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Rev. 07/10/02

Lockformer Work Plan

The Lockformer Company
711 W. Ogden Avenue
Lisle, Illinois 60532

Volume I: Text, Figures, & Tables

Clayton Project No. 15-65263.01-010
September 20, 2002

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CONTENTS

Volume I: Text, Figures, & Tables
Volume II: Appendix A
Volume III: Quality Assurance Project Plan

Section		Page
1.0	**BACKGROUND**	**1-1**
1.1	INTRODUCTION	1-1
1.2	OBJECTIVE	1-2
1.3	SITE DESCRIPTION	1-3
1.3.1	Topography	1-4
1.3.2	Geology	1-5
1.3.3	Hydrogeology	1-8
1.4	DATA QUALITY OBJECTIVES	1-10
1.4.1	Current State of Investigation and Summary of Existing Problem	1-10
1.4.2	Identification of Key Decisions	1-13
1.4.3	Identification of Data Necessary to Satisfy Key Decision Making	1-14
1.4.4	Study Boundaries	1-14
1.4.5	Development of a Decision Role	1-15
1.4.6	Specified Limit on Decision Errors	1-16
1.4.7	Optimization of the Design	1-18
2.0	**DATA SUMMARY**	**2-1**
2.1	AREA 1 AND 2 DATA SUMMARY	2-1
2.1.1	Area 1 and 2 Soil Investigations	2-2
2.1.1.1	*Soil Investigations Related to Manufacturing Processes at the Lockformer Facility*	2-2
2.1.1.2	*Soil and Sediment Sampling Related to the Exterior Utility Lines in Areas 1 and 2*	2-3
2.1.1.3	*Soil Investigations Related to the TCE Fill Pipe Releases*	2-3
2.1.2	Areas 1 and 2 Groundwater Investigations	2-4
2.2	AREA 3 DATA SUMMARY	2-5
2.2.1	Area 3 Soil Investigations	2-5
2.2.2	Area 3 Groundwater Investigations	2-5
2.3	SEMI-REGIONAL GROUNDWATER DATA SUMMARY	2-5
3.0	**REMOVAL ACTION OBJECTIVES**	**3-1**
4.0	**REMEDIAL TECHNOLOGY IMPLEMENTATION**	**4-1**
4.1	ELECTRICAL RESISTIVE HEATING	4-1
4.1.1	Electrical Resistive Heating Process	4-2
4.1.2	Performance and Reliability of Technology	4-4
4.1.3	Feasibility of Implementation	4-6
4.1.4	Design and Technical Specifications	4-9
4.1.4.1	*ERH Electrodes*	4-10
4.1.4.2	*Temperature Monitoring Points*	4-12

CONTENTS
(Continued)

Section		Page
4.1.4.3	*Vapor Recovery Wells*	4-13
4.1.4.4	*Plenum*	4-14
4.1.4.5	*Surface Water Diversion and Drainage*	4-15
4.1.4.6	*Vacuum Piezometers*	4-15
4.1.4.7	*Exclusion Zone Fence*	4-16
4.1.4.8	*Condenser*	4-16
4.1.4.9	*Vacuum Blower*	4-17
4.1.4.10	*ERH Power Supply*	4-18
4.1.5	System Installation	4-19
4.1.5.1	*Electrode, Vapor Recovery Wells, and Temperature Monitoring Point Installation*	4-19
4.1.5.2	*Equipment and Piping Installation*	4-19
4.1.5.3	*Testing and Start-up*	4-20
4.1.5.4	*System Removal*	4-20
4.1.6	Time Frame to Achieve Remedial Objectives	4-21
4.1.7	Project Management	4-22
4.1.8	Construction QA/QC	4-23
4.2	SOIL VAPOR EXTRACTION	4-23
4.2.1	Performance and Reliability of Technology	4-24
4.2.2	Feasibility of Implementation	4-25
4.2.2.1	*Pilot Test*	4-26
4.2.3	Design and Technical Specifications	4-29
4.2.3.1	*Vertical Vapor Extraction Wells*	4-30
4.2.3.2	*Monitoring Probes*	4-32
4.2.3.3	*Condensation Tank*	4-32
4.2.3.4	*Vacuum Blower*	4-33
4.2.3.5	*Transfer Pump*	4-33
4.2.3.6	*Equalization Tank*	4-33
4.2.3.7	*Silencer*	4-34
4.2.3.8	*SVE Power Supply*	4-34
4.2.3.9	*Water Treatment System*	4-34
4.2.3.10	*Air Treatment System*	4-35
4.2.4	SVE System Installation	4-39
4.2.4.1	*Vapor Extraction Wells*	4-39
4.2.4.2	*Process Piping, Manifold, and Equipment Installation*	4-39
4.2.4.3	*Testing and Start-Up*	4-40
4.2.5	Operation and Maintenance	4-41
4.2.6	Time Frame to Achieve Remedial Objectives	4-42
4.2.7	Project Management	4-43
4.2.8	Construction QA/QC	4-45
4.2.9	SVE System Removal	4-45
4.3	WATER DISCHARGE MONITORING	4-45

CONTENTS
(Continued)

Section		Page
4.4	AIR MONITORING	4-46
4.4.1	Monitoring Worker Exposure and the Air Treatment Systems	4-47
4.4.2	Ambient Air Monitoring	4-49
4.4.2.1	*Determination of Background VOC Concentrations*	4-50
4.4.3	Corrective Actions	4-51
4.4.4	QA/QC	4-51
4.5	TREATMENT SYSTEM INSTALLATION-DERIVED WASTES	4-52
4.5.1	Soil Cuttings and Decontamination Water	4-52
4.5.2	Water from Soil Moisture	4-52
4.5.3	VOC Vapor Emissions	4-53
4.5.4	Used Carbon	4-53
4.5.5	Non-Hazardous Miscellaneous Waste	4-53
4.6	SOIL REMEDIATION – FORMER VAPOR DEGREASER AREA	4-54
4.6.1	Former Vapor Degreaser Area Soil Excavation	4-54
4.6.2	Waste Characterization	4-55
4.6.3	VOC Characterization	4-56
4.6.4	Transportation/Disposal	4-56
4.6.5	Confirmation Sampling	4-56
4.6.6	Backfilling	4-57
4.6.7	Equipment Decontamination	4-57
5.0	**CONFIRMATION SAMPLING**	**5-1**
5.1	SURFICIAL SILTY CLAY TILL AND FILL	5-2
5.2	MASS WASTE SAND AND GRAVEL UNIT	5-6
5.3	VAPOR DEGREASER EXCAVATION	5-7
6.0	**PERMITTING**	**6-1**
7.0	**SCHEDULE**	**7-1**
8.0	**PROJECT MANAGEMENT**	**8-1**
9.0	**HEALTH AND SAFETY PLAN**	**9-1**

CONTENTS
(Continued)

Figures

1.3-1	Site Location Map
1.3-2	Site Map Illustrating Areas 1, 2, and 3
1.3-3	Site Topographic Map: 1962 / 2001
1.3-4	Cross Section Reference Map
1.3-5	Cross Section A-A'
1.3-6	Cross Section B-B'
1.3-7	Cross Section C-C'
2.1-1	Investigation Results around the Former TCE Degreaser, Sanitary Storm Sewer Lines and Associated Floor Drains, and the South Exterior Door
2.1-2	Building Basement Sump Sampling Results
2.1-3	Storm and Sanitary Sewer Sampling Locations and Results
2.1-4	Storm and Sanitary Sewer
2.1-5A	Soil Analytical Results in the Fill/Till at the 0-5' Depth Interval
2.1-5B	Soil Analytical Results in the Fill/Till at the 5-10' Depth Interval
2.1-5C	Soil Analytical Results in the Fill/Till at the 10-15' Depth Interval
2.1-5D	Soil Analytical Results in the Fill/Till at the 15-20' Depth Interval
2.1-5E	Soil Analytical Results in the Fill/Till at the 20-34' Depth Interval
2.1-5F	Soil Analytical Results for the Mass Waste Unit
2.1-5G	Soil Analytical Results for the Lower Till Unit
2.1-6	Cross Section Locations for SA-1/SA-1' and SA-2/SA-2'
2.1-7	Cross Section "SA-1 – SA-1'" with TCE and Cis-1,2-DCE Sample Results
2.1-8	Cross Section "SA-2 – SA-2'" with TCE and Cis-1,2-DCE Sample Results
2.1-9	Most Recent Groundwater Sampling Results from Monitoring Wells in Areas 1 and 2
2.2-1	Summary of Results from the 1500-Series Borings in Area 3
2.2-2	Summary of the Groundwater Sampling Results from Monitoring Wells and the 1500-Series Borings in Area 3
2.3-1	Semi-Regional Surface Water and Groundwater Measuring Points
2.3-2	Offsite Groundwater Monitoring Results
4.1-1	Preliminary Locations of Electrodes, Temperature Monitoring Probes, Plenums & Vacuum Piezometers for the ERH System
4.1-2	Area 1 – Conceptual Electrode
4.1-3	Area 2 – Conceptual Electrode
4.1-4	Temperature Monitoring Point Detail – ERH Remediation
4.1-5	Plenum Design for Areas 1 and 2
4.1-6	Proposed Surface Water Control
4.1-7	Vacuum Piezometer
4.1-8	Remediation Process Flow Diagram
4.1-9	Preliminary Vapor Lines Layout for the ERH System
4.1-10	Preliminary Electrical Lines Layout for the ERH System
4.2-1	SVE Pilot Test Layout

CONTENTS
(Continued)

Figures *(continued)*

4.2-2	Design for SVE Pilot Test Extraction Well
4.2-3	Typical Multi-Point Monitoring Probe Construction Details
4.2-4	Conceptual Soil Vapor Extraction System Design in Mass Waste Sand and Gravel
4.2-5	Typical Design for Vertical Vapor Extraction Well
4.2-6	Approximate Layout of Remediation Equipment
4.2-7	Conceptual Soil Vapor Extraction System Layout in Mass Waste Sand and Gravel
4.3-1	Plan View of Carbon Source Addition Pilot Test Injection and Monitoring Wells
4.3-2	Cross-Section of Pilot Test Injection Wells
4.3-3	Conceptual Design of Full Scale Carbon Source Injection System
4.3-4	Cross Section of Conceptual Full Scale Carbon Source Addition System
4.7-1	Proposed Soil Excavation Layout Map – Former Degreaser Area
6.1.2-1	Most Recent Groundwater Sampling Results from the Fill/Till and Mass Waste Unit Monitoring Wells in Areas 1 and 2

Tables

2.1-1	Clayton Soil Borings Inside the Facility Building – Around the Storm and Sanitary Sewer and the Vapor Degreaser
2.1-2	Clayton Soil Boring Results – Around South Exterior Door
2.1-3	Soil Analytical Results – Sewer System Sediment
2.1-4	Soil Sample Results – 1200-Series Borings in Immediate Vicinity of TCE Fill Pipe
2.1-4A	Soil Analytical Results – 1100 Series Soil Borings
2.1-5	Geotechnical Analyses – Soils in the Immediate Vicinity of the TCE Fill Pipe
2.1-6	Sample Results from Monitoring Wells – Completed in the Glacial Sediments During the Lockformer Groundwater Investigations
2.1-7	Sample Results – Single Packer Tests Performed during Drilling of Bedrock Monitoring Wells
2.1-8	Sample Results – Double Packer Tests Performed on Bedrock Monitoring Wells
2.1-9	Water Level Measurements – Groundwater Monitoring Wells, Staff Gages, And Stand-By Production Wells
2.2-1	Soil Analytical Results – 1500-Series Soil Borings Performed in Area 3
2.2-2	Groundwater Analytical – Area 3
3.0-1	Summary of Removal Action Objectives (RAOs)

Appendix

A Boring Logs

CONTENTS

(Continued)

Attachments

4-A Electrical Resistive Heating Remediation System
Construction Quality Control Plan

4-B Soil Vapor Extraction Remediation System
Construction Quality Control Plan

4-C Thermo Environmental Instruments
Model 51 – Heated Total Hydrocarbon Analyzer

4-D Commercial WeatherNet System

4-E Thermo Environmental Instruments
MIRAN SapphlRE Portable Infrared Ambient Air Analyzer

4-F Chain of Custody Record
Performance Analytical Inc.

SECTION 1

1.0 BACKGROUND

1.1 INTRODUCTION

The subject work outlined by this work plan is being conducted pursuant to the Unilateral Administrative Order (UAO) Docket No. V-W-02-665 issued by United States Environmental Protection Agency (USEPA) to Lockformer Company and Met-Coil Systems Corporation. The Lockformer Work Plan (LWP) addresses the Removal Action work to be performed as required in the UAO. The scope in this work plan has been prepared to address activities as required under the UAO issued by the USEPA and will address the work to be performed as required by the Order. The current clean-up goals are requirements of the USEPA Emergency Response Branch to address the trichloroethene (TCE) source material and eliminate the immediate threats posed by conditions at the site; future clean-up of the soil, groundwater, and other media may be required under other federal, state, or other programs to address constituents and contaminant exposure pathways and sources not addressed under the scope of this work plan. Upon approval of this and until the termination of the UAO, Lockformer will submit monthly written progress reports to USEPA. The monthly reports will describe all significant developments during the preceding period, including the work performed and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of the work to be performed, anticipated problems, and planned resolutions of past anticipated problems.

Numerous meetings have taken place between the USEPA, the Illinois Environmental Protection Agency (IEPA), the Illinois Attorney General (IAG), Lockformer, and their representatives to define the nature and scope of work presented in this work plan. The nature of further work to be conducted at the Lockformer site can generally be described as follows:

1. The Lockformer site will be divided into three working areas. Area 1 will encompass the entirety of the Lockformer parcel of property. Area 2 will encompass the northern portion of the MetCoil property, and Area 3 will consist of the southern portion of the MetCoil property.

2. The LWP describes additional investigation of Areas 1, 2, and 3, and remediation of soil in Areas 1 and 2.

3. Additional investigation and remediation efforts in Area 3 will be necessary. Additional investigation efforts for Area 3 will be presented in the LWP.

4. Remediation of the soil and groundwater contamination in Area 3 will be designed and performed after completion of the soil and groundwater investigation efforts.

5. Lockformer will commit to performing groundwater remediation at the site upon completing the soil and groundwater investigations in Area 3.

The remainder of this LWP will describe the investigations and methodologies that will be utilized to accomplish the investigation and remediation objectives for the site.

1.2 OBJECTIVE

The objectives of this LWP are as follows:

1. To present the methods by which soils will be remediated in Areas 1 and 2, and perform the treatability and pilot studies for the proposed remedies, as needed. These soils consist of cohesive fine-grained soils, till and fill occurring to a depth of approximately 30 feet, and coarse-grained unconsolidated soils occurring from approximately 30 feet to 45 feet in depth.

2. To present the additional sampling that will take place around the former degreaser and the excavation of soil around it.

3. To present the additional soil investigations around Area 1, 2, and 3 to more definitively determine the volume of soil exceeding the Removal Action Objectives (RAOs).

4. To present the additional soil investigation efforts necessary to characterize any contamination occurring in surface drainage on and in the vicinity of the Lockformer site.

5. To present the additional soil investigation efforts necessary to define any contamination occurring in the vicinity of the northeast loading dock at the Lockformer facility.

6. To collect the additional soil and groundwater data necessary to characterize the extent of contamination occurring in Area 3, and in preparation for designing and implementing a groundwater remediation system for the site.

1.3 SITE DESCRIPTION

The site is located in south-central DuPage County, Illinois (Figure 1.3-1). The site comprises an east and west parcel that encompass a total of 18.5 acres (Figure 1.3-2). The east parcel, which has commonly been referred to as the Lockformer parcel, is identified as Area 1. Area 1 comprises approximately 6.54 acres and is occupied by a single structure with associated landscaped and drive/parking areas. The structure is utilized by Lockformer as a manufacturing facility for production of sheet metal processing equipment and roll-forming machines. The west parcel, which has commonly been referred to as the MetCoil parcel, has been divided into two separate areas. The northern portion of the MetCoil property will be referred to as Area 2, and the southern portion will be referred to as Area 3. The west parcel comprises approximately 11.96 acres of undeveloped land. The site is located in a mixed area of industrial, commercial, and residential use, approximately 1,300 to 1,800 feet west of Interstate 355.

The site is bounded to the north by Ogden Avenue, beyond which exists a residential subdivision; to the east by the Bill Kay car dealership; to the south by a surface water retention basin servicing the Bill Kay property (beyond which exists single-family homes) and the Burlington Northern railroad (beyond which exists St. Joseph's Creek and residential homes); and to the west by a multi-unit commercial building.

Soil impacted by TCE was first discovered in the fall of 1991 during underground utility (water line) repair work conducted along the west side of the Lockformer manufacturing

building. The TCE impacts to soil and groundwater in Areas 1 and 2 are believed to be the result of filling operations of the roof-mounted TCE tank formerly located along the west side of the manufacturing building. The location of this tank can be reviewed in Figure 1.3-2. The tank was equipped with metal fill and vent pipes that extended down the west building wall to approximately 4 feet above grade.

1.3.1 Topography

Clayton obtained (from DuPage County) and reviewed a topographical survey for the vicinity of the site. The topographical information for the site is illustrated in Figure 1.3-3. In general, the site's west parcel is higher in elevation than the east parcel. However, both parcels slope to the south/southwest. The eastern portion of the east parcel slopes east. A low-lying (ditch) right-of-way is located at the western edge of the east parcel and the eastern edge of the west parcel. Elevations on the east parcel range from approximately 714 feet above mean sea level (msl) adjacent to Ogden Avenue to approximately 700 feet above msl at the most southwestern portion of the parcel. Elevations on the west parcel range from approximately 714 feet above msl adjacent to Ogden Avenue to approximately 674 feet above msl at the southern portion of the parcel.

The retention basin constructed by Bill Kay just south of Area 1 is not currently depicted on the topographic map of the site Figure 1.3-3. The next time surveying activities are conducted at the site, the surveyors will be directed to survey the current topographic configuration of the Bill Kay retention basin. Figure 1.3-3 will be updated and submitted at that time.

A drainage swale runs north to south between Areas 1 and 2, and along the east side of Area 3. Prior to approximately 1983, this drainage swale contained a headwall at approximately the boundary between Areas 2 and 3, where storm water collected from Area 1 was discharged to the swale. The swale then ran to the south along the east side

of Area 3 to ultimately discharge into an east-west drainage feature at the very southern end of Area 3, immediately north of the railroad tracks. In approximately 1983, the headwall in this drainage swale was taken out of service, and a new storm sewer line was installed east of the drainage swale in the West Avenue right-of-way. This storm sewer line runs to the south, down the West Avenue right-of-way, to an east-west storm sewer line that crosses the southern end of Area 3. At approximately the time the headwall was removed, a retention basin was installed on the southern end of the MetCoil property in Area 3 to collect surface water runoff from the MetCoil property. Based on the historical topography of the site as depicted in Figures 1.3-1 and 1.3-3, prior to construction of the retention basin, the bottom of the retention basin was approximately the same elevation as the existing ground surface. A more detailed discussion concerning the previous surficial drainage at the site can be found in a report developed for USEPA by Lockheed Martin Services titled *Historical Aerial Photographic Analysis Lockformer Site.*

Topographical information from 1962 for the site is superimposed on the existing site topographic profile and is illustrated in Figure 1.3-3. A review of the information reveals that the pre-development surface elevation of the site ranged from approximately 674 feet above msl to 720 feet above msl. The site sloped to the south, east, and west from its high point located centrally along the northern perimeter. A large portion of Area 2, Area 3, and Area 1 (via a drainage swale located along its east edge) discharged to a low-lying area located centrally in Area 3. A review of Figure 1.3-3 indicates that, generally, 8 to 10 feet of fill have been placed on Areas 2 and 3, north of the Area 3 retention basin. A geotechnical study, conducted on the Metcoil property by Claude H. Hurley Company in 1994, supports the fill distribution discussed above.

1.3.2 Geology

The site is located within the Wheaton Morainal section of the Great Lakes physiographic province. Based on the Illinois State Geological Survey (ISGS) Circular 460 *Summary of*

the Geology of the Chicago Area – 1971, the uppermost surficial glacial unit present at the site comprises undifferentiated Valparaiso Moraine deposits. The Valparaiso Moraine includes a buried drift of questionable age, informally called the Lemont Drift, which consists of yellow-gray silty till, sand and gravel, and dune sand. The deposits are generally overlain by a thin Richland Loess or modern soil *(Illinois State Water Survey/Ground Water Resources of DuPage County, Illinois, Cooperative Ground Water Report 2 – 1962).*

Based on the ISGS Circular 460 and Circular 532 *Potential for Contamination of Shallow Aquifers in Illinois – 1984*, the Mackinaw Member of the Henry Formation is depicted as being deposited along the course of St. Joseph's Creek throughout the area in the vicinity of the Lockformer site. The Mackinaw Member comprises unconsolidated, well-sorted sand and gravel and appears to be deposited as a valley train associated with St. Joseph's Creek. The thickness of the alluvium is variable and may directly overlie the Silurian Age dolomitic bedrock.

The Paleozoic bedrock underlying the glacial deposits comprises about 3,500 feet of consolidated, stratified, sedimentary rocks of Cambrian, Ordovician, and Silurian ages. The formations dip gradually to the east and southeast at about 10 feet per mile and are folded into a series of gentle anticlines and synclines. The glacial deposits at the subject property rest upon a synclinal fold of Silurian-aged bedrock of the Niagaran Series. The Niagaran rocks range from clean dolomite to highly silty, argillaceous, and cherty dolomite with some thin shale beds and may contain reefs locally *(Illinois State Water Survey / Ground Water Resources of DuPage County, Illinois, Cooperative Ground Water Report 2 – 1962).*

Since investigative activities began in 1992, a series of subsurface investigations have been conducted at the site to evaluate the extent of volatile organic compound (VOC) contamination. The investigations have included the advancement of approximately

187 soil borings to facilitate the collection of discrete soil samples, and the installation of 78 monitoring wells to facilitate the collection of groundwater samples, for chemical analysis. A large number of these soil borings and groundwater monitoring wells have been installed in Areas 1 and 2 to define the geology and the extent of contamination there.

Based on subsurface investigations conducted in Areas 1 and 2, the lithologies underlying the vicinity of the former TCE fill pipe comprise cohesive silty clay glacial till and fill from surface grade to a depth of approximately 25 to 30 feet (elevation of approximately 675 to 680 feet above msl). The silty clay is underlain by a mass waste deposit predominantly composed of unconsolidated sand and gravel that contains variable amounts of silt and clay. It is readily distinguished by its high percentage of angular gravel clasts composed of dolomite. It is typically very poorly sorted, and grades to sand and silt toward the base of the deposit at some locations.

A cohesive clayey silt comprises the lower glacial till that underlies the mass waste deposit at an elevation of approximately 662 feet msl in the vicinity of the TCE fill pipe. The lower clayey silt till extends down to an approximate elevation of 643 to 650 feet msl, at which point it is underlain by a lower sand at some locations, but extends to the weathered bedrock surface at most locations within Areas 1 and 2. The lower sand contains significant amounts of silt and clay.

In Areas 1 and 2, the upper weathered portion of the Silurian dolomite is encountered at an elevation of approximately 630 msl. The competent dolomitic bedrock surface typically occurs at approximately 620 to 625 feet msl.

A significant amount of topographic slope occurs from north to south on the MetCoil property and results in significantly lower surface grade elevations in Area 3. A retention basin has also been constructed in the southern portion of Area 3. The net result of these

topographic changes is that the surficial silty clay glacial till and fill gradually thins to the south to the point where the mass waste sand and gravel is exposed at surface grade within the retention basin. There also appears to be a transitional environment of deposition within the lower till unit. It appears that the lower till contains a higher percentage of sand where it was observed at monitoring well nest MW-1113. However, the lithologies still exhibited a cohesive nature and, therefore, are indicative of high percentages of silt and clay. At this time, no borings have extended to bedrock along the southern property boundary. As a result, the existence of the lower till within or below the mass waste sand and gravel, and above bedrock in this portion of the site, is undetermined.

Cross-sections have been prepared to illustrate the sequence of lithologies described above and their lateral variation across the site. Figure 1.3-4 is a cross-section reference map that shows the location of each cross section. Figure 1.3-5 presents cross-section A-A'. Figure 1.3-6 presents cross-section B-B'. Figure 1.3-7 presents cross-section C-C'.

Further details regarding the site geology are provided in Section 2.0 of this LWP. However, the timeframe under which this LWP was developed precluded the development of a discussion including interpretive detail regarding the site geology. Further interpretive detail will be provided in the Comprehensive VOC Investigation Report that will be submitted to the IEPA as a result of the work performed under the May 25, 2001 IEPA-approved work plan.

1.3.3 Hydrogeology

Investigations in Areas 1 and 2 indicate that groundwater occurs variably within the upper surficial silty clay till and fill. At some locations, wells completed in the upper surficial silty clay till and fill will encounter groundwater that will yield to a well and

allow sampling. At other locations, wells completed in the upper surficial silty clay till and fill are dry. The upper surficial silty clay till and fill in Areas 1 and 2 generally occurs from surface grade to approximately 25 to 30 feet in depth.

Groundwater occurring within the surficial silty clay till and fill does not appear to form a water table condition. Instead, it appears groundwater variably occurs within the surficial silty clay till and fill, and is controlled by the occurrence of fractures and coarse-grained lithologies contained within the lithologic sequence.

The glacial mass waste sand and gravel occurs below the surficial silty clay till and fill. This mass waste sand and gravel is predominantly unconsolidated and exhibits significantly increased permeabilities over those in the surficial silty clay till and fill. Some isolated portions of the mass waste unit across Areas 1 and 2 exhibit a loosely cohesive nature indicative of a greater percentage of fine-grained lithologies and lower permeabilities.

The investigations in Areas 1 and 2 indicate that the mass waste unit across these areas is positioned above a silty clay glacial till. This lower silty clay glacial till has been determined to be present below the mass waste sand and gravel over the entirety of Areas 1 and 2 in each boring drilled to its depth. The upper surface of the lower silty clay glacial till occurs at an approximate elevation of 662 feet msl in the vicinity of the TCE fill pipe. The upper surface of the lower silty clay glacial till slopes down in areas to the west and south away from the TCE fill pipe.

The mass waste sand and gravel is unsaturated in the vicinity of the TCE fill pipe where extensive soil contamination occurs. The contact between the upper surface of the lower silty clay glacial till and the mass waste sand and gravel slopes down away from the area of the TCE fill pipe. When the upper surface of the lower silty clay till surface occurs

below an elevation of approximately 655 feet msl, groundwater saturates the mass waste sand and gravel sediments to form a water table condition.

Recent investigations in Area 3 indicate the presence of a transitional environment of deposition in the lower till below the mass waste sand and gravel. A limited thickness of saturated sediments occurs in the coarse-grained sediments above the lower till in the vicinity of monitoring well nest MW-1113. At monitoring well nest MW-1113, a 6-foot clay separates the 3- to 4-foot-thick saturated zone in unconsolidated, saturated sediments from the lower till unit.

Further to the south in Area 3 along the southern boundary of the site, investigations have primarily been directed toward determining the extent of soil contamination related to releases from the Lisle sanitary sewer system. As a result, the depth of investigation has extended down only to the water table. The water table in this area occurs within the mass waste sand and gravel at a depth of approximately 26 feet.

1.4 DATA QUALITY OBJECTIVES

1.4.1 Current State of Investigation and Summary of Existing Problem

The current state of investigation at the Lockformer site is described in the *Comprehensive VOC Investigation Report* for the Lockformer site developed by Clayton and dated May10, 2002. The majority of these investigations have been under oversight by the IEPA. The most recent investigations have been performed according to the *Comprehensive VOC Investigation Work Plan* for the Lockformer site developed by Clayton and dated May 25, 2001. IEPA approved this work plan on June 28, 2001.

As a result of previous investigations, a large volume of data currently exists for the Lockformer site. The May 10, 2002 *Comprehensive VOC Investigation Report* describes

in detail the hydrogeologic flow and routes of exposure for the site. Due to the large volume of data presented in that report and the analysis provided, it would be very difficult to summarize that data and analysis here. As a result, to gain an understanding of soil contamination impacts, and the resulting surface water and groundwater routes of exposure, the May 10, 2002 *Comprehensive VOC Investigation Report* should be consulted.

Through numerous meetings with the USEPA, the IEPA, the IAG, and their consultants, a plan has been constructed for further evaluation and remediation of the Lockformer site. The primary participants during these planning meetings have included the following:

USEPA	Steve Faryan, On-Scene Coordinator (OSC)
R.F. Weston	Om Patel Brian Voss
IEPA	Stan Komperda
Parsons	Rick Frendt Sasa Jazic
IAG	Howard Chinn
Clayton	Ron St. John Bill Elwell
Lockformer	Rian Scheel Arthur Bourlard

The meetings held between the parties identified above have resulted in the following definition of exposure and scope of work under this Removal Action:

1. Protection of industrial worker safety. The soils to a depth of approximately 30 feet where releases occurred in the vicinity of the former TCE fill pipe will be remediated through use of Electrical Resistive Heating (ERH) to a RAO of 8.9 milligrams per kilogram (mg/kg) to be protective of worker safety.

2. Protection of industrial worker safety. The shallow soils around the former vapor degreaser inside the Lockformer building where releases occurred will be excavated to the extent practicable to achieve a RAO of 8.9 mg/kg to be protective of worker safety.

3. Protection of groundwater. The mass waste unit sand and gravel that generally occurs from approximately 30 to 50 feet in depth in the vicinity of the former TCE fill pipe area will be remediated through use of Soil Vapor Extraction (SVE) to a RAO of 0.060 mg/kg to be protective of a migration to groundwater potential.

4. Protection of groundwater. The lower till unit will be further investigated to determine if TCE concentrations greater than the saturation limit of 1,300 mg/kg occur in these silty clay lithologies in order to be protective of groundwater.

5. Protection of groundwater. The groundwater that saturates the lower portion of the mass waste sand and gravel in areas away from the former TCE fill pipe will be evaluated to determine the occurrence of Dense Non-Aqueous Phase Liquid (DNAPL) TCE on top of the lower till or within the mass waste unit impacting groundwater. The criteria to be applied to this evaluation will be a TCE determination of greater than 1% of the soluble limit of TCE or 11 milligrams per liter (mg/L).

