Notes: all concentrations are in ug/L
ND = Not detected
< = compound not detected at the indicated concentration

Table 6
Linemaster IRTS TCE and Total VOCs Removals and Permit Limits

Month	Days/Mo	Flow (gpm)	TCE (lbs/mo)	TCE (lbs/hr)	VOCs (lbs/mo)	VOCs (lbs/hr)
Jan-13	31	24	0.29	0.00039	1.88	0.00253
Feb-13	28	27	0.56	0.00083	2.29	0.00341
Mar-13	31	23	0.36	0.00048	2.06	0.00277
Apr-13	30	29	0.96	0.00133	2.80	0.00389
May-13	31	22	0.99	0.00133	2.52	0.00339
Jun-13	30	23	1.25	0.00174	3.00	0.00417
Jul-13	31	29	1.71	0.00230	4.56	0.00613
Aug-13	31	21	0.91	0.00122	2.53	0.00340
Sep-13	30	23	0.68	0.00094	2.33	0.00324
Oct-13	31	30	1.27	0.00171	2.27	0.00305
Nov-13	30	34	0.83	0.00115	1.72	0.00239
Dec-13	31	40	1.64	0.00220	3.24	0.00435
12 Month Average/Total	365	27	11.45	0.00130	31.2	0.00356

Check Against 1998 CT DEP Air Permit Emission Limits and Actual Emissions:

VOCs limit in permit in lbs/hr: 1.11

Calculated average lbs/hr over 12 month period = **0.00356 OK, <1.11 lbs/hr permit limit**

Maximum Allowable Stack Concentration for TCE (µg/m3) in permit = 756,540

Actual Stack Concentration in $\mu g/m^3 = C^* 2.00^*10^5$, Where C = average lbs/hr:

ASC for TCE ($\mu g/m^3$) = **261 OK, <756,540 $\mu g/m^3$**

Notes: Data obtained from Annual Monitoring Report January to December 2013 (Woodard & Curran, 2014), represents the mass of contaminants removed from groundwater, which is assumed to be primarily through air stripping, with carbon as a polishing step.

MASC = Maximum Allowable Stack Concentration, calculated by multiplying the HLV, Hazard Limiting Value for TCE, which is 1,350 µg/m3 by the factor 560.4
ASC = Actual Stack Concentration, calculated by multiplying the average lbs/hr emission rate by a factor of 2x105
TCE = trichloroethylene
VOCs = volatile organic chemicals
lbs/hr = pounds per hour

Table 7
Groundwater Clean-up Levels and Comparison Levels for Site Contaminants

Contaminant	ROD Clean-up Level (ppb)	ROD Clean-up Level Basis	Current MCLs (ppb)	2014 Tapwater RSLs (ppb)	Connecticut RSRs for Groundwater		
					GWPC–GA (ppb)	SWPC (ppb)	Residential GWVC (ppb)
Acetone	3,700	HQ	NA	**14,000**	**700**	NA	50,000
Arsenic	50	MCL[1]	**10**	**0.052**	50	**4**	NA
Benzene	5	MCL	5	**0.45**	**1**	710	215
Beryllium	4	MCL	4	**25**	4	4	NA
Cadmium	5	MCL	5	**9.2**	5	6	NA
CCl_4	5	MCL	5	**0.45**	5	132	16
Chloroform	100	MCL[2]	NA	**0.22**	**6**	14,100	287
CH_3Cl	6.5	CR	6.5	**190**	47	NA	NA
1,2-DCA	5	MCL	5	**0.17**	**1**	2,970	21
1,1-DCE	7	MCL	7	**280**	7	96	**1**
Cis-1,2-DCE	70	MCL	70	**36**	70	NA	NA
DCM	5	MCL	5	**11**	5	48,000	50,000
1,2-DCP	5	MCL	5	**0.44**	5	NA	14
2-hexanone	1,500	HQ	NA	**38**	NA	NA	NA
MEK	1,800	HQ	NA	**5,600**	**400**	NA	50,000
PCE	5	MCL	5	**11**	5	88	1,500
1,1,1-TCA	200	MCL	200	**8,000**	200	62,000	20,400
1,1,2-TCA	5	MCL	5	**0.28**	5	1,260	8,000
TCE	5	MCL	5	**0.49**	5	2,340	219
Toluene	1,000	MCL	1,000	**1,100**	1,000	4,000,000	23,500
VC	2	MCL	2	**0.019**	2	15,750	2

Notes:

(1) The MCL for arsenic has changed to 10 ppb.
(2) There is currently no MCL for chloroform; the current maximum contaminant level goal (MCLG) is 70 ppb. An MCL of 80 ppb exists for trihalomethanes as a group.

Bold RSRs are less than original ROD clean-up goals.
ROD = Record of Decision (EPA, 1993)
ppb = Parts per billion (micrograms per liter).
HQ = hazard quotient; target HQ was 1.
CR = cancer risk; target cancer risk was 1E-6.
MCL = maximum contaminant level
NA = Not Available
RSL = EPA's Regional Screening Levels, May 2014 based on cancer risk of $1x10^{-6}$ or HQ=1.
RSR = Remediation Standard Regulations, amended June 27, 2013.
GWPC–GA = groundwater protection criteria for GA aquifers

SWPC = surface water protection criteria
GWVC = groundwater volatilization criteria
DCE = dichloroethylene
PCE = perchloroethylene
CCl_4 = carbon tetrachloride
DCA = dichloroethane
DCP = dichloropropane
MEK = methyl ethyl ketone
TCA = trichloroethane
VC = vinyl chloride
DCM = dichloromethane
CH_3Cl = chlorormethane

.

Table 8
Soil Clean-up Levels and Current Comparison Levels for Site Contaminants

Contaminant	ROD Clean-up Level (ppb)	ROD Clean-up Level Basis	2014 Residential Soil RSLs (ppb)	Connecticut RSRs for Soil, PMC-GA (ppb)
1,2-dichloroethane	4.0	MCL	460	20
Cis-1,2-dichloroethene	50	MCL	160,000	1,400
Dichloromethane	3.0	MCL	57,000	100
PCE	10	MCL	24,000	100
1,1,1-trichloroethane	300	MCL	8,100,000	4,000
TCE	5	MCL	940	100
Toluene	1,000	MCL	4,900,000	20,000
Xylenes	100	MCL	580,000	19,500

Notes:
ROD = Record of Decision (EPA, 1993).
ppb = Parts per billion (micrograms per liter).
HQ = hazard quotient; target HQ was 1.
CR = cancer risk; target cancer risk was 1E-6.
MCL = maximum contaminant level - ROD cleanup goals for soil were based on modeling potential migration from soil to groundwater, with the target concentration in groundwater set at the MCL.
RSL = EPA residential soil Regional Screening Levels (May 2014) based on cancer risk of $1x10^{-6}$ or HQ=1.
RSR = Remediation Standard Regulations, amended June 27, 2013.
PMC – GA = pollutant mobility criteria for protection of GA aquifers.
DEC = residential soil direct contact criteria.
Each of the original ROD clean-up goals for soil is less than currently available soil RSRs or RSLs.

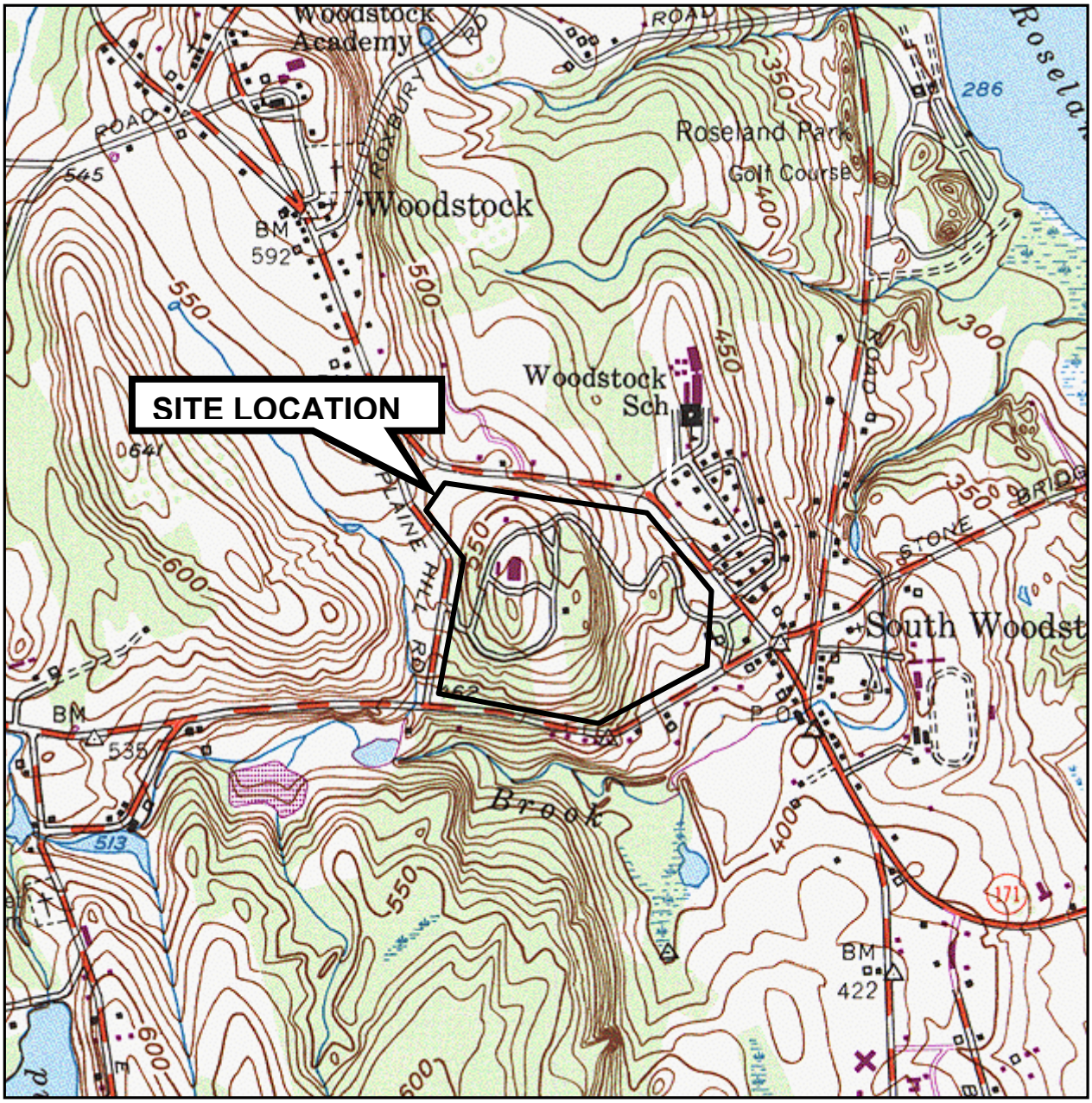
Table 9
Vapor Intrusion Screening Levels Used in the 2011/2012 Vapor Intrusion Evaluation versus Current Vapor Intrusion Screening Levels

Contaminant	2012 Indoor Air VISLs[1] ($\mu g/m^3$)	2014 Indoor Air VISLs[2] ($\mu g/m^3$)	2012 Soil Gas VISLs[1] ($\mu g/m^3$)	Current Soil Gas VISLs[2] ($\mu g/m^3$)
1,1-dichloroethane	1.5	1.8	15	18
1,1-dichloroethylene	210	210	2100	2100
1,2-dichloroethane	0.094	0.11	0.94	1.1
Cis-1,2-dichloroethylene	NA	NA	NA	NA
Trans-1,2-dichloroethylene	63	NA	630	NA
Tetrachloroethylene	9.4	11	94	110
Trichloroethylene	0.43	0.48	4.3	4.8
Vinyl chloride	0.16	0.17	1.6	1.7

Notes:
1 - VISL = Vapor Intrusion Screening Level EPA, March 2012.
2 - VISL = Vapor Intrusion Screening Level EPA, May 2014 based on cancer risk of $1x10^{-6}$ or HQ=1.
$\mu g/m^3$ = micrograms per cubic meter.

FIGURES

Linemaster Switch Third Five-Year Review



QUADRANGLE LOCATION

Source: TOPO! Interactive Maps on CD, U.S.G.S.
7.5 Minute Series Topographic Quadrangle Map
Putnam, Conn. 1955, Photorevised 1970

0 1/2 1 MILE
1000 0 1000 2000 3000 4000 FEET

N

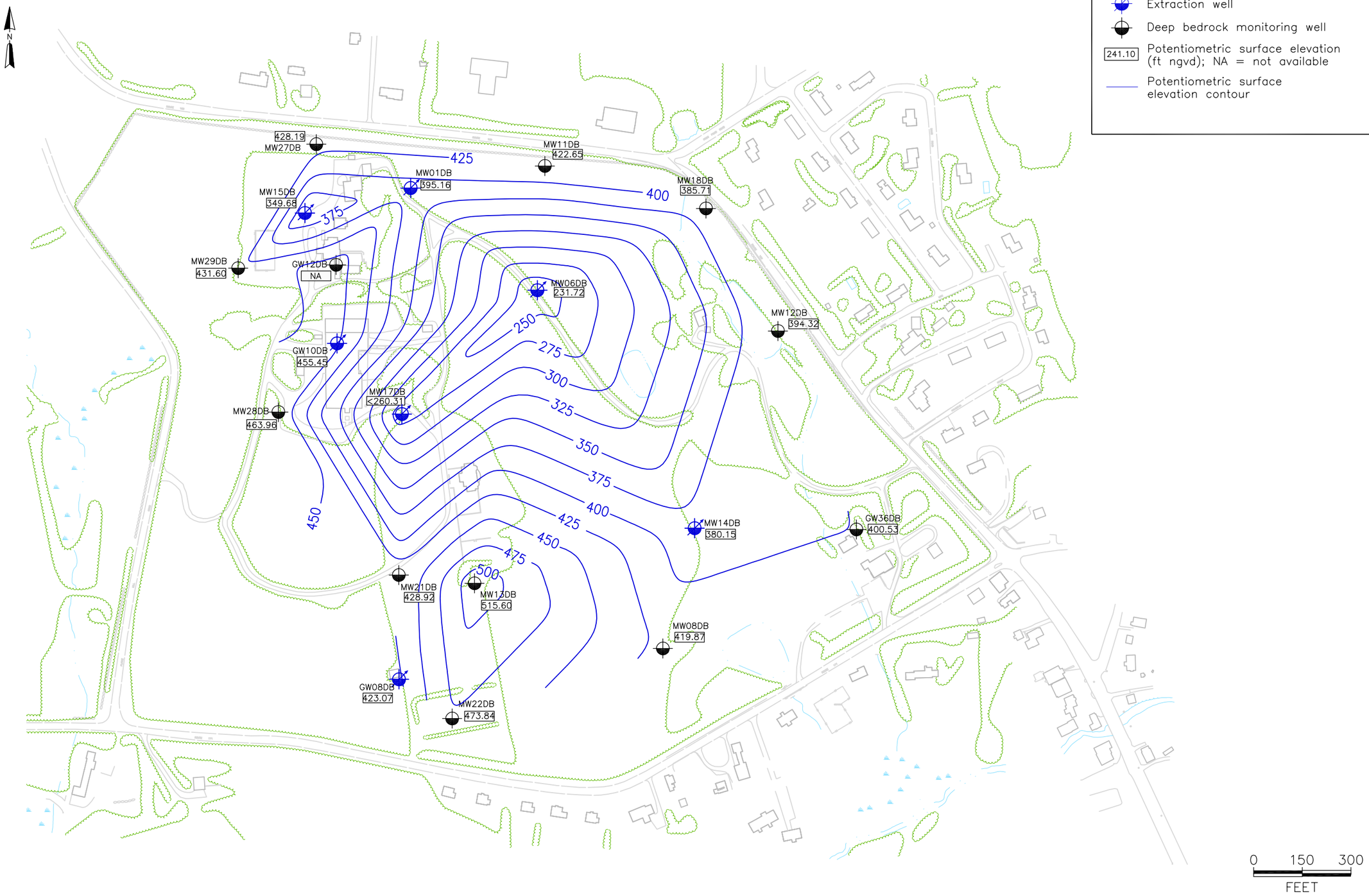
WOODARD &CURRAN

DATE: March 2014
DWN: L. Warner
APP: J. Markey
REV.: 0

FIGURE 1

LINEMASTER SWITCH CORPORATION
PLAINE HILL ROAD
WOODSTOCK, CONNECTICUT

SITE LOCATION MAP



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

DEEP BEDROCK POTENTIOMETRIC SURFACE CONTOUR MAP – MAY 2013

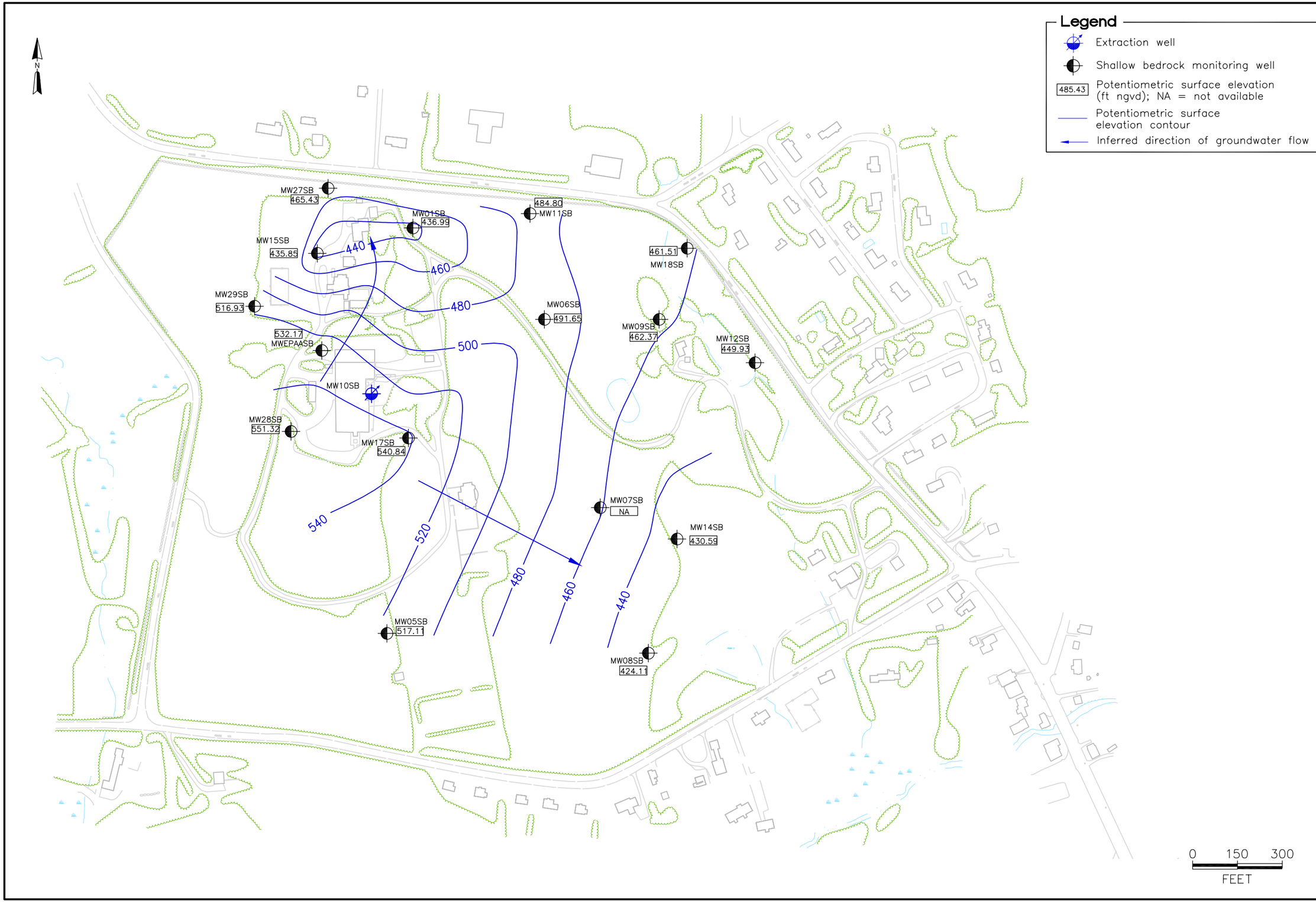
DESIGNED BY: DS
DRAWN BY: DS
CHECKED BY: JM
Fig 3-1 -2013 Rpt dpbrpot May.dwg

LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT

2013 ANNUAL MONITORING REPORT

JOB NO: 206922
DATE: MARCH 2014
SCALE: AS NOTED

FIGURE 2



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

SHALLOW BEDROCK POTENTIOMETRIC SURFACE CONTOUR MAP – MAY 2013

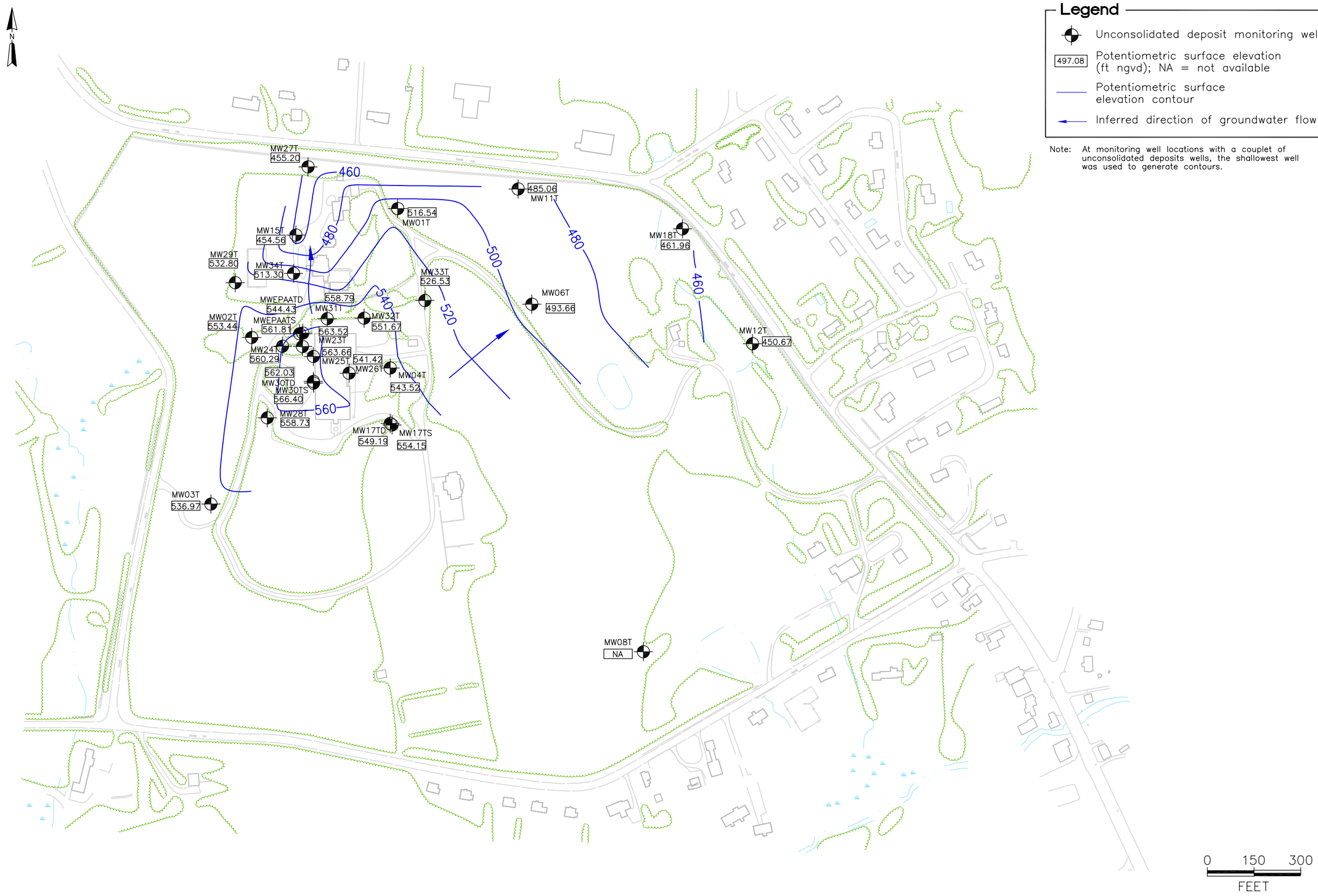
DESIGNED BY: DS
DRAWN BY: DS
CHECKED BY: JM
Fig 3-3 – 2013 Rpt shbrpot May.dwg

LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT

2013 ANNUAL MONITORING REPORT

JOB NO: 206922
DATE: MARCH 2014
SCALE: AS NOTED

FIGURE 3



Legend

- Unconsolidated deposit monitoring well
- 497.08 Potentiometric surface elevation (ft ngvd); NA = not available
- Potentiometric surface elevation contour
- Inferred direction of groundwater flow

Note: At monitoring well locations with a couplet of unconsolidated deposits wells, the shallowest well was used to generate contours.