6. Protection of groundwater. Groundwater remediation related to the mass waste sand and gravel unit in Areas 2 and Area 3 will be the subject of a separate work plan under this Removal Action order.

7. Protection of groundwater. Groundwater remediation related to the Silurian Dolomite in Areas 1, 2, and 3 will be the subject of a separate work plan under this Removal Action order.

8. Protection of nearby receptors from surface water runoff. A significant portion of investigation in this RAWP is devoted to determining the impacts to surface soils and sediments resulting from surface water drainage away from the Lockformer site. The nature of this exposure or the potential exposure will be defined as a result of these investigations.

9. Protection of receptors from remediation system air discharges. A significant portion of this RAWP is devoted to the control and monitoring of the remediation system air discharges.

Based on the data collected during further investigations described by this RAWP, the exact nature of the ERH and SVE remediation systems will be defined. The final design of these remediation systems will be submitted to EPA in the form of a technical memorandum. The further investigations outlined in this RAWP will also aid in the development of the groundwater remediation work plan to be submitted sometime after

approval and implementation of this RAWP. It is the intent of these further investigations to satisfy the data quality objectives (DQOs) discussed and developed in the remainder of this section.

1.4.2 Identification of Key Decisions

The principle study questions that require further data collection to allow key decisions and design work to be carried out are identified as follows:

1. The extent of contamination greater than 8.9 mg/kg in the shallow till/fill soils will impact the location and design of the ERH remediation system.

2. The extent of contamination greater than 0.060 mg/kg in the mass waste sand and gravel will impact the location and design of the SVE remediation system.

3. The concentration of TCE determined to be present in the unsaturated, upper surface of the lower till will determine the need for remedial measures to address this lithology.

4. The concentration of TCE determined to be present in groundwater in the mass waste unit groundwater will determine the need for additional measures to remediate the groundwater occurring there.

5. The determination as to the existence of TCE in surface soils and sediment along surface drainage ways will determine whether remedial measures are required along these surficial drainage ways.

There is the possibility that the further data collection defined by this RAWP will result in the inability to make the key decisions identified above. To the extent possible, Clayton will review all data as it is acquired, and identify its adequacy for resolving the key questions and decision-making. In the event that a significant data gap still exists after the RAWP investigation efforts are completed, it will be necessary to discuss these data gaps with USEPA personnel and define measures necessary to satisfy these data gaps as soon as reasonably possible.

1.4.3 Identification of Data Necessary to Satisfy Key Decision Making

The following data inputs are necessary to satisfy the key decision-making related to investigation tasks under this RAWP:

1. The volume of soil in the upper till exceeding 8.9 mg/kg will need to be identified at the completion of the further field investigations under this RAWP.

2. The volume of soil in the mass waste unit sand and gravel exceeding 0.060 mg/kg will need to be identified at the completion of the further field investigations under this RAWP.

3. The occurrence of TCE concentrations in excess of 1,300 mg/kg (if determined in the unsaturated upper surface of the lower till in areas where the mass waste unit is being investigated) will require further field investigations under this RAWP.

4. The occurrence of TCE concentrations in groundwater of the mass waste unit exceeding 11 mg/L will require further field investigations under this RAWP.

5. The occurrence of TCE in surficial drainage way soils and sediments will be necessary to determine compliance to the most stringent action level of 0.060 mg/kg for migration to groundwater; otherwise, further field investigations under this RAWP will be necessary.

In all instances, the analytical methods identified in this RAWP will be capable of identifying whether the data collected meet the applicable data decision-making requirements.

1.4.4 Study Boundaries

The Lockformer site has been divided into three areas. The boundaries for Areas 1, 2, and 3 are identified in Figure 1.3-2. It is currently anticipated that all the investigations included in this RAWP will be performed within Areas 1, 2, and 3 with the exception of the following:

1. Investigations taking place east and west off the Lockformer site at the south end of Area 3 along the Lisle sanitary sewer to determine the extent of contamination related to releases from this sewer system.

2. Investigations taking place to the east off the Lockformer site along the Lockformer sanitary sewer east of Area 3 to determine the extent of contamination related to releases from this sewer.

3. Investigations taking place south of Area 1 to determine the extent of contamination related to surface water drainage off the Lockformer site.

The onsite investigations to define the extent of contamination in Areas 1 and 2 will generally be advanced to the water table in the mass waste unit or the upper surface of the lower till, whichever is encountered first. The sewer investigations will be advanced to the water table and will be completed by acquiring a groundwater grab sample at each location. The surface water drainage way sampling will be advanced to the upper till and mass waste unit contact, and will be advanced further only if contamination is indicated.

The investigations outlined in this RAWP will be performed as soon as reasonably possible upon approval of the plan. A schedule is provided in Section 7.0 of this RAWP that identifies the timing of investigation, design, and remedial system implementation.

1.4.5 Development of a Decision Rule

The decision rule for investigations related to the Lockformer site can be straightforwardly defined as follows:

If the lateral and vertical extents of contamination have not been defined to the applicable action level for any contamination source, further investigation will then be performed to provide adequate definition.

The decision rule for remediation activities related to the Lockformer site can be defined as follows:

If the confirmatory sampling does not indicate that the applicable action level has been achieved to a 95% confidence level (to a maximum of 10 mg/kg), further application of remediation efforts will then continue until the action level has been achieved to a 95% confidence level (to a maximum of 10 mg/kg), or USEPA determines the practicable limits of the remedial technology have been achieved.

Further discussion of the confirmation sampling and achieving the 95% confidence limit to meet the remediation action levels is provided in Section 5.0 of this RAWP. The Quality Assurance Project Plan (QAPP) incorporated within this RAWP has been developed with the identified action levels in mind, and ensures that the analytical detection limits will allow reliable comparisons with the action levels identified.

1.4.6 Specified Limits on Decision Errors

Investigation error related to sampling programs is generally related to two main components: sampling design error and measurement error. Sampling design error is influenced by the sample collection design, the number of samples collected, and the actual variability of the population over space and time. Measurement error is a result of inaccuracies in the analytical methods utilized or the use of different analytical methods. Both of these types of errors can lead to decision error related to the goals of the project.

There is at least the likelihood that some degree of error has been introduced into the data collected at the Lockformer site to date as a result of the following:

1. Different analytical laboratory techniques
2. Sampling location bias resulting from sample acquisition in a non-uniform manner
3. Temporal distribution of sample acquisition
4. Sampling techniques employed by different investigators

Significant investigation of the source areas in the vicinity of the former TCE fill pipe and vapor degreaser has been made. Previous investigations suggest that the TCE level in the upper till ranges from non-detect to concentrations in excess of the saturation limit in soils for TCE. The concentration range for TCE in the mass waste unit sand and gravel is significantly smaller and ranges from non-detect to approximately 42 mg/kg.

Given the investigation data development for the source areas on the site to date, and the impending remedial measures that will be implemented, it is reasonable to currently expend resources to determine only the lateral definition of the source areas. These investigations are being conducted on a quasi-grid pattern based on previous investigation results with the intent that the areas of remediation system implementation will be defined as a result. This level of definition is appropriate since the remedial technologies to be implemented have been demonstrated to reduce concentrations of TCE from levels above the soil saturation limit to the action levels defined for the Lockformer site. As a result, decision error should be minimized.

Sampling design error and measurement error throughout the remainder of the investigations employed at the Lockformer site should be minimized to the extent possible as a result of the following:

1. Use of consistent analytical laboratory techniques
2. Use of uniform sample acquisition based on grid sampling when possible
3. Collection and analysis of data over a limited time frame
4. Consistent sampling techniques based on uniform work plan design

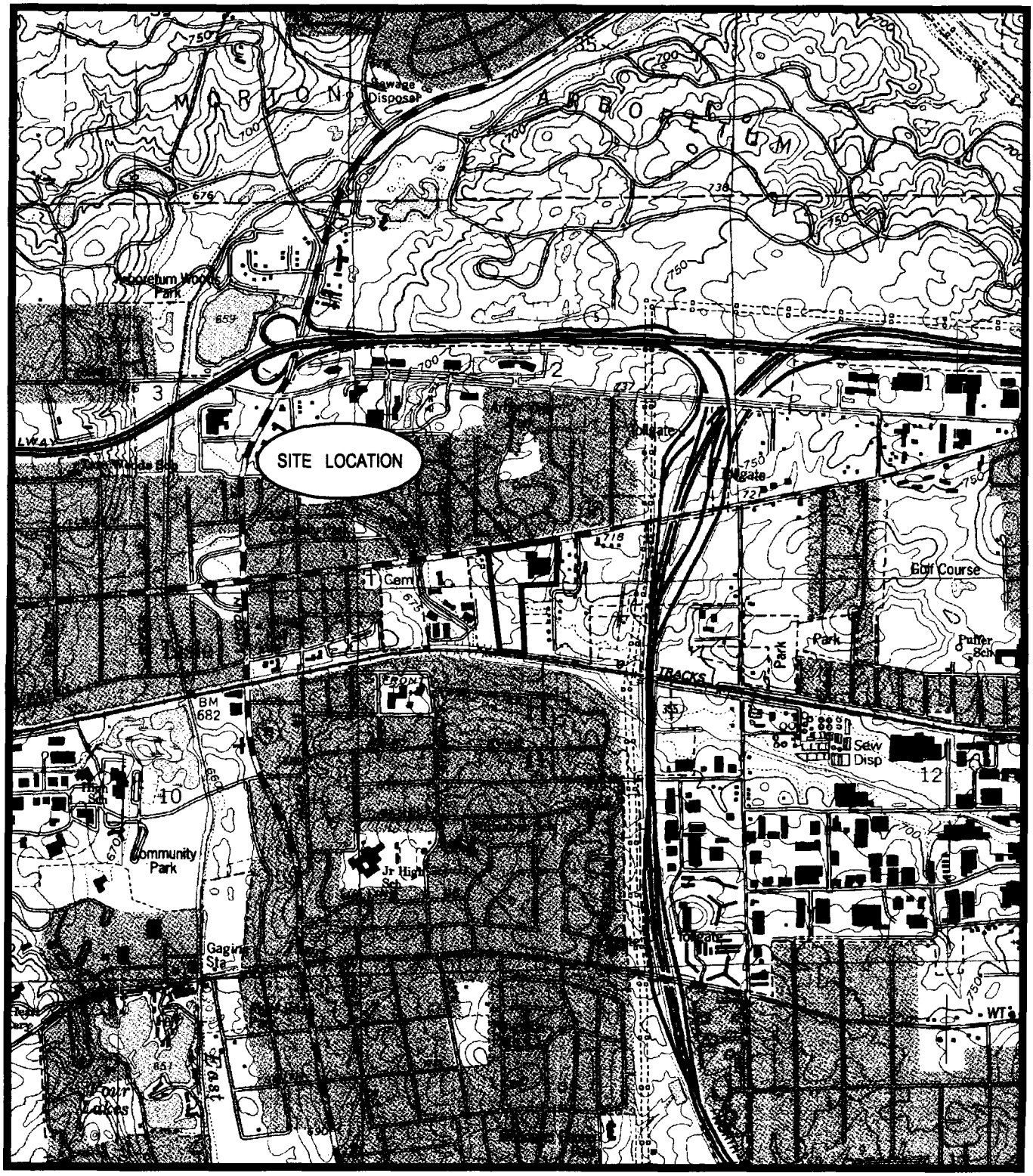
At this stage in the Lockformer site evaluation and remediation, the decision goal performance evaluation is relatively straightforward. This is the result of the soil remediation efforts being required to meet the requirements of the confirmatory sampling program in Section 5.0, and Lockformer's commitment to perform groundwater containment of all impacted mass waste and Silurian dolomite groundwater. As a result,

statistical analyses are applied to confirmation sampling programs for areas of soil contamination to define when the RAOs have been achieved, and the groundwater containment systems will have a requisite degree of "over-capture" to reduce concern regarding decision error.

1.4.7 Optimization of the Design

The data sampling and analysis design for generating data expected to satisfy the DQOs for this RAWP have been the result of numerous meetings and discussions between the USEPA, the IEPA, the IAG, and their consultants. It is fair to say that, through this process, evaluation and re-evaluation of the DQOs have taken place. The current version of the RAWP and the DQOs incorporated within it will need to be modified in the future with submittal of the groundwater remediation work plan.

FIGURES



Scale 1:24000

0 1/2 1 MILE

1000 0 1000 2000 3000 FEET

QUADRANGLE LOCATION

FIGURE 1.3-1

SITE LOCATION MAP

THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAP, WHEATON, ILLINOIS - MAP EDITED 1993)

CHECK BY	DJL
DRAWN BY	BCP / OS
DATE	4-5-02
SCALE	AS SHOWN
CAD NO.	6526307Y
PRJ NO.	65263.01

SITE MAP ILLUSTRATING AREAS 1, 2 AND 3

LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

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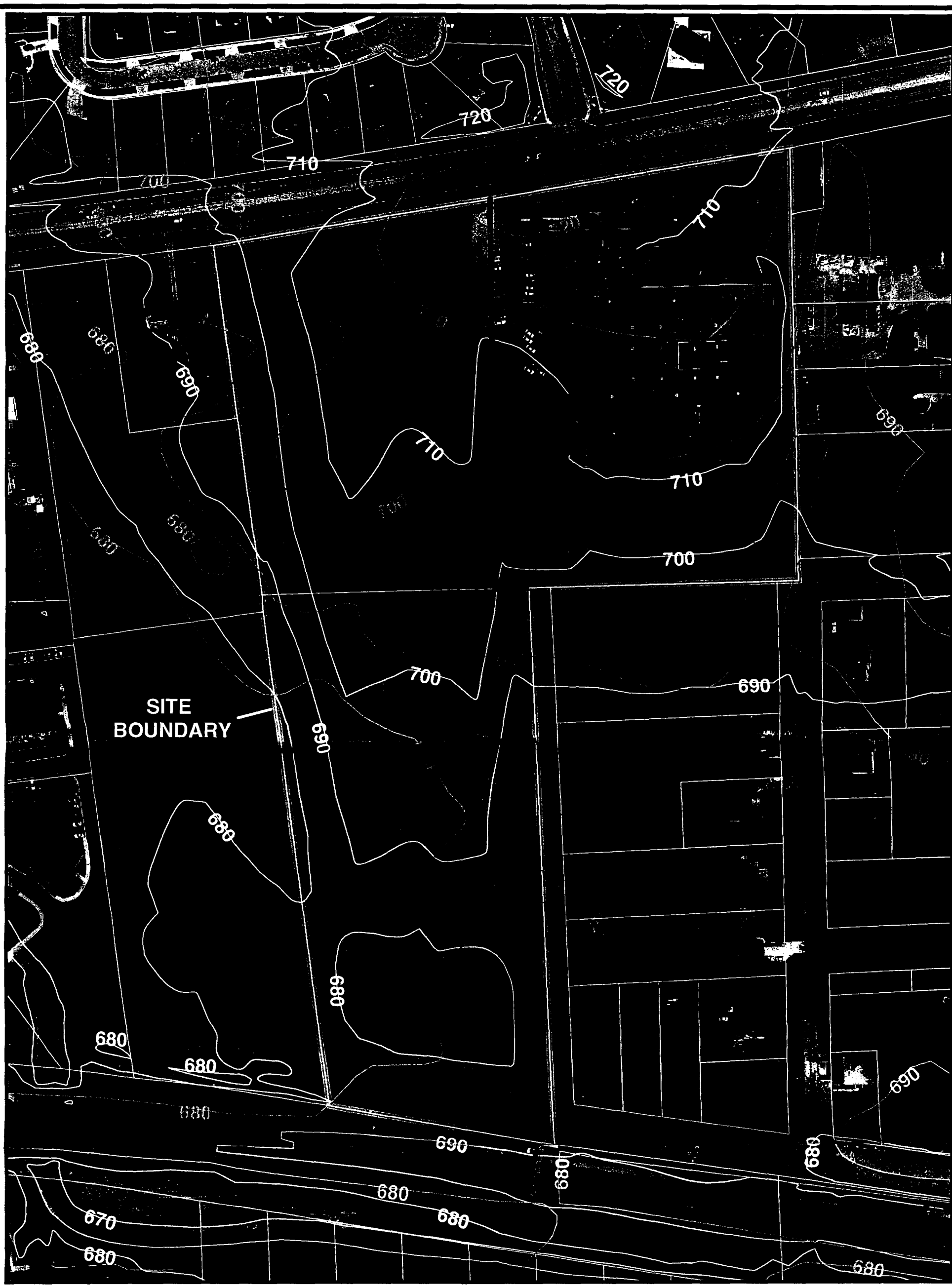
FIGURE 1.3-2



SITE TOPOGRAPHIC MAP: 1962 / 2001
THE LOCKFORMER COMPANY / LISLE, ILLINOIS

N

Legend

1962 Surface Contours 10 Foot Interval
2001Surface Contours 10 Foot Interval
Parcel Boundaries

0 70 140 280 420 Feet

Note: Map Sources

Aerial photograph, propertiy boundaries and 2001 contours obtained from DuPage County Government, date of aerial photography: April 1998.
1962 contour lines obtained from 1962 (Rev.1972 / 1980) USGS Quadrangle - Wheaton, IL

Map is in Illinois State Plane, NAD 83, Feet

Project: 15-65263.01
SiteTopoMap_R.MXD
Date: 04/01/02
Drawn by: SFS

Clayton GROUP SERVICES

FIGURE 1.3-3

OGDEN AVENUE (RTE 34)

OGDEN CORPORATE CENTER

BUILDING

BUILDING

LOCKFORMER FACILITY

SITE BOUNDARY

A

A'

B

B'

C

C'

MW-1106D
MW-1107D
MW-508S
MW-508D
MW-505S
MW-506S
MW-507S
MW-123
MW-401
MW-501D
MW-1108S
MW-1108D
MW-101
MW-504D
MW-504S
MW-1114D
MW-1114S
SB-807
SB-805
MW-1110D
MW-1110S
MW-522
MW-120
MW-502S
MW-513D
MW-500D
MW-515
MW-402
MW-514D
MW-517D
MW-516D
MW-521
MW-1111D
MW-1111S
MW-1112S
MW-1112D
MW-126
MW-1105D
MW-1109
MW-1101D
MW-1100D
MW-1100S
MW-1101S
MW-1104D
MW-1102S
MW-1104S
MW-1102D
MW-1103M
MW-1103D
MW-1103S
MW-1113M
MW-1113D
MW-1113S

LEGEND

EXISTING MONITORING WELL

SCALE IN FEET

0 60 120 240

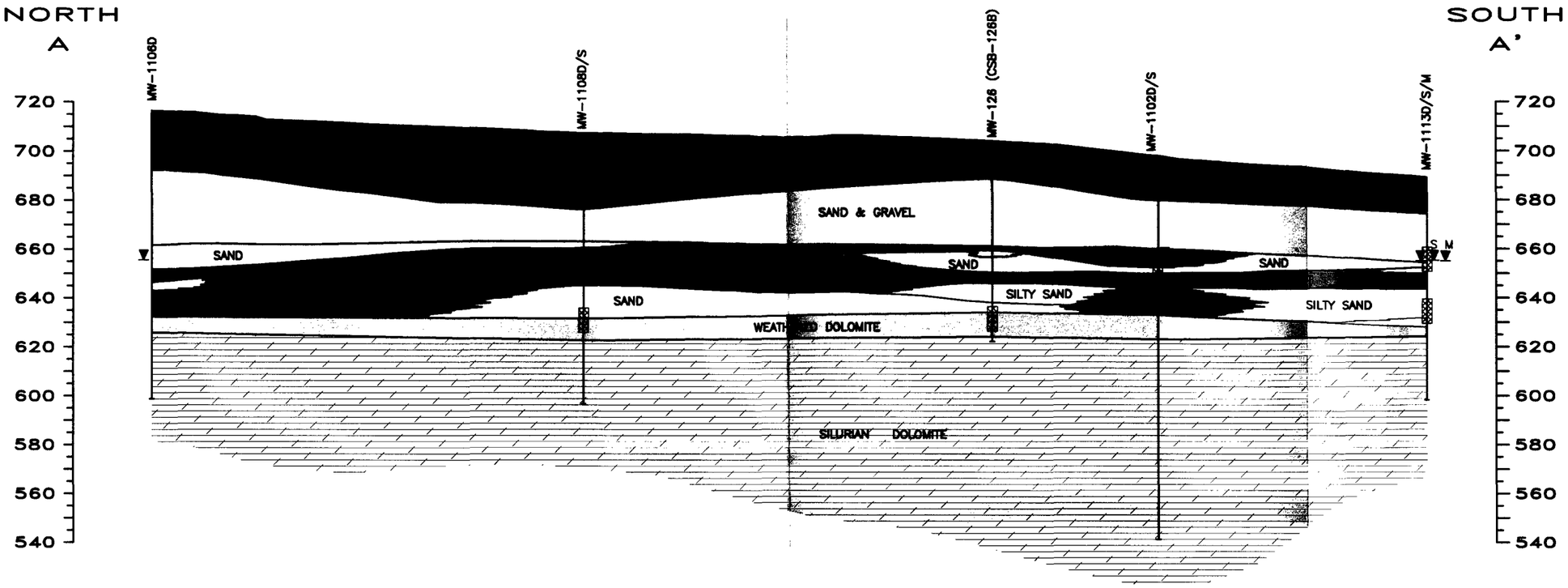
CHECK BY	
DRAWN BY	BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526307L
PRJ NO.	65263.01

CROSS-SECTION REFERENCE MAP

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 1.3-4



LEGEND

- SILTY CLAY
- CLAYEY SILT
- CLAY
- CLAYEY SAND & GRAVEL
- SAND & GRAVEL
- SAND
- SILTY SAND
- SILT
- WEATHERED DOLOMITE
- DOLOMITE

LEGEND

- WATER LEVEL MEASURED ON OCTOBER 17, 2001
  BEDROCK MEASUREMENT ON LEFT
  GLACIAL DRIFT MEASUREMENT ON RIGHT
- SCREEN INTERVAL

HORIZONTAL
SCALE IN FEET
0 50 100 200

VERTICAL EXAGGERATION = 2X

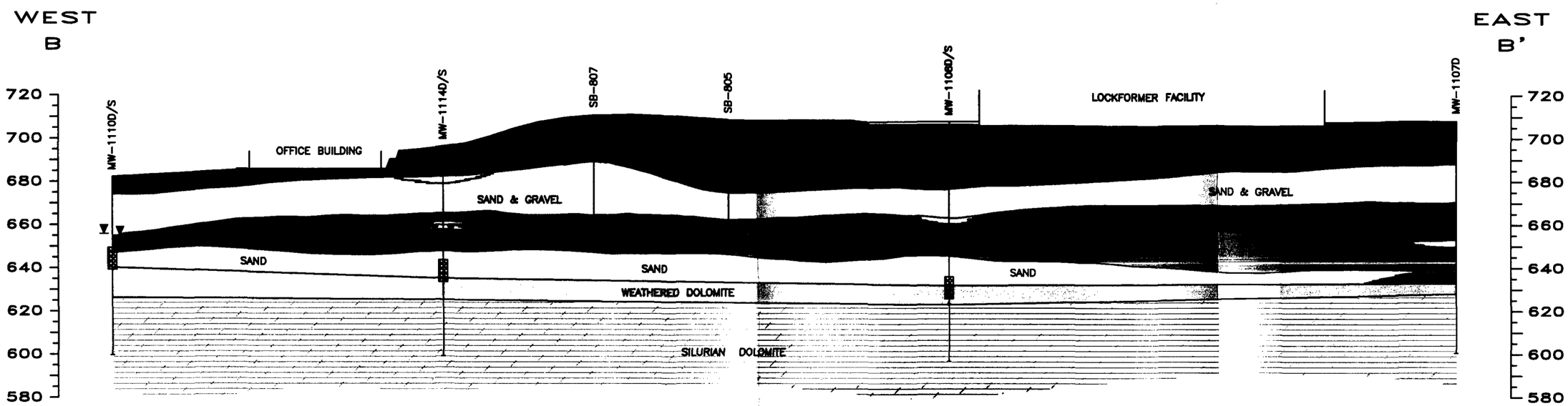
CHECK BY	WSE
DRAWN BY	BCP
DATE	4-5-02
SCALE	AS SHOWN
CAD NO.	6526307o
PRJ NO.	65263.01

CROSS-SECTION A – A'

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton™
GROUP SERVICES

FIGURE
1.3-5



SILTY CLAY

CLAYEY SILT

CLAY

CLAYEY SAND & GRAVEL

SAND & GRAVEL

SAND

SILTY SAND

SILT

WEATHERED DOLOMITE

DOLOMITE

LEGEND

▼ WATER LEVEL MEASURED ON OCTOBER 17, 2001
BEDROCK MEASUREMENT ON LEFT
GLACIAL DRIFT MEASUREMENT ON RIGHT

SCREEN INTERVAL

HORIZONTAL
SCALE IN FEET

0 50 100 200

VERTICAL EXAGGERATION = 2X

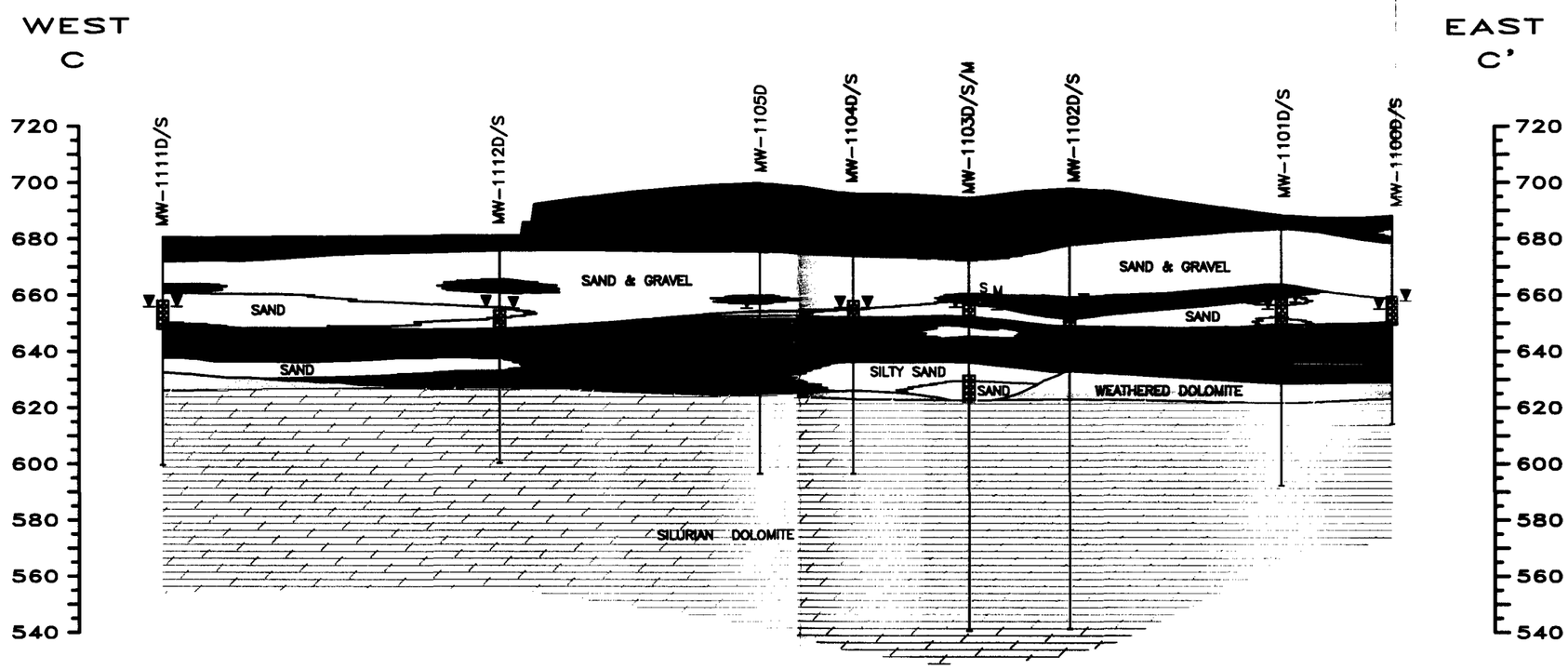
CHECK BY	WSE
DRAWN BY	BCP
DATE	4-5-02
SCALE	AS SHOWN
CAD NO.	6526307M
PRJ NO.	65263.01

CROSS-SECTION B – B'

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
1.3-6



SILTY CLAY

CLAYEY SILT

CLAY

CLAYEY SAND & GRAVEL

SAND & GRAVEL

SAND

SILTY SAND

SILT

WEATHERED DOLOMITE

DOLOMITE

LEGEND

▼ WATER LEVEL MEASURED ON OCTOBER 17, 2001
BEDROCK MEASUREMENT ON LEFT
GLACIAL DRIFT MEASUREMENT ON RIGHT

SCREEN INTERVAL

HORIZONTAL
SCALE IN FEET

0 50 100 200

VERTICAL EXAGGERATION = 2X

CHECK BY	WSE
DRAWN BY	BCP
DATE	4-5-02
SCALE	AS SHOWN
CAD NO.	6526307N
PRJ NO.	65263.01

CROSS-SECTION C – C'

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

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FIGURE
1.3-7

SECTION 2

2.0 DATA SUMMARY

This section of the LWP summarizes the results of field investigations performed to date. The data are primarily presented in a graphical and tabular format and in an organized manner to help the reviewer gain a better understanding of site conditions. In each instance, the figures provided contain a summary of all investigation data collected to date, including data previously reported in the *Interim Investigation Report* prepared by Clayton and dated January 25, 2001. Most of the tabulated data contained in this LWP has been developed since the Clayton January 25, 2001 report. To aid in the review of this data summary, all the boring logs from drilling performed to date involving investigations of the Lockformer site are provided in numeric sequence in Appendix A, Volume II.

Clayton is in the process of preparing a comprehensive investigation report that includes interpretations of the all site investigation data collected to date. The production of this report, in part, will satisfy the requirements of the consent order that Lockformer has entered into with the IAG and the IEPA. Clayton expects to complete and distribute the Lockformer site investigation report on approximately May 10, 2002.