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OVERBURDEN POTENTIOMETRIC SURFACE CONTOUR MAP – MAY 2013

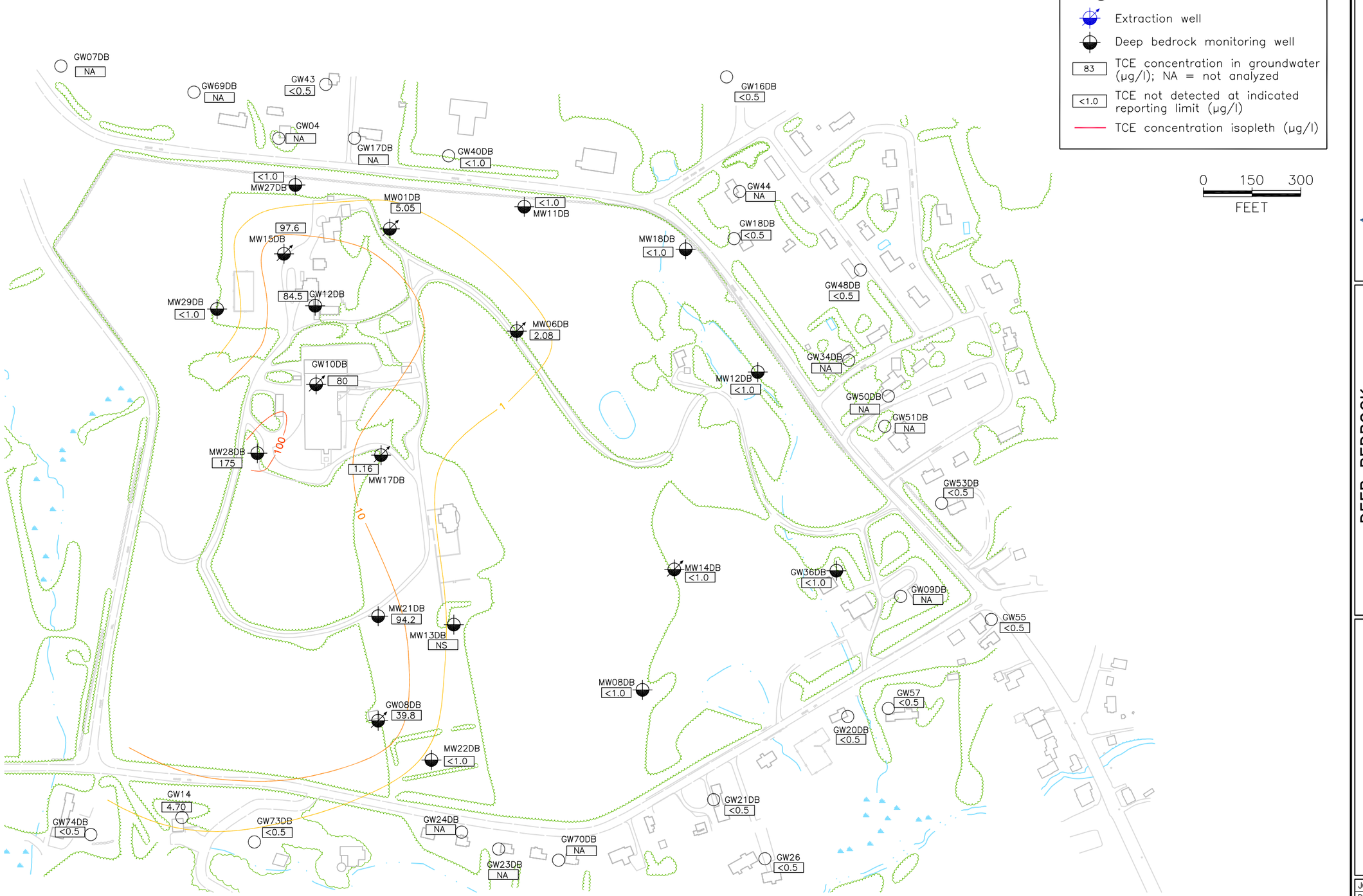
DESIGNED BY: DS
DRAWN BY: BML
CHECKED BY: JM
Fig 3-5 – 2013 Rpt unconpot May.dwg

LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT

2013 ANNUAL MONITORING REPORT

JOB NO: 206922
DATE: MARCH 2014
SCALE: AS NOTED

FIGURE 4



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

DEEP BEDROCK TCE ISOPLETH MAP MAY 2013

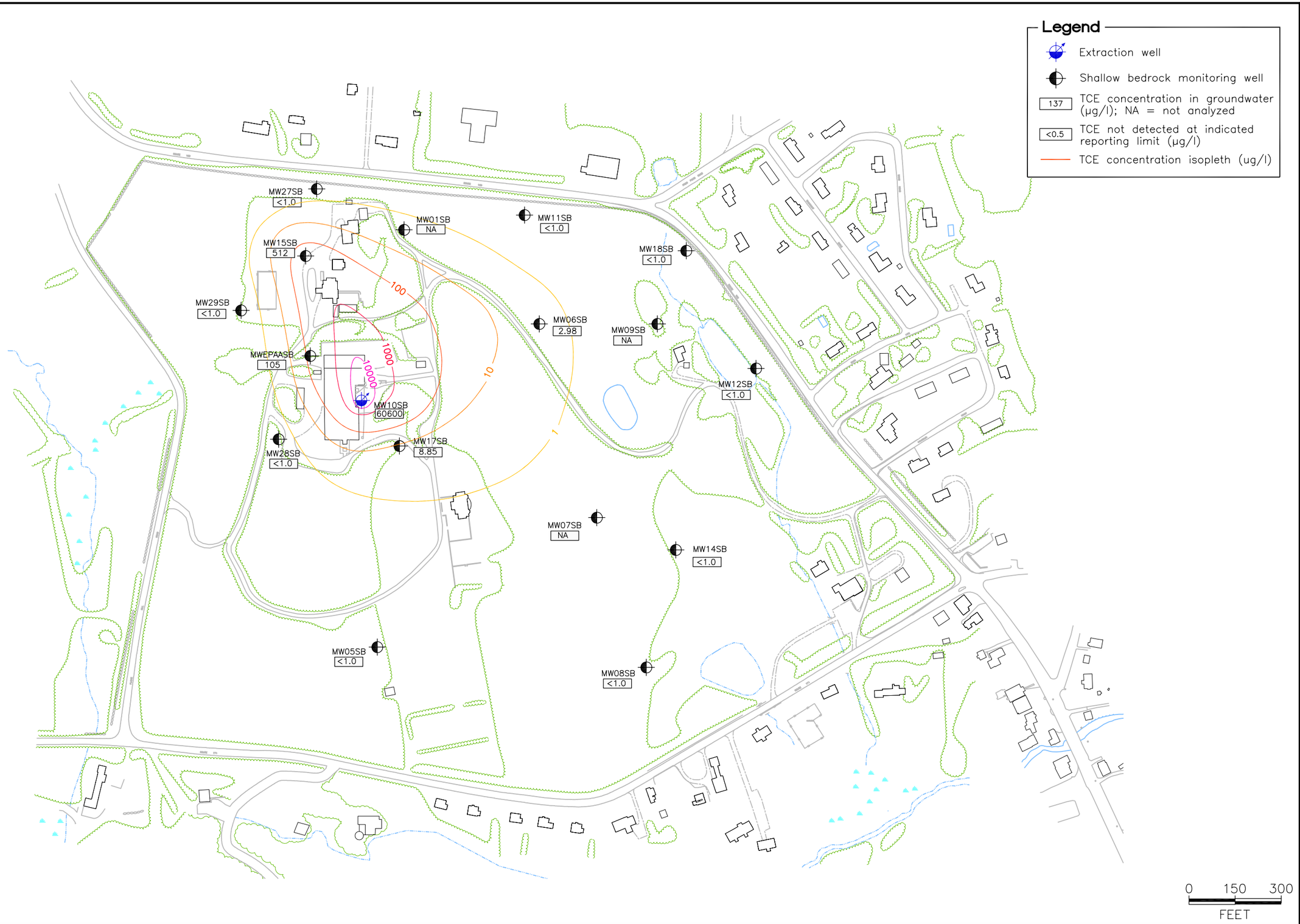
DESIGNED BY: DS
DRAWN BY: BL
CHECKED BY: JM
Fig 3-7 -2013 Rpt dpbrtce May.dwg

LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT

2013 ANNUAL MONITORING REPORT

JOB NO: 206922
DATE: MARCH 2014
SCALE: AS NOTED

FIGURE 5



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

SHALLOW BEDROCK TCE ISOPLETH MAP MAY 2013

DESIGNED BY: MH
DRAWN BY: PFF
CHECKED BY: JM

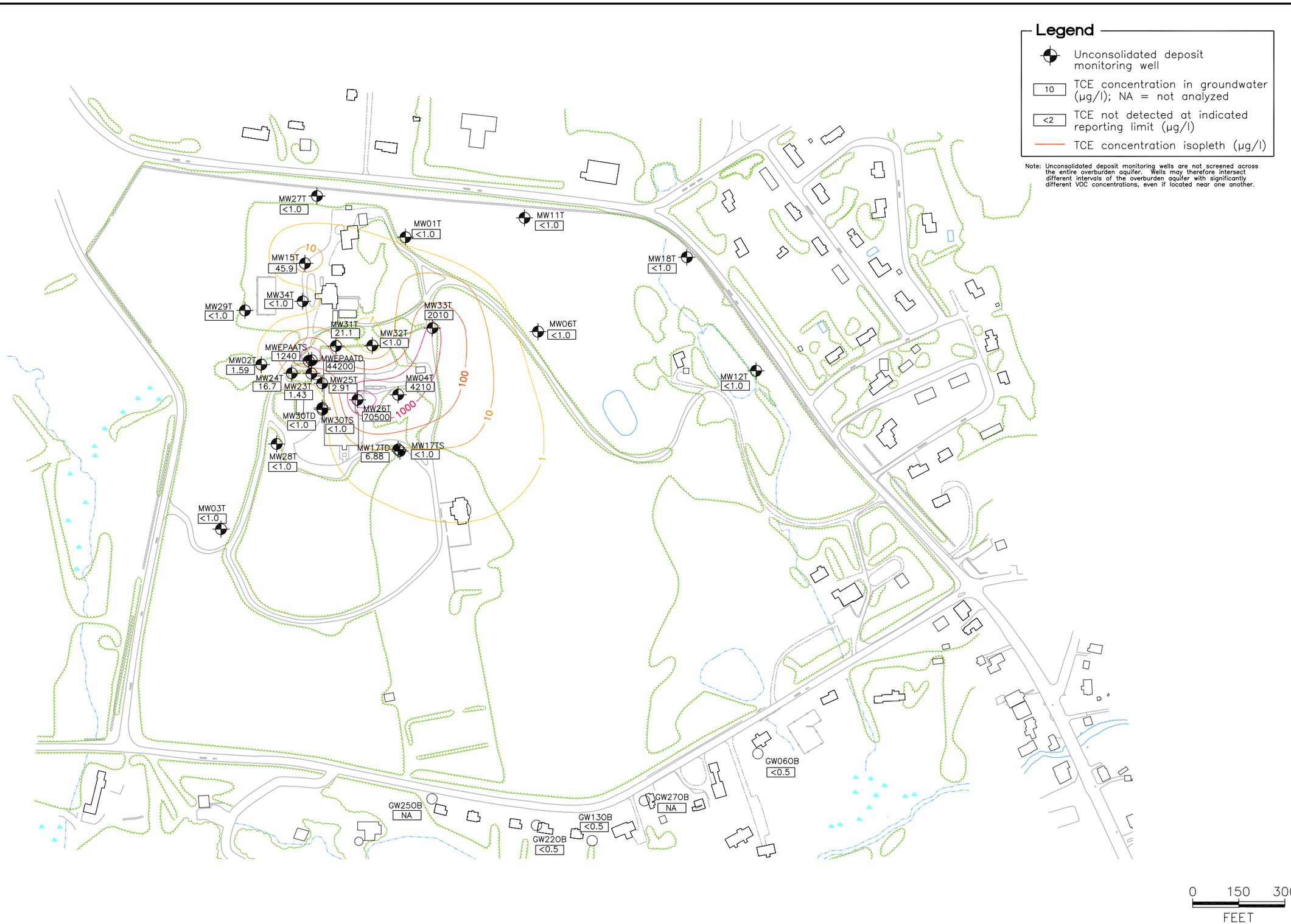
Fig 3-9 – 2013 LM Rpt SB TCE May.dwg

LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT

2013 ANNUAL MONITORING REPORT

JOB NO: 206922
DATE: MARCH 2014
SCALE: AS NOTED

FIGURE 6



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

OVERBURDEN TCE ISOPLETH MAP MAY 2013

DESIGNED BY: MH
DRAWN BY: PFF
CHECKED BY: JM

Fig 3-11 2013 LM Rpt OB TCE May.dwg

LINEMASTER SWITCH CORPORATION
WOODSTOCK, CONNECTICUT

2013 ANNUAL MONITORING REPORT

JOB NO: 206922
DATE: MARCH 2014
SCALE: AS NOTED

FIGURE 7

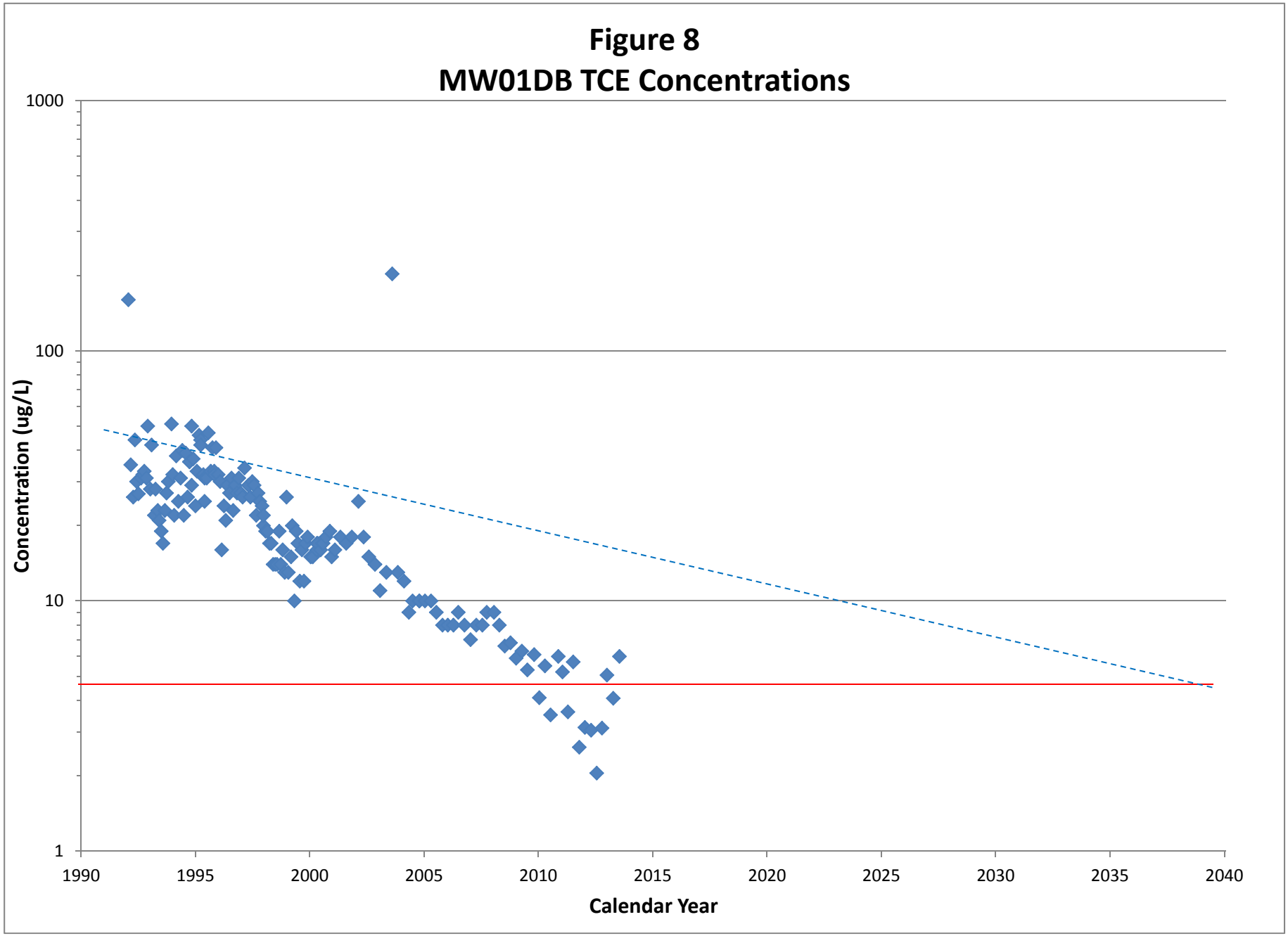
Figure 8
MW01DB TCE Concentrations
1000
100
10
1
Concentration (ug/L)
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year

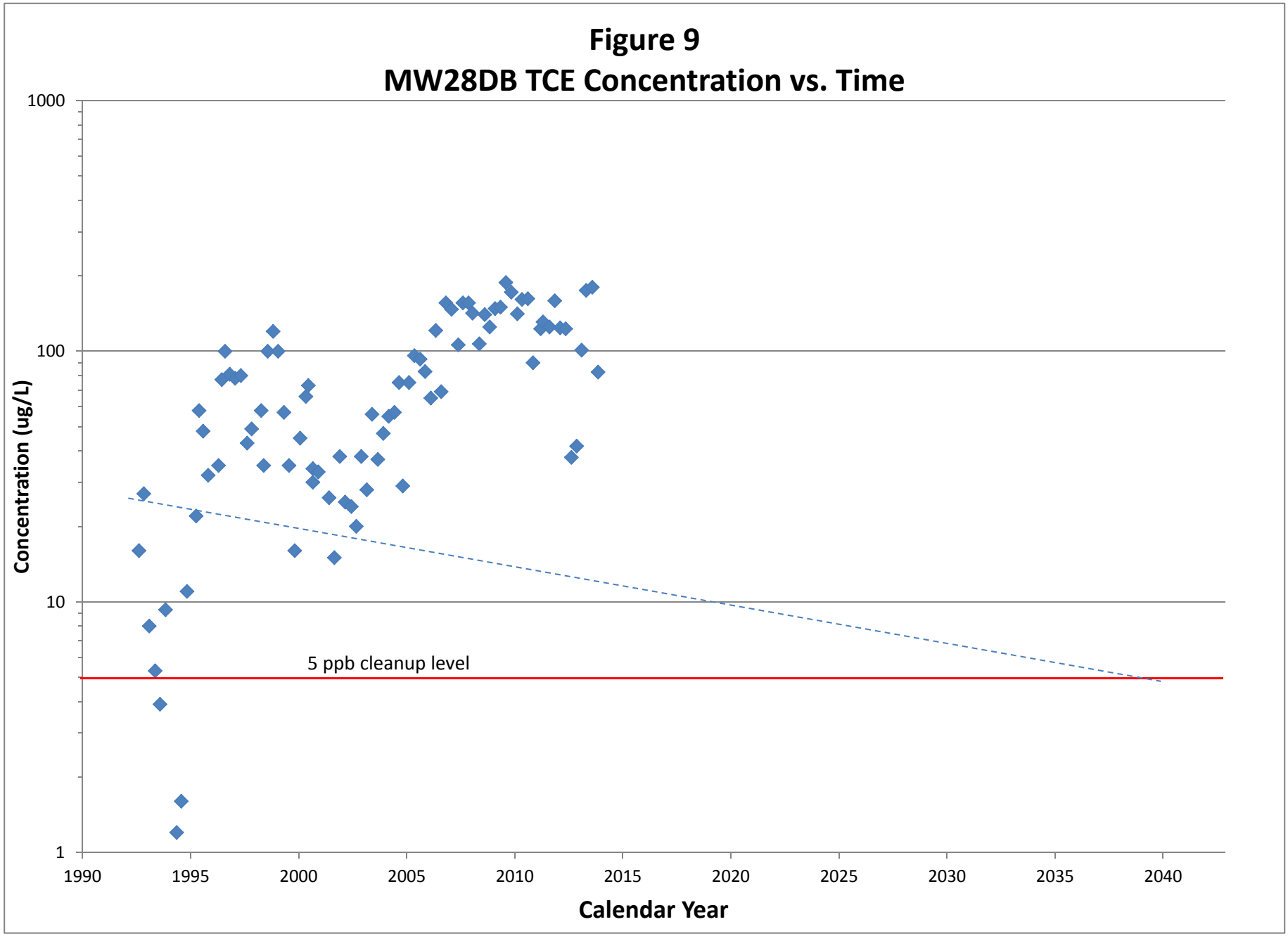
Figure 9
MW28DB TCE Concentration vs. Time
1000
100
10
1
Concentration (ug/L)
5 ppb cleanup level
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
Calendar Year

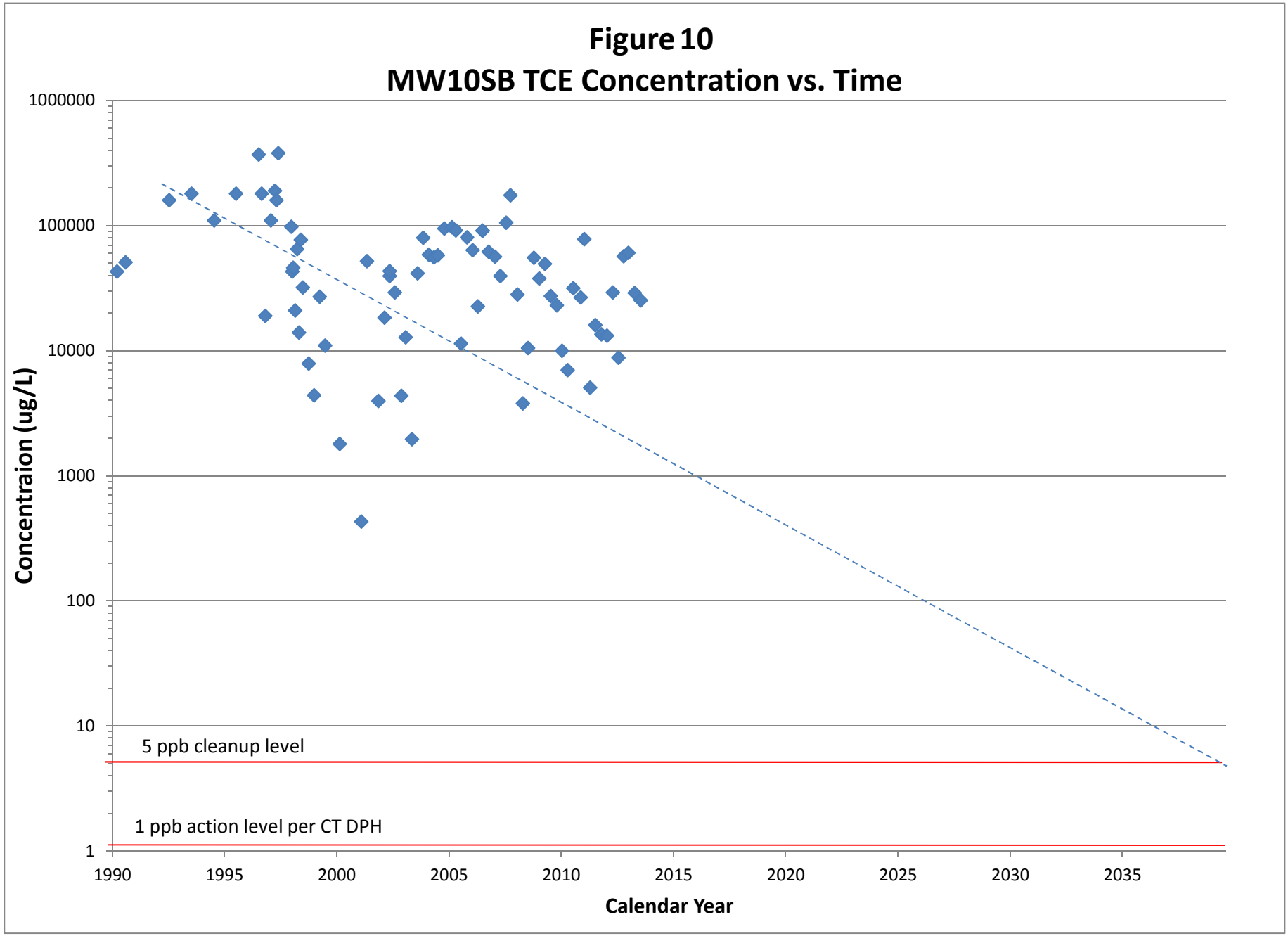
Figure 10
MW10SB TCE Concentration vs. Time
1000000
100000
10000
1000
100
10
1
Concentraion (ug/L)
5 ppb cleanup level
1 ppb action level per CT DPH
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
Calendar Year

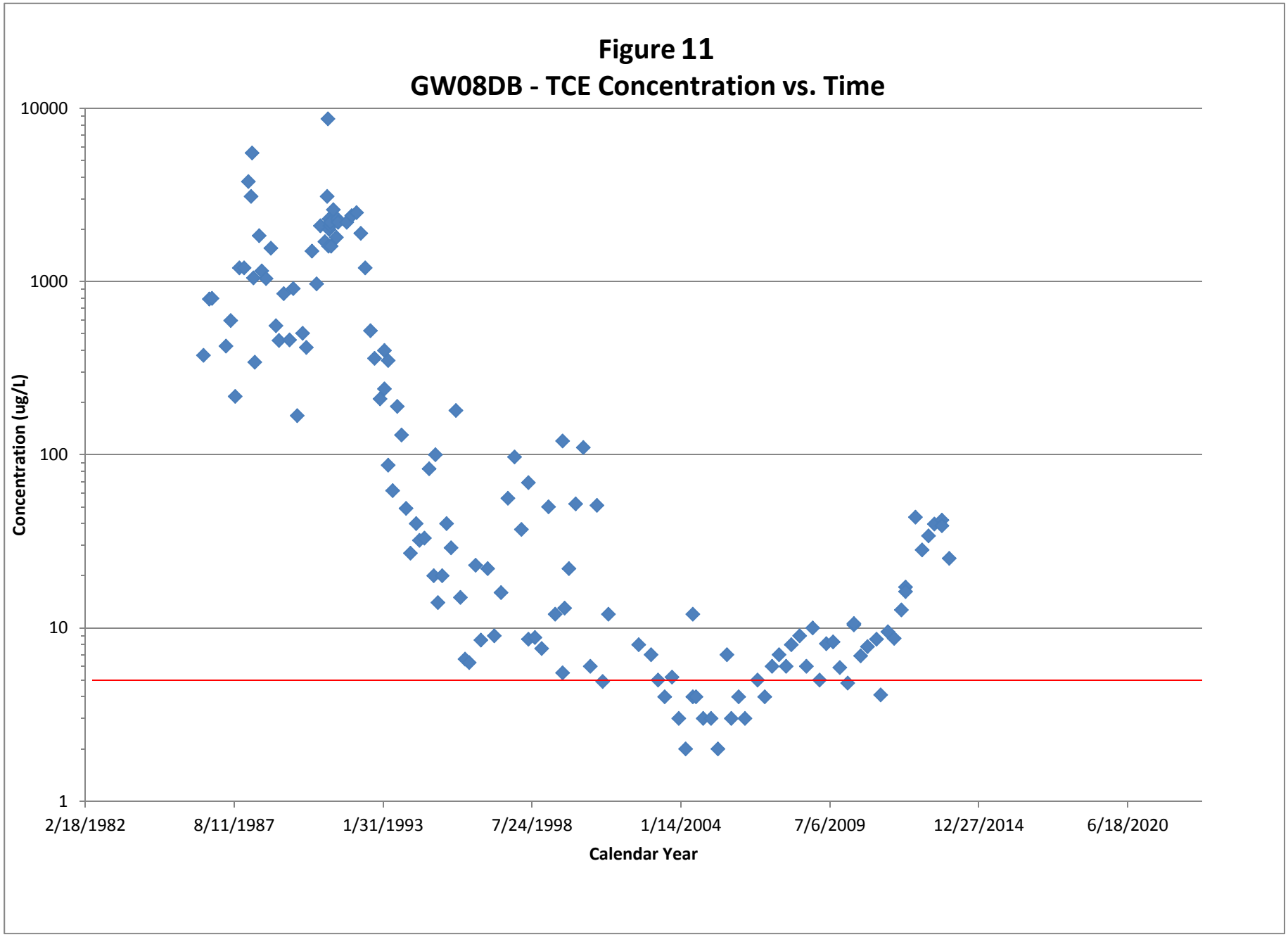
Figure 11
GW08DB - TCE Concentration vs. Time
10000
1000
100
10
1
Concentration (ug/L)
2/18/1982
8/11/1987
1/31/1993
7/24/1998
1/14/2004
7/6/2009
12/27/2014
6/18/2020
Calendar Year

APPENDIX A
EXISTING SITE INFORMATION

Linemaster Switch Third Five-Year Review

A. SITE CHRONOLOGY

Table A-1
Site Chronology

Event	Date
CTDEP conducted Site inspection pursuant to RCRA	July 1980
CTDEP conducted a Preliminary Assessment pursuant to CERCLA	July 1984
EPA conducted Site Inspections	December 1985 and February 1986
First Cleanup Action Initiated	July 9, 1986
Administrative Order by Consent signed between EPA and LSC	September 1987
Proposed NPL Listing	June 24, 1988
Final NPL listing	February 21, 1990
Groundwater extraction and treatment system is installed to control contaminant migration off Site.	June 1992
Remedial Investigation/Feasibility Study complete	December 1992
ROD signature	July 21, 1993
Consent Decree governing the remedial activities at the Site is signed by LSC and EPA.	1994
Construction of the dual vapor extraction (DVE) remedial system is completed.	November 1998
Due to lack of performance, the DVE system is re-evaluated in a Final DVE Optimization Report	November 21, 2003.
EPA authorizes LSC to deactivate the vacuum extraction portion of the DVE system	November 26, 2003.
First Five Year Review	May 24, 2004
EPA approves the ESD to the ROD, allowing the deactivation of the vacuum extraction system.	December 13, 2004
LSC submits a final reconfiguration proposal to the EPA.	February 25, 2005
W&C updates the Sampling and Analysis Plan for the Site.	November 20, 2007
Initiation of second Five-Year review.	March 2009
Completion of the Second Five-Year Review Report	July 2009.
Begin sampling program for 1,4 Dioxane	May 2010
Complete one sampling round for manganese	November 2010
Completion of vapor intrusion study at two on-Site buildings	March 2011
Addendum to Second Five-Year Review regarding 1,4-Dioxane and manganese in residential supply wells	August 2012
LSC/W&C submits semi-annual data packages and annual Long-Term Monitoring Reports.	2004 to present.
Initiation of Third Five-Year Review	May 2014

B. BACKGROUND

The Site is located east of Plaine Hill Road in Woodstock, Connecticut. The Site is bounded on the north and east by Route 169, on the west by Plaine Hill Road and on the south by State Route 171. The Site consists of 90 acres. A map depicting the location of the Site is presented as Figure 1 (Appendix A).

Physical Characteristics

The LSC is an active manufacturing facility. The Site includes woodlands, grass meadows, wetland areas, and several ponds and streams. The manufacturing facility is situated on a hill, with topography dropping off in all directions. Surface water streams in the vicinity of the Site generally flow east or northeasterly into Roseland Lake, located about 0.75 miles east of the Site, which then drains south into the Little River. Most of the properties surrounding the Site are residential. Drinking water for LSC facility and surrounding properties is provided by individual overburden and bedrock groundwater wells. The primary direction of groundwater flow is to the east-northeast, following the natural hydraulic gradient and two major fracture traces identified at the Site.

Land and Resource Use

Prior to 1952, the Site was used for residential purposes and small-scale farming. Starting in 1952 LSC began manufacturing foot operated switches at the Site. Currently, LSC manufactures electrical power switches, air valves, electrical cord sets, and metal. The LSC manufacturing facility is located near the center of the Site, and on its topographic high point. In addition to the manufacturing facility, several residential parcels and a commercial parcel, on which a restaurant is located, are also located on the Site.

The Site includes woodlands, grass meadows, wetland areas, and several ponds and streams. The Site is surrounded mainly by residential property, with most of the nearby residences located to the northeast, east, and southeast. Linemaster as well as all other residential and commercial property located on and in the vicinity of the Site obtain their drinking water from individual bedrock and overburden wells.

A more complete description of the Site can be found in the “Remedial Investigation/Feasibility Study, Linemaster Switch Corporation, Woodstock, Connecticut, December 1992”, in Section 1 of Volume I.

The potential for exposure to contaminated soil and groundwater has been addressed through ICs in the form of deed restrictions that were recorded on January 3, 2005.

History of Contamination

As part of LSC’s manufacturing operations, paint thinner, TCE, and other VOCs were used for spray painting and vapor degreasing operations. Approximately 20 to 200 gallons per year of TCE and other chemicals were discharged into an on-Site drywell located in front of the east side of the LSC manufacturing building. The exact amount of TCE and other chemicals discharged to the drywell is unknown, but the discharge reportedly occurred from 1969 through 1979.

Initial Response

In July 1980, CT DEP conducted a Site Inspection of the facility pursuant to the RCRA and, in July 1984, it conducted a Preliminary Assessment pursuant to the CERCLA.

As a result of the investigatory findings in the 1980 and 1984 CTDEP studies, EPA conducted Site Inspections at LSC in December 1985 and February 1986. During these inspections EPA sampled the on-Site production well and the back-up production well, in addition to off-Site drinking water supply wells. Results of sampling and analysis indicated the presence of VOCs in the production well, the back-up production well, and several off-Site wells. VOCs, primarily TCE, were identified at concentrations exceeding state and federal drinking water standards. TCE was identified on Site at concentrations as high as 3,900 µg/L. TCE was detected in three off-Site water supply wells at 5,000 µg/L, 11 µg/L, and 2.4 µg/L.

EPA conducted soil sampling in the area between the factory building and the paint storage shed. The results of this sampling were the basis for making a recommendation to conduct additional sampling to determine the extent of contamination.

On April 8, 1986, CTDEP issued an Abatement Order to LSC to investigate the extent of contamination at the Site, and to take the actions necessary to minimize or eliminate any contamination. A Superfund Removal Action took place in mid-1986 to provide bottled water to affected users. In February 1987, in response to State demands, LSC began designing an IRTS to address groundwater contamination. This system would treat contaminated groundwater to drinking water standards using an air stripper and activated carbon. In September 1987, an Administrative Order by Consent (AOC) was signed between EPA and LSC that required LSC to perform a Site investigation and well monitoring, in addition to providing alternate drinking water supplies, as needed (a subsequent water line was installed). In June 1989, LSC removed the drywell. The Site was added to the National Priorities List (NPL) in February 1990. Thereafter, EPA and LSC entered into a second AOC in September 1991, under which LSC agreed to perform a Remedial Investigation/Feasibility Study (RI/FS) at the Site.

Basis for Taking Action

The RI/FS for the Site was completed in 1992. The RI/FS concluded that the disposal of TCE and other hazardous substances into the drywell had contaminated soil and on-Site groundwater to levels that were above state and federal standards. Table A-2 summarizes the list of contaminants at the Site, and includes a list of cleanup levels included in the ROD. Moreover, so long as soil in the vicinity of the drywell continued to act as a source of groundwater contamination, EPA concluded that VOC concentrations in groundwater posed an unacceptable risk to human health and the environment given the present and potential future use of the Site groundwater as a drinking water supply.

The exposure pathways considered in the HHRA performed during the RI, upon which the decisions in the ROD were based, primarily included: (1) ingestion of groundwater; (2) ingestion of soil; and (3) inhalation of vapors during excavation of soil within the Site.

Table A-2
List of Site Contaminants
Linemaster Switch Corporation Superfund Site
Woodstock, Connecticut

Media	Contaminant	ROD Clean-up Level (ppb)[1]	Pre-ROD Concentrations (ppb)	
			average	maximum
Soil	1,2-dichloroethane	4	N/A	N/A
	Dichloromethane	3	N/A	N/A
	Tetrachloroethylene (PCE)	10	80.1	2,800
	Trichloroethylene (TCE)	5	122.6	4,022
	Cis-1,2-dichloroethene (DCE)	50	47.2	938
	Toluene	1,000	274.5	7,577
	1,1,1-tricholoethane	300	9.1	11
	Xylenes	100	264.4	8,300
Groundwater	Acetone	3,700	2,129	50,000
	Arsenic	50	41.2	513
	Benzene	5	44.7	54
	Beryllium	4	9.7	87
	Cadmium	5	63.3	757
	Carbon tetrachloride	5	14	47.5
	Chloroform	100	17	58.7
	Chloromethane	6.5	11.8	120
	1,2-dichloroethane	5	7.8	70.9
	1,1-dichloroethene	7	109.5	813
	Cis-1,2-DCE	70	803.5	26,000
	Dichloromethane	5	236.6	1,810
	1,2-dichloropropane	5	169.9	420
	2-hexanone	1,500	766.3	2,100
	Methyl ethyl ketone	1,800	1,366.5	38,000
	PCE	5	132.1	1,800
	1,1,1-trichloroethane	200	103.1	1,700
	1,1,2-trichloroethane	5	23	71.9
	TCE	5	42,931.9	800,000
	Toluene	1,000	2,529.6	64,000
	Vinyl chloride	2	10	20.3

Note: ppb = parts per billion

C. REMEDIAL ACTIONS

Remedy Selection

The RAOs specified in the 1993 ROD included both source control measures and management of migration measures to mitigate existing and future threats to public health and the environment. These response objectives are:

[1] This chart does not include or reflect any standards promulgated since issuance of the ROD.

Source Control

- Prevent or mitigate the continued release of hazardous substances to the groundwater and surface water by removing the opportunity for contact between precipitation and groundwater and the contaminated soils.

- Reduce the concentrations of VOCs in soil within the Zone 1 area so that concentrations of VOCs in the groundwater will not exceed drinking water standards and will not pose a risk to human health and the environment.

Management of Migration Measures

- Eliminate or minimize the threat posed to human health and the environment by preventing exposure to groundwater contaminants.
- Prevent further migration of groundwater contamination beyond its current extent.
- Restore contaminated groundwater to drinking water standards, and to a level that is protective of human health and the environment, as soon as practicable.

The selected remedy for the Site was contained in the 1993 ROD and included both source control and management of migration (or groundwater control) components:

- In situ vacuum extraction of contaminated soil to remove VOCs.
- Extraction of contaminated groundwater from the overburden and bedrock using extraction wells.
- Treatment of contaminated groundwater using air stripping with carbon emission controls.
- Environmental monitoring of soil, groundwater, surface water, and private residential wells.
- Institutional controls in the form of deed restrictions to prohibit the use of the groundwater until the cleanup levels are met.
- Five-Year reviews

Remedy Implementation

In a CD, Linemaster agreed to perform the Remedial Action specified in the 1993 ROD.

In December 1994, LSC performed a pilot test to gather data that would be used to design the DVE system. Based on the results of this test, LSC concluded that there was insufficient data on soil characteristics to develop a Conceptual RD, and that enhancements to the natural characteristics of overburden would be required to achieve adequate air and groundwater flow for the performance of the DVE system. To address these two issues, LSC performed a second pilot study in November 1995 to delineate the extent of soil contamination to be addressed by DVE, and evaluate whether or not the permeability of the overburden could be enhanced through hydraulic fracturing. Based on the results of this test, EPA concluded that hydraulic fracturing would enhance the permeability of the overburden and therefore, design of the DVE system could proceed. However, in recognition that the extremely low permeability of the soil may limit the ability of this system and available technology to meet the cleanup levels specified in the ROD, EPA divided the design of the DVE into two phases (i.e., Phase 1A and 1B), with the implementation of the second phase being delayed until EPA, CTDEP and LSC had the

opportunity to evaluate the performance of the DVE system on soil located within the vicinity of the former drywell.

During fall 1996, LSC installed a series of hydro-fractured wells in the former drywell area. Construction of the DVE system occurred between 1997 and 1998 and in April 1999, dewatering of the former drywell area commenced. All of these activities occurred prior to EPA approving the 100% RD on May 27, 1999, because it was determined that construction and operation of the DVE system within the former drywell area would serve as a pilot study for the use of this remedial approach on other areas targeted for DVE.