2.1 AREA 1 AND AREA 2 DATA SUMMARY

This section of the LWP summarizes the results of the field investigations performed to date in Areas 1 and 2. The investigations in Areas 1 and 2 have primarily focused on releases that resulted from the manufacturing processes associated with (and potentially impacting the area under and around) the facility building and releases associated with the TCE fill pipe.

2.1.1 Area 1 and Area 2 Soil Investigations

2.1.1.1 Soil Investigations Related to Manufacturing Processes at the Lockformer Facility

Soil investigations related to the manufacturing processes at the Lockformer facility have primarily focused on the following areas within and directly around the facility building:

- The former TCE vapor degreaser.
- The sanitary and storm sewer lines and associated floor drains under the building floor.
- The south side door leading to the outside from the manufacturing operation.
- The basement area sump that collects water from the footing drains and the secondary containment sump for the petroleum tank.

The results of all investigations performed around the former TCE vapor degreaser, the sanitary and storm sewer lines and associated floor drains under the building floor, and the south side exterior door are illustrated in Figure 2.1-1. The results of Clayton investigations around the former TCE vapor degreaser and the storm and sanitary sewer lines are tabulated in Table 2.1-1. The results of the soil borings around the south exterior door leading to the manufacturing operation are summarized in Table 2.1-2.

The results of the two investigation borings performed in the Lockformer basement area (adjacent to the footing drain sump and the sump in the secondary containment for the petroleum tank) are illustrated in Figure 2.1-2. The data from these borings are summarized in Table 2.1-1.

2.1.1.2 Soil and Sediment Sampling Related to Exterior Utility Lines in Areas 1 and 2

The storm and sanitary sewer catch basins and manholes in Areas 1 and 2 were inspected as part of the investigative work associated with the IEPA work plan. Sediment, if present in these catch basins and manholes, was submitted for laboratory analysis. Figure 2.1-3 illustrates the catch basins and manholes in Areas 1 and 2 that were inspected and sampled. The results of the sediment sample analyses are indicated. Table 2.1-3 summarizes the laboratory analytical results from sampling these catch basins and manholes.

A series of trenches were previously excavated along the utility lines in Areas 1 and 2 to determine the nature of any contamination that might have been released from the sewer systems and/or migrating through any coarse-grained bedding material associated with the sewers or other utilities. The location of the excavations and results of samples taken from them to perform these investigations appear in Figure 2.1-3. The samples from these trenches were acquired as grab samples of the bedding material adjacent to the sewer pipe or utility line from a backhoe performing the excavation.

The storm and sanitary sewer catch basins and manholes at the Lockformer site, including invert elevations, were surveyed and appear in Figure 2.1-4.

2.1.1.3 Soil Investigations Related to the TCE Fill Pipe Releases

Soil investigations related to releases at the TCE fill pipe have been extensive. Figures 2.1-5A through G illustrate the soil sampling results for specific depth intervals obtained during investigations to define the extent of the TCE fill pipe releases. The results from recent investigations involving the 1200-series borings installed in the immediate vicinity of the TCE fill pipe are provided in Table 2.1-4. Table 2.1-4a provides a summary laboratory soil analytical results from wells and hydrostratigraphic

borings installed during the investigations related to the former TCE fill pipe. The results of geotechnical analyses of samples acquired from the 1200-series borings in the immediate vicinity of the TCE fill pipe are provided in Table 2.1-5

Two cross-sections in the immediate vicinity of the TCE fill pipe have been developed from the recently performed 1200-series borings. Figure 2.1-6 illustrates the locations for cross-sections SA-1 to SA-1' and SA-2 to SA-2'. Figures 2.1-7 and 2.1-8 illustrate the sequence of lithologies in the vicinity of the former TCE fill pipe along cross-sections SA-1 to SA-1' and SA-2 to SA-2'. Superimposed on cross-sections SA-1 to SA-1' and SA-2 to SA-2' are soil sampling results for TCE and cis-1,2-dichloroethene (DCE) and the potentiometric surface of the lower sand on November 30, 2001.

2.1.2 Area 1 and Area 2 Groundwater Investigations

The most recent results of groundwater sampling from monitoring wells in Areas 1 and 2 are illustrated in Figure 2.1-9. All groundwater sample results appearing in Figure 2.1-9 were acquired in 2001. Sample results from monitoring wells completed in the glacial sediments during the Lockformer groundwater investigations and sampled since the January 25, 2001 Clayton report are tabulated and appear in Table 2.1-6. Sample results from the single packer tests performed during drilling of the bedrock wells during the Lockformer groundwater investigations are tabulated and appear in Table 2.1-7. Sample results from double packer test performed on the bedrock monitoring wells during the Lockformer groundwater investigations are tabulated and appear in Table 2.1-8. Water level measurements acquired from monitoring wells completed in the glacial sediments and bedrock appear in Table 2.1-9.

2.2 AREA 3 DATA SUMMARY

2.2.1 Area 3 Soil Investigations

The Area 3 soil investigations have primarily involved sampling along the drainage ways and the sanitary sewer system. Table 2.2-1 summarizes the data from these 1500-series soil borings performed in Area 3. Figure 2.2-1 summarizes the data collected in the 1500-series soil borings in Area 3.

2.2.2 Area 3 Groundwater Investigations

The Area 3 groundwater investigations have been primarily focused along the drainage ways and the sanitary sewer system. Table 2.2-2 provides a tabulated summary of laboratory analytical results for groundwater samples collected in Area 3. Figure 2.2-2 provides a summary of the groundwater sampling results from monitoring wells, and groundwater grab sample results from the 1500-series soil borings in Area 3.

Sample results from the single packer tests performed during the drilling of the MW-1113D bedrock well are tabulated and appear in Table 2.1-7. Sample results from double packer tests performed on bedrock monitoring well MW-1113D appear in Table 2.1-8. Water level measurements acquired from monitoring wells completed in the glacial sediments and bedrock appear in Table 2.1-9.

2.3 SEMI-REGIONAL GROUNDWATER DATA SUMMARY

A variety of data was collected in order to determine the nature of groundwater flow in the semi-regional area around the Lockformer site. In order to make this determination, groundwater monitoring wells were installed in offsite locations along Front Street and Riedy Road in the residential area south of Lockformer. Groundwater monitoring wells

were also installed in the Ellsworth Industrial District immediately east of Interstate 355. A series of staff gages were also established along the St. Joseph Creek and the East Branch of the DuPage River. Figure 2.3-1 summarizes the location of these semi-regional surface water and groundwater measurement points. Offsite groundwater monitoring well sampling results available at the time of issuance of this LWP are summarized in Figure 2.3-2.

Sample results from the single packer tests performed during the drilling of the offsite bedrock monitoring wells are tabulated and appear in Table 2.1-7. Sample results from double packer tests performed on the offsite bedrock monitoring wells appear in Table 2.1-8. Sample results for the offsite monitoring wells completed in the glacial sediments appear in Table 2.1-6. Water level measurements acquired from the offsite monitoring wells completed in the glacial sediments and bedrock appear in Table 2.1-9.

FIGURES

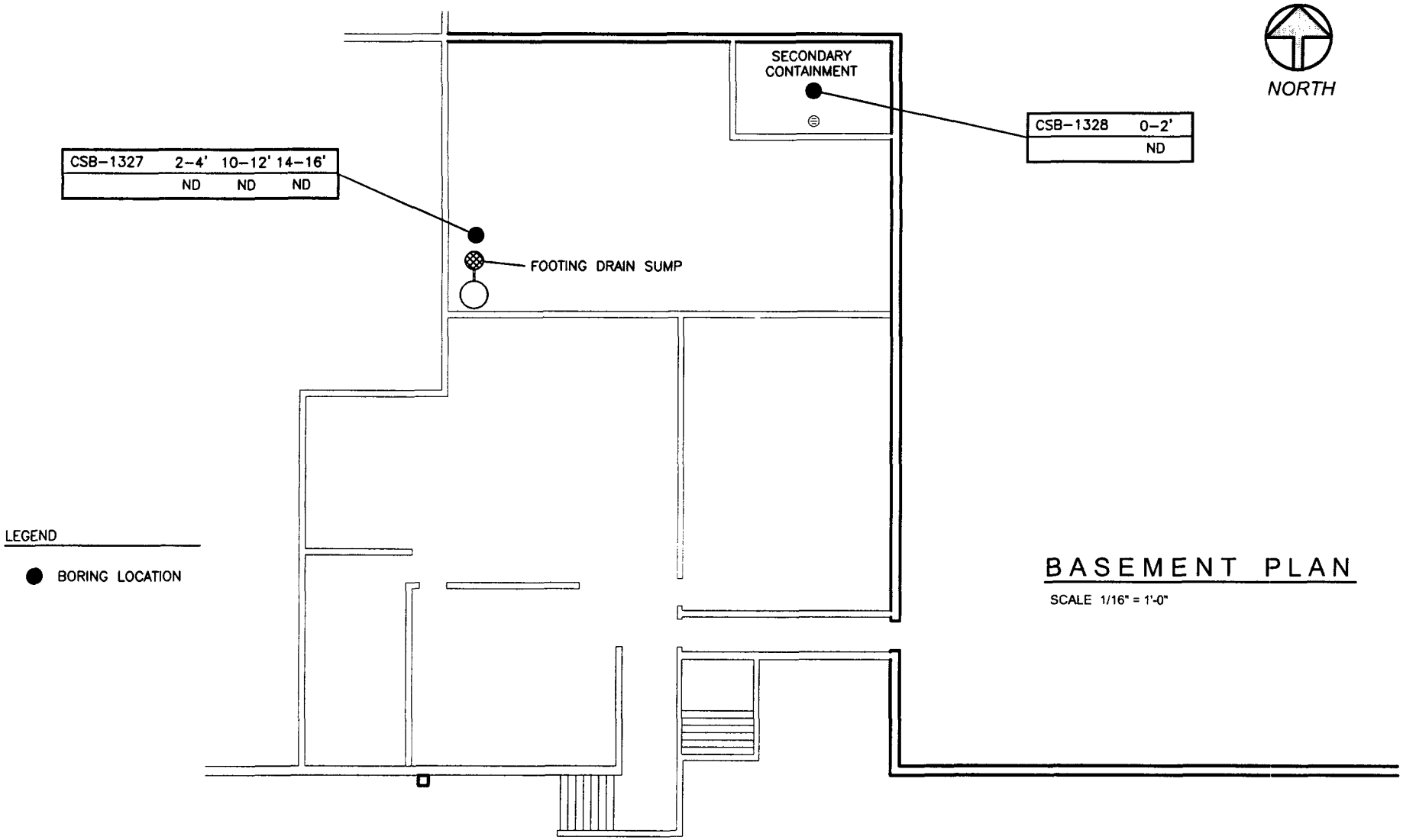
NORTH

FACTORY PLAN

SCALE 1/16" = 1'-0"

NOTE: THIS DRAWING IS A REDRAWN DUPLICATE OF THE BADLY DAMAGED ONLY EXISTING AS-BUILT OF DRAWING P-3 DWG. MARCH 20, 2001

1 ES	INVESTIGATION RESULTS AROUND THE FORMER TCE DEGREASER, SANITARY STORM SEWER LINES AND ASSOCIATED FLOOR DRAINS, AND THE SOUTH EXTERIOR DOOR THE LOCKFORMER COMPANY 711 W. OGDEN AVENUE LISLE, ILLINOIS	FIGURE 2.1-1



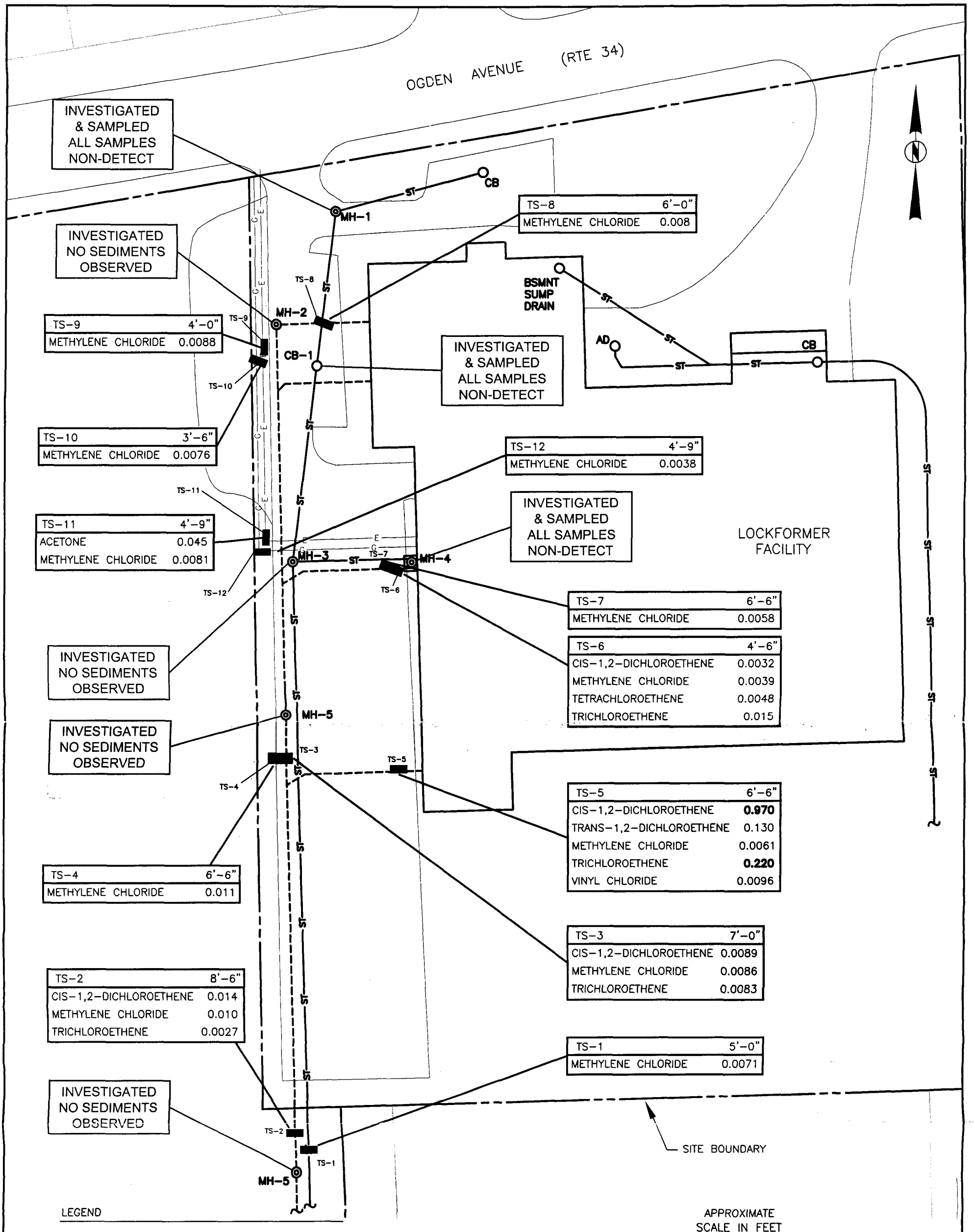
CHK BY	
DWN BY	BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526303i
PRJ NO.	65263.01

BUILDING BASEMENT
SUMP SAMPLING RESULTS

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
2.1-2



NOTE: ALL RESULTS SHOWN IN mg/kg.

NOTE:
FACILITY LAYOUT AND TRENCH LOCATIONS BASED ON CARLSON ENVIRONMENTAL, INC.'S TRENCH SAMPLE LOCATION MAP.

CHECK BY	
DRAWN BY	BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526302T
PRJ NO.	65263.01

STORM AND SANITARY SEWER SAMPLING LOCATIONS AND RESULTS

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 2.1-3

SITE BENCHMARK:
IRON PIPE CONTROL POINT NUMBER 9003 SET AT THE NORTH CENTER POINT OF THE LOCKFORMER PROPERTY ALONG OGDEN AVENUE.

ELEVATION= 715.14

MOST RECENT TOPOGRAPHIC FIELD WORK COMPLETED ON NOVEMBER 30, 2001

STORM MH 10
681.55 TOP RIM
668.59 INVERT NORTH
668.59 INVERT WEST

SAN MH 1
680.95 TOP RIM
661.13 INVERT EAST
661.13 INVERT SOUTHWEST

H
TOP RIM
INVERT NORTHEAST
INVERT WEST

SCALE IN FEET
0 25 50 100

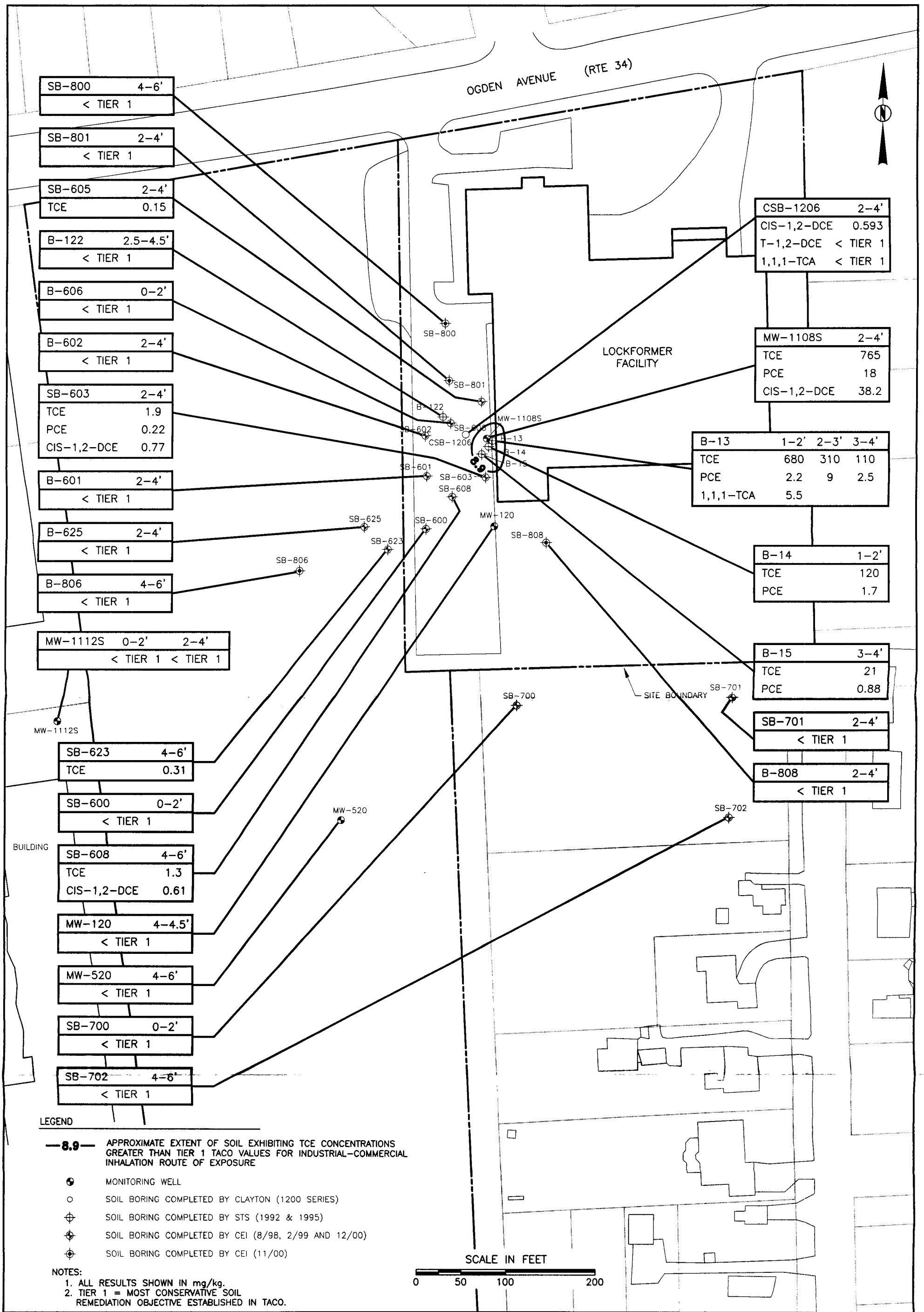
Y MAP CREATED BY MANHARD CONSULTING LTD. FOR CLAYTON GROUP SERVICES.

STORM AND SANITARY SEWER

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

FIGURE

2.1-4



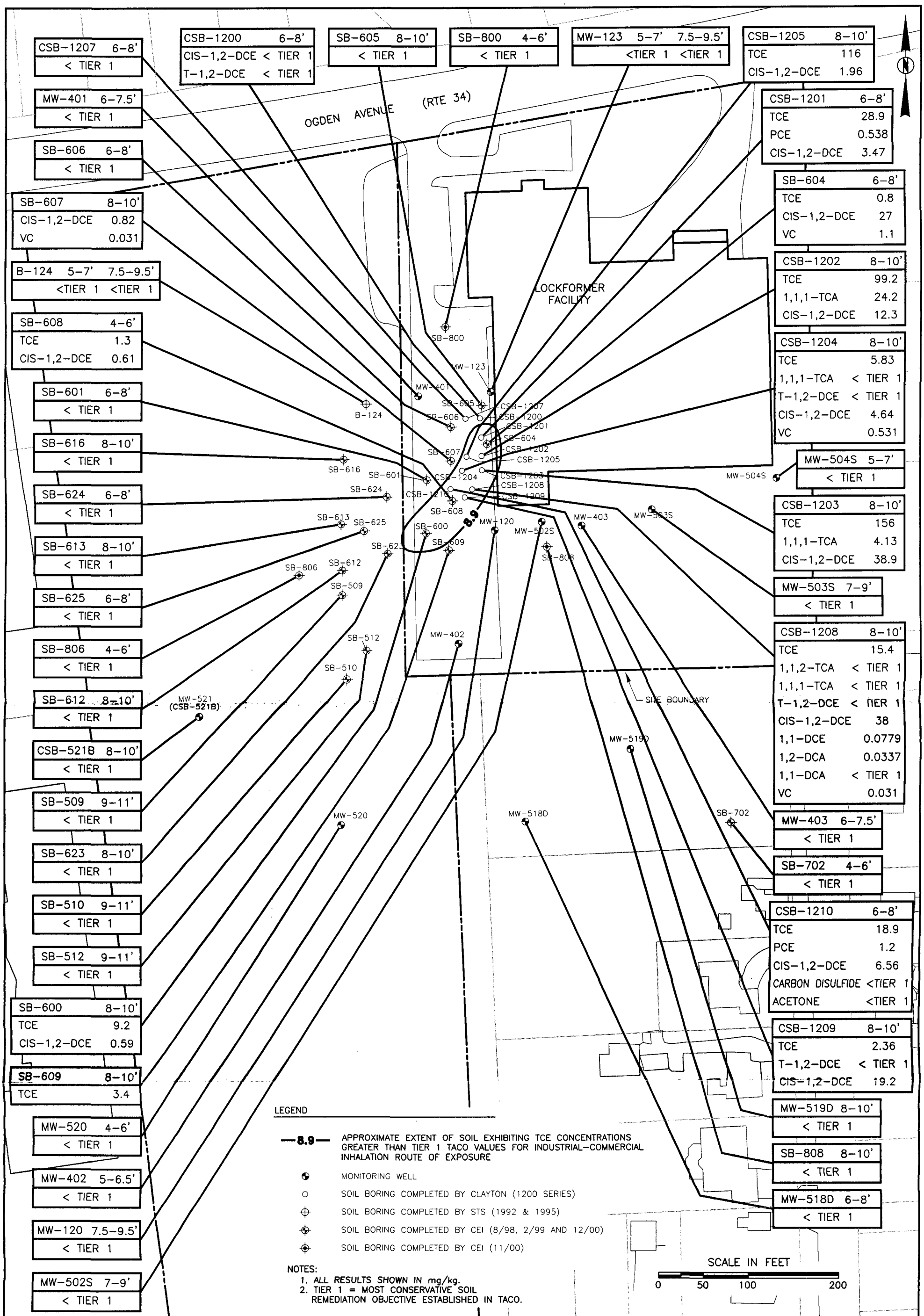
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08A
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS IN THE FILL/TILL AT THE 0-5' DEPTH INTERVAL

LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.1-5A



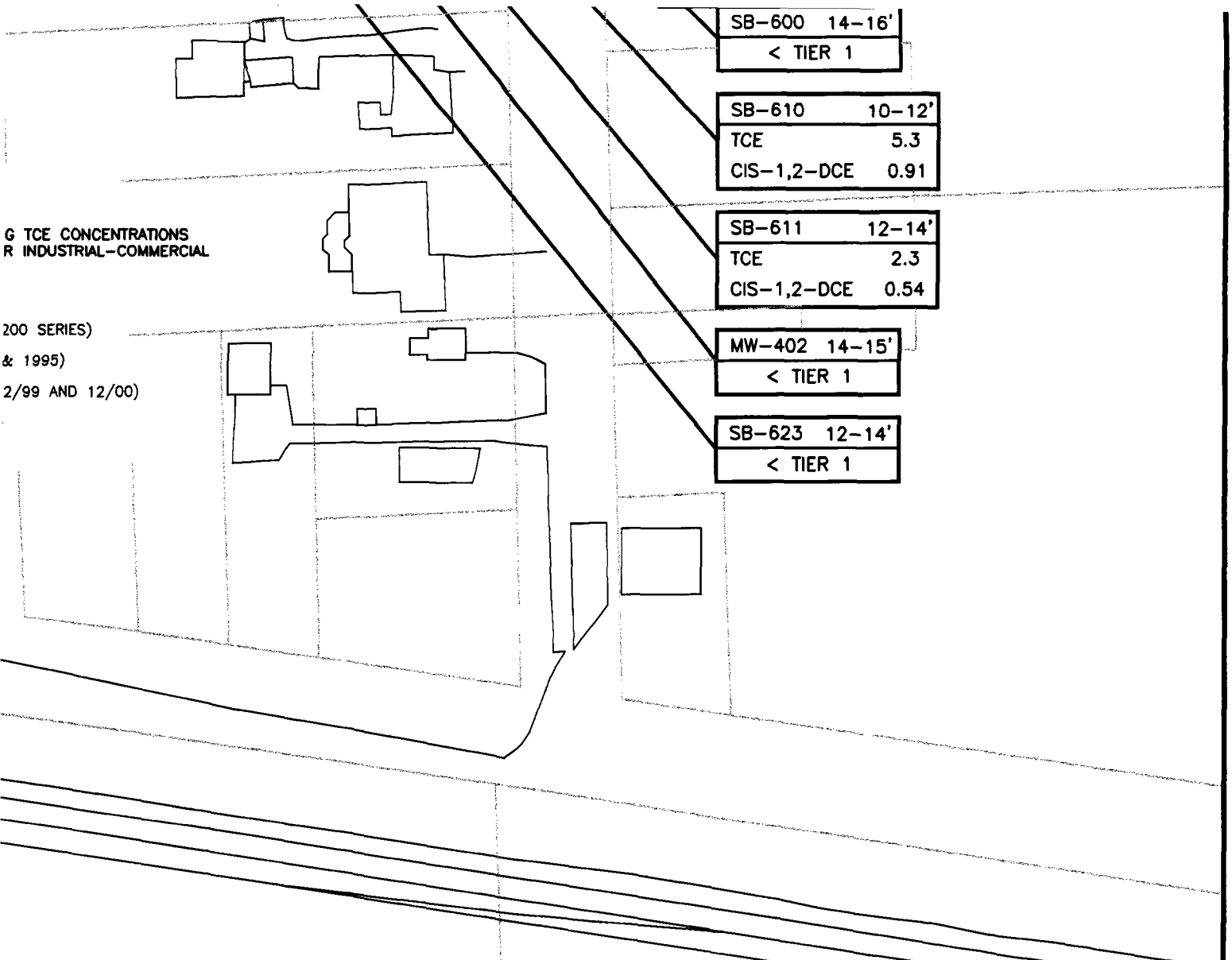
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08B
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS IN THE FILL/TILL
AT THE 5-10' DEPTH INTERVAL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.1-5B



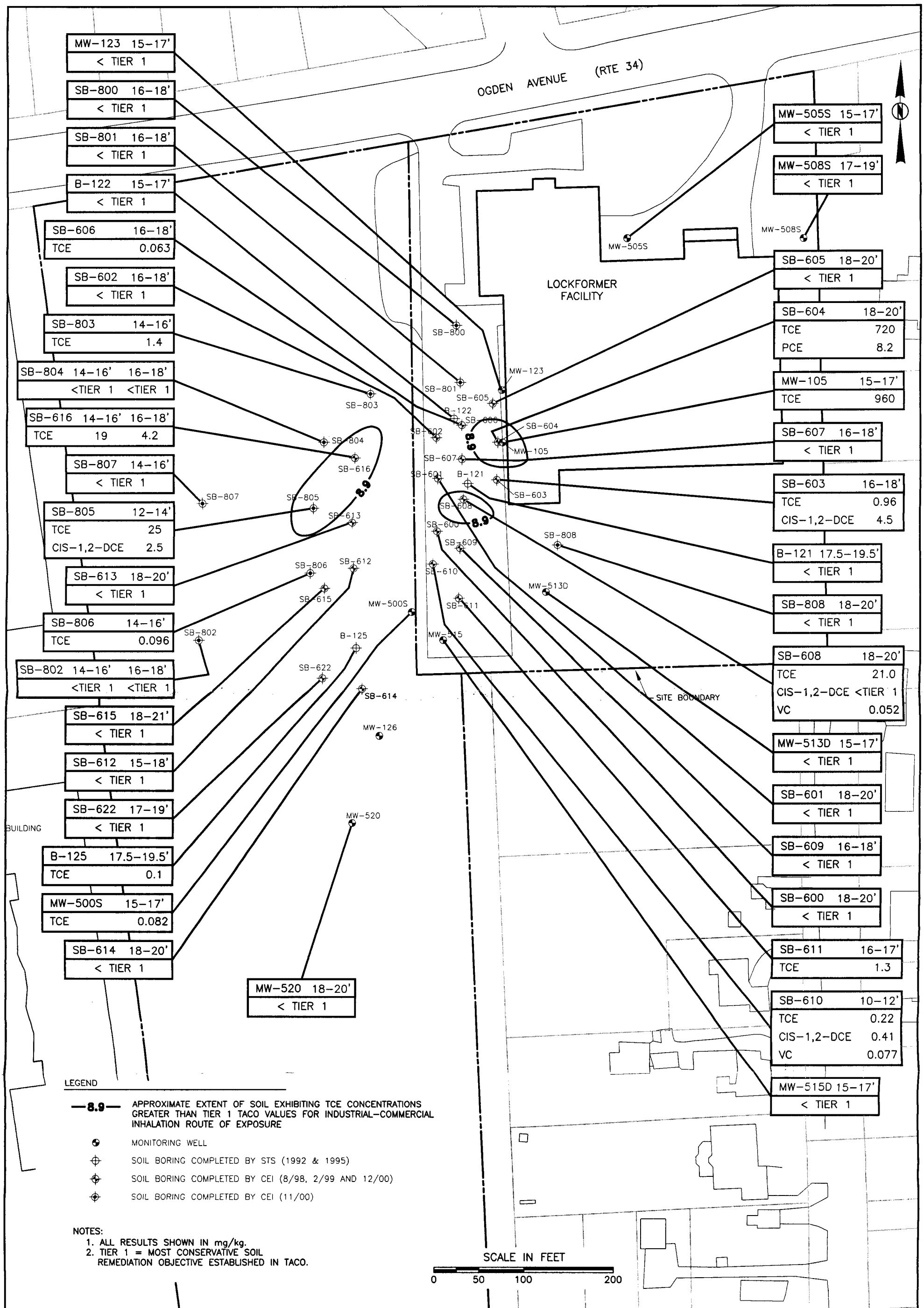
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08C
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS IN THE FILL/TILL
AT THE 10-15' DEPTH INTERVAL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton
GROUP SERVICES