EPA, CTDEP, and LSC monitored the performance of the DVE system after it became operational in December 1998. In February 2001, LSC, with EPA and CTDEP oversight, developed and implemented a DVE Optimization Plan because monitoring of the DVE system had shown that the hydro-fractured wells had only dewatered 60% of the Phase 1A area, and the VOC removal rates of the vapor extraction component of the DVE system were steadily declining. The optimization plan included, among other things, testing of the dewatering wells, increasing the subsurface vacuum, and redevelopment of the fractured wells. These tasks were intended to improve both dewatering and VOC removal rates within soil. However, as presented in W&C's November 2003 Final Dual Vapor Extraction System Optimization Report, none of the tasks performed as part of the optimization plan significantly improved the performance of the DVE system. Based on this report, EPA concluded that the low-permeability soil was preventing further dewatering and VOC removal within the Phase 1A area. Consequently, EPA determined that the vapor extraction component of the DVE system was no longer significantly contributing to the remediation of the Site and that further remediation via vapor extraction should not be pursued. This determination resulted in EPA agreeing to a moratorium on the vapor extraction component of the DVE system in November 2003. The purpose of the moratorium was to allow EPA the opportunity to perform a formal review and evaluation of the DVE and IRTS systems to determine if the cleanup objectives presented in the 1993 ROD were still achievable. EPA completed its evaluation and determined that the remedy selected in the 1993 ROD needed to be modified.

In December 2004, EPA signed an ESD to the ROD. The remedy was revised for this Site to discontinue operation of the vacuum extraction component of the DVE system while maintaining continued operation of the groundwater extraction and treatment component of the system. EPA did not change the cleanup objectives for the Site, or any of the cleanup levels provided in the 1993 ROD. This modified remedy does not rely on vapor extraction for further remediation of soil. Rather, the soil cleanup levels presented in the ROD will be achieved through the flushing of contaminants via the continued operation of the groundwater extraction component of the DVE system. The vapor extraction component of the DVE system was permanently decommissioned in 2004/2005.

System Operation/Operation and Maintenance

The current remediation system includes a total of 13 wells, which are categorized in the following ways:

- seven wells that comprise the IRTS, including the facility water supply well GW08DB and six other wells - GW10DB, MW01DB, MW06DB, MW14DB, MW15DB, and MW17DB; and
- six wells that comprise the reconfigured Phase 1A system, including FW-E, FW-H, FW-I, FW-J, FW-F35, and MW-10SB.

There are two treatment systems for these thirteen wells, twelve of which are on one system consisting of air stripping followed by polishing by granular activated carbon (GAC). The second system is dedicated to supply well GW08DB and includes air stripping following by polishing by GAC and chlorination. The GW08DB-dedicated system is considered to contribute towards plume capture and TCE removal.

LSC has been conducting O&M of the remediation system in accordance with the O&M Manual for Phase 1A Remediation. The primary activities associated with this O&M Plan are weekly system inspections and sampling of the system's influent and effluent groundwater and air sampling ports to verify that there are no exceedances to allowable discharge limits. Semi-annual groundwater sampling and analysis for the contaminants of concern is performed as well as on-Site surface water monitoring and nearby residential domestic water supplies. This data is contained in long-term monitoring reports (LTMP).

Institutional controls are monitored for compliance on an annual basis. Recorded deed restrictions prohibit specified activities at the Site, including:

- Groundwater may not be used for any purpose, except (a) where contaminants have been reduced through treatment and attain drinking water levels, with prior approval by EPA, (b) as required for the performance of the Remedial Action for the Site; or (c) as otherwise approved by EPA. There are also monthly volume limits on the volume of groundwater that Linemaster may pump from its production well.

- An area delineated as the Soil Restriction Area may be used solely for commercial or industrial activities. The Soil Restriction Area includes Zone 1 and Zone 4, which was incorporated into Zone 1, and the area of contaminated soils beneath the manufacturing building.

- No excavation or construction is permitted within the Soil Restriction Area and/or the bedrock underlying the Linemaster property, unless approved by EPA.

- No excavation or construction activities that include dewatering or lowering the groundwater table shall be taken outside the Soil Restriction Area, unless approved by EPA.[2]

Additional O&M activities occur on an as-needed basis.

[2] While the ROD for the Site required deed restrictions to prohibit the use of the groundwater, the restrictions as implemented contain detailed prohibitions, as summarized in part above.

APPENDIX B

MEMORANDA FROM RICHARD SUGATT TO LESLIE MCVICKAR RE: CALCULATIONS OF INDOOR AIR CANCER AND NON-CANCER RISK IN RESIDENCE #105

Linemaster Switch Third Five-Year Review

MEMORANDUM

To: Leslie McVickar
From: Richard Sugatt
Date: August 7, 2014
Subject: Updated calculation of indoor air cancer and non-cancer risk in Residence #105, Linemaster Switch Superfund Site

The purpose of this memorandum is to update my memo dated August 7, 2012 because non-cancer toxicity information for trichloroethene (TCE) has since been issued in EPA's IRIS database. As shown in table 3 of the supplemental vapor intrusion report (Woodard and Curran, 2011), the only detected chemicals in indoor air of two residences were 1, 2-Dichloroethane at 0.210 ug/m^3 and Trichloroethene at 1.16 ug/m^3, both in Residence # 105. All other target VOCs were not detected in either of the two residences that were studied. The report concluded that the detection of 1, 2-Dichloroethane was not site-related because it has not been found in groundwater at the site and the concentration was in the range reported for background in other studies.

The cancer risk of each chemical was calculated by dividing the indoor air concentration of a chemical by the updated (May, 2014) cancer-based EPA Regional Screening Level (RSL) for residential indoor air for that chemical and then multiplying by 1E-06, which is the cancer risk associated with the cancer-based RSL. As shown in Table 1, the updated cancer risk was 1.9E-06 for 1, 2-Dichloroethane and 2.4E-06 for Trichloroethene. The cumulative cancer risk of both detected chemicals was calculated by adding the individual cancer risks of the individual chemicals. The cumulative cancer risk was 4.4E-06, which is lower than EPA's maximum acceptable cancer risk of 1×10^{-4}. Therefore, the cumulative cancer risk due to VOCs detected in indoor air of Residence # 105 is lower than EPA's maximum risk limit.

The non-cancer risk of each chemical was calculated by dividing the indoor air concentration of a chemical by the updated (May, 2014) non-cancer-based EPA RSL for residential indoor air for that chemical, representing a Hazard Quotient (HQ) of 1. As shown in Table 1, the updated non-cancer risk was HQ = 2.9E-02 for 1, 2-Dichloroethane and HQ = 5.6E-01 for Trichloroethene. The cumulative non-cancer risk of both detected chemicals was calculated by adding the HQ values for each chemical. This sum is called a Hazard Index (HI). The HI was 5.8E-01, which is lower than EPA's maximum acceptable non-cancer risk of HI =1. Therefore, the cumulative non-cancer risk due to VOCs detected in indoor air of Residence #105 is lower than EPA's maximum risk limit. It is concluded that the cancer and non-cancer risks are below EPA's maximum risk criteria.

Table 1. Cumulative cancer and non-cancer risk in indoor air Residence #105, Linemaster Switch Superfund Site

Target VOC	Indoor Air Residence # 105 (ug/m^3)	RSL for Residential Air: For ICLR= 1.0E-06 (ug/m^3)	RSL for Residential Air: For HQ =1 (ug/m^3)	Risk: ILCR	Risk: HQ
1,1-Dichloroethane	<0.081				
1,1-Dichloroethene	<0.079				
1,2-Dichloroethane	0.210	1.08E-01	7.3E+00	1.9E-06	2.9E-02
cis-1,2-Dichloroethene	<0.079				
trans-1,2-Dichloroethene	<0.079				
Tetrachloroethene	<0.136				
Trichloroethene	1.16	4.78E-01	2.1E+00	2.4E-06	5.6E-01
Vinyl Chloride	<0.051				
				4.4E-06	5.8E-01

RSL= EPA Regional Screening Level
Cancer risk = (Concentration in air/ cancer RSL)*1E-06
Non-cancer risk = concentration in air/non-cancer RSL
ILCR = Incremental Lifetime Cancer Risk
HQ = Hazard Quotient
Indoor air data are from Table 3 of Woodard and Curran (2011)

Reference

Woodard and Curran. 2011. Vapor Intrusion Investigation Report 22 Plaine Hill Road, Woodstock, Connecticut. June, 2011

MEMORANDUM

To: Leslie McVickar
From: Richard Sugatt
Date: August 23, 2012
Subject: Cumulative cancer risk in indoor air

As shown in table 3 of the supplemental vapor intrusion report (Woodard and Curran, 2012), the only detected chemicals in indoor air of two residences were 1, 2-Dichloroethane at 0.094 µg/m^3 and Trichloroethene at 1.16 µg/m^3, both in Residence # 105. All other target VOCs were not detected in either of the two residences that were studied. The cancer risk of each chemical was calculated by dividing the indoor air concentration of a chemical by the EPA Regional Screening Level (RSL) for that chemical and then multiplying by 1 x 10^{-6}, which is the cancer risk associated with the RSL. As shown below the cancer risk was 2.2 x 10^{-6} for 1, 2-Dichloroethane and 2.7 x 10^{-6} for Trichloroethene. The cumulative cancer risk of both detected chemicals was calculated by adding the individual cancer risks for the individual chemicals. The cumulative cancer risk was 4.9 x 10^{-6}, which is lower than EPA's maximum acceptable cancer risk of 1 x 10^{-4}. Therefore, the cumulative cancer risk due to VOCs detected in indoor air of Residence # 105 is lower than EPA's maximum risk limit.

Table 1
Cumulative cancer risk-indoor air Linemaster Switch Superfund Site

Target VOC	**Indoor Air Residence # 105 (µg/m^3)**	**RSL Residential Air (µg/m^3)**	**Cancer Risk**
1,1-Dichloroethane	ND		
1,1-Dichloroethene	ND		
1,2-Dichloroethane	0.210	9.40E-02	2.2E-06
cis-1,2-Dichloroethene	ND		
trans-1,2-Dichloroethene	ND		
Tetrachloroethene	ND		
Trichloroethene	1.16	4.30E-01	2.7E-06
Vinyl Chloride	ND		
		Total Cancer Risk:	4.9E-06

ND = Not Detected
RSL= EPA Regional Screening Level
Cancer risk = (Concentration in air/RSL)*1x 10^{-6}
Indoor air data are from Table 3 Linemaster VI Report

Reference

Woodard and Curran. 2012. Linemaster Vapor Intrusion Report. August 2012.

APPENDIX C

PRESS RELEASE ANNOUNCING FIVE-YEAR REVIEW

Linemaster Switch Third Five-Year Review

EPA New England News Release
Protecting Human Health and the Environment
www.epa.gov/region1/news

News Release
U.S. Environmental Protection Agency
New England Regional Office
February 13, 2014

Contact: Emily Zimmerman, 617-918-1037

EPA Will Review 27 Superfund Site Clean Ups This Year

Boston, Mass. – (February 13, 2014) – EPA will review Site clean ups and remedies at 27 Superfund Sites across New England this year by doing routine Five-Year Reviews at each Site.

EPA conducts evaluations every five years on previously-completed clean up and remediation work performed at Superfund Sites and Federal Facilities listed on the "National Priorities List" (aka Superfund Sites) to determine whether the implemented remedies at the Sites continue to be protective of human health and the environment. Further, five-year review evaluations identify any deficiencies to the previous work and, if called for, recommend action(s) necessary to address them.

In addition to a careful evaluation of technical work at the Sites, during the Five Year Review process EPA also provides the public with an opportunity to evaluate preliminary findings and to provide input on potential follow up activity that may be required following the review process.

The Superfund Sites at which EPA is performing Five Year Reviews over the following several months include the following Sites. Please note: the Web link provided after each Site provides detailed information on Site status and past assessment and cleanup activity.

Connecticut

Linemaster, Woodstock, CT. http://www.epa.gov/region1/superfund/Sites/linemaster
Nutmeg Valley, Wolcott, CT. http://www.epa.gov/region1/superfund/Sites/nutmeg

Maine

Saco Tannery Waste Pits, Saco. http://www.epa.gov/region1/superfund/Sites/sacotannery

Massachusetts

Nyanza Chemical Waste Dump, Ashland. http://www.epa.gov/region1/superfund/Sites/nyanza
Baird & McGuire, Holbrook. http://www.epa.gov/region1/superfund/Sites/baird
Hatheway & Patterson, Mansfield. http://www.epa.gov/region1/superfund/Sites/hatheway
Hocomonco Pond, Westborough. http://www.epa.gov/region1/superfund/Sites/hocomonco
Rose Disposal, Lanesborough. http://www.epa.gov/region1/superfund/Sites/ftrose
Silresim, Lowell. http://www.epa.gov/region1/superfund/Sites/silresim

W.R. Grace, Acton. http://www.epa.gov/region1/superfund/Sites/graceacton
Wells G&H, Woburn. http://www.epa.gov/region1/superfund/Sites/wellsgh
Norwood PCBs, Norwood. http://www.epa.gov/region1/superfund/Sites/norwood
South Weymouth Naval, Weymouth, MA. http://www.epa.gov/region1/superfund/Sites/sweymouth

New Hampshire

Ottati & Goss, Kingston. http://www.epa.gov/region1/superfund/Sites/og
Tinkham Garage, Londonderry. http://www.epa.gov/region1/superfund/Sites/tinkham
Sylvester, Hillsborough County. http://www.epa.gov/region1/superfund/Sites/sylvester
Town Garage/Radio Beacon, Rockingham.
http://www.epa.gov/region1/superfund/Sites/towngarage
New Hampshire Plating, Hillsborough County.
http://www.epa.gov/region1/superfund/Sites/nhplating
Pease Air Force Base, Portsmouth, Newington, and Greenland, NH.
http://www.epa.gov/region1/superfund/Sites/pease