FIGURE
2.1-5C



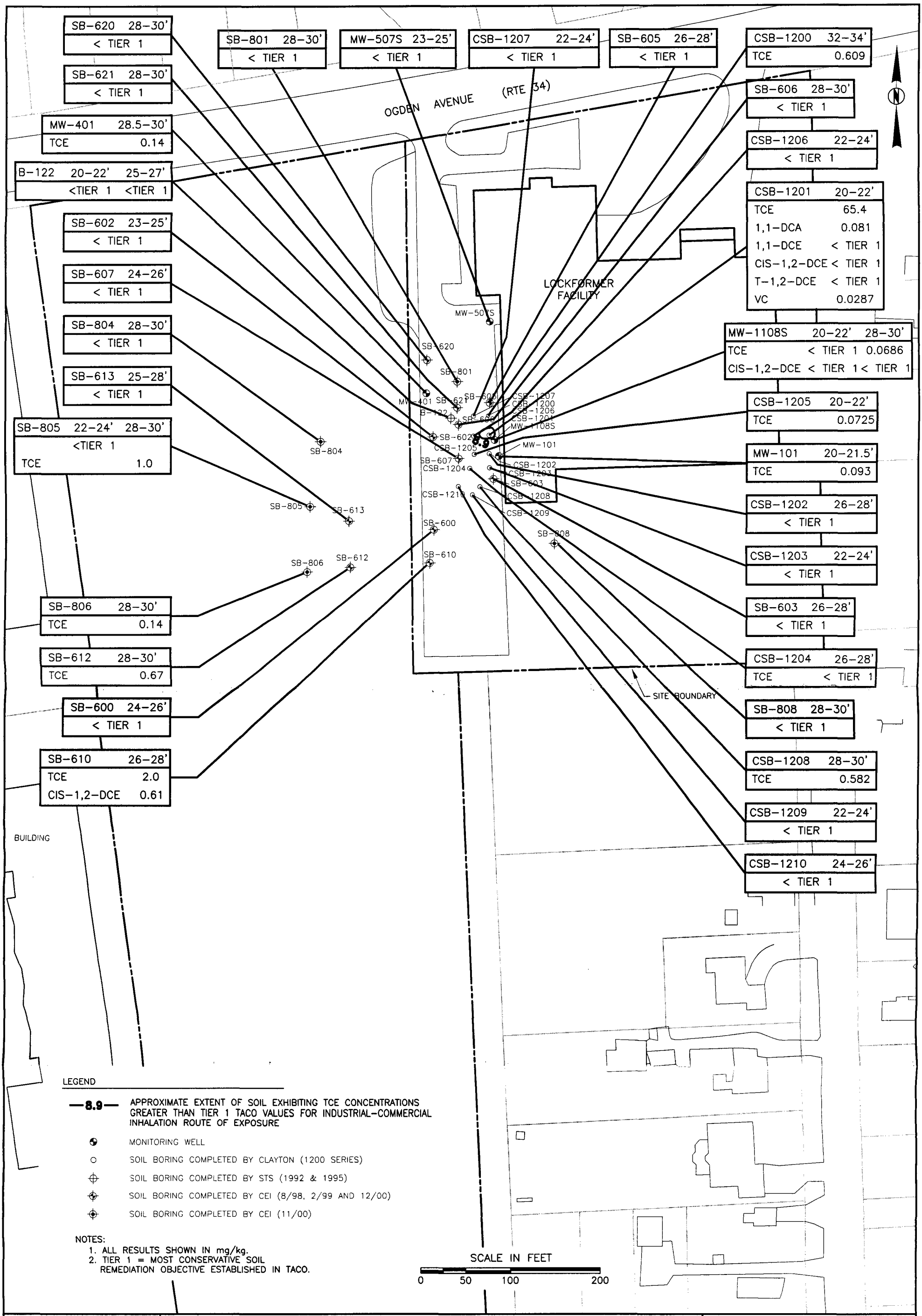
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08D
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS IN THE FILL/TILL AT THE 15-20' DEPTH INTERVAL

LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.1-5D



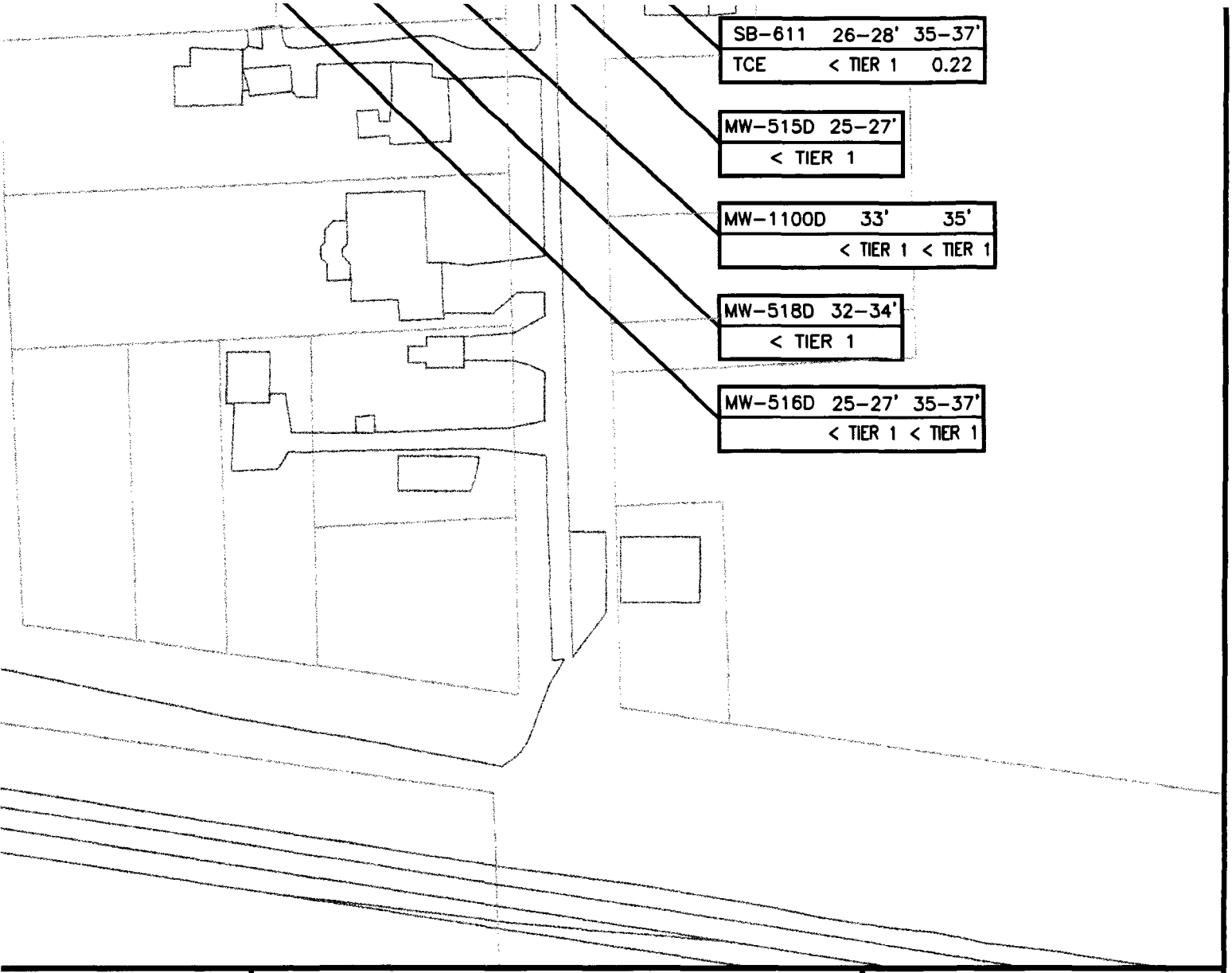
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08E
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS IN THE FILL/TILL
AT THE 20-34' DEPTH INTERVAL

LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.1-5E



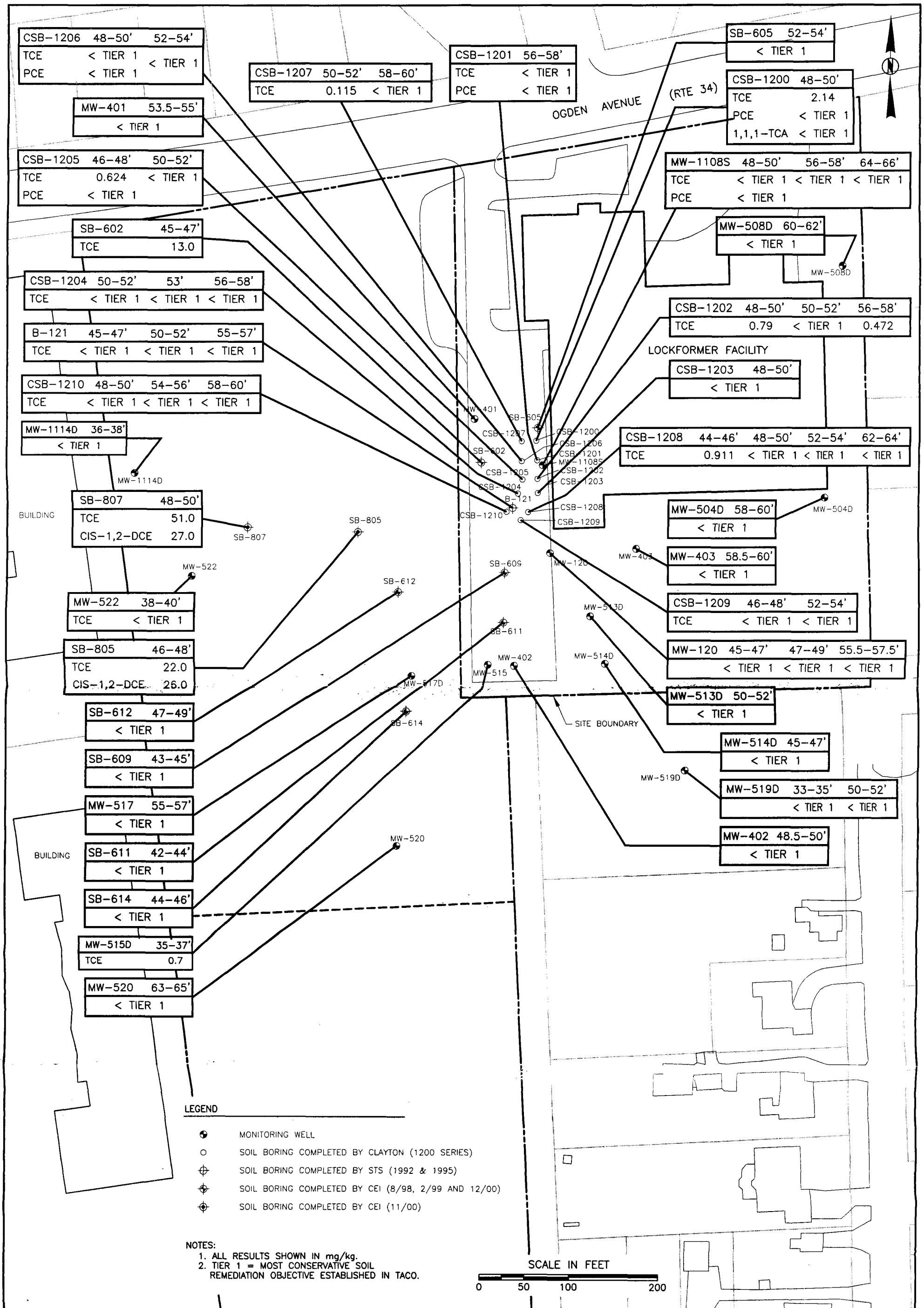
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08F
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS
FOR THE MASS WASTE UNIT

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton
GROUP SERVICES

FIGURE
2.1-5F



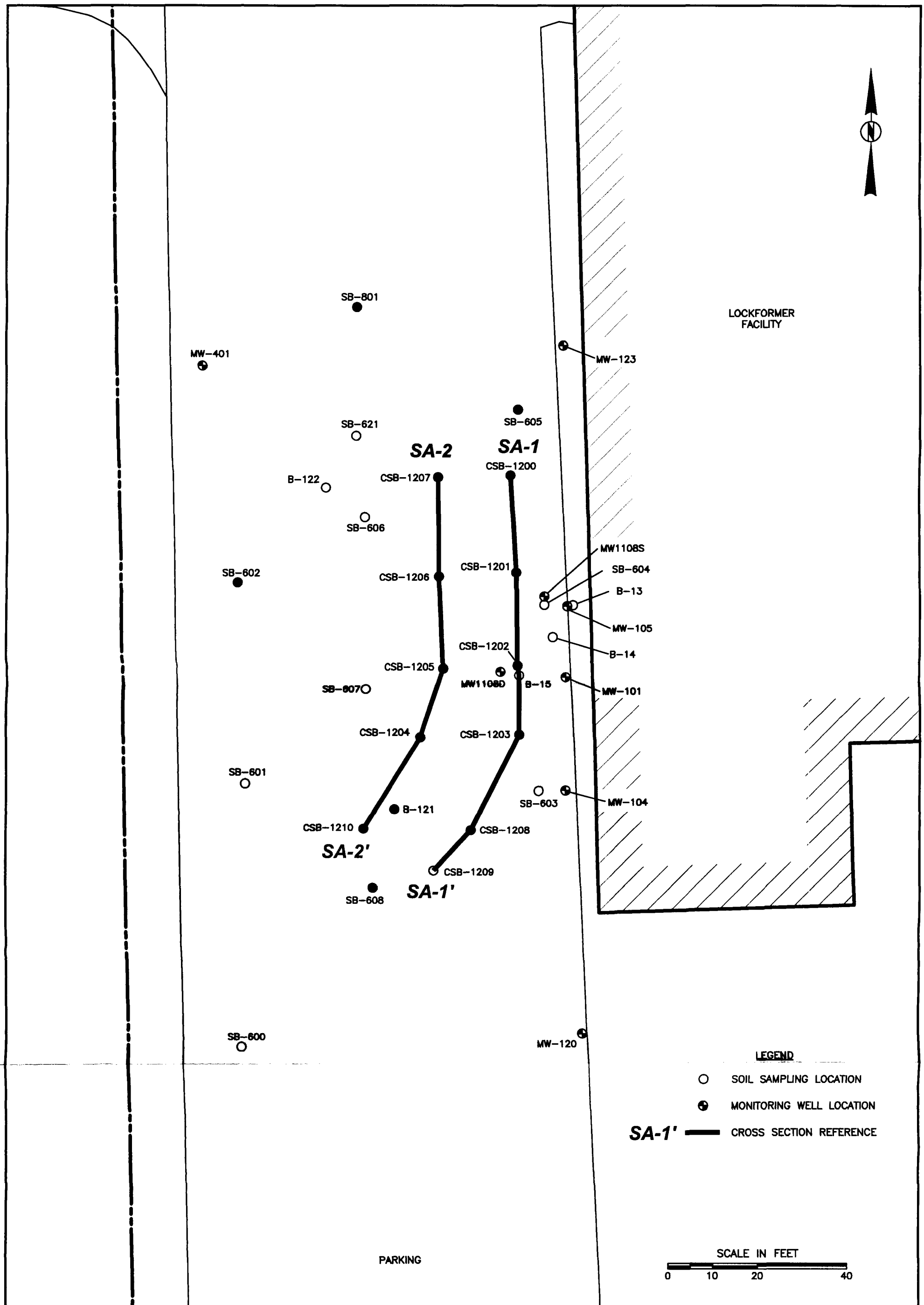
CHECK BY	
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	65263-08G
PRJ NO.	65263.01

SOIL ANALYTICAL RESULTS
FOR THE LOWER TILL UNIT

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.1-5G



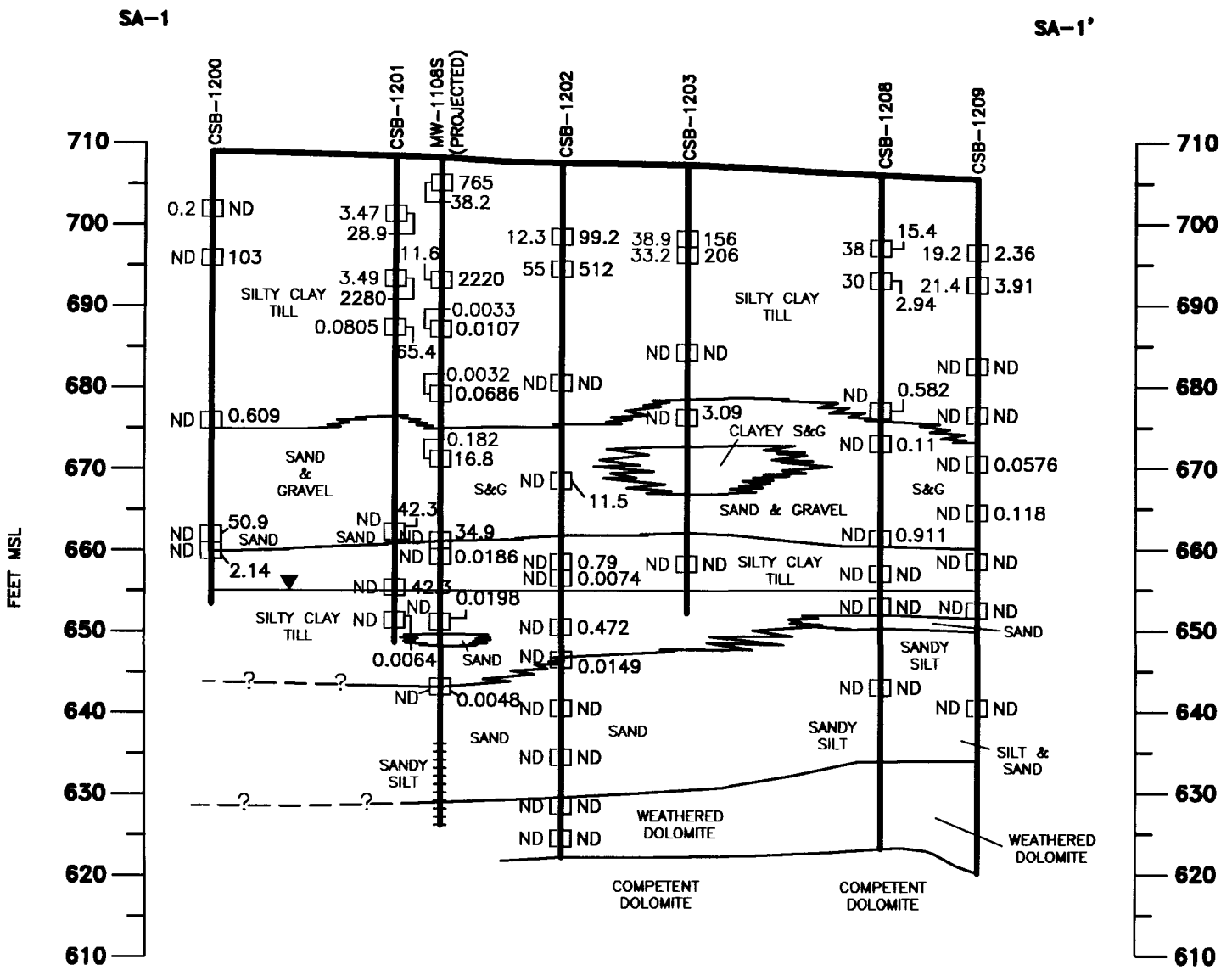
CHECK BY	
DRAWN BY	BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526302W
PRJ NO.	65263.01

CROSS SECTION LOCATIONS FOR
SA-1/SA-1' AND SA-2/SA-2'

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton
GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 2.1-6



LEGEND

0.2 [CIS-1,2-DCE CONCENTRATIONS

] 103 TCE CONCENTRATIONS

ALL RESULTS SHOWN IN mg/kg.

POTENTIOMETRIC SURFACE OF LOWER SAND ON 11/30/2001

HORIZONTAL SCALE IN FEET

0 10 20 40

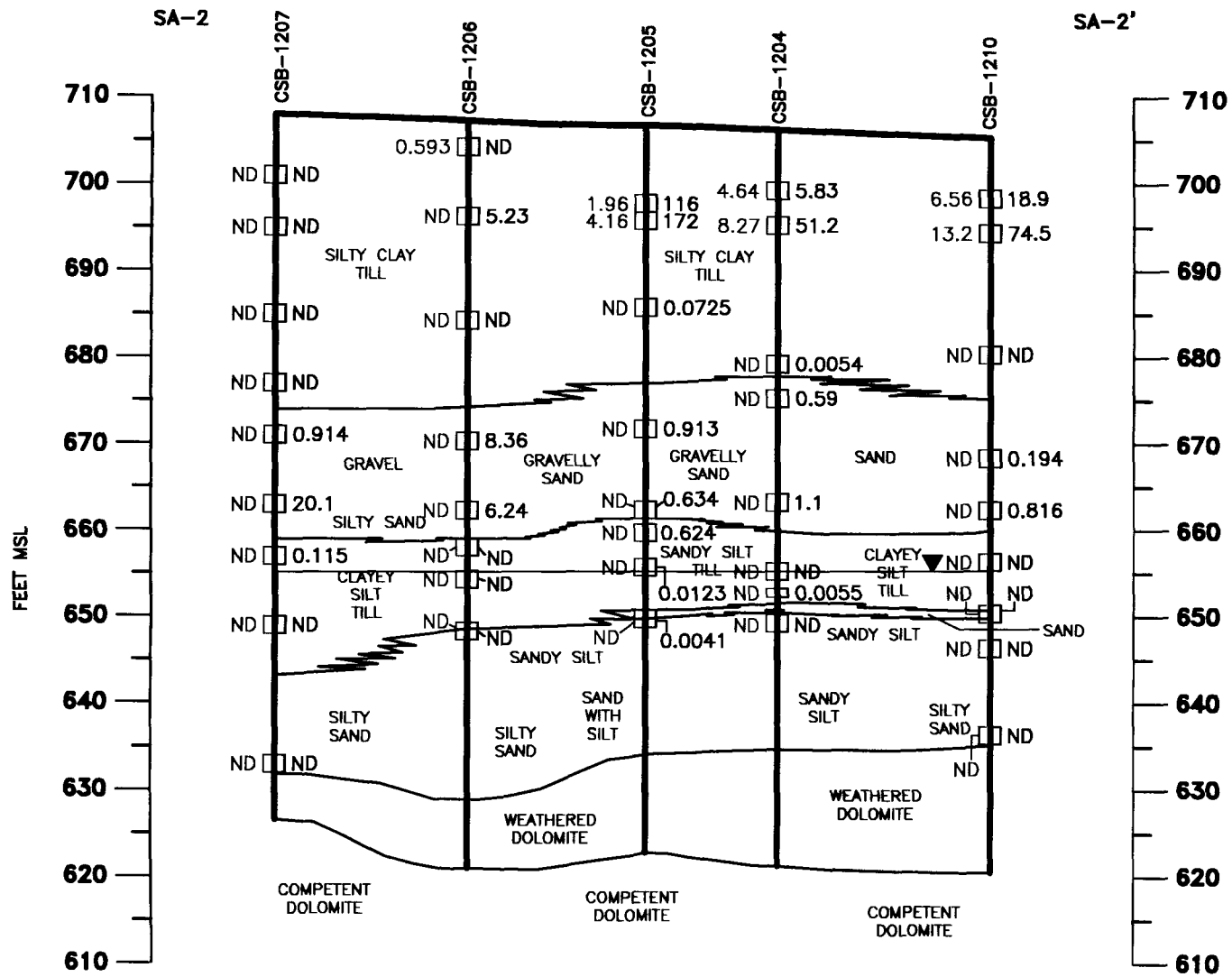
CHK BY	
DWN BY	OS/BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526302u
PRJ NO.	65263.01

CROSS SECTION "SA-1 – SA-1'" WITH TCE AND CIS-1,2-DCE SAMPLE RESULTS

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.1-7



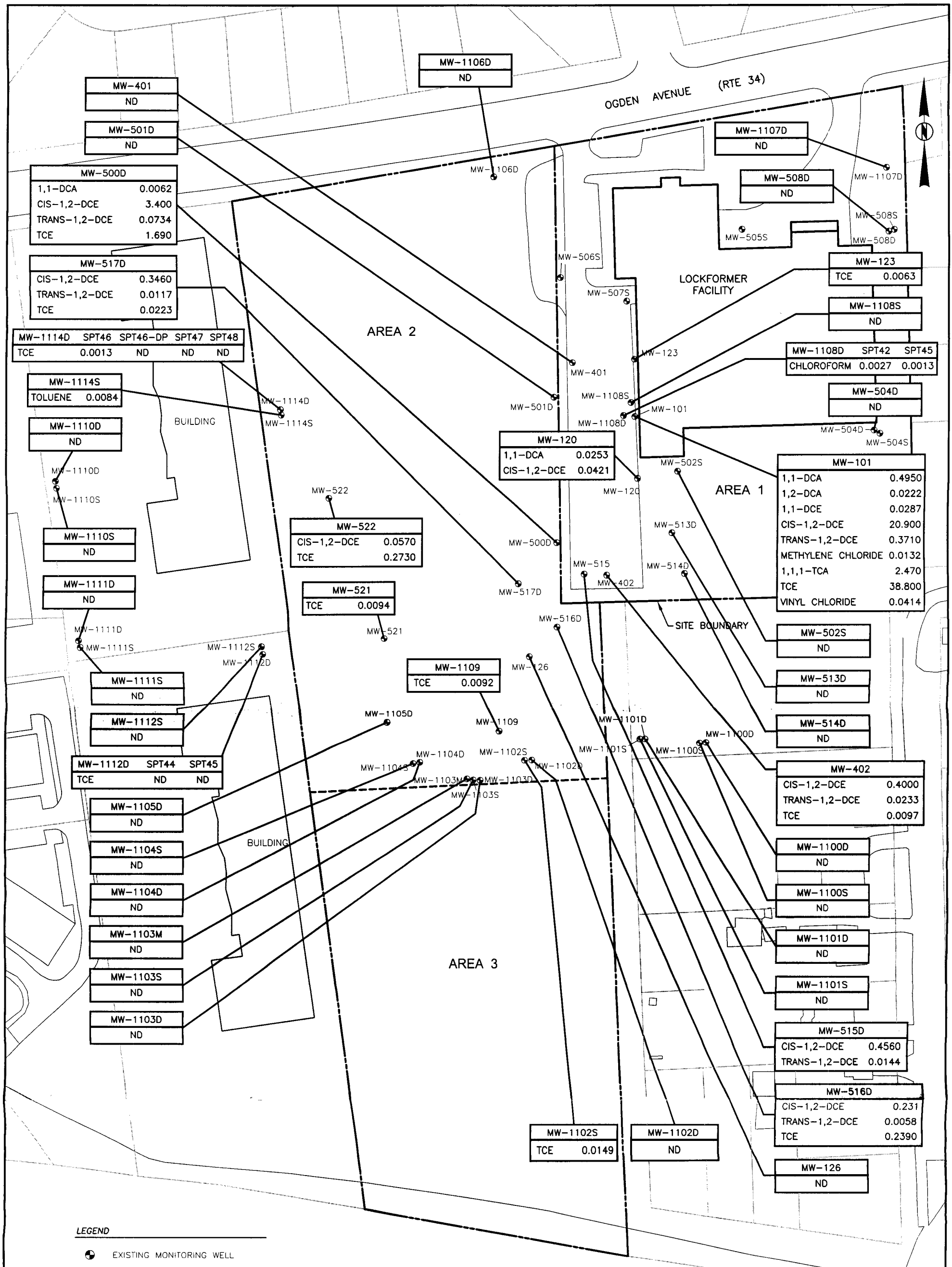
CHK BY	
DWN BY	OS/BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526302v
PRJ NO.	15-65263

CROSS SECTION "SA-2 – SA-2'"
WITH TCE AND CIS-1,2-DCE SAMPLE RESULTS

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
2.1-8



NOTES:

1. ALL RESULTS IN mg/L.
2. RESULTS FOR DEEP WELLS ARE FROM DOUBLE PACKER TESTS.

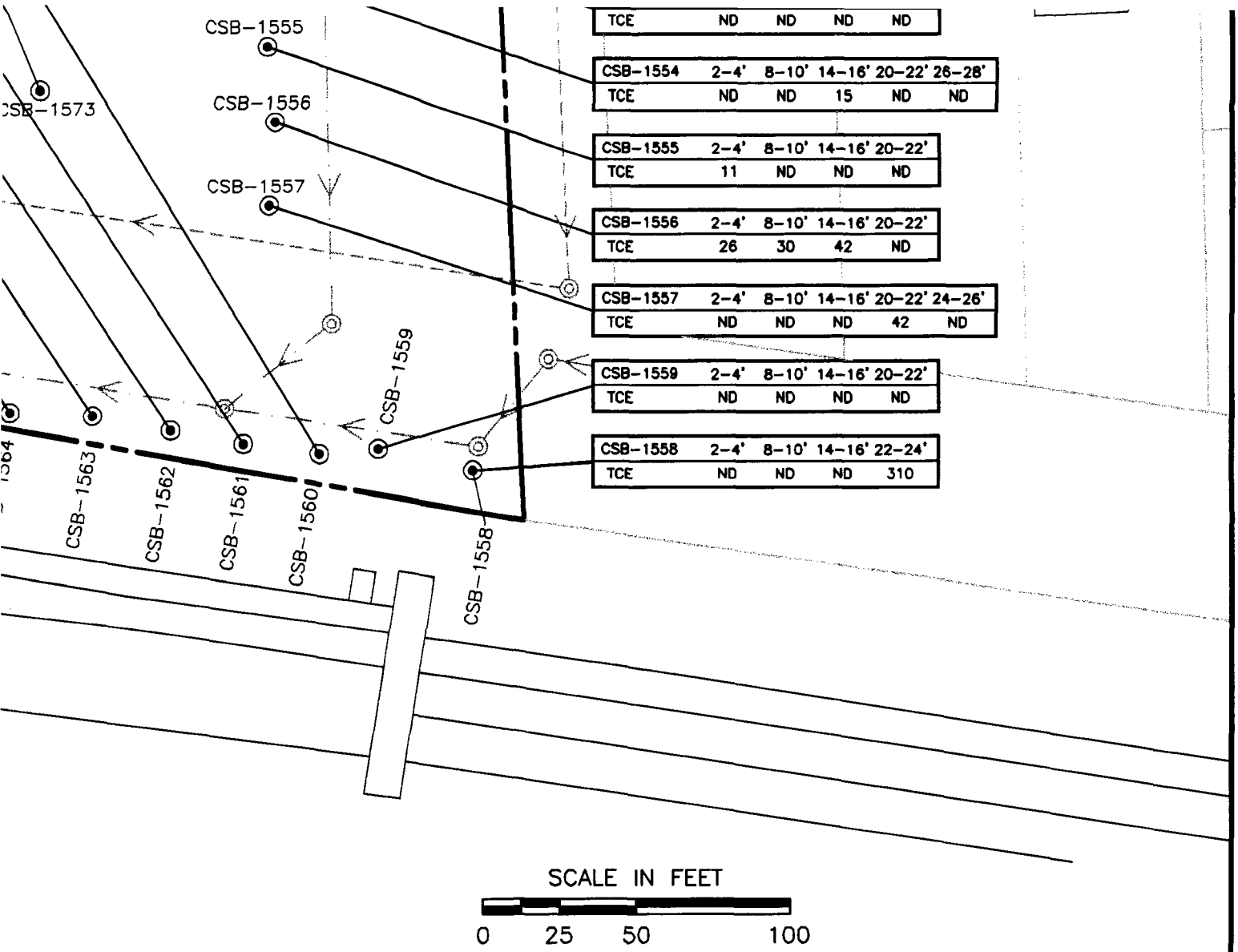
CHECK BY	
DRAWN BY	BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526308C
PRJ NO.	65263.01

MOST RECENT GROUNDWATER SAMPLING RESULTS
FROM MONITORING WELLS IN AREAS 1 AND 2

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 2.1-9



TCE	ND	ND	ND	ND	

CSB-1554	2-4'	8-10'	14-16'	20-22'	26-28'
TCE	ND	ND	15	ND	ND

CSB-1555	2-4'	8-10'	14-16'	20-22'
TCE	11	ND	ND	ND

CSB-1556	2-4'	8-10'	14-16'	20-22'
TCE	26	30	42	ND

CSB-1557	2-4'	8-10'	14-16'	20-22'	24-26'
TCE	ND	ND	ND	42	ND

CSB-1559	2-4'	8-10'	14-16'	20-22'
TCE	ND	ND	ND	ND

CSB-1558	2-4'	8-10'	14-16'	22-24'
TCE	ND	ND	ND	310

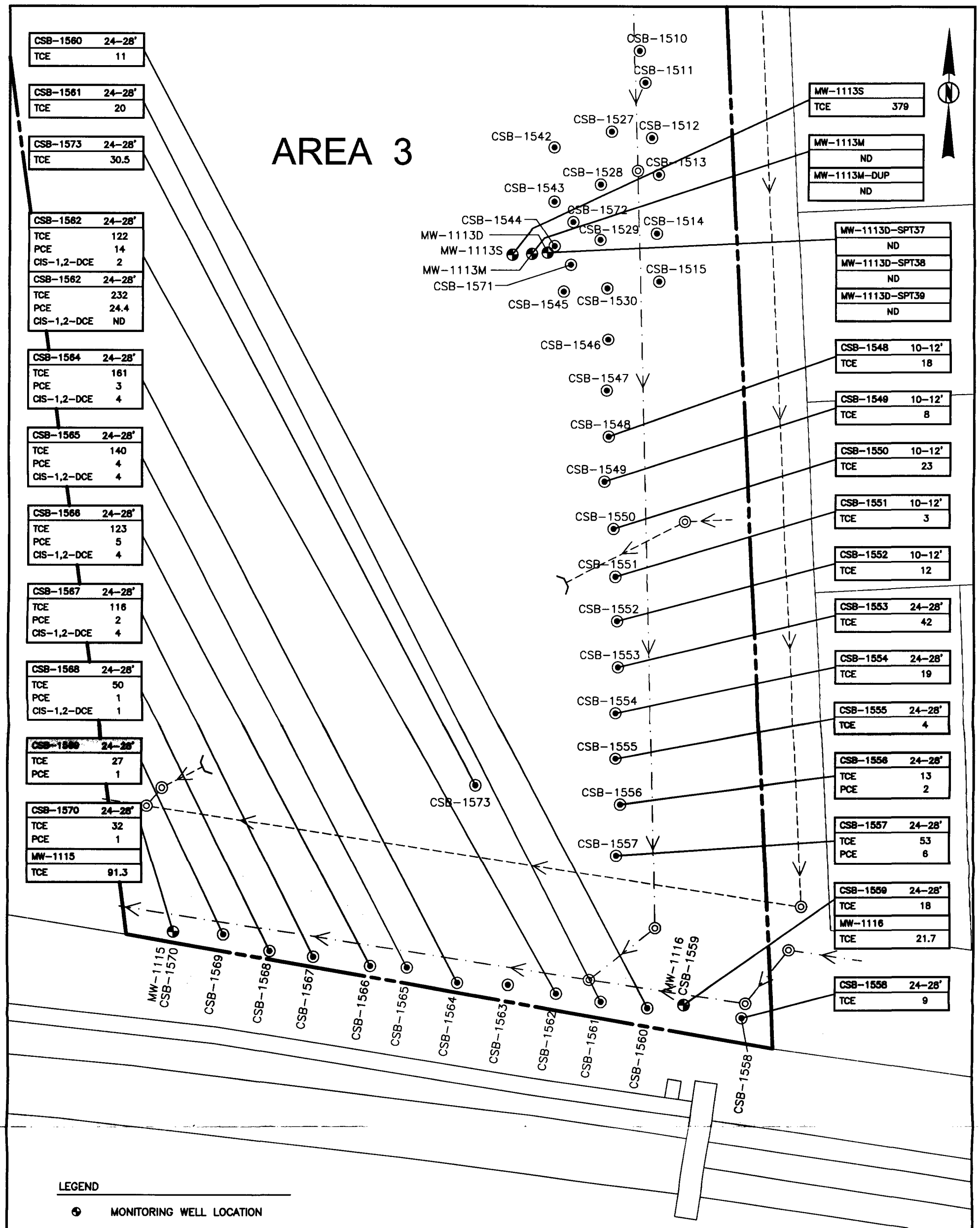
HECK BY	
RAWN BY	BCP
ATE	12-12-01
CALE	AS SHOWN
AD NO.	6526303E
RJ NO.	65263.01

SUMMARY OF RESULTS FROM THE
1500-SERIES BORINGS IN AREA 3

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton
GROUP SERVICES

FIGURE
2.2-1



CHECK BY	
DRAWN BY	BCP
DATE	12-12-01
SCALE	AS SHOWN
CAD NO.	6526303F
PRJ NO.	65263.01

SUMMARY OF THE GROUNDWATER SAMPLING RESULTS FROM MONITORING WELLS AND THE 1500-SERIES BORINGS IN AREA 3

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2.2-2

N

SEMI-REGIONAL SURFACE WATER AND GROUND WATER MEASUREMENT POINTS

Legend

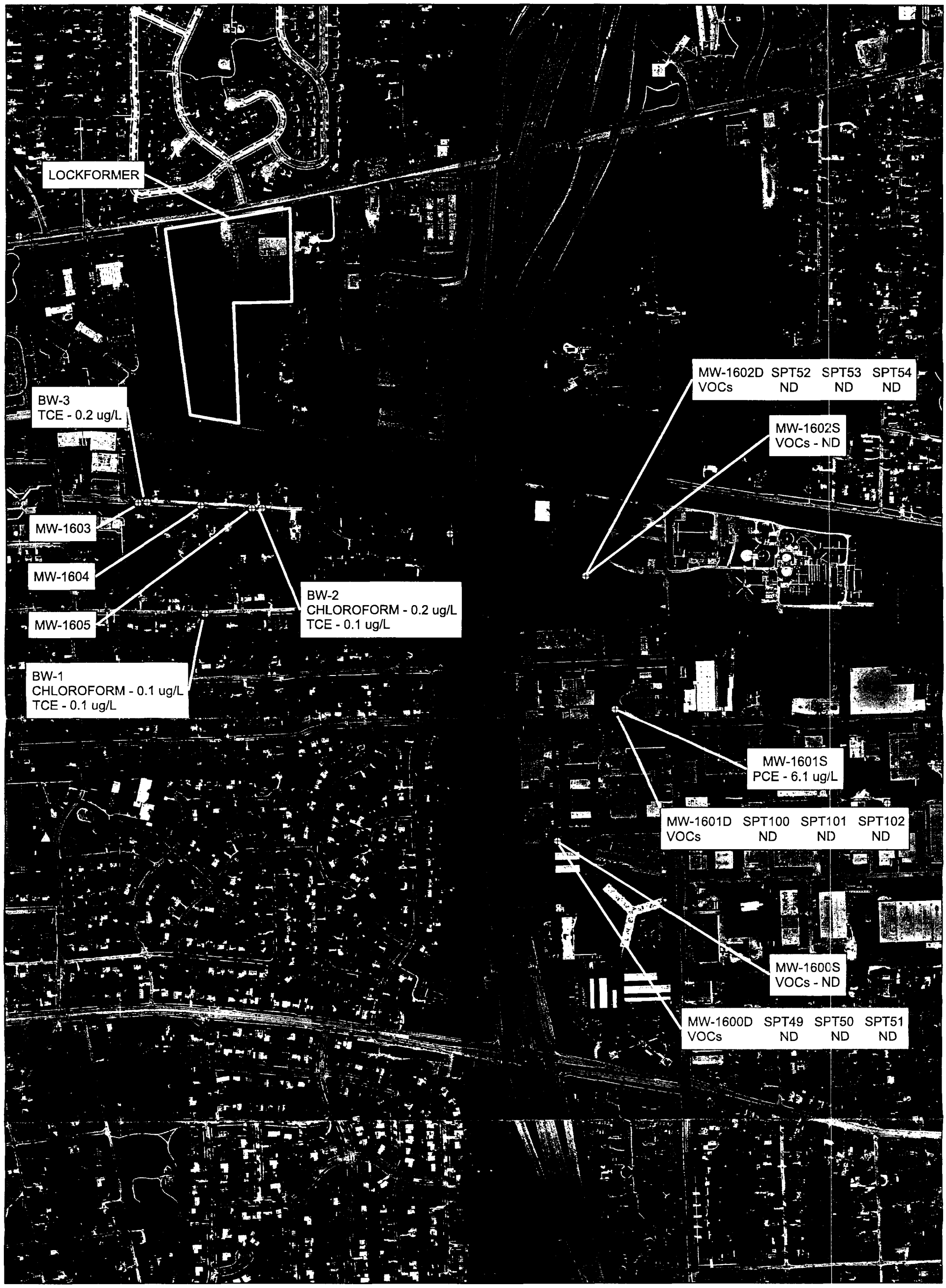
SAMPLE SITE LOCATION

0 2,400 4,800 7,200 9,600 Feet

Project: 15-65263.01
GWT_1205.MXD
Date: 12/07/01
Drawn By SFS

Clayton GROUP SERVICES

FIGURE 2.3-1



N

OFFSITE GROUNDWATER MONITORING RESULTS
THE LOCKFORMER COMPANY / LISLE, ILLINOIS

Legend

⊕ MONITORING WELL LOCATION

ND - NO DETECTIONS

0 700 1,400 2,100 2,800 Feet

Project: 15-65263.01
OFF_SITE_GW.MXD
Date: 12/07/01
Drawn By SFS

Clayton GROUP SERVICES

FIGURE 2.3-2

TABLES

TABLE 2.1-1

Clayton Soil Borings Inside the Facility Building

Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION											
			CSB-1300			CSB-1301			CSB-1302			CSB-1303		
			2-4 ft	4-6 ft	12-14 ft	6-8 ft	10-12 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	2-4 ft	4-6 ft	14-16 ft
			CL	CL	ML	CL	CL	CL	CL	CL	CL	sand fill	sand fill	CL
	(a)	(b)	5/18/01	5/18/01	5/18/01	5/18/01	5/18/01	5/18/01	5/21/01	5/21/01	5/21/01	5/21/01	5/21/01	5/21/01
Acetone	100,000	16	<0.010	<0.010	<0.010	**0.179**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Bromoform	15	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	**0.036**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
Chloroform	0.54	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	**0.157**	**0.555**	**0.0084**	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	**0.0026**	**0.0212**	**0.0015**	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	**0.005**	**0.005**	**0.005**	<0.005	<0.005	<0.005	<0.100	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005
Trichloroethene	8.9	0.06	**0.0097**	**3.61**	<0.005	**0.0036**	**0.051**	**0.0027**	<0.005	<0.005	<0.005	<0.005	**1.07**	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.

b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.

c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742

NE = Not Established SRO = Soil Remediation Objective

Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).

Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-1
Clayton Soil Borings Inside the Facility Building
Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION											
			CSB-1304			CSB-1305			CSB-1306			CSB-1307		
			2-4 ft	8-10 ft	14-16 ft	8-10 ft	10-12 ft	14-16 ft	4-6 ft	10-12 ft	14-16 ft	8-10 ft	10-12 ft	14-16 ft
			CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
	(a)	(b)	5/21/01	5/21/01	5/21/01	5/21/01	5/21/01	5/21/01	5/18/01	5/18/01	5/18/01	5/18/01	5/18/01	5/18/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.1**	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	15	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.
b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.
c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742
NE = Not Established SRO = Soil Remediation Objective
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-1
Clayton Soil Borings Inside the Facility Building
Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION											
			CSB-1308			CSB-1309			CSB-1310			CSB-1311		
			2-4 ft	12-14 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	0-2 ft	2-4 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft
			CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
	(a)	(b)	5/18/01	5/18/01	5/18/01	5/17/01	5/17/01	5/17/01	5/17/01	5/17/01	5/17/01	5/17/01	5/17/01	5/17/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	**0.085**	<0.010	<0.010	<0.010	<0.010	<0.010	**0.131**	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	15	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	**0.0129**	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**0.0048**	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0158**	**0.0683**	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.
b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.
c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742
NE = Not Established SRO = Soil Remediation Objective
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-1
Clayton Soil Borings Inside the Facility Building
Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION											
			CSB-1312			CSB-1313			CSB-1314			CSB-1315		
			2-4 ft	8-10 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	4-6 ft	8-10 ft	14-16 ft	4-6 ft	6-8 ft	14-16 ft
			CL	CL	CL	CL	CL	CL	CL	CL	CL	sand fill	CL	CL
	(a)	(b)	5/17/01	5/17/01	5/17/01	5/21/01	5/21/01	5/21/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Bromoform	15	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
Chloroform	0.54	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
1,1,1-Trichloroethane	1,200	2	**0.005**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.100	<0.005
Trichloroethene	8.9	0.06	<0.005	<0.005	<0.005	**0.0296**	<0.005	<0.005	<0.005	<0.005	<0.005	**2.52**	**14.7**	**0.011**
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0055**	<0.005	<0.100	<0.100	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.
b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.
c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742
NE = Not Established SRO = Soil Remediation Objective
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-1
Clayton Soil Borings Inside the Facility Building
Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION													
			CSB-1316			CSB-1317			CSB-1318					CSB-1319		
			2-4 ft	4-6 ft	14-16 ft	2-4 ft	4-6 ft	14-16 ft	4-6 ft	6-8 ft	10-12 ft	12-14 ft	16-18 ft	0-2 ft	2-4 ft	14-16 ft
			CL	CL	CL	CL	CL	CL	sand fill	CL	CL	CL	CL	sand fill	CL	CL
	(a)	(b)	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/22/01	5/23/01	5/23/01	5/23/01
Acetone	100,000	16	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
Benzene	1.6	0.03	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Bromodichloromethane	3,000	0.6	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Bromoform	15	0.8	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Bromomethane	NE	0.2	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
2-Butanone	NE	NE	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
Carbon disulfide	720	32	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Carbon tetrachloride	0.64	0.07	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Chlorobenzene	210	1	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Chlorodibromomethane	1,300	0.4	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Chloroethane	NE	NE	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
Chloroform	0.54	0.6	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Chloromethane	NE	NE	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
1,1,-Dichloroethane	1,700	23	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
1,2-Dichloroethane	0.7	0.02	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.100	<0.005	<0.005	<0.100	**0.0308**	<0.005	**1.01**	**12.4**	**8.67**	**2.9**	**0.0355**	<0.100	<0.100	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	**0.219**	**0.16**	**0.0053**	<0.100	<0.100	<0.005
1,2-Dichloropropane	23	0.03	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
trans,1,3-Dichloropropene			<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Ethyl benzene	400	13	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
2-Hexanone	NE	NE	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
4-Methyl-2-pentanone	NE	NE	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
Methylene chloride	24	0.02	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Styrene	1,500	4	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Tetrachloroethene	20	0.06	**0.465**	**0.0182**	<0.005	**5.81**	**0.0284**	<0.005	**1.32**	<0.100	<0.100	<0.100	<0.005	<0.100	**0.216**	<0.005
Toluene	650	12	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
1,1,1-Trichloroethane	1,200	2	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005
Trichloroethene	8.9	0.06	**23.3**	**6.37**	**0.0039 J**	**147**	**9.2**	<0.005	**81.3**	<0.100	**3.35**	**4.6**	**0.0356**	**5.04**	**26.4**	<0.005
Vinyl acetate	1,600	170	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
Vinyl chloride	1.1	0.01	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.010	<0.100	<0.100	<0.010
Xylenes (total)	320	150	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.
b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.
c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742
NE = Not Established SRO = Soil Remediation Objective
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-1
Clayton Soil Borings Inside the Facility Building
Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION											
			CSB-1320			CSB-1321			CSB-1322			CSB-1323		
			2-4 ft	4-6 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft
			sand fill	sand fill	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
	(a)	(b)	5/23/01	5/23/01	5/23/01	5/24/01	5/24/01	5/24/01	5/24/01	5/24/01	5/24/01	5/24/01	5/24/01	5/24/01
Acetone	100,000	16	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	**0.0915**	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	15	0.8	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.6	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	**0.0111**	<0.005	<0.005	**0.0119**	<0.005	<0.005
Toluene	650	12	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**1.53**	**10.6**	**0.0064**	<0.005	<0.005	<0.005	**0.480**	<0.005	<0.005	**0.26**	<0.005	<0.005
Vinyl acetate	1,600	170	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.
b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.
c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742
NE = Not Established SRO = Soil Remediation Objective
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = *Detected* **Bold** = *Exceeds Objective*

TABLE 2.1-1
Clayton Soil Borings Inside the Facility Building
Around the Storm and Sanitary Sewer, and the Vapor Degreaser

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill	RAO for Mass Waste Unit	SAMPLE LOCATION												
			CSB-1324			CSB-1325			CSB-1326			CSB-1327			CSB-1328
			2-4 ft	8-10 ft	14-16 ft	0-2 ft	2-4 ft	14-16 ft	2-4 ft	4-6 ft	14-16 ft	2-4 ft	10-12 ft	14-16 ft	0-2 ft
			CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	GP	CL
	(a)	(b)	5/24/01	5/24/01	5/24/01	5/23/01	5/23/01	5/23/01	5/23/01	5/23/01	5/23/01	5/25/01	5/25/01	5/25/01	5/25/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	15	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**0.0147**	**0.168**	<0.005	<0.005	<0.005	<0.005	**0.0056**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	**0.0089**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	*400*	13	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	**0.0062**	<0.005	<0.005	**0.0053**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	*650*	12	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	**0.0193**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**8.56**	**0.0079**	<0.005	**5.62**	**14.7**	<0.005	**3.67**	**4.27**	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: a = Value based on industrial/commercial worker SRO for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.

b = TACO Tier 1 SRO for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.

c = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742

NE = Not Established SRO = Soil Remediation Objective

Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).

Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-2
Clayton Soil Boring Results
Around South Exterior Door

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE											
			CSB-1401			CSB-1402			CSB-1403			CSB-1404		
			0-2 ft	8-10 ft	14-16 ft	0-2 ft	8-10 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	2-4 ft	4-6 ft	14-16 ft
			CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
			5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01
Acetone	100,000	16	**0.0844**	**0.0227**	**0.0206**	**0.0704**	**0.0269**	**0.0311**	**0.0141**	**0.0156**	**0.0276**	<0.010	**0.0416**	**0.0454**
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	**0.0012**	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0019**	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.005	**0.0016**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	**0.0081**	**0.0035**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	**0.0056**	<0.005	<0.005	**0.0065**	<0.005	<0.005	<0.005	<0.005	**0.0042**	<0.005	**0.0042**	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<0.005	**0.0018**	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0033**	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0028**	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	**0.0068**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	**0.0016**	<0.005	<0.005	**0.0016**	<0.005	**0.0017**	**0.0018**	<0.005	**0.0014**	**0.0021**	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	<0.005	<0.005	<0.005	<0.005	**0.0089**	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0017**	<0.005
Vinyl Acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	1.1	0.01	<0.010	<0.010	**0.0021**	<0.010	<0.010	**0.0059**	<0.010	<0.010	**0.0057**	<0.010	<0.010	**0.0031**
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES:
[a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
NE = Not Established
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-2
Clayton Soil Boring Results
Around South Exterior Door

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE											
			CSB-1405			CSB-1406			CSB-1407			CSB-1408		
			2-4 ft	8-10 ft	14-16 ft	0-2 ft	8-10 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft	2-4 ft	8-10 ft	14-16 ft
			CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
			5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01	5/30/01
Acetone	100,000	16	**0.0199**	**0.0154**	**0.0144**	**0.109**	**0.0942**	**0.0215**	**0.0873**	**0.0799**	**0.0255**	**0.199**	**0.0523**	**0.0184**
Benzene	1.6	0.03	**0.0012**	<0.005	**0.0014**	<0.005	<0.005	**0.0015**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	**0.0106**	<0.010	**0.0070**	**0.0053**	<0.010	**0.0245**	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0043**	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	**0.0031**	**0.0031**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	1,700	23	<0.005	**0.0057**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethene	1,200	0.4	<0.005	**0.0048**	**0.0025**	<0.005	**0.0055**	**0.0107**	<0.005	<0.005	<0.005	<0.005	**0.0072**	<0.005
trans-1,2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	**0.0072**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	**0.0011**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	**0.002**	**0.0012**	**0.0023**	<0.005	<0.005	**0.002**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	**0.0243**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**0.0018**	**0.0632**	<0.005	**0.0063**	<0.005	<0.005	<0.005	**0.0052**	<0.005	**0.0029**	**0.0062**	<0.005
Vinyl Acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	1.1	0.01	<0.010	<0.010	**0.0014**	<0.010	**0.0088**	**0.0026**	<0.010	<0.010	**0.0016**	<0.010	**0.0057**	**0.0024**
Xylenes (total)	320	150	**0.0019**	**0.0016**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES:
[a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
NE = Not Established
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-3
Soil Analytical Results
Sewer System Sediment

The Lockformer Company / Lisle, Illinois

COMPOUNDS	*TACO Tier 1 Soil Remediation Objectives	SAMPLE LOCATION / COLLECTION DATE		
		MH-1 6/26/01	MH-4 6/26/01	CB-1 6/26/01
Acetone	16	<0.010	<0.010	<0.010
Benzene	0.03	<0.005	<0.005	<0.005
Bromodichloromethane	0.6	<0.005	<0.005	<0.005
Bromoform	0.8	<0.005	<0.005	<0.005
Bromomethane	0.2	<0.010	<0.010	<0.010
2-Butanone	NE	<0.010	<0.010	<0.010
Carbon disulfide	32	<0.005	<0.005	<0.005
Carbon tetrachloride	0.07	<0.005	<0.005	<0.005
Chlorobenzene	1	<0.005	<0.005	<0.005
Chlorodibromomethane	0.4	<0.005	<0.005	<0.005
Chloroethane	NE	<0.010	<0.010	<0.010
Chloroform	0.3	<0.005	<0.005	<0.005
Chloromethane	NE	<0.010	<0.010	<0.010
1,1,-Dichloroethane	23	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.02	<0.005	<0.005	<0.005
1,1,-Dichloroethene	0.06	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	0.4	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	0.7	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.03	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	0.004	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene		<0.005	<0.005	<0.005
Ethyl benzene	13	<0.005	<0.005	<0.005
2-Hexanone	NE	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	<0.010	<0.010	<0.010
Methylene chloride	0.02	<0.005	<0.005	<0.005
Styrene	4	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	<0.005	<0.005	<0.005
Tetrachloroethene	0.06	<0.005	<0.005	<0.005
Toluene	12	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	2	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.02	<0.005	<0.005	<0.005
Trichloroethene	0.06	<0.005	<0.005	<0.005
Vinyl acetate	170	<0.010	<0.010	<0.010
Vinyl chloride	0.01	<0.010	<0.010	<0.010
Xylenes (total)	150	<0.005	<0.005	<0.005

NOTES:

* = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE									
			CSB-1200					CSB-1201				
			6-8 ft	12-14 ft	32-34 ft	46-48 ft	48-50 ft	6-8 ft	14-16 ft	20-22 ft	52-54 ft	56-58 ft
			CL	CL	CL	SW	CL	CL	CL	CL	SW	CL
			4/22/01	4/22/01	4/22/01	4/22/01	4/22/01	4/22/01	4/22/01	4/22/01	4/22/01	4/22/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	**0.0279**	<0.010	<0.100	<0.010
Benzene	1.6	0.03	<0.005	**0.0068**	<0.005	<0.005	<0.005	<0.100	**0.0114**	<0.005	<0.100	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Bromoform	100	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Carbon tetrachloride	*0.64*	*0.07*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.100*	*<0.005*	*<0.005*	*<0.100*	*<0.005*
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
Chloroform	0.54	0.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0123**	<0.005	<0.100	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0899**	**0.081**	<0.100	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0074**	<0.005	<0.100	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0608**	**0.0428**	<0.100	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**0.2**	<0.005	<0.005	<0.005	<0.005	**3.47**	**3.49**	**0.0805**	<0.100	<0.005
trans,1-2-Dichloroethene	3,100	0.7	**0.0205**	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0232**	**0.015**	<0.100	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.119**	<0.005	<0.100	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	**0.0076**	<0.005	**0.538**	**11.5**	<0.005	**0.336**	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0315**	<0.005	<0.100	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	**0.0135**	<0.005	**0.0011**	<0.005	<0.100	**0.0311**	<0.005	<0.100	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0163**	<0.005	<0.100	<0.005
Trichloroethene	8.9	0.06	<0.005	**103**	**0.609**	**60.9**	**2.14**	**28.9**	**2,280**	**65.4**	**42.3**	**0.0064**
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	**0.0149**	**0.0287**	<0.100	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.100	**0.0018**	<0.005	<0.100	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE											
			CSB-1202											
			8-10 ft	12-14 ft	26-28 ft	38-40 ft	48-50 ft	50-52 ft	56-58 ft	60-62 ft	66-68 ft	72-74 ft	78-80 ft	82-84 ft
			CL	CL	CL	GP	CL	CL	CL	CL	SP	SP	wthr bed	wthr bed
			4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01	4/23/01
Acetone	100,000	16	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<1.000	**4.86**	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**12.3**	**55**	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<1.000	**1.95**	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<1.000	<1.000	<0.005	**0.371**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	**24.2**	**89**	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**99.2**	**512**	<0.005	**11.6**	**0.79**	**0.0074**	**0.472**	**0.0149**	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<1.000	<1.000	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<1.000	<1.000	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE												
			CSB-1203					CSB-1204							
			8-10 ft	10-12 ft	22-24 ft	30-32 ft	48-50 ft	6-8 ft	10-12 ft	26-28 ft	30-32 ft	42-44 ft	50-52 ft	53 ft	56-58 ft
			CL	CL	CL	GP	CL	CL	CL	CL	SW	SW	CL	CL	SM
			4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01	4/24/01
Acetone	100,000	16	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**38.9**	**33.2**	<0.005	<0.100	<0.005	**4.64**	**8.27**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<1.000	<1.000	<0.005	<0.100	<0.005	**0.333**	**0.263**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	**0.123**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	**0.0073**	**0.0126**	<0.005	<0.005	<0.005
Toluene	650	12	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	**4.13**	**10.8**	<0.005	<0.100	<0.005	**0.0208**	**0.432**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**156**	**206**	<0.005	**3.09**	<0.005	**5.83**	**51.2**	**0.0054**	**0.59**	**1.1**	<0.005	**0.0055**	<0.005
Vinyl acetate	1,600	170	<1.000	<1.000	<0.010	<0.100	<0.010	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<1.000	<1.000	<0.010	<0.100	<0.010	**0.531**	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<1.000	<1.000	<0.005	<0.100	<0.005	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay TIII/FIII[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE							
			CSB-1205							
			8-10 ft	10-12 ft	20-22 ft	34-36 ft	44-46 ft	46-48 ft	50-52 ft	56-58 ft
			CL	CL	CL	SP	CL	CL	CL	SW
			4/25/01	4/25/01	4/25/01	4/25/01	4/25/01	4/25/01	4/25/01	4/25/01
Acetone	100,000	16	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**1.96**	**4.16**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.100	**0.0256**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.100	<0.005	<0.005	**0.0165**	**0.0143**	<0.005	<0.005	<0.005
Toluene	650	12	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.100	**0.035**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**116**	**172**	**0.0725**	**0.913**	**0.634**	**0.624**	**0.0123**	**0.0041**
Vinyl acetate	1,600	170	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE							
			CSB-1206							
			2-4 ft	10-12 ft	22-24 ft	36-38 ft	44-46 ft	48-50 ft	52-54 ft	58-60 ft
			CL	CL	CL	SW	SW	CL	CL	SM
			5/1/01	5/1/01	5/1/01	5/1/01	5/1/01	5/1/01	5/1/01	5/1/01
Acetone	100,000	16	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Carbon tetrachloride	*0.64*	*0.07*	*<0.005*	*<0.100*	*<0.005*	*<0.100*	*<0.100*	*<0.005*	*<0.005*	*<0.005*
Chlorobenzene	210	1	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**0.593**	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	**0.0143**	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.100	<0.005	**0.239**	**0.218**	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	**0.005**	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	*1,800*	*0.02*	*<0.005*	*<0.100*	*<0.005*	*<0.100*	*<0.100*	*<0.005*	*<0.005*	*<0.005*
Trichloroethene	8.9	0.06	<0.005	**5.23**	<0.005	**8.36**	**6.24**	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.100	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.100	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE								
			CSB-1207								
			6-8 ft	12-14 ft	22-24 ft	30-32 ft	36-38 ft	44-46 ft	50-52 ft	58-60 ft	74-76 ft
			CL	CL	CL	CL	GW	GW	CL	CL	SM
			5/1/01	5/1/01	5/1/01	5/1/01	5/1/01	5/1/01	5/2/02	5/2/02	5/2/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	**0.0085**	**0.0214**	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	**0.0057**	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	<0.005	<0.005	<0.005	<0.005	**0.914**	**20.1**	**0.115**	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE							
			CSB-1208							
			8-10 ft	12-14 ft	28-30 ft	32-34 ft	44-46 ft	48-50 ft	52-54 ft	62-64 ft
			CL	CL	CL	GW	SP	CL	CL	SM
			5/2/02	5/2/02	5/2/02	5/2/02	5/2/02	5/2/02	5/2/02	5/2/02
Acetone	100,000	16	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	**0.0062**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	**0.0109**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	**0.109**	**0.175**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	**0.0337**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	**0.0779**	**0.111**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**38**	**30**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	**0.656**	**0.716**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	**0.0317**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	**0.015**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**15.4**	**2.94**	**0.582**	**0.11**	**0.911**	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	**0.031**	**0.127**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE								
			CSB-1209								
			8-10 ft	12-14 ft	22-24 ft	28-30 ft	34-36 ft	40-42 ft	46-48 ft	52-54 ft	64-66 ft
			CL	CL	CL	CL	SP	SP	CL	CL	SP
			5/4/01	5/4/01	5/4/01	5/4/01	5/4/01	5/4/01	5/4/01	5/4/01	5/4/01
Acetone	100,000	16	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**19.2**	**21.4**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	**0.365**	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**2.36**	**3.91**	<0.005	<0.005	**0.0576**	**0.118**	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<1.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<1.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE								
			CSB-1210								
			6-8 ft	10-12 ft	24-26 ft	36-38 ft	42-44 ft	48-50 ft	54-56 ft	58-60 ft	68-70 ft
			CL	CL	CL	SP	SP	CL	SM	SM	SM
			5/4/01	5/5/01	5/5/01	5/5/01	5/5/01	5/5/01	5/5/01	5/5/01	5/5/01
Acetone	100,000	16	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	**1**	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**6.56**	**13.2**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<1.000	**0.414**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	**1.2**	**0.45**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<1.000	**0.181**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**18.9**	**74.5**	<0.005	**0.194**	**0.816**	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<1.000	<0.100	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<1.000	<0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4
Soil Sample Results
1200 Series Borings in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE								
			MW-1108S								
			2-4 ft	14-16 ft	20-22 ft	28-30 ft	36-38 ft	46-48 ft	48-50 ft	56-58 ft	64-66 ft
			CL	CL	CL	CL	SP	SP	CL	CL	SP
			5/3/01	5/3/01	5/3/01	5/3/01	5/3/01	5/3/01	5/3/01	5/3/01	5/3/01
Acetone	100,000	16	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Bromoform	100	0.8	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,2-Dichloroethane	*0.7*	*0.02*	*<5.000*	*<1.000*	*<0.005*	*<0.005*	*<0.100*	*<0.100*	*<0.005*	*<0.005*	*<0.005*
1,1,-Dichloroethene	1,500	0.06	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	**38.2**	**11.6**	**0.0033**	**0.0032**	**0.182**	<0.100	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Styrene	1,500	4	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	**18**	**14.7**	<0.005	<0.005	**0.394**	**0.408**	<0.005	<0.005	<0.005
Toluene	650	12	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	**765**	**2,220**	**0.0107**	**0.0686**	**16.8**	**34.9**	**0.0186**	**0.0198**	**0.0048**
Vinyl acetate	1,600	170	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<5.000	<1.000	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<5.000	<1.000	<0.005	<0.005	<0.100	<0.100	<0.005	<0.005	<0.005

NOTES: [a] = Most conservative soil remediation objective established in 35 IAC 742.Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds Objective

TABLE 2.1-4A
Soil Analytical Results
1100 Series Soil Borings

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for Surficial Silty Clay Till/Fill[b]	RAO for Mass Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE												
			CSB-126B				CSB-521B			MW-1100D		MW-1102D	MW-1107D	MW-1110D	
			10-12 ft	18-20 ft	42-44 ft	44-46 ft	8-10 ft	12-14 ft	28-30 ft	33 ft	35 ft	39 ft	10-15 ft	6-8 ft	8-10 ft
			CL	GP	GP	CL	CL	CL	GP	SP	SP	CL	CL	CL	GP
			9/6/01	9/6/01	9/6/01	9/6/01	9/8/01	9/8/01	9/8/01	3/1/01	3/1/01	3/2/01	3/21/01	8/22/01	8/22/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	720	32	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES:
[a] = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds objective

TABLE 2.1-4A
Soil Analytical Results
1100 Series Soil Borings

The Lockformer Company / Lisle, Illinois

COMPOUNDS	RAO for *Surficial* Silty Clay Till/Fill[b]	RAO for *Mass* Waste Unit[a]	SAMPLE LOCATION, DEPTH, MATERIAL[c] AND COLLECTION DATE								
			MW-1112S				MW-1113D		MW-1114D		
			0-2 ft	2-4 ft	10-12 ft	22-24 ft	16-18 ft	32-34 ft	10-12 ft	28-30 ft	36-38 ft
			CL	CL	GP	GP	GP	GP	CL	GP	CL
			8/26/01	8/26/01	8/26/01	8/26/01	9/7/01	9/7/01	9/8/01	9/8/01	9/8/01
Acetone	100,000	16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	1.6	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	3,000	0.6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	100	0.8	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	NE	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon disulfide	*720*	*32*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*
Carbon tetrachloride	0.64	0.07	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	210	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	1,300	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.54	0.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1,-Dichloroethane	1,700	23	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.7	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,-Dichloroethene	1,500	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-2-Dichloroethene	1,200	0.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1-2-Dichloroethene	3,100	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	23	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis,1-3-Dichloropropene	2.1	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans,1,3-Dichloropropene			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethyl benzene	400	13	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene chloride	24	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	1,500	4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	20	0.06	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	650	12	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	1,200	2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	1,800	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	8.9	0.06	<0.005	<0.005	<0.005	<0.005	**0.0183**	**0.0128**	<0.005	<0.005	<0.005
Vinyl acetate	1,600	170	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	1.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (total)	320	150	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES:
[a] = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.
[b] = TACO Tier 1soil remediation objective for industrial/commercial inhalation exposure route established in 35 IAC 742 Appendix B.Table B.
[c] = Unified Soil Classification System (USCS).
Values expressed in milligrams per kilogram (mg/kg) or parts per million (ppm).
NE = Not Established
Bold = Detected **Bold** = Exceeds objective

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1203			CSB-1204			
	43 ft 4/24/01	46 ft 4/24/01	53 ft 4/24/01	5 ft 4/24/01	25 ft 4/24/01	33 ft 4/24/01	46 ft 4/24/01
Non-Carbonate Organic Carbon (%)	0.1805	0.9225	0.669	0.7725	0.8055	0.376	0.283
Grain Size (USCS)	Sandy Gravel, Little Silt, **GP-GM**	Silty Clay, Trace Sand, Trace Gravel, **CL**	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Silty Clay, Little Sand, Trace Gravel, **CL**	Sand, Some Gravel, Little Silt, **SW-SM**	Sandy Gravel, Trace Silt, Trace Clay, **GW-GM**
Moisture Content (%)	NA	18.3	17.9	27.8	21.4	NA	NA
Specific Gravity	2.70	2.75	2.75	2.75	2.75	2.70	2.70
Bulk Density (pounds/ft^3)	NA	132.3	132.8	121.4	128.8	NA	NA

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1204				CSB-1205		
	50 ft 4/24/01	54 ft 4/24/01	56 ft 4/24/01	70 ft 4/24/01	5 ft 4/25/01	26 ft 4/25/01	32 ft 4/25/01
Non-Carbonate Organic Carbon (%)	0.872	0.8825	0.243	0.0979	0.544	0.812	0.268
Grain Size (USCS)	Silty Clay, Trace Sand, Trace Gravel, **CL**	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Silty Clay, Little Sand, Trace Gravel, **CL**	Sand, Some Gravel, Little Silt, **SP-SM**
Moisture Content (%)	21.7	22.8	11.4	15.3	22.0	22.6	NA
Specific Gravity	2.75	2.75	2.79	2.79	2.79	2.75	2.70
Bulk Density (pounds/ft^3)	129.0	126.5	143.8	137.5	125.2	127.0	NA

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1205					CSB-1206	
	45 ft 4/25/01	49 ft 4/25/01	54 ft 4/25/01	60 ft 4/25/01	73 ft 4/25/01	3 ft 5/1/01	33 ft 5/1/01
Non-Carbonate Organic Carbon (%)	0.2635	0.5115	0.8635	0.1835	0.0772	0.5505	0.8435
Grain Size (USCS)	Gravelly Sand, Little Silt, **SW-SM**	Silty Clay, Some Sand, **CL**	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Little Gravel, **CL**	Sand, Little Silt, **SP-SM**	Silty Clay, Little Sand, Trace Gravel, **CL**	Silty Clay, Little Sand, Trace Gravel, **CL**
Moisture Content (%)	NA	14.3	20.8	8.6	NA	20.0	22.5
Specific Gravity	2.70	2.79	2.75	2.79	2.70	2.75	2.75
Bulk Density (pounds/ft^3)	NA	139.1	128.5	149.6	NA	129.8	127.3

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1206						
	36 ft 5/1/01	47 ft 5/1/01	49 ft 5/1/01	53 ft 5/1/01	56 ft 5/1/01	59 ft 5/1/01	75 ft 5/1/01
Non-Carbonate Organic Carbon (%)	0.2545	0.212	0.6325	0.825	0.688	0.172	0.0854
Grain Size (USCS)	Gravelly Sand, Little Silt, **SW-SM**	Sand, Trace Gravel, Some Silt, **SM**	Silty Clay, Trace Sand, **CL**	Silty Clay, Trace Sand, **CL**	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Clayey Sand, Trace Gravel, **SC**
Moisture Content (%)	NA	NA	18.1	19.1	22.9	10.5	16.1
Specific Gravity	2.70	2.70	2.75	2.75	2.75	2.79	2.78
Bulk Density (pounds/ft^3)	NA	NA	132.8	131.6	127.3	145.8	126.7

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1207						
	3 ft 5/1/01	33 ft 5/1/01	36 ft 5/1/01	47 ft 5/1/01	51 ft 5/1/01	64 ft 5/1/01	67 ft 5/1/01
Non-Carbonate Organic Carbon (%)	0.472	0.827	0.143	0.27	0.84	0.22	0.06
Grain Size (USCS)	Silty Clay, Some Sand, Trace Gravel, **CL**	Silty Clay, Little Sand, Trace Gravel, **CL**	Gravel, Some Sand, Little Silt, **GW-GM**	Sand, Little Gravel, Some Silt, **SM**	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Silty Sand, Trace Clay, **SM**
Moisture Content (%)	18.3	17.3	NA	NA	19.0	15.0	15.3
Specific Gravity	2.79	2.79	2.70	2.70	2.75	2.79	2.78
Bulk Density (pounds/ft^3)	133.3	134.8	NA	NA	130.9	137.8	134.3

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1207	CSB-1208					
	75 ft 5/1/01	5 ft 5/2/01	28 ft 5/2/01	32 ft 5/2/01	44 ft 5/2/01	47 ft 5/2/01	52 ft 5/2/01
Non-Carbonate Organic Carbon (%)	0.10	0.89	0.82	0.35	0.27	0.57	0.89
Grain Size (USCS)	Clayey Sand, **SM**	Silty Clay, Little Sand, Trace Gravel, **CL**	Silty Clay, Little Sand, Trace Gravel, **CL**	Sandy Gravel, Little Silt, **GW-GM**	Sand, Some Gravel, Trace Silt, **SP**	Silty Clay, Some Sand, Some Gravel, **CL**	Silty Clay, Trace Sand, **CL**
Moisture Content (%)	17.1	24.5	18.9	NA	NA	17.9	22.4
Specific Gravity	2.78	2.75	2.75	2.70	2.70	2.78	2.75
Bulk Density (pounds/ft^3)	129.1	124.2	131.2	NA	NA	130.9	127.0

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1208		CSB-1209				
	57 ft 5/2/01	71 ft 5/2/01	3 ft 5/4/01	29 ft 5/4/01	33 ft 5/4/01	44 ft 5/4/01	46 ft 5/4/01
Non-Carbonate Organic Carbon (%)	0.17	0.21	0.28	0.81	0.32	0.32	0.86
Grain Size (USCS)	Clayey Sand, Some Gravel, **SC**	Silty Clay, Little Sand, Trace Gravel, **CL**	Silty Clay, Little Sand, Little Gravel, **CL**	Silty Clay, Little Sand, Trace Gravel, **CL**	Sand, Some Gravel, Little Silt, **SP-SM**	Gravelly Sand, Little Silt, **SW-SM**	Silty Clay, Trace Sand, **CL**
Moisture Content (%)	10.9	13.4	19.7	21.8	NA	NA	21.0
Specific Gravity	2.78	2.79	2.79	2.75	2.70	2.70	2.75
Bulk Density (pounds/ft^3)	144.8	140.4	127.7	128.4	NA	NA	129.0

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1209			CSB-1210			
	52 ft 5/4/01	57 ft 5/4/01	70 ft 5/4/01	3 ft 5/4/01	28 ft 5/4/01	31 ft 5/4/01	45 ft 5/4/01
Non-Carbonate Organic Carbon (%)	0.84	0.23	0.08	0.48	0.83	0.24	0.31
Grain Size (USCS)	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Little Gravel, **CL**	Silt and Sand, **ML**	Silty Clay, Little Sand, Trace Gravel, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Sand, Some Gravel, Some Silt, **SM**	Sand, Some Gravel, Little Silt, **SP-SM**
Moisture Content (%)	21.9	13.9	17.5	18.3	16.5	NA	NA
Specific Gravity	2.75	2.79	2.79	2.79	2.79	2.70	2.70
Bulk Density (pounds/ft^3)	127.8	139.6	128.0	132.8	136.4	NA	NA

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE						
	CSB-1210				MW-1108S		
	46 ft 5/5/01	54 ft 5/5/01	57 ft 5/5/01	69 ft 5/5/01	4 ft 5/3/01	32 ft 5/3/01	35 ft 5/3/01
Non-Carbonate Organic Carbon (%)	0.85	0.91	0.45	0.09	0.57	0.82	0.10
Grain Size (USCS)	Silty Clay, Trace Sand, Trace Gravel, **CL**	Silty Clay, Trace Sand, **CL**	Silty Clay, Some Sand, Little Gravel, **CL**	Sand, Some Silt, **SC**	Silty Clay, Little Sand, Trace Gravel, **CL**	Silty Clay, Some Sand, Trace Gravel, **CL**	Sand, Little Gravel, Some Silt, **SM**
Moisture Content (%)	20.7	20.5	12.0	NA	22.7	17.0	NA
Specific Gravity	2.75	2.75	2.79	2.70	2.75	2.79	2.70
Bulk Density (pounds/ft^3)	129.2	129.5	143.0	NA	126.9	134.8	NA

TABLE 2.1-5
Geotechnical Analyses
Soils in the Immediate Vicinity of the TCE Fill Pipe

The Lockformer Company / Lisle, Illinois

COMPOUNDS	SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE				
	MW-1108S				
	45 ft 5/3/01	49 ft 5/3/01	55 ft 5/3/01	75 ft 5/3/01	60 ft 5/3/01
Non-Carbonate Organic Carbon (%)	0.33	0.74	0.93	0.13	0.23
Grain Size (USCS)	Sandy Gravel, Little Silt, **GP-GM**	Silty Clay, Trace Sand, **CL**	Silty Clay, Trace Sand, **CL**	Sand, Trace Silt, **SP**	Silty Clay, Some Sand, Some Gravel, **CL**
Moisture Content (%)	NA	19.3	18.9	NA	12.5
Specific Gravity	2.70	2.75	2.75	2.70	2.78
Bulk Density (pounds/ft^3)	NA	131.2	130.2	NA	142.2

TABLE 2.1-6
Sample Results from Monitoring Wells
Completed in the Glacial Sediments During the Lockformer Groundwater Investigation

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-101	MW-120	MW-123	MW-126	MW-401	MW-402	MW-500D	MW-501D	MW-502S	MW-504D	MW-508D	MW-513D
			6/21/01	6/21/01	6/20/01	6/15/01	6/15/01	6/19/01	6/21/01	6/19/01	6/14/01	6/13/01	6/12/01	6/12/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	**0.4950**	**0.0253**	<0.005	<0.005	<0.005	<0.005	**0.0062**	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	**0.0222**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	**0.0287**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	**20.900**	**0.0421**	<0.005	<0.005	<0.005	**0.4000**	**3.400**	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	**0.3710**	<0.005	<0.005	<0.005	<0.005	**0.0233**	**0.0734**	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	**0.0132**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	**2.470**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	**0.0263**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	**38.800**	<0.005	**0.0063**	<0.005	<0.005	**0.0097**	**1.690**	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	**0.0414**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-6

Sample Results from Monitoring Wells

Completed in the Glacial Sediments During the Lockformer Groundwater Investigation

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-514D 6/14/01	MW-515D 6/14/01	MW-515D *Duplicate 2* 6/14/01	MW-516D 6/20/01	MW-516D *Duplicate 3* 6/20/01	MW-517D 6/19/01	MW-521 6/18/01	MW-522 6/18/01	MW-1100S 6/11/01	MW-1101S 6/11/01	MW-1102S 6/6/01	MW-1102S *Duplicate 1* 6/6/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	**0.4560**	**0.4290**	**0.2310**	**0.2330**	**0.3460**	<0.005	**0.0570**	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	**0.0144**	**0.0143**	**0.0058**	**0.0061**	**0.0117**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	**0.2390**	**0.2480**	**0.0223**	**0.0094**	**0.2730**	<0.005	<0.005	**0.0149**	**0.0152**
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-6
Sample Results from Monitoring Wells
Completed in the Glacial Sediments During the Lockformer Groundwater Investigation

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-1103S 6/6/01	MW-1103M 6/5/01	MW-1104S 6/6/01	MW-1108S 6/12/01	MW-1109 6/19/01	MW-1110S 9/25/01	MW-1111S 9/25/01	MW-1112S 9/25/01	MW-1113S 9/26/01	MW-1113M 9/26/01	MW-1113M *Duplicate 4* 9/26/01	MW-1114S 9/26/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0084**
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	**0.0092**	<0.005	<0.005	<0.005	**0.379**	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742, Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-6
Sample Results from Monitoring Wells
Completed in the Glacial Sediments During the Lockformer Groundwater Investigation

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE					
	Class I	Class II	MW-1115 11/27/01	MW-1116 11/27/01	MW-1600S 11/26/01	MW-1601S 11/27/01	MW-1602S 11/26/01	MW-1602S *Duplicate 6* 11/26/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	**0.0061**	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	**0.0913**	**0.0217**	<0.005	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-7
Sample Results
Single Packer Tests Performed During Drilling of the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE										
			MW-1100D		MW-1101D			MW-1102D					MW-1102D
	Class I	Class II	PT-1 66.0-71.0 FT 3/31/01	PT-2 67.0-74.0 FT 3/31/01	PT-1 74.3-81.3 FT 4/17/01	PT-2 84.4-91.4 FT	PT-3 89.4-96.4 FT	PT-1 80.0-87.0 FT 4/2/01	PT-2 90.0-97.0 FT 4/2/01	PT-3 100.0-107.0 FT 4/2/01	PT-4 109.0-116.0 FT 4/2/01	DUP-1/PT-4 109.0-116.0 FT 4/2/01	PT-5 120.0-127.0 FT 4/3/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromodichloromethane	0.0002	0.0002	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromoform	0.001	0.001	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Carbon Tetrachloride	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorobenzene	0.1	0.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorodibromomethane	0.14	0.14	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloroethane	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloromethane	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloroethane	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1-Dichloroethene	0.007	0.035	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,2-Dichloroethene	0.07	0.2	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,2-Dichloroethene	0.1	0.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloropropane	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	0.7	1.0	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Styrene	0.1	0.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2,2-Tetrachloroethane	NE	NE	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tetrachloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	1.0	2.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,1-Trichloroethane	0.2	1.0	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2-Trichloroethane	0.005	0.05	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trichloroethene	0.005	0.025	**0.0011**	**0.0010**	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
NS = Not Sampled due to dry conditions.
* = 35 IAC 742.Appendix B, Table E.
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-7
Sample Results
Single Packer Tests Performed During Drilling of the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE										
			MW-1102D			MW-1103D						MW-1103D	
	Class I	Class II	PT-6 130.0-137.0 FT 4/3/01	PT-7 139.0-146.0 FT 4/4/01	PT-8 150.0-157 FT 4/4/01	PT-1 74.0-81.5 FT 4/9/01	PT-2 84.5-91.5 FT 4/9/01	PT-3 94.5-101.5 FT 4/10/01	PT-4 104.5-111.5 FT 4/10/01	PT-5 114.5-121.5 FT 4/10/01	PT-6 124.5-131.5 FT 4/10/01	DUP-2/PT-6 124.5-131.5 FT 4/10/01	PT-7 134.5-141.5 FT 4/10/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromodichloromethane	0.0002	0.0002	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromoform	0.001	0.001	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Carbon Tetrachloride	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorobenzene	0.1	0.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorodibromomethane	0.14	0.14	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloroethane	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1-Dichloroethene	0.007	0.035	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,2-Dichloroethene	0.07	0.2	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,2-Dichloroethene	0.1	0.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloropropane	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	0.7	1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Styrene	0.1	0.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2,2-Tetrachloroethane	NE	NE	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tetrachloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	1.0	2.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,1-Trichloroethane	0.2	1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2-Trichloroethane	0.005	0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trichloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
NS = Not Sampled due to dry conditions.
* = 35 IAC 742.Appendix B, Table E.
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-7
Sample Results
Single Packer Tests Performed During Drilling of the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE										
			MW-1103D		MW-1104D			MW-1105D			MW-1108D	MW-1110D	MW-1111D
	Class I	Class II	PT-8 144.5-151.5 FT 4/10/01	PT-9 147.0-154.0 FT 4/10/01	PT-1 74.5-81.5 FT 4/12/01	PT-2 84.5-91.5 FT	PT-3 92.0-99.5 FT	PT-1 80.0-88.0 FT 3/30/01	PT-2 92.0-99.0 FT 3/30/01	PT-3 97.0-104.0 FT 3/30/01	PT-1 86.0-96.0 FT 9/9/01	PT-1 56.0-66.0 FT 8/27/01	PT-1 56.0-66.0 FT 8/28/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromodichloromethane	0.0002	0.0002	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromoform	0.001	0.001	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Carbon Tetrachloride	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorobenzene	0.1	0.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorodibromomethane	0.14	0.14	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloroethane	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloromethane	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloroethane	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1-Dichloroethene	0.007	0.035	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,2-Dichloroethene	0.07	0.2	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,2-Dichloroethene	0.1	0.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloropropane	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	0.7	1.0	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Styrene	0.1	0.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2,2-Tetrachloroethane	NE	NE	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tetrachloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	**0.007**	<0.0050
Toluene	1.0	2.5	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,1-Trichloroethane	0.2	1.0	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2-Trichloroethane	0.005	0.05	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trichloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	NS	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.0050	<0.0050	<0.0050	NS	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
NS = Not Sampled due to dry conditions.
* = 35 IAC 742.Appendix B, Table E.
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-7
Sample Results
Single Packer Tests Performed During Drilling of the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION, DEPTH (bgs) AND COLLECTION DATE					
			MW-1112D	MW-1113D	MW-1114D	MW-1600D	MW-1601D	MW-1602D
	Class I	Class II	PT-1 55.5-66.0 FT 8/28/01	PT-1 66.0-76.0 FT 9/9/01	PT-1 77.0-82.0 FT 9/11/01	PT-1 102.0-112.0 FT 11/13/01	PT-1 84.0-92.0 FT 11/11/01	PT-1 67.0-77.0 FT 11/12/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromodichloromethane	0.0002	0.0002	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromoform	0.001	0.001	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Carbon Tetrachloride	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorobenzene	0.1	0.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chlorodibromomethane	0.14	0.14	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloroethane	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1-Dichloroethene	0.007	0.035	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,2-Dichloroethene	0.07	0.2	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,2-Dichloroethene	0.1	0.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloropropane	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cis-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trans-1,3-Dichloropropane	0.001	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	0.7	1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Styrene	0.1	0.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2,2-Tetrachloroethane	NE	NE	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tetrachloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	1.0	2.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,1-Trichloroethane	0.2	1.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,1,2-Trichloroethane	0.005	0.05	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trichloroethene	0.005	0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
NS = Not Sampled due to dry conditions.
* = 35 IAC 742.Appendix B, Table E.
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-8
Sample Results
Double Packer Tests Performed on the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-1102D-SPT1 6/11/01	MW-1102D-SPT2 6/12/01	MW-1102D-SPT3 6/12/01	MW-1102D-SPT4 6/13/01	MW-1102D-SPT5 6/13/01	MW-1102D-SPT6 6/13/01	MW-1102D-SPT7 6/14/01	MW-1102D-SPT8 6/14/01	MW-1102D-SPT9 6/14/01	MW-1103D-SPT10 6/15/01	MW-1103D-SPT11 6/15/01	MW-1103D-SPT12 6/15/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.282**	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-8
Sample Results
Double Packer Tests Performed on the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-1103D-SPT13	MW-1103D-SPT14	MW-1103D-SPT15	MW-1103D-SPT16	MW-1103D-SPT17	MW-1103D-SPT18	MW-1100D-SPT19	MW-1101D-SPT20	MW-1101D-SPT21	MW-1101D-SPT22	MW-1104D-SPT23	MW-1104D-SPT24
			6/18/01	6/19/01	6/19/01	6/19/01	6/19/01	6/19/01	6/20/01	6/20/01	6/20/01	6/20/01	6/21/01	6/21/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.0125**	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	*0.005*	*0.025*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-8
Sample Results
Double Packer Tests Performed on the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-1104D-SPT25 6/21/01	MW-1105D-SPT26 6/22/01	MW-1105D-SPT27 6/22/01	MW-1105D-SPT28 6/22/01	MW-1106D-SPT29 6/25/01	MW-1106D-SPT30 6/25/01	MW-1106D-SPT31 6/25/01	MW-1107D-SPT32 6/26/01	MW-1107D-SPT33 6/26/01	MW-1107D-SPT34 6/26/01	MW-1111D-SPT35 9/26/01	MW-1111D-SPT36 9/26/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**0.600**	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-8
Sample Results
Double Packer Tests Performed on the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE											
	Class I	Class II	MW-1113D-SPT37 9/27/01	MW-1113D-SPT38 9/27/01	MW-1113D-SPT39 9/27/01	MW-1110D-SPT40 9/28/01	MW-1110D-SPT41 9/28/01	MW-1108D-SPT42 10/1/01	MW-1108D-SPT43 10/1/01	MW-1112D-SPT44 10/2/01	MW-1112D-SPT45 10/2/01	MW-1114D-SPT46 10/3/01	MW-1114D-SPT46 (Duplicate #5) 10/3/01	MW-1114D-SPT47 10/3/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.0027	0.0013	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	*0.001*	*0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*	*<0.005*
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0013**	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-8
Sample Results
Double Packer Tests Performed on the Bedrock Monitoring Wells

The Lockformer Company / Lisle, Illinois

COMPOUNDS	* TACO Tier 1 Groundwater Remediation Objectives		SAMPLE LOCATION AND COLLECTION DATE									
	Class I	Class II	MW-1114D-SPT48 10/3/01	MW-1600D-SPT49 11/19/01	MW-1600D-SPT50 11/19/01	MW-1600D-SPT51 11/19/01	MW-1601D-SPT100 11/18/01	MW-1601D-SPT101 11/18/01	MW-1601D-SPT102 11/18/01	MW-1602D-SPT52 11/28/01	MW-1602D-SPT53 11/28/01	MW-1602D-SPT54 11/28/01
Acetone	0.7	0.7	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	0.0002	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	0.001	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromomethane	0.0098	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-Butanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon Disulfide	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Tetrachloride	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorodibromomethane	0.14	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chloroform	0.0002	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloromethane	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,1-Dichloroethane	0.7	3.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethene	0.007	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,2-Dichloroethene	0.07	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,2-Dichloroethene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cis-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trans-1,3-Dichloropropane	0.001	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
4-Methyl-2-Pentanone	NE	NE	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methylene Chloride	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	0.1	0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	NE	NE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1.0	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane	0.2	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethene	0.005	0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl Acetate	7.0	7.0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl Chloride	0.002	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	10.0	10.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

NOTES: All results reported in milligrams per liter (mg/L) or parts per million (ppm).
NE = Not Established
* = 35 IAC 742. Appendix B, Table E
Bold = Detected
Bold = Exceeds Groundwater Remediation Objective

TABLE 2.1-9
Water Level Measurements
Groundwater Monitoring Wels, Staff Gages, and Standby Production Wells

The Lockformer Company / Lisle, Illinois

Monitoring Well ID	Top of Casing Elevation (msl)	Top of Casing Elevation (Updated)	Depth to GW (ft) Aug-98	Depth to GW (ft) Feb-99	Depth to GW (ft) Mar-99	Depth to GW (ft) Dec-99	Depth to GW (ft) Nov-00	Depth to GW (ft) Dec-00	Depth to GW (ft) 1/11/01	Depth to GW (ft) 3/21/01	Depth to GW (ft) 5/15/01	Depth to GW (ft) 6/27/01	Depth to GW (ft) 7/12/01	Depth to GW (ft) 8/10/01	Depth to GW (ft) 9/10/01	Depth to GW (ft) 9/20/01	Depth to GW (ft) 10/17/01	Depth to GW (ft) 11/30/01	GW Elev. Aug-98 (msl)	GW Elev. Feb-99 (msl)	GW Elev. Mar-99 (msl)	GW Elev. Dec-99 (msl)	GW Elev. Nov-00 (msl)	GW Elev. 12/19/01 (msl)	GW Elev. 1/11/01 (msl)	GW Elev. 3/21/01 (msl)	GW Elev. 5/15/01 (msl)	GW Elev. 6/27/01 (msl)	GW Elev. 7/12/01 (msl)	GW Elev. 8/10/01 (msl)	GW Elev. 9/10/01 (msl)	GW Elev. 9/20/01 (msl)	GW Elev. 10/17/01 (msl)	GW Elev. 11/30/01 (msl)
BW-1	742.67	742.67						90.46	85.91	88.97	88.87	89.40	89.91	90.01	89.94	90.03	88.47	88.89						652.21	656.76	653.70	653.80	653.27	652.76	652.66	652.73	652.64	654.20	653.78
BW-2	689.16							36.40	36.65	35.10	34.91	35.52	35.91	36.06	36.02	36.01	34.37	34.98						652.76	652.51	654.06	654.25	653.64	652.76	653.10	653.14	653.15	654.79	654.18
BW-3	698.58							45.68	45.92	44.36	44.18	44.84	45.21	45.36	45.29	45.27	43.63	44.27						652.90	652.66	654.22	654.40	653.74	653.25	653.22	653.29	653.31	654.95	654.31
P-1	742.87							33.29	33.10	32.94	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned							709.58	709.77	709.93									
P-2	689.25							20.88	21.09	21.20	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned							668.37	668.16	668.05									
P-3	698.68							45.93	46.15	44.62	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned							652.75	652.53	654.06									
MW-101	710.84		11.44	8.40	9.21	Dry	12.20	12.91	11.35	9.97	11.47	12.27		12.33		12.17	11.06	12.08	710.84	702.44	701.63		698.64	697.93	699.49	700.87	699.37	698.57		698.51		698.67	699.78	698.76
MW-104	710.12		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Abandoned	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned																		
MW-105	710.90		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Abandoned	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned																		
MW-120	707.84		32.8	32.65	32.98	33.10	39.34	39.54	39.66	38.52	39.41	47.76		41.72		41.79	41.01	40.95	707.84	675.19	674.86	674.74	668.50	668.30	668.18	669.32	668.43	660.08		666.12		666.05	666.83	666.89
MW-123	712.62		12.35	10.15	10.14	12.81	12.35	12.72	12.32	11.05	11.52	12.43		12.45		12.06	11.07	12.15	712.62	702.47	702.48	699.81	700.27	699.90	700.30	701.57	701.10	700.19		700.17		700.56	701.55	700.47
MW-126(B)	706.30		50.5	51.30	51.39	53.38	52.70	52.57	51.04	51.12	51.58	52.22		52.77		52.80	51.14	51.70	706.30	655.00	654.91	652.92	653.60	653.73	655.26	655.18	654.72	654.08		653.53		653.50	655.16	654.60
MW-401	707.68	707.67	50.25	50.95	50.88	51.72	51.95	52.07	52.22	51.85	51.26	51.11		51.36		51.68	51.65	51.22	0.01	656.73	656.80	655.96	655.73	655.61	655.46	655.83	656.42	656.56		656.31		655.99	656.02	656.45
MW-402	700.71	700.74	45.15	43.00	44.90	46.51	45.85	46.54	46.92	45.51	44.77	45.43		45.95		45.81	43.45	44.91	-0.03	657.71	655.81	654.20	654.86	654.17	653.79	655.20	655.94	655.31		654.79		654.93	657.29	655.83
MW-403	* 709.10		52.95	53.15	53.36	55.63	Buried	Buried	Buried	Buried	Buried	Buried		Buried		Buried	Buried		709.10	655.95	655.74	653.47												
MW-500S	703.29		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Abandoned	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned																		
MW-500D	703.66			47.40	47.94	47.86	49.17	48.30	49.12	43.81	47.90	48.43		49.03		49.27	47.58	48.09		656.26	655.72	655.80	654.49	655.36	654.54	659.85	655.76	655.23		654.63		654.39	656.08	655.57
MW-501S	706.96		Dry	Dry	Dry	11.43	10.98	17.47	14.13	Abandoned	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned					695.53		689.49	692.83	706.96									
MW-501D	707.34			50.50	50.55	52.11	51.92	52.15	52.33	51.31	50.87	50.93		51.38		51.76	51.28	51.11		656.84	656.79	655.23	655.42	655.19	655.01	656.03	656.47	656.41		655.96		655.58	656.06	656.23
MW-502S	712.38		12.98	11.10	10.45	8.65	5.32	5.13	5.72	5.52	4.49	8.29		6.59		5.16	5.58	3.02	712.38	701.28	661.83	703.73	707.06	707.25	706.66	706.86	707.89	704.09		705.79		707.22	706.80	709.36
MW-503S	* 712.07		Dry	Dry	Dry	18.68	Buried	Buried	Buried	Buried	Buried	Buried		Buried		Buried	Buried					693.39													
MW-504S	710.35		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry		Dry		Dry	Dry	Dry																	
MW-504D	711.51			55.40	54.12	57.64	56.70	56.09	52.87	55.03	55.58	56.06		56.63		56.82	55.89	55.79		656.11	657.39	653.87	654.81	655.42	658.64	656.48	655.93	655.45		654.88		654.69	655.62	655.72
MW-505S	707.00		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry		Dry		Dry	Dry	Dry																	
MW-506S	* 710.90		Dry	Dry	Dry	Dry	Dry	Not located	Not located	Not Located	Not Located	Not Located		Not Located		Not Located	Not Located																		
MW-507S	711.59		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry		Dry		Dry	Dry	Dry																	
MW-508S	707.43		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry		Dry		Dry	Dry	Dry																	
MW-508D	707.50			49.20	50.96	53.60	52.50	52.71	53.02	52.03	51.62	51.88		52.46		52.76	52.37	51.87		658.30	656.54	653.90	655.00	654.79	654.48	655.47	655.88	655.62		655.04		654.74	655.13	655.63
MW-513D	706.90			50.75	51.14	53.41	52.23	52.89	51.38	51.36	51.17	51.79		52.35		52.19	50.61	51.37		656.15	655.76	653.49	654.67	654.01	655.52	655.54	655.73	655.11		654.55		654.71	656.29	655.53
MW-514D	701.19			43.90	45.41	47.48	46.24	47.05	47.43	45.39	45.26	45.92		46.40		46.01	44.28	Destroyed		657.29	655.78	653.71	654.95	654.14	653.76	655.80	655.93	655.27		654.79		655.18	656.91	701.19
MW-515D	703.07			46.50	47.13	49.55	48.26	48.54	46.07	43.45	47.20	47.83		48.37		48.29	46.02	47.38		656.57	655.94	653.52	654.81	654.53	657.00	659.62	655.87	655.24		654.70		654.78	657.05	655.69
MW-516D	700.59			44.00	44.65	46.98	45.84	46.52	41.91	41.92	44.72	45.35		45.94		45.71	43.23	44.87		656.59	655.94	653.61	654.75	654.07	658.68	658.67	655.87	655.24		654.65		654.88	657.36	655.72
MW-517D	709.66			53.30	53.89	55.99	55.15	55.69	53.13	49.81	53.91	54.48		55.04		55.25	53.30	54.02		656.36	655.77	653.67	654.51	653.97	656.53	659.85	655.75	655.18		654.62		654.41	656.36	655.64
MW-518D	* 690.65					37.19	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned					653.46													
MW-519D	* 693.83					40.02	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned					653.81													
MW-520	701.71						47.66	48.04	48.28	46.49	Abandoned	Abandoned		Abandoned		Abandoned	Abandoned						654.05	653.67	653.43	655.22									
MW-521	709.11						52.96	55.32	53.11	53.25	53.73	54.20		54.80		55.00	54.00	53.81					656.15	653.79	656.00	655.86	655.38	654.91		654.31		654.11	655.11	655.30
MW-522	706.29						52.03	52.53	52.78	50.78	50.48	50.94		52.03		52.11	51.17	50.59					654.26	653.76	653.51	655.51	655.81	655.35		654.26		654.18	655.12	655.70
MW-1100S	690.42										34.31	35.03		35.44		34.82	32.33	34.50									656.11	655.39		654.98		655.60	658.09	655.92
MW-1100D	690.90	690.91									36.16	36.83	37.25	37.37	37.35	37.37	35.76	36.34									654.74	654.08	653.66	653.54	653.56	653.54	655.15	654.57
MW-1101S	690.82										34.71	35.43		35.87		35.20	33.10	34.91									656.11	655.39		654.95		655.62	657.72	655.91
MW-1101D	691.27	691.26									36.54	37.20	37.62	37.74	37.72	37.72	36.14	36.71									654.73	654.06	653.64	653.52	653.54	653.54	655.12	654.55
MW-1102S	700.52										45.04	45.62		46.21		46.41	44.15	45.25									655.48	654.90		654.31		654.11	656.37	655.27
MW-1102D	700.57	700.56									45.89	46.51	46.91	47.01	46.98	47.02	45.29	46.01									654.68	654.05	653.65	653.55	653.58	653.54	655.27	654.55
MW-1103S	696.85										41.52	42.06		42.62		42.78	40.78	42.23									655.33	654.79		654.23		654.07	656.07	654.62
MW-1103M	696.82										42.10	42.71		43.25		43.20	41.98	41.73									654.72	654.11		653.57		653.62	654.84	655.09
MW-1103D	697.27	697.25									42.59	43.21	43.61	43.71	43.70	43.64	41.60	42.69									654.68	654.04	653.64	653.54	653.55	653.61	655.65	654.56
MW-1104S	698.84										43.70	44.18		44.76		44.91	43.42	43.86									655.14	654.66		654.08		653.93	655.42	654.98
MW-1104D	698.85	698.83									44.01	44.63	45.04	45.16	45.11	45.10	43.41	44.14									654.84	654.20	653.79	653.67	653.72	653.73	655.42	654.69
MW-1105D	702.89	702.88									48.02	48.62	49.03	49.15	49.11	49.09	47.40	48.15									654.87	654.26	653.85	653.73	653.77	653.79	655.48	654.73
MW-1106D	718.88	718.87									63.82	64.41	64.84	64.96	64.91	64.91	63.17	53.99									655.06	654.46	654.03	653.91	653.96	653.96	655.70	664.88
MW-1107D	710.03	710.05									55.16	55.73	56.15	56.27	56.24	56.27	54.57	55.22									654.87	654.32	653.90	653.78	653.81	653.78	655.48	654.83
MW-1108S	708.25										53.50	54.09		54.67	54.65	54.67	53.01	53.59									654.75	654.16		653.58		653.58	655.24	654.66
MW-1108D		707.32															51.69	52.44															655.63	654.88
MW-1109	701.04	701.05									45.56	46.14		46.73		46.95	44.76	45.81									655.48	654.91		654.32	701.05	654.10	656.29	655.24
MW-1110S		681.90														27.87	26.08	26.93													681.90	654.03	655.82	654.97
MW-1110D		681.94													27.97	29.74	28.11	26.99													653.97	652.20	655.83	654.95
MW-1111S		680.22														26.21	24.32	25.33													680.22	654.01	655.90	654.89
MW-1111D		680.17													26.23	26.19	24.42	25.24													653.94	653.98	655.75	654.93
MW-1112S		681.32														27.14	25.99	26.04													681.32	654.18	655.33	655.28
MW-1112D		680.75													26.89	26.85	25.11	25.84													653.86	653.90	655.64	654.91
MW-1113S		692.11														38.59	36.81	37.53														653.52	655.30	654.58
MW-1113M		692.40														38.95	37.33	37.89														653.45	655.07	654.51
MW-1113D		692.11														38.65	37.03	37.60														653.46	655.08	654.51
MW-1114S		698.87														44.89	43.11	43.98														653.98	655.76	654.89
MW-1114D		699.10														45.12	43.36	44.19														653.98	655.74	654.91
MW-1115		684.23																29.89																654.34
MW-1116		682.50																28.16																654.34
MW-1600S		729.08																77.04																652.04
MW-1600D		729.09																77.18																651.91
MW-1601S		703.97																50.81																653.16
MW-1601D		703.82																51.13																652.69
MW-1602S		686.61																32.61																654.00
MW-1602D		687.05																33.37																653.68
MW-1603		698.74																44.50																654.24
MW-1604		690.29																36.14																654.15
MW-1605		689.32																35.25																654.07
SG-1	681.80									10.47	11.21	11.39	Dry	11.29	11.14	10.86	10.82	10.95								671.33	670.59	670.41		670.51	670.66	670.94	670.98	670.85
SG-2	676.50									9.51	10.06	10.18	10.23	10.09	9.99	9.78	9.57	9.67								666.99	666.44	666.32	666.27	666.41	666.51	666.72	666.93	666.83
SG-3	677.70									13.58	14.36	14.50	14.66	14.33	14.22	13.97	13.99	14.06								664.12	663.34	663.20	663.04	663.37	663.48	663.73	663.71	663.64
SG-4		680.6											16.26	16.07	15.86	14.14	14.99	15.40											664.34	664.53	664.74	666.46	665.61	665.20
SG-5		671											14.20	14.04	13.86	12.28	12.91	13.58											656.80	656.96	657.14	658.72	658.09	657.42
SG-6		668.88											16.95	16.48	16.17	13.90	14.62	15.72											651.93	652.40	652.71	654.98	654.26	653.16
Katrine Well		708.78											60.29		58.66			58.97											648.49		650.12			649.81
Finley Well		749.74											80.66		82.54			79.39											669.08		667.20			670.35
Downer Dr. Well		754.96											102.54		103.02			101.55											652.42		651.94			653.41
67th St. Well		751.09											109.74		110.23			108.90											641.35		640.86			642.19
71st St. Well		784.76											142.90		143.22			141.67											641.86		641.54			643.09
63rd St. Well		739.55													92.78			92.43													646.77			647.12

NOTES: Shaded cells = Not applicable
msl = mean sea level
All top of casing elevations based on survey, unless otherwise noted.
Depth to groundwater measured from the top of the well casing.
* = Top of casing elevations were calculated using an average difference observed between Carlson's relative elevation measurements and the January 5, 2001 survey.

TABLE 2.2-1
Soil Analytical Results
1500 Series Soil Borings Performed in Area 3

The Lockformer Company / Lisle, Illinois

Sample ID	Depth (bgs)	Material Description[b]	Collection Date	Constituents and Objectives[a]					
				1,1,1-TCA	1,1-DCE	Trans-1,2-DCE	Cis-1,2-DCE	TCE	PCE
				2,000	60	700	400	60	60
CSB-1500	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1501	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1502	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	16'-18'	GM	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1503	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1504	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1505	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1506	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1507	2'-4'	CL	10/22/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/22/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/22/01	<150	<50	<50	<50	<50	<50
CSB-1508	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1509	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1510	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1511	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1512	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1513	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1514	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	GC	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1515	2'-4'	CL	10/23/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/23/01	<150	<50	<50	<50	<50	<50
CSB-1527	2'-4'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/24/01	<150	<50	<50	<50	<50	<50
CSB-1528	2'-4'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/24/01	<150	<50	<50	<50	<50	<50
CSB-1529	2'-4'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/24/01	<150	<50	<50	<50	331	<50
CSB-1530	2'-4'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	14'-15.5'	CL	10/24/01	<150	<50	<50	<50	<50	<50

NOTES:

[a] = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.

[b] = Unified Soil Classification System (USCS).

Results in micrograms per kilogram or parts per billion (ppb).

= Exceeds objective

= indicates analysis conducted at First Environmental Laboratories, Inc.

TABLE 2.2-1
Soil Analytical Results
1500 Series Soil Borings Performed in Area 3

The Lockformer Company / Lisle, Illinois

Sample ID	Depth (bgs)	Material Description[b]	Collection Date	Constituents and Objectives[a]					
				1,1,1-TCA	1,1-DCE	Trans-1,2-DCE	Cis-1,2-DCE	TCE	PCE
				2,000	60	700	400	60	60
CSB-1542	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	20'-22'	GC	10/25/01	<150	<50	<50	<50	<50	<50
CSB-1543	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	20'-22'	GC	10/25/01	<150	<50	<50	<50	<50	<50
CSB-1544	2'-4'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/24/01	<150	<50	<50	<50	<50	<50
CSB-1545	2'-4'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	6'-8'	CL	10/24/01	<150	<50	<50	<50	<50	<50
	14'-16'	GC	10/24/01	<150	<50	<50	<50	<50	<50
CSB-1546	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	14'-16'	SC	10/25/01	<150	<50	<50	<50	<50	<50
CSB-1547	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/25/01	<150	<50	<50	<50	<50	<50
CSB-1548	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	14'-16'	SC	10/25/01	<150	<50	<50	<50	<50	<50
CSB-1549	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	SC	10/25/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/25/01	<150	<50	<50	<50	**18**	<50
CSB-1550	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/25/01	<150	<50	<50	<50	<50	<50
CSB-1551	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	SC	10/25/01	<150	<50	<50	<50	**27**	<50
CSB-1552	2'-4'	CL	10/25/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/26/01	<150	<50	<50	<50	<50	<50
CSB-1553	2'-4'	SC	10/26/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	10/26/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/26/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/26/01	<150	<50	<50	<50	<50	<50
CSB-1554	2'-4'	GM	10/26/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/26/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/26/01	<150	<50	<50	<50	**15**	<50
	20'-22'	GM	10/26/01	<150	<50	<50	<50	<50	<50
	26'-28'	GM	10/26/01	<150	<50	<50	<50	<50	<50
CSB-1555	2'-4'	CL	10/26/01	<150	<50	<50	<50	**11**	<50
	8'-10'	GM	10/29/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/29/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/29/01	<150	<50	<50	<50	<50	<50

NOTES:

[a] = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.

[b] = Unified Soil Classification System (USCS).

Results in micrograms per kilogram or parts per billion (ppb).

= Exceeds objective

= indicates analysis conducted at First Environmental Laboratories, Inc.

TABLE 2.2-1
Soil Analytical Results
1500 Series Soil Borings Performed in Area 3

The Lockformer Company / Lisle, Illinois

Sample ID	Depth (bgs)	Material Description[b]	Collection Date	Constituents and Objectives[a]					
				1,1,1-TCA	1,1-DCE	Trans-1,2-DCE	Cis-1,2-DCE	TCE	PCE
				2,000	60	700	400	60	60
CSB-1556	2'-4'	GM	10/26/01	<150	<50	<50	<50	**26**	<50
	8'-10'	GM	10/26/01	<150	<50	<50	<50	**30**	<50
	14'-16'	GM	10/26/01	<150	<50	<50	<50	**42**	<50
	20'-22'	GM	10/29/01	<150	<50	<50	<50	<50	<50
CSB-1557	2'-4'	GM	10/29/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/29/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/29/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/29/01	<150	<50	<50	<50	**42**	<50
	24'-26'	GM	10/29/01	<150	<50	<50	<50	<50	<50
CSB-1558	2'-4'	CL	10/30/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	22'-24'	CL	10/30/01	<150	<50	<50	<50	**310**	<50
CSB-1559	2'-4'	CL	10/30/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/30/01	<150	<50	<50	<50	<50	<50
CSB-1560	2'-4'	CL	10/30/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/30/01	<150	<50	<50	<50	<50	<50
CSB-1561	2'-4'	CL	10/30/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/30/01	<150	<50	<50	<50	**21**	<50
	14'-16'	GM	10/30/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/30/01	<150	<50	<50	<50	**173**	<50
CSB-1562	2'-4'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	10'-12'	GM	11/5/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	11/5/01	<150	<50	<50	<50	**64**	**29**
	16'-18	CL	11/5/01	<150	<50	<50	<50	**378**	**326**
	22'-24'	CL	11/5/01	<150	<50	<50	<50	**1,694**	**927**
	22'-24'	CL	11/5/01	<5	<5	<5	<5	**186**	**188**
	26'-28'	GM	11/5/01	<150	<50	<50	<50	**1,092**	**404**
	26'-28'	GM	11/5/01	<5	<5	<5	<5	**80.2**	**55.7**
	30'-32'	CL	11/5/01	<150	<50	<50	<50	**551**	**166**
CSB-1563	2'-4'	CL	11/1/01	<150	<50	<50	<50	<50	<50
	6'-8'	GM	11/1/01	<150	<50	<50	<50	<50	<50
CSB-1564	2'-4'	CL	11/1/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	11/1/01	<150	<50	<50	<50	<50	<50
	14'-16'	GM	11/1/01	<150	<50	<50	<50	**110**	<50
	18'-20'	GM	11/1/01	<150	<50	<50	<50	**279**	<50
	20'-22	GM	11/1/01	<150	<50	<50	<50	**16**	<50
	22'-24'	SP	11/1/01	<150	<50	<50	<50	**758**	**58**
	24'-26'	GM	11/1/01	<150	<50	<50	<50	**41**	<50
	26'-28'	GM	11/1/01	<150	<50	<50	<50	**445**	43
	28'-30'	GM	11/1/01	<150	<50	<50	<50	**124**	<50
CSB-1565	2'-4'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	18'-20'	GM	10/31/01	<150	<50	<50	<50	**418**	**81**
	22'-24	SP	10/31/01	<150	<50	<50	<50	**139**	**31**

NOTES:

[a] = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.

[b] = Unified Soil Classification System (USCS).

Results in micrograms per kilogram or parts per billion (ppb).

= Exceeds objective

= indicates analysis conducted at First Environmental Laboratories, Inc.

TABLE 2.2-1
Soil Analytical Results
1500 Series Soil Borings Performed in Area 3

The Lockformer Company / Lisle, Illinois

Sample ID	Depth (bgs)	Material Description[b]	Collection Date	Constituents and Objectives[a]					
				1,1,1-TCA	1,1-DCE	Trans-1,2-DCE	Cis-1,2-DCE	TCE	PCE
				2,000	60	700	400	60	60
CSB-1566	2'-4'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	18'-20'	GM	10/31/01	<150	<50	<50	<50	**466**	**90**
	20'-22'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	22'-24'	GM	10/31/01	<150	<50	<50	<50	**58**	<50
CSB-1567	6'-8'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	11/1/01	<150	<50	<50	<50	<50	<50
	16'-18'	GM	11/1/01	<150	<50	<50	<50	**86**	<50
	18'-20'	GM	11/1/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	11/1/01	<150	<50	<50	<50	<50	<50
	22'-24'	GM	11/1/01	<150	<50	<50	<50	<50	<50
CSB-1568	2'-4'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	8'-10'	SM	10/31/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/31/01	<150	<50	<50	<50	**73**	<50
CSB-1569	6'-8'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	10'-12'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	16'-18'	GM	10/31/01	<150	<50	<50	<50	**269**	<50
	20'-22'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	22'-24	CL	10/31/01	<150	<50	<50	<50	<50	<50
CSB-1570	2'-4'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	8'-10'	GM	10/31/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	10/31/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	10/31/01	<150	<50	<50	<50	**18**	<50
	22'-24'	SP	10/31/01	<150	<50	<50	<50	**34**	<50
CSB-1571	4'-6'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	11/5/01	<150	<50	<50	<50	<50	<50
	20'-22'	GM	11/5/01	<5	<5	<5	<5	<5	<5
	22'-24'	GM	11/5/01	<150	<50	<50	<50	<50	<50
	22'-24'	GM	11/5/01	<5	<5	<5	<5	<5	<5
	26'-28'	GM	11/5/01	<150	<50	<50	<50	<50	<50
CSB-1572	2'-4'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	8'-10'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	14'-16'	CL	11/5/01	<150	<50	<50	<50	<50	<50
	20'-22'	CL	11/5/01	<150	<50	<50	<50	**159**	<50
	20'-22'	CL	11/5/01	<5	<5	<5	<5	**66.8**	<5
	26'-28'	GM	11/5/01	<150	<50	<50	<50	<50	<50
	26'-28'	GM	11/5/01	<5	<5	<5	<5	<5	<5
CSB-1573	14'-16'	GM	11/6/01	<5	<5	<5	<5	**8**	<5
	18'-20'	GM	11/6/01	<5	<5	<5	<5	**12.3**	<5
	20'-22'	GM	11/6/01	<5	<5	<5	<5	**13.8**	<5
	22'-24'	GM	11/6/01	<5	<5	<5	<5	**15.2**	<5

NOTES:

[a] = Most conservative remediation objective established in 35 IAC 742 Appendix B.Table A.

[b] = Unified Soil Classification System (USCS).

Results in micrograms per kilogram or parts per billion (ppb).

= Exceeds objective

= indicates analysis conducted at First Environmental Laboratories, Inc.

TABLE 2.2-2
Groundwater Analytical Results
Area 3

The Lockformer Company / Lisle, Illinois

Sample ID	Relative Depth	Collection Date	Constituents and Objectives[a]					
			1,1,1-TCA	1,1-DCE	Trans-1,2-DCE	Cis-1,2-DCE	TCE	PCE
			200	7	100	70	5	5
CSB-1548	Shallow	10/26/01	<3	<1	<1	<1	18	<1
CSB-1549	Shallow	10/26/01	<3	<1	<1	<1	8	<1
CSB-1550	Shallow	10/26/01	<3	<1	<1	<1	23	<1
CSB-1551	Shallow	10/26/01	<3	<1	<1	<1	3	<1
CSB-1552	Shallow	10/26/01	<3	<1	<1	<1	12	<1
CSB-1553	Deep	10/29/01	<3	<1	<1	<1	42	<1
CSB-1554	Deep	10/26/01	<3	<1	<1	<1	19	<1
CSB-1555	Deep	10/29/01	<3	<1	<1	<1	4	<1
CSB-1556	Deep	10/29/01	<3	<1	<1	<1	13	2
CSB-1557	Deep	10/29/01	<3	<1	<1	<1	53	6
CSB-1558	Deep	10/30/01	<3	<1	<1	<1	9	<1
CSB-1559	Deep	10/30/01	<3	<1	<1	<1	18	<1
CSB-1560	Deep	10/30/01	<3	<1	<1	<1	11	<1
CSB-1561	Deep	10/30/01	<3	<1	<1	<1	20	<1
CSB-1562	Deep	11/5/01	<3	<1	<1	2	122	14
CSB-1562	Deep	11/5/01	<5	<5	<5	<5	232	24.4
CSB-1564	Deep	11/1/01	<3	<1	<1	4	161	3
CSB-1565	Deep	11/1/01	<3	<1	<1	4	140	4
CSB-1566	Deep	10/31/01	<3	<1	<1	4	123	5
CSB-1567	Deep	11/1/01	<3	<1	<1	4	116	2
CSB-1568	Deep	10/31/01	<3	<1	<1	1	50	1
CSB-1569	Deep	10/31/01	<3	<1	<1	<1	27	1
CSB-1570	Deep	10/31/01	<3	<1	<1	<1	32	1
CSB-1573	Deep	11/6/01	<5	<5	<5	<5	30.5	<5

NOTES:

a = TACO Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Class I Groundwater Ingestion Route established in 35 IAC 742 Appendix B.Table E.
Results in micrograms per liter or parts per billion (ppb).
Shallow = approximately 10 to 12 feet below ground surface (bgs)
Deep = approximately 24 to 28 feet bgs
= indicates analysis conducted at First Environmental Laboratories, Inc.
= *exceeds objective*

SECTION 3

3.0 REMOVAL ACTION OBJECTIVES

Removal action objectives (RAOs) for the soil in Areas 1 and 2 have been developed through the combined effort of the USEPA, the IEPA, the IAG, Lockformer, and their representatives. Individual RAOs have been established for the individual soil lithologies encountered at the site. The RAOs were developed in accordance with the potential risk that VOCs in each lithology might present to human health and the environment. Table 3.0-1 identifies the various RAOs established for the site. The RAOs established for the upper silty clay till/fill in Areas 1 and 2 consist of the Tiered Approach to Corrective Action Objectives (TACO) Tier I Soil Remediation Objectives (SROs) for the protection of the Industrial/Commercial Inhalation exposure route established in Title 35 of the Illinois Administrative Code (IAC) Part 742 (35 IAC 742). The RAOs established for the mass waste sand and gravel in Areas 1 and 2 consist of the TACO Tier I SROs for the protection of the Soil Component of the Class I Groundwater Ingestion Route established in 35 IAC 742.

The RAOs for Area 3 will consist of the TACO Tier I SROs for the protection of the Soil Component of the Class I Groundwater Ingestion Route established in 35 IAC 742.

The RAOs presented within this section are in accordance with the UAO and are based on cleanup standards negotiated with the USEPA Removal Section for the TCE source removal activities addressed by this LWP. Additional RAOs may be developed in the future based on requirements of other federal and/or state remedial programs.