Rhode Island

Landfill Resource & Recovery, North Smithfield. http://www.epa.gov/region1/superfund/Sites/lrr

Vermont

Elizabeth Mine, Strafford. http://www.epa.gov/region1/superfund/Sites/elizmine
Parker Sanitary Landfill, Lyndonville. http://www.epa.gov/region1/superfund/Sites/parker
Pownal, North Pownal. http://www.epa.gov/region1/superfund/Sites/pownal
Bennington Municipal Landfill, Bennington.
http://www.epa.gov/region1/superfund/Sites/bennington
BFI Sanitary Landfill, Rockingham. http://www.epa.gov/region1/superfund/Sites/bfi
Tansitor Electronics, Inc., Bennington County.
http://www.epa.gov/region1/superfund/Sites/tansitor.
Pine Street Canal, Burlington. http://www.epa.gov/region1/superfund/Sites/pinestreet

Learn more about the Latest EPA News & Events in New England
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APPENDIX D

INTERVIEW RECORDS AND SITE INSPECTION FORM

Linemaster Switch Third Five-Year Review

INTERVIEW RECORD

Site Name: Linemaster Switch Corporation	**EPA ID No.:** CTD001153923
Subject: Linemaster Switch Corporation Five-Year Review	**Time: Date:** 5/23/2014
Type: □ **Telephone** □ **Visit** ■ **Other** **Location of Visit:** Town Offices	□ Incoming □ Outgoing

Contact Made By:

Name: Lisa Kammer	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: Delia P. Fey, AICP	**Title:** Town Planner / ZEO	**Organization:** Town of Woodstock, CT Building, Water Pollution Control Authority, and Planning & Zoning Departments

Telephone No: 860/928-1388x332 **Telecopy No:** 860/963-7557 **E-Mail Address:** **townplanner@woodstockct.gov**	**Street Address:** 415 Route 169 **City, State, Zip:** Woodstock, CT 06281-3039

Summary Of Conversation

1. What is your overall impression (i.e. general sentiment) of the project and do you feel that information regarding the Site is readily available?

   A. It is good that the contamination has been cleaned up. Yes, I was quickly able to find a report online about it, since I was not previously familiar with the contamination.

2. Do you have any comments regarding outstanding environmental conditions in close proximity to the Site and are you aware of any planned land use changes in the area?

   A. No, I am not aware of any other environmental concerns in close proximity to the Site. Linemaster Switch has received approval from all agencies to build a 7,900 SF banquet center adjacent to their mansion restaurant /B&B.

3. Have there been any complaints, violations, or other incidents related to the Site requiring a response by your office?

   A. No.

4. What effects have Site operations had on the surrounding community?

   A. I am not aware of any effects on the surrounding community.

5. Do you feel well informed about the Site's activities and progress?

   A. I had not heard of anything about the contamination until the application for the banquet center that was submitted approx. 6 months ago. I have been working here since April 2006.

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

   A. No comments.

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INTERVIEW RECORD

Site Name: Linemaster Switch Corporation	**EPA ID No.:** CTD001153923
Subject: Linemaster Switch Corporation Five-Year Review	**Time: Date:** May 23, 2014
Type: □ **Telephone** □ **Visit** ■ **Other** **Location of Visit:**	□ Incoming ■ Outgoing

Contact Made By:

Name: Lisa Kammer	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: Joseph Carlone	**Title:** President	**Organization:** Linemaster Switch Corporation

Telephone No: 860/974-1000 **Telecopy No:** 860/974-9100 **E-Mail Address:** jcarlone@linemaster.com	**Street Address:** 29 Plaine Hill Road **City, State, Zip:** Woodstock, CT 06281

Summary Of Conversation

1. What is your overall impression (i.e. general sentiment) of the project?

   Linemaster feels that our current system is effective and proven.

2. What is the current status of remediation (e.g. budget and schedule)? What is your estimation of the time until cleanup goals are achieved?

   The current project budget is relatively constant and sustainable. The remediation schedule is on track per the original ROD.

3. Have any problems or challenges been encountered that have affected progress or implementation of the remedy?

   There have not been any problems or challenges.

4. Is the remedy functioning as expected and what is your opinion of its performance?

   The remedy is performing as expected.

5. What is your interpretation of the monitoring data (i.e. increasing trends, decreasing trends, evidence of stability)?

   The monitoring data is predominately consistent and stable. The majority of the data shows a steady and slow decline in detected contaminants.

6. Please describe the continuous on-Site O&M presence, including personnel and activities. Also, describe on-Site presence of W&C personnel and frequency of Site inspections and activities.

   Linemaster O&M consists of well maintenance and daily data collection and reporting. Linemaster maintains an extensive inventory of well-related repair parts. Woodard and Curran O&M consist of quarterly sampling, data collection, and reporting of all on-Site and off-Site wells.

7. Please summarize any changes in the O&M requirements, maintenance schedules, or

sampling routines since start-up and any changes that have occurred within the last five years. How do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

The O&M requirements, maintenance schedules, and sampling routines have not changed in the past five years.

8. Have there been any unexpected O&M challenges or costs at the Site since start-up or within the last five years? If so, please provide details.

   The unbudgeted increase in the oversight charges was unexpected.

9. Have there been any opportunities to optimize O&M or sampling efforts? Please describe changes and resulting or desired cost savings or improved efficiencies.

   There have been opportunities to optimize O&M and sampling efforts. The sampling plan has been reduced and optimized. This has allowed a reduction in the cost associated with sampling, while maintaining positive results.

10. Do you have any comments, suggestions, or recommendations regarding the project (i.e. design, management, regulatory, etc.)?

    We are maintaining the system O&M per the ROD. Linemaster continues to seek Site and system cost containment while maintaining positive results.

Page 2 of 2

INTERVIEW RECORD

Site Name: Linemaster Switch Corporation	**EPA ID No.:** CTD001153923
Subject: Linemaster Switch Corporation Five-Year Review	**Time: Date:** May 19, 2014
Type: □ **Telephone** □ **Visit** ■ **Other** **Location of Visit:**	□ Incoming ■ Outgoing

Contact Made By:

Name: Lisa Kammer	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: Jack Markey, LEP	**Title:** Project Manager	**Organization:** Woodward & Curran, Inc.

Telephone No: 203/271-0379 **Mobile Phone No.:** 860/214-9795 **Telecopy No:** 203/271-7952 **E-Mail Address:** jmarkey@woodardcurran.com	**Street Address:** 1520 Highland Avenue **City, State, Zip:** Cheshire, CT 06410

Summary Of Conversation

1. What is your overall impression (i.e. general sentiment) of the project?

   The project and systems continue to perform as designed with minimal problems, interruption, or downtime. Linemaster is committed to the effective operation and successful implementation of the remedy and takes its responsibility to this project and the surrounding community very seriously.

2. What is the current status of remediation (e.g. budget and schedule)? What is your estimation of the time until cleanup goals are achieved?

   The remedy continues to operate within the expected budget and is anticipated to achieve goals within the timeframes outlined in the ROD and ESD.

3. Do you have any comments regarding the problems that have been encountered and required changes to this remedial design and, potentially, this ROD?

   Minimal problems with the remedial operation and design as established in the ROD and subsequent ESD have been encountered since the last five-year review.

4. Have any problems or difficulties been encountered that have influenced progress or implementation since the ESD to the ROD was completed?

   No. Limited system operational difficulties have been minor and immediately addressed with no significant effect on program progress.

5. Is the remedy functioning as expected?

   Yes, the remedy is performing consistent with the requirements of the ROD and ESD. Overall, the systems continue to effectively control plume migration and remove VOC contaminant mass from Site groundwater.

6. What is your interpretation of the monitoring data (i.e. increasing trends, decreasing trends, evidence of stability)?

   Based on over 20 yrs of monitoring it is our opinion that the groundwater plume is well

controlled by the P&T system. Groundwater concentrations have decreased over time and remained stable across the Site, demonstrating the continued overall effectiveness of the remedy.

7. Please describe the continuous on-Site O&M presence, including staff roles and activities. Also, describe W&C staff and frequency of Site inspections and activities.

   System O&M and operation monitoring is conducted by full-time, on-Site Linemaster staff, led by Steve Radcliffe, the Maintenance Manager at the Linemaster facility. Linemaster has a very proactive approach to the system's operation, which has proven effective in minimizing unnecessary downtime and included routine inspection and maintenance and on-Site storage of many replacement parts. W&C provides technical consultation as needed, performs monthly system checks and analytical sampling, and quarterly groundwater monitoring to evaluate system progress and effectiveness.

8. Please summarize any changes in the O&M requirements, maintenance schedules, or sampling routines since start-up and any changes that have occurred within the last five years. How do they affect the protectiveness and effectiveness of the remedy? Please describe changes and impacts.

   There have been no significant changes to the O&M requirements, schedule, or routines over the past 5 years. Any significant changes since the ROD and system startup are related to the program changes outlined in the ESD and well documented in project reports.

9. Have there been any opportunities to optimize O&M or sampling efforts? Please describe changes and resulting or desired cost savings or improved efficiencies.

   Several changes in sampling and reporting frequency were implemented in 2013 as documented in quarterly and annual monitoring reports and in the October 19, 2012 letter to the USEPA entitled Revised Long-Term Monitoring Program Modifications. These changes streamlined the sampling and reporting program and resulted in project cost savings.

10. Do you have any comments, suggestions, or recommendations regarding the project (i.e. design, management, regulatory, etc.)?

    None at this time.

Page 2 of 2

INTERVIEW RECORD

Site Name: Linemaster Switch Corporation	**EPA ID No.:** CTD001153923
Subject: Linemaster Switch Corporation Five-Year Review	**Time:** 12:50 **Date:** May 19, 2014
Type: ■ **Telephone** □ **Visit** □ **Other** **Location of Visit:** Northeast District Department of Health Office	□ Incoming ■ Outgoing

Contact Made By:

Name: Lisa Kammer	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: Maureen Marcoux	**Title:** Sanitarian	**Organization:** Northeast District Department of Health

Telephone No: 860/774-7350 **Telecopy No:** **E-Mail Address:** mmarcoux@nddh.org	**Street Address:** 69 South Main Street **City, State, Zip:** Brooklin, CT

Summary Of Conversation

1. What is your overall impression (i.e. general sentiment) of the project and do you feel that information regarding the Site is readily available?

   LSC is doing their job and water testing results are forwarded to NHHD regularly.

2. Do you have any comments regarding outstanding environmental conditions in close proximity to the Site and are you aware of any planned land use changes in the area?

   Not aware of any changes/conditions in close proximity to the Site. Has heard of the proposed reception hall and if built NHHD would require a permit for food service portion of the hall, however, this is not currently an issue.

3. Have there been any complaints, violations, or other incidents related to the Site requiring a response by your office? If so, please give details of the events and results of the responses.

   None on record.

4. What effects have Site operations had on the surrounding community? *Not aware of any*.

5. Do you feel well informed about the Site's activities and progress?

   Yes, water testing results are forwarded to NHHD regularly.

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

   No. LCS appears to be doing everything they are supposed to do.

Page 1 of 1

INTERVIEW RECORD

Site Name: Linemaster Switch Corporation	**EPA ID No.:** CTD001153923
Subject: Linemaster Switch Corporation Five-Year Review	**Time: Date:** May 23, 2014
Type: □ **Telephone** □ **Visit** ■ **Other** **Location of Visit:**	□ Incoming ■ Outgoing

Contact Made By:

Name: Lisa Kammer	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: Steve Radcliffe	**Title:** Maintenance Manager	**Organization:** Linemaster Switch Corporation

Telephone No: 860/974-1000 **Telecopy No:** 860/974-9100 **E-Mail Address:** sradcliffe@linemaster.com	**Street Address:** 29 Plaine Hill Road **City, State, Zip:** Woodstock, CT 06281

Summary Of Conversation

1. What is your overall impression (i.e. general sentiment) of the project?

   Linemaster feels that our current system is effective and proven.

2. What is the current status of remediation (e.g. budget and schedule)? What is your estimation of the time until cleanup goals are achieved?

   The current project budget is relatively constant and sustainable. The remediation schedule is on track per the original ROD.

3. Have any problems or challenges been encountered that have affected progress or implementation of the remedy?

   There have not been any problems or challenges.

4. Is the remedy functioning as expected and what is your opinion of its performance?

   The remedy is performing as expected.

5. What is your interpretation of the monitoring data (i.e. increasing trends, decreasing trends, evidence of stability)?

   The monitoring data is predominately consistent and stable. The majority of the data shows a steady and slow decline in detected contaminants.

6. Please describe the continuous on-Site O&M presence, including personnel and activities. Also, describe on-Site presence of W&C personnel and frequency of Site inspections and activities.

   Linemaster O&M consists of well maintenance and daily data collection and reporting. Linemaster maintains an extensive inventory of well-related repair parts. Woodard and Curran O&M consist of quarterly sampling, data collection, and reporting of all on-Site and off-Site wells.

7. Please summarize any changes in the O&M requirements, maintenance schedules, or sampling routines since start-up and any changes that have occurred within the last

five years. How do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

The O&M requirements, maintenance schedules, and sampling routines have not changed in the past five years.

8. Have there been any unexpected O&M challenges or costs at the Site since start-up or within the last five years? If so, please provide details.

   The unbudgeted increase in the oversight charges was unexpected.

9. Have there been any opportunities to optimize O&M or sampling efforts? Please describe changes and resulting or desired cost savings or improved efficiencies.

   There have been opportunities to optimize O&M and sampling efforts. The sampling plan has been reduced and optimized. This has allowed a reduction in the cost associated with sampling, while maintaining positive results.

10. Do you have any comments, suggestions, or recommendations regarding the project (i.e. design, management, regulatory, etc.)?

    We are maintaining the system O&M per the ROD. Linemaster continues to seek Site and system cost containment while maintaining positive results.

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INTERVIEW RECORD

Site Name: Linemaster Switch Corporation	**EPA ID No.:** CTD001153923
Subject: Linemaster Switch Corporation Five-Year Review	**Time: Date:** May 19, 2014
Type: □ **Telephone** □ **Visit** ■ **Other** **Location of Visit:**	□ Incoming ■ Outgoing

Contact Made By:

Name: Lisa Kammer	**Title:** Project Geoscientist	**Organization:** Weston Solutions, Inc.

Individual Contacted:

Name: Michael Senyk[3]	**Title:** Project Manager	**Organization:** Eastern District Remedial Program, CTDEEP

Telephone No: 860/424-3267 **Telecopy No:** 860/424-4057 **E-Mail Address:** michael.senyk@ct.gov	**Street Address:** 79 Elm Street **City, State, Zip:** Hartford, CT 06106-5127

Summary Of Conversation

1. What is your overall impression (i.e. general sentiment) of the project and do you feel that information regarding the Site is readily available?

   Mark Lewis – I have been working on this project since year 2000 and just handed project off to Mike Senyk recently, so I will provide most details on the questions.

   This is an example of how Superfund should work. The PRP is very cooperative and good to work with. They are trying to do the right thing. The remedy remains protective of human health and the environment. There was an issue that came up about 1 year ago during routine groundwater sampling of a domestic well - TCE was detected at 4 µg/L. It had not been detected before, and Nobis has been pointing out that there were weaknesses or lack of info about how well the extraction system has been working in that area. TCE has not been found in any other domestic wells in that area.

   Air stripper and GAC system is doing its job and providing safe water for the Site.

   Meeting 2040 Cleanup goal -Amount of solvents being removed has stalled out. Leslie McVickar (EPA) encouraged Linemaster to look at emerging technologies for going after the source area. PRPs have hired TRC to evaluate 2 to 3 remedies to use to go after source area. Electrical resistivity heating and drilling w/ an oxygen releasing compound (ORC) component, where large augers mix in ORC in the source area. Traditional methods have difficulties getting reagent in there. This technique will do a better job mixing. Linemaster appears to be leaning towards doing a feasibility study.

   Leslie McVickar is encouraging them to do it because they are spending a lot of money running the pump and treat system. It may actually be cheaper to look at source removal. It would be more money up front, but could reduce the extent of P&T.

   If nothing is done on source, the goal of meeting Site cleanup objectives by 2040 could be in jeopardy.

[3] This interview was conducted by phone on June 11, 2014 with both Michael Senyk and Mark Lewis present. Mr. Senyk is the incoming Project Manager while Mr. Lewis is the outgoing Project Manager for CTDEEP.

2. Do you have any comments regarding outstanding environmental conditions in close proximity to the Site and are you aware of any planned land use changes in the area?

Environmental conditions – see above regarding the domestic well south of the Site. Planned land use changes –Linemaster Switch Corporation (LSC) is planning to put in catering hall about 250 feet SE of source area, adjacent to the mansion. They run a restaurant and B&B in the mansion, and the catering building would be immediately to the north of the mansion. They have applied to the town for all permits, and are close to getting them. LSC has asked CTDEEP and EPA for their opinion. A letter in February in response to this inquiry indicated that CTDEEP was not concerned with disturbance to Site soils during construction, due to the location of the proposed facility being more than 250 feet away from the area and the limited amount of soil that would be disturbed provided the facility is designed with a frost wall, spread footings and slab-on-grade construction.

Secondly, there are restrictions on the amount of GW LSC can withdraw in any month. The supply well serves the mansion and office building. LSC would still be well under the monthly max of 160,000 gallons per month including the additional use by the catering hall.

In the vicinity of where TCE was found in the domestic well, there are a number of houses on that street. Is LM doing any monitoring further south from 171, given that TCE is migrating to the south? Possibly add this as recommendation to add wells south of 171.

For this Site, there is not much understanding of what is going on in the bedrock. Now borehole geophysics can be used to gather information on the fractures. Back in 1992 when the RI was done these techniques did not really exist. Because the technology has advanced significantly since 1992-3, LSC could take a second look at previous numbers and get better idea of what is going on in bedrock. Given the technology available at the time, LSC did a really good job in 1993.

3. Within the last five years, have there been routine communications or activities (i.e. Site visits, inspections, reporting activities, domestic water supply sampling, etc.) conducted by or provided to your office? If so, please provide the purpose and results of those activities.

CTDEEP has not been doing any monitoring for a very long time. The PRP is only doing the monitoring of domestic wells and monitoring wells, and containment wells. CTDEEP receives those results. The only thing that has changed is the TCE in the domestic well south of the Site. Site visits have been few and far between.

EPA and CTDEEP talk as needed. Good line of communication.

Bette Nowack has been present at meetings with Linemaster and also reviews reports for Leslie McVickar. Has done a very thorough job of reviewing.

4. Within the last five years, have there been any changes to regulations that may impact protectiveness of the remedy?

TCE is one of those chemicals that at 4 ppb is in a grey area now given that the MCL still at 5 ppb and the CT drinking water action level was lowered to 1 ppb in May of 2013.

In CT, supply wells are regulated by DPH. Enforcement of the federal MCL for TCE has not

changed. CTDEEP relies on the CT Department of Public Health to establish action levels, and periodically reviews concentration levels pursuant to that law, and updates the list, and was last done in 2013. TCE was among a handful of compounds where this changed.

Health department enforces 5 ppb and CTDEEP enforces 1 ppb. The DPH is trying to get water companies to use 1 ppb, if between 1 and 5. Public water supplies and private wells are regulated by DPH.

Local health director does not have authority to make someone do something for an existing house.

For something new, if it came back at 2, a GAC system may be required. The state Toxicologist felt need to lower the level to 1 ppb, given sufficient research available.

The house (GW14) has a GAC system, which was previously bypassed, but now that is resolved. Owner is ok with the current situation.

1,4 Dioxane – the detection limit (DL) they were using was too high when the MCL was lowered and EPA asked LSC to lower DL to meet that.

5. With regard to the domestic water supply sampling program, has the Site been in compliance with permitting and reporting requirements?

   With exception of the one well, yes. All other domestic wells are ND's. Reporting has been done in a timely manner and meeting schedule.

6. What effects have Site operations had on the surrounding community?

   There have been no known negative effects, other than the one domestic well, which is under control. Life goes on around the Site as it did. It is an operating Site, not a rundown Site like a brownfield Site. Many people come there for weddings.

7. Are you aware of any events, incidents, or activities on the Site such as vandalism, trespassing, or emergency responses from local authorities? If so, please provide details.

   Not to Mike's knowledge nothing at all.

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

   Nothing we haven't already discussed.

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SITE INSPECTION FORM

Linemaster Switch Third Five-Year Review

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Linemaster Switch Corporation Superfund Site	**Date of inspection:** July 11, 2014
Location and Region: Woodstock, CT – Region 1	**EPA ID:** CTD001153923
Agency, office, or company leading the five-year review: EPA	**Weather/temperature: Sunny, 70's**

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation
☐ Access controls ☑ Groundwater containment
☑ Institutional controls ☐ Vertical barrier walls
☑ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other_____

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M Site manager** Jack Markey, LEP Project Manager May 19, 2014
Name Title Date
Interviewed ☐ at Site ☑at office ☐ by phone Phone no. (860)426-4262
Problems, suggestions; ☐ Report attached *Indicated that the remedy is functioning in accordance with the ROD, as modified by the ESD to the ROD. Groundwater concentrations are generally decreasing, and of-Site migration of contaminated groundwater is being mitigated.*

2. **O&M staff** Steve Radcliffe Maintenance Manager July 11, 2014
Name Title Date
Interviewed ☑ at Site ☐ at office ☐ by phone Phone no. (860)974-1000
Problems, suggestions; ☐ Report attached _ *Indicated that the remedy is functioning as expected, any issues are addressed immediately, spare parts are stored on-Site to support rapid response.*

4. **Other interviews** (optional) ☑ Report attached. See all interviews in this appendix.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☑ N/A
☑ As-built drawings ☐ Readily available ☐ Up to date ☑ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☑ N/A
Remarks: O&M manual for injection system is available but others are not. Records are kept on Site and at W&C office.

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: There is a HASP for the overall facility but not the treatment system operation.

3.	**O&M and OSHA Training Records**	☐ Readily available	☑ Up to date	☐ N/A
	Remarks__8 hour refresher records are kept up to date and are in office.			
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: W&C has copy of the effluent discharge permit.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☑ Air	☐ Readily available	☐ Up to date	☑ N/A
	☑ Water (effluent)	☑ Readily available	☑ Up to date	☐ N/A
	Remarks: All records are reported annually by W&C based upon monthly and quarterly sampling results._____			
10.	**Daily Access/Security Logs**	☑ Readily available	☐ Up to date	☐ N/A
	Remarks: Kept at GW treatment building.			

	IV. O&M COSTS		
1.	**O&M Organization**		
	☐ State in-house	☐ Contractor for State	
	☑ PRP in-house	☑ Contractor for PRP	
	☐ Federal Facility in-house	☐ Contractor for Federal Facility	
	☐ Other_____		

2. **O&M Cost Records**
☑ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From 2007 To 2008 $1.5 million ☐ Breakdown attached
Date Date Total cost
From 2009 To 2013 Not Provided ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: Nothing unexpected, usual replacement of worn out equipment

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on Site map ☐ Gates secured ☐ N/A
Remarks: Perimeter of property is fenced but the gates on not regularly secured, as this is an active manufacturing facility

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on Site map ☐ N/A
Remarks: No trespassing signs around perimeter of property.

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 _____ _____ _____ _____

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

Remarks *Institutional controls for the Site are included in the Record of Decision (ROD), and have been implemented.*

_____

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☑ N/A

Remarks: Pavement covering source area is beginning to show signs of deterioration.

_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on Site map ☑ No vandalism evident

Remarks_____

2. **Land use changes on Site** ☐ N/A

Remarks: Construction of new function hall was ongoing at the time of the Site visit, which completion by end of November 2014.

_____

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 _____ _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☑ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☑ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☑ Good condition ☐ All wells properly operating ☐ Needs maintenance ☐ N/A Remarks _We were able to observe some wells properly operating however, not all wells were actively pumping at time of Site visit due to cycle times. _____ _____
2. **Extraction System Pipelines, Valves, Valve Boxes, and other Appurtenances** ☑ Good condition ☐ Needs maintenance Remark: Pipelines underground. Other visible equipment in good condition. _____ _____
3. **Spare Parts and Equipment** ☑ Good condition ☑ All wells properly operating ☐ Needs maintenance ☐ N/A Remarks: Adequate collection of spare parts for items that are not readily available. _____ _____
B. Surface Water Collection Systems and Pipelines ☐ Applicable ☑ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ All wells properly operating ☐ Needs maintenance ☐ N/A Remarks_____ _____
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and other Appurtenances** ☐ Good condition ☐ Needs maintenance Remarks_____ _____
3. **Spare Parts and Equipment** ☐ Good condition ☐ All wells properly operating ☐ Needs maintenance ☐ N/A 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 Bag filter present for well 15. ☐ Additive (*e.g.*, chelation agent, flocculent)_____ ☐ Others_____ ☑ Good condition ☐ Needs Maintenance ☑ Sampling ports properly marked and functional ☑ Sampling/maintenance log displayed and up to date ☑Equipment properly identified ☑ Quantity of groundwater treated annually 12 to 15 million ☐ Quantity of surface water treated annually_____ Remarks: DNAPL phase separate at old DVE system building. _____
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_____ _____
D. Monitoring Data	
1.	Monitoring Data ☑ Is routinely submitted on time ☑ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks: See Five-year Review report and recommendations_____

D. Monitored Natural Attenuation			
1. **Monitoring Wells** (natural attenuation remedy)			
☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled	☐ Good condition
☐ All required wells located	☐ Needs Maintenance		☑ N/A
Remarks_____			

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy, as modified by the 2004 ESD to the ROD, is designed to mitigate the off-Site migration of contaminants in groundwater and surface water. Available groundwater and surface water analytical results indicate that the remedy is accomplishing these tasks at certain areas of the Site; however, in some wells, there has been an increase in TCE concentrations or an appearance of TCE near the MCL (GW14). There is currently no active remediation of the soil source area at the Site.

B. Adequacy of OHM

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.

O&M of the remedy at the Site is being performed in a timely and proactive manner.

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.

There is currently no active remediation of the soil source area at the Site. This coupled with recent data trends threaten to extend the timeframe required for achievement of interim soil and groundwater remedial goals.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

LSC could investigate possible new locations for both monitoring the plume (e.g., west of MW28 and southwest corner of the Site) and extraction of groundwater. In some cases, TCE concentrations have increased, indicating poor capture. In other cases, such as at MW14 DB, a high pumping rate is used with no removal of TCE. A better understanding of overall Site hydrogeology is needed.