TABLES

TABLE 3.0-1
Summary of Removal Action Objectives (RAOs)

The Lockformer Company / Lisle, Illinois

Compound	RAOs for Areas 1 and 2		RAOs for Area 3
	RAO for Surficial Silty Clay Till/Fill[a] (mg/kg)	RAO for Mass Waste Unit[b] (mg/kg)	RAO for Soil[c] (mg/kg)
Acetone	100,000	16	16
Benzene	1.6	0.03	0.03
Bromodichloromethane	3,000	0.6	0.6
Bromoform	100	0.8	0.8
Bromomethane	15	0.2	0.2
2-Butanone	NE	NE	NE
Carbon disulfide	720	32	9
Carbon tetrachloride	0.64	0.07	0.07
Chlorobenzene	210	1	1
Chlorodibromomethane	1,300	0.4	0.4
Chloroethane	NE	NE	NE
Chloroform	0.54	0.6	0.3
Chloromethane	NE	NE	NE
1,1-Dichloroethane	1,700	23	23
1,2-Dichloroethane	0.7	0.02	0.02
1,1-Dichloroethene	1,500	0.06	0.06
cis-1,2-Dichloroethene	1,200	0.4	0.4
trans-1,2-Dichloroethene	3,100	0.7	0.7
1,2-Dichloropropane	23	0.03	0.03
cis-1,3-Dichloropropene	2.1	0.004	0.004
trans-1,3-Dichloropropene			
Ethylbenzene	400	13	13
2-Hexanone	NE	NE	NE
4-Methyl-2-pentanone	NE	NE	NE
Methylene chloride	24	0.02	0.02
Styrene	1,500	4	4
1,1,2,2-Tetrachloroethane	NE	NE	NE
Tetrachloroethene	20	0.06	0.06
Toluene	650	12	12
1,1,1-Trichloroethane	1,200	2	2
1,1,2-Trichloroethane	1,800	0.02	0.02
Trichloroethene	8.9	0.06	0.06
Vinyl acetate	1,600	170	10
Vinyl chloride	1.1	0.01	0.01
Xylenes (total)	320	150	150

NOTES:

[a] = Value based on industrial/commercial worker soil remediation objective for the inhalation pathway contained in 35 IAC 742, Appendix B, Table B.

[b] = TACO Tier 1 soil remediation objective for the soil component of the groundwater ingestion pathway (Class I groundwater) established in 35 IAC 742 Appendix B.Table B.

[c] = Most conservative value contained in Appendix B, Tables A and B of 35 IAC 742

NE = Not Established

SECTION 4

4.0 REMEDIAL TECHNOLOGY IMPLEMENTATION

This section describes remedial technologies that will be implemented in Areas 1 and 2 of the site as part of this Removal Action.

Lockformer has chosen Electrical Resistive Heating (ERH), an in-situ technology, for remediation of the Surficial Silty Clay Till and Fill in Areas 1 and 2. The process description and design specifications are provided in Section 4.1. Soil Vapor Extraction (SVE) has been selected as the in-situ remedial technology for treatment of the Mass Waste Sand and Gravel in Areas 1 and 2. The process description and design specifications for the Mass Waste Sand and Gravel SVE system are described in Section 4.2. This section also provides design specifications for the liquid phase and gaseous phase carbon adsorption systems that will be used to treat waters and gases from both the ERH and SVE systems. Section 4.3 describes the water discharge monitoring that will occur during the removal action. Section 4.4 describes the proposed air monitoring program. Management of the installation-derived wastes is discussed in Section 4.5.

4.1 ELECTRICAL RESISTIVE HEATING

ERH is typically employed in fine-grained soils and involves heating the subsurface to enhance SVE of the contaminants. At the Lockformer site, ERH will be used to treat the silty clay till/fill soils with a VOC concentration greater than the Removal Action Objectives (RAOs) stated in Section 3.0. Thermal Remediation Services (THERMAL) will implement the ERH remediation technology, which is a multi-phase electrical technique that uses common power line frequency electricity to resistively heat soil. This in-situ heating process both directly volatilizes contaminants and creates an in-situ source of steam that strips volatile contaminants from soil. The ERH process enhances the conventional SVE process, which is used to pull steam and contaminated vapors into

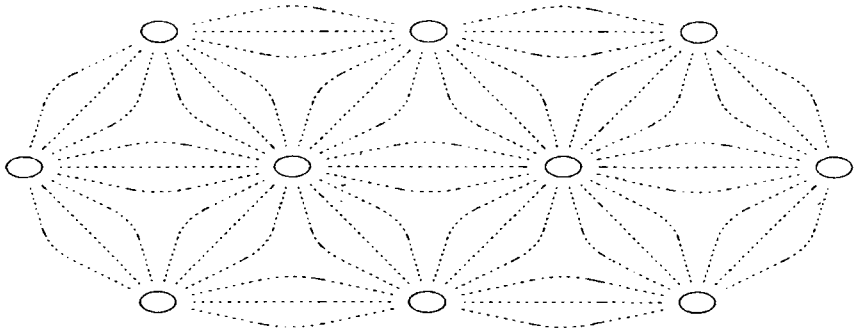
vapor recovery wells, and then to the surface where the steam is condensed to water, and vapors are treated to remove contaminants. The preliminary design for the spacing of electrodes is shown in Figure 4.1-1. The final design will be based on the results of the additional investigations described in the Field Sampling Plan (see Volume III of this LWP).

The success of the remediation will be judged based on a conservative confirmatory soil sampling and testing plan (see Section 5.0). Confirmatory sampling will be performed by sampling the area over which contamination is defined as exceeding the RAOs per Section 3.0.

4.1.1 Electrical Resistive Heating Process

ERH remediates the subsurface by passing an electrical current through the soil matrix. Heat is generated evenly throughout the soil in the remediation area, and the temperature of the soil is increased to the boiling point of the water/contaminant mixture contained in the soil pores. Soil moisture boils into steam carrying contaminant vapors that travel to vapor recovery wells for removal.

Typically, electrodes are installed in a hexagonal arrangement, and each electrode conducts electricity with as many as six other nearby electrodes. In addition to flowing along the straight-line path between the electrodes, the current also fans out slightly as it travels as shown below:



The electrical current also fans out in the vertical direction, treating soil that lies in the conductive depth interval of the electrodes, plus soil that lies up to approximately 3 feet above or below the conductive interval. The result of this electrical current pattern is very even heat generation in the subsurface that leads to uniform steam production and VOC volatilization throughout the treatment volume.

A vacuum is applied to the vapor recovery wells, which pulls steam, air, and chlorinated solvents vapor to the surface. High-temperature CPVC piping is used to convey the vapor from the recovery wells to the steam condenser. The steam is condensed into water vapor and pumped into the condenser-cooling loop where most of the water is then re-evaporated and discharged to the atmosphere as water vapor. VOC vapor and air is conveyed from the condenser to the vacuum blower through a carbon adsorption system, and finally discharged to the atmosphere.

It is not necessary that all electrodes be placed on service simultaneously. A balance between two factors determines the number of in-service electrodes:

- Faster treatment of smaller volumes leads to more efficient energy usage; less heat conducts away from a small volume than from a large volume.
- Concentrating all ERH power on too small a volume can lead to electrode dryout problems.

Electrodes will be taken off service when operational data indicate their region is likely to meet the remediation objective. Indications of meeting the objective include:

- Temperature monitoring shows the subsurface has reached the boiling point of water. Highly contaminated regions will be boiled for several weeks.
- The VOC concentration in the off gas typically fluctuates widely during heat-up of the site. Once a region reaches the boiling point of water, the off gas concentrations typically stabilize and decline. It is expected VOC vapor concentrations below 1 milligram per liter (mg/L) will be indicative that the region being heated will most likely meet the remediation objective. However, the 1 mg/L concentration is only a general guideline to help determine when to take confirmatory soil samples. Analysis of the soil samples will determine if the treatment goal has been met.

When a region is likely to have reached the remediation objective, ERH operation in that area will be stopped, and interim soil samples will be collected. Based upon the results of interim sampling, heating can be continued, or sampling can be conducted to document that the cleanup objectives have been achieved. If necessary, a region will undergo more than one round of ERH operation and confirmatory soil sampling.

4.1.2 Performance and Reliability of Technology

ERH remediates the subsurface by passing an electrical current through the soil matrix. The current passage generates heat due to the soil electrical resistance. This is the same process used in any electrically heated device (clothes iron, heater, stove, etc.). Heat is generated throughout the soil in the remediation area, and the temperature of the soil is increased to the boiling point of the water/contaminant mixture contained in the soil pores. Soil moisture boils into steam, and contaminant vapors travel to vapor recovery wells for removal from the subsurface.

ERH is a very thorough and reliable remediation technique for this application for the following reasons:

- Heat is generated uniformly throughout the treatment volume. Soil heterogeneity or low permeability do not adversely effect ERH. In fact, low permeability soils tend to carry a greater current than sandy soils and thus receive more energy and heat to boiling faster.

  The passage of electrical current through the soil and soil moisture increases the subsurface temperature to boiling and generates steam in-situ. The electrodes do not get any hotter than the rest of the site. The electrical conductivity of the soils at a site varies only slightly with soil type. Clay soils tend to have a ionic surface charge structure that makes them slightly more electrically conductive – this is the basis of conductivity logging as an aid to soil classification.

- Anaerobic dechlorination of TCE, the primary VOC of concern, adds conductive chloride ions to "hot spots," likewise attracting current for faster remediation of the impacted regions of the site.

- The boiling of soil moisture in clay lenses will form steam that will sweep out TCE. This steam stripping process effectively increases the permeability of clay soils. When steam is generated in a very low permeability clay lens, it must escape or its pressure will increase. Eventually, the steam pressure will increase until the steam forces its way out via a relic root channel or other path or until micro-fractures form in the clay lens.

- Because ERH treats all soils in the treatment volume, there are no untreated regions from which contaminants could diffuse later and cause rebound. Rebound has not been observed at any ERH site.

- The volatilization properties of TCE favor heating as a removal method. Vapor pressures increase with temperature, resulting in a corresponding increase in the Henry's Law Constant (H_c) for DNAPL constituents. The Henry's Law Constants for TCE have been found to increase by an order of magnitude when the temperature is increased from 20°C (68°F) to 90°C (193°F) (Heron et al. 1996). TCE boils at 87° C, far below the boiling point of water that will be attained throughout the treatment volume towards the end of the remediation process.

- As subsurface temperatures rise, the rates of naturally occurring biological activity and chemical reactions that cause in-situ dechlorination are dramatically increased. Although volatilization usually is the primary removal mechanism for VOCs during ERH, some VOCs are degraded in place by in-situ processes. These in-situ processes include bio-attenuation, hydrolysis, and hydrous pyrolysis-oxidation (HPO).

- Hydrolysis is a chemical substitution reaction in which hydrogen ions in water react with organic molecules, replacing chlorine atoms. Oxidizing conditions or available

oxygen are not required for hydrolysis. While hydrolysis will degrade VOCs at room temperature, it is generally slower than biodegradation, except for compounds such as chlorinated ethanes. Hydrolysis is not expected to be an important reaction at the Lockformer site.

- Hydrous pyrolysis is breaking apart complex molecules into simpler units while dissolved in hot water. It generally is referred to as HPO to differentiate it from hydrolysis. HPO requires oxidizing conditions or dissolved oxygen. HPO is insignificant at room temperature but can become important at elevated temperatures.

- Both hydrolysis and HPO are strongly affected by temperature as described by the Arrhenius Equation. In essence, each 10°C (18°F) increase in temperature will increase the reaction rates by a factor of two to four, depending on the activation energy for the reaction. The remediation volumes at the Lockformer site will be heated from a temperature of approximately 13°C (55°F) to a temperature of approximately 100°C (212°F).

4.1.3 Feasibility of Implementation

The ERH technology was identified by Lockformer as the only effective, practical, and cost-effective approach for remediating the soils at this facility. This technology was discussed in meetings with the USEPA and determined by Lockformer to be the most effective approach to remediation of the Surficial Silty Clay Till and Fill in Areas 1 and 2.

In the late 1980s, scientists at the U.S. Department of Energy's Pacific Northwest National Laboratories were tasked with the development of a technology to remove VOCs from low permeability soils. In response, these scientists invented ERH. Over the past 10 years, ERH has become recognized as a leading technology for in-situ VOC remediation of groundwater and low permeability soil. ERH particularly excels in the low permeability soils for which it was originally developed – soils similar to those found at the Lockformer facility.

The most common potential implementability problems that may arise during the operation of the ERH system include:

- Drying of electrodes
- Delayed progress of cleanup due to elevated organic carbon in soils
- Vapors potentially bypassing recovery from recovery wells and/or the plenum

If any of these problems are encountered, they will be handled in the following manner:

Drying of Electrodes – Drying of electrodes can be detected by the excessive resistance of soils to conducting electrical current (drawing lower amperage) resulting in excessive temperature increases immediately around the electrode and not in the soils away from the electrode. This problem is addressed by adding water to the conductive backfill around the electrode via a ¼-inch Teflon tube that is installed at each electrode. During peak operation of the system, it may be necessary to add up to 6 gallons water per hour through this Teflon tube to each electrode to keep the soils adjacent to the electrodes from drying out. If necessary, additional water will be added to combat this problem.

Elevated Organic Carbon in Soils – If elevated organic carbon exists in the upper fill/till soils over what geotechnical analysis has indicated to date, the migration of contaminants will be retarded, and recovery efforts will not proceed as rapidly as they would otherwise. This will be indicated by the slow recovery of vapors over a long period of time with no asymptotic decline to very low or no contaminant mass removal. If this occurs, there is not much that can be done to perform corrective action. The only option is to run the ERH system longer, and at greater expense.

Vapors Potentially Bypassing the Vapor Recovery Wells and/or the Plenum – Vapors generated in the subsurface by the ERH system could potentially bypass the vapor recovery wells and plenum, and be emitted at the ground surface. The detection of these fugitive vapors is one of the primary focus points of the monitoring program for the remediation system. Should any fugitive vapors be detected during the air monitoring program, the plenum will either be extended, or an additional plenum will be installed to

cover the area from where the emissions are emanating. The installation of additional vapor recovery wells will also be evaluated to determine their effectiveness.

An additional 200 square feet of plenum installation materials will be kept on hand at all times during remediation efforts in the event that fugitive emissions occur and corrective measures are necessary. Clayton employees will perform these corrective measures should they be necessary and will be available on a short-notice installation basis. The Clayton Project Coordinator and Field Project Manager will be available on a 24-hour basis to address any necessary corrective measures.

ERH has been successfully demonstrated at two sites in Illinois, one at the Lucent Technologies Site in Skokie, Illinois, and one at the Avery Dennison Site in Waukegan, Illinois. Both sites are described below.

Lucent Site

The remediation of contaminated soil at the former Lucent Technologies facility in Skokie (IL0312880005-Cook County) has been completed using this process. A "No Further Remediation" (NFR) letter was issued for the site in 1998. The Lucent facility has soil conditions (silty-clay) similar to the Lockformer facility.

The regulatory authorities raised two concerns about implementation of the technology at the Lucent site: (1) the presence of vinyl chloride (VC) and (2) the variability of sampling results. Both issues are discussed in further detail below.

The ERH remediation at the Skokie facility was preceded by several years of enhanced biodegradation using elevated temperatures and chlorine dioxide injections. The principal VC concern was not within the ERH treatment zone, but within an adjacent region treated only by enhanced biodegradation. The VC concentrations in the adjacent

zone reached unacceptable levels, and ERH remediation was expanded into this area to reduce the concentrations of both VC and its parent compounds.

A waste VOC sump was the principal release location of the VOCs at the Skokie site. A monitoring well immediately adjacent to this sump showed unusual variability from one sample event to the next, indicating low TCE concentrations in one sample and high TCE concentrations in the next. A brief review of the records indicated this sump had never been cleaned after its use ended; rainfall events were flushing additional TCE from a crack in the sump wall. The sump was cleaned with an oxidation solution, and the ERH heat input was increased in that region. These actions stopped the continuing TCE source, and the nearby monitoring well concentrations decreased to a low and consistent level.

Avery Dennison Site

The technology has also been successfully applied by Clayton at an Avery Dennison facility in Waukegan, Illinois. The constituent of concern at this site was methylene chloride. A NFR letter was obtained from the IEPA for this site in 2001.

Mr. Greg Beyke of THERMAL gave a presentation of the technology to representatives of the USEPA and the IEPA in February 2002. Mr. Beyke addressed all concerns raised by the regulatory authorities regarding implementation of this technology. The regulatory authorities subsequently identified ERH as the chosen technology at a public meeting held February 26, 2002.

4.1.4 Design and Technical Specifications

This section describes the preliminary design. A final design will be prepared after the additional Area 1 and 2 investigations are complete.

All equipment and components will be designed to operate in all-weather conditions. The treatment systems will be capable of four-season operation under all ambient atmospheric conditions. This will include provisions for operation of equipment during extreme heat as well as extreme temperatures below freezing point. Insulation, heat tracing, equipment buildings, etc., will be considered to facilitate system operation year round.

4.1.4.1 ERH Electrodes

The electrodes are designed to efficiently couple the electrical current to the soil and direct the current to the region requiring treatment. THERMAL will install ERH electrodes on an approximate 17-foot spacing as shown in Figure 4.1-1. The spacing of the electrodes is based on prior experience. The electrodes will treat two separate areas. Area 1 measures about 9,307 square feet, and Area 2 measures about 9,160 square feet. In Area 1, the electrically conductive electrode interval is expected to extend from a depth of approximately 3 to 22.5 feet below grade surface (bgs). In Area 2, the electrically conductive interval is expected to extend from approximately 10 to 24 feet bgs. After the additional Area 1 and 2 investigations are complete, the required number of electrodes and the final depths of the electrodes will be established so that the entire Surficial Clay Till and Fill unit is within the heating zone of the ERH system. Currently, the volume of soils under the Lockformer building requiring treatment or at what depth the treatment would be necessary is unknown. If it is determined that horizontal or diagonal electrodes should be installed to address soil contamination under the building, Lockformer will provide the details for these installations in the technical memorandum to USEPA that contains the remainder of the detailed ERH design.

The current site characterization data suggest that the electrode depths identified above will be sufficient to treat soils where the VOC concentration exceeds the RAOs. Each electrode will have a separate identification number. The electrodes will be constructed inside 12-inch-diameter boreholes, and the electrically conductive interval will be

backfilled with granular graphite or steel shot. Small quantities of Epsom salt (magnesium sulfate) are added to the conductive intervals to increase the electrical conductivity of soil immediately adjacent to the electrodes. Epsom salt, steel shot, and graphite are non-hazardous and inert; electricians commonly use these materials in installation of subsurface electrical grounding and cathodic protection systems. The non-conductive intervals at the top of the electrodes will be backfilled with sand to assist vapor recovery efforts, and cement grout to seal the electrode boreholes. Electrode installation on the eastern side of Area 2 will require that benches or terraces be constructed along the ridge to facilitate the drilling rig. Soils removed for the construction of these benches will be characterized and properly disposed.

An electrically insulating CPVC oversleeve will also be placed in the non-conductive upper region of the electrode. These oversleeves and a shallow soil grounding system are used to reduce the induced voltage at the surface to limit shock hazards. Conceptual electrode cross sections are shown in Figures 4.1-2 and 4.1-3 for Areas 1 and 2, respectively.

Type W extra-hard-use portable power cables are used to connect each on-service electrode to the ERH Power Control Unit (PCU). These wires will be placed on the asphalt surface of the plenum and connected to the PCU. At start-up, about 200 to 250 volts will be applied, and approximately 65 amperes of current will be supplied to each electrode, resulting in the application of about 13 to 16 kilowatts (kW) of power to the soils near each electrode. The actual applied voltage will be determined by operational conditions and will be varied as the soil heats and subsurface resistance changes.

As the site is heated and boiling begins, soil moisture will be reduced. If the soil immediately adjacent to the electrode dries excessively, the electrical contact of the electrode with the soil will be degraded. This condition is commonly termed electrode

dryout. THERMAL will add a small amount of water (2 to 6 gallons per hour) to each electrode to ensure soil conductivity is not degraded. The electrode wetting supply will be potable water.

As shown in Figure 4.1-1, some of the 43 electrodes to be installed in Area 1 will be installed by directional drilling technique under the building. The electrodes and vapor recovery wells will be installed below the floor in a similar fashion to other electrodes and vapor recovery wells at the site. It may be necessary to install some electrical and process piping from these electrodes and vapor wells on the outside of the building, through the sidewall of the foundation, using saw-cuts. The floor of the facility will serve as the plenum.

The directional installation of the system under the building will take no longer than 7 days. After the installation is complete, the area will be tested for any voltage leaks. Assuming the area meets the THERMAL specifications for voltage, workers will be allowed to resume normal activities in the area.

4.1.4.2 Temperature Monitoring Points

For monitoring purposes, each treatment area will have seven temperature monitoring points (TMPs) as shown in Figure 4.1-1. TMPs are typically located equidistant between electrodes, as this is the location with the slowest energy input. The design of a typical temperature monitoring probe is provided in Figure 4.1-4.

Each TMP will have thermocouples installed at approximate 5-foot intervals to monitor subsurface temperature. The deepest thermocouple is typically located at the bottom of the treatment volume, and the shallow thermocouple will be located just above the top of the treatment volume. TMPs will be installed by boring or direct push. Push installation is preferred because it results in less soil disturbance.

Throughout the remediation, thermocouple temperatures will be monitored and logged at least twice a week by THERMAL or Clayton personnel. These data can be accessed remotely by modem. The system operation/configuration will be modified if thermocouple temperatures indicate the target temperatures cannot be attained.

4.1.4.3 Vapor Recovery Wells

Vapor recovery wells differ from vapor extraction wells in principal; however, they are similar to vapor extraction wells in practice. A vapor extraction well must be designed to drive airflow evenly through all soils in order to remediate them properly. An ERH vapor recovery well does not drive flow; the current between electrodes generates a uniform steam flow. A vapor recovery well intercepts the steam flow to prevent steam from venting to the surface or migrating from the treatment volume.

In Area 1, the conductive portion at each electrode will be installed to within 3 feet of the surface. Vapor recovery in Area 1 will consist of horizontal recovery wells placed on the ground surface, covered with a layer of permeable rock beneath a plenum (Figure 4.1-5) designed to help seal the treatment area and reduce heat loss to the atmosphere. As shown in Figure 4.1-2, the electrodes used in Area 1 will also have a vapor recovery vent. Vapors coming from this vent will be captured in the plenum gravel layer and removed via horizontal recovery slotted piping.

In Area 2, the conductive portion of each ERH electrode will terminate at approximately 10 feet bgs. Vapor recovery in Area 2 will be accomplished using vertical recovery wells constructed in the upper (non-conductive) portion of the electrode boreholes. These wells will be constructed of 2-inch-diameter CPVC plastic casing with screened intervals extending from 3 to 8 feet bgs. Approximately 40 vapor recovery wells will be installed in the electrode borings as shown in Figure 4.1-1. Figure 4.1-3 shows the vapor recovery vent that will be used in each electrode.

The size of vapor recovery header piping is specified in the following table:

Number of Wells Served	Pipe Diameter
1-2	2"
3-5	3"
6-12	4"
More than 12	6"

4.1.4.4 Plenum

A plenum will be installed over Areas 1 and 2. The plenum design is shown in Figure 4.1-5. The plenum serves three purposes:

- Limits heat loss to the surface to ensure shallow soil is sufficiently heated for proper remediation.
- Assists with the performance of the horizontal vapor recovery wells in Area 1.
- Acts as a vapor cap to prevent the potential release of steam generated near the surface.

The plenum consists of the following components:

- Horizontal vapor recovery pipes at the surface to recover any venting steam (Area 1 only). If the vapor recovery wells are unable to provide the required radius of influence, a minimal amount of horizontal extraction piping will be installed in the gravel layer of the Area 2 plenum to allow for extraction.
- An insulating component (geotextile) that acts as a heat loss barrier.
- A layer of crushed rock.
- Asphalt.
- A rain cover to divert water from the remediation area. Rain will be directed to the new storm sewer.

4.1.4.5 Surface Water Diversion and Drainage

Surface water drainage in both areas will be diverted around the plenums to minimize the potential for water infiltration during remediation. Figure 4.1-6 shows the expected surface water flow patterns once the plenums are constructed. For Area 1, a curb will be constructed on the northwest side to divert any surface water drainage from the parking lot to the drainage swale at the site. Since the drainage swale will be blocked by the Area 1 plenum, a new manhole will be installed in the existing stormwater pipe located beneath the drainage swale. Both the water diverted from reaching the Area 1 plenum and the other surface water drainage from the northern portion of the site will be allowed to drain to the existing storm sewer via this new manhole.

In Area 2, the overburden soils west of the proposed plenum location will be graded to allow for surface water drainage around the plenum on the west side. Grading is expected to be minimal due to low expected surface water flows during rain events.

4.1.4.6 Vacuum Piezometers

In order to address the concern about horizontal migration of contaminants, vacuum piezometers will be installed at the approximate locations shown in Figure 4.1-1. The piezometers will be spaced in conjunction with every other perimeter electrode, approximately 20 feet from the maximum extent of the remediation area (and 10 feet beyond the plenum). In the event that one of these piezometers indicates a positive pressure or VOC concentrations exceeding established baseline conditions, the piezometer will be connected to the recovery system. Figure 4.1-7 shows the typical cross-section of a vacuum piezometer.

The vacuum piezometers installed to monitor the ERH remediation will be fitted with a quick-connect access port to allow the acquisition of a vacuum measurement and air

sample. The vacuum measurements and air samples will be collected and recorded according to SOP 340. The air samples will be analyzed by taking the calibration port from the total hydrocarbon analyzer off line temporarily, and using it to analyze the vacuum piezometer air samples. The vacuum piezometer air samples will be collected multiple times prior to the ERH system startup to determine baseline conditions – daily during system startup until approximately steady-state conditions are obtained, and weekly throughout the course of the ERH remediation. Each vacuum piezometer will have its own log for recording measurements (SOP 340) of vacuum and air sample analyses.

4.1.4.7 Exclusion Zone Fence

The entire ERH remediation area will be enclosed within a 6-foot-high chain link fence. Figure 4.1-1 shows the approximate location of the exclusion zone fence. The fence fabric is 11-gauge galvanized steel with top bar and bottom tension wire. If surface voltages indicate entry into the ERH remediation area while the system is energized is unsafe, the access gate into the ERH remediation area will have an interlock to automatically deactivate the ERH electrodes if anyone tries to enter. The ERH condenser and the vacuum blower will continue to operate in this instance.

4.1.4.8 Condenser

The vapor recovery piping is routed to the ERH condenser where steam is converted to liquid water and separated from the recovered air and chlorinated solvents. The capacity of the condenser is compared with the requirements for the Lockformer site in the following table:

Parameter	Condenser Capacity	Required for Site
Steam Flow Rate	900 scfm	260 scfm
Air Flow Rate	300 scfm	120 scfm
Vacuum Rating	To 20" Hg	To 12" Hg

The condenser includes a mist eliminator to remove over 99 % of water droplets that exceed 10 micron. An integral cartridge filter removes any particulate that might enter the condenser. The condensed water is pumped into a recirculation loop that cools the condenser. Based on THERMAL'S design, the maximum flow rate of condensed water that will be discharged and treated is 1.7 gpm from Area 1 and 1.4 gpm from Area 2. The recovered air and chlorinated-solvents vapor exit the condenser and are conveyed to the vacuum blower. The actual water flow rate is expected to be less than half of these flow rates, since most of the water is evaporated.

4.1.4.9 Vacuum Blower

The minimum capacity of the vacuum blower will be 200 standard cubic feet per minute (scfm) at 15 inches of mercury vacuum. A 25-horsepower (hp) positive displacement (rotary lobe) blower will provide the required capacity. At present, a 25-hp rotary blower is planned for use so that it will have spare capacity for this application. The discharge from the blower will be routed to the inlet of the primary 1,800-pound granular activated carbon (GAC) vessel, which will be connected in series to the secondary 1,800-pound GAC vessel. After passing through the secondary GAC vessel, the treated air stream will be discharged to the atmosphere through a stack. The stack will be cut through the wall, west of the carbon treatment units, and will run alongside the building to approximately 5 feet above the height of the building. The total stack height will be approximately 25 feet above surface grade. Condenser water will be treated in two 200-gallon activated carbon units, operated in series, prior to discharge to the sanitary sewer. Figure 4.1-8 illustrates the proposed process flow for the ERH system.

The design bases for the water treatment system and the air treatment system are provided in Sections 4.2.3.10 and 4.2.3.11. Treated water will not be used to wet the electrodes.

4.1.4.10 ERH Power Supply

An ERH power control unit (PCU) is used to convert standard three-phase electrical power to the electrical phases required for site remediation. The PCU includes isolation transformers that force ERH current to flow between the electrodes only, and it is physically impossible for ERH current to flow to a distant electrical sink.

The PCU is a skid-mounted unit with six individually controllable electrical phases. It is rated at a capacity of 500 kW; however, THERMAL anticipates the average power input to be 325kW when shutdown periods and load balancing considerations are included. The ERH PCU includes isolation transformers that provide power to the electrodes. In an isolation transformer, there is no physical link between input power and output power. The transformer input power is converted into a magnetic field, and this magnetic field generates power in the transformer output windings – without physical contact, mixing, or interaction between the electrons in the utility power and the electrons that flow through the soil. The isolation transformer can be considered a "pump" that sucks electrons from one set of electrodes and pushes the electrons into another set of electrodes. The magnetic field provides the driving force for the electron pump.

Electrons cannot leave the ERH region and flow to a distant electrical sink because that would require the isolation transformer to create electrons – something it cannot do. The electrons cannot flow to a distant location and then flow back via the utility lines, because there is no physical connection to allow the electrons to return to the transformer's output side.

The ERH power supply can be remotely monitored and controlled by modem connection and can be used to supply electricity to the condenser and the vacuum blower. It is anticipated that the PCU will be connected to the existing transformer on the west side of the Lockformer building. This transformer currently services the entire facility and has been upgraded to supply the additional capacity to operate the ERH system.

4.1.5 System Installation

4.1.5.1 Electrode, Vapor Recovery Well, and Temperature Monitoring Point Installation

TMPs, electrodes, and vapor recovery wells in Area 1 will be installed first. Subsurface installations will require about three weeks to complete. Upon completion of construction activities, the exclusion zone fence will be installed and the plenum constructed. The construction of the plenum will be coordinated with the installation of the SVE wells. This is required since the SVE wells will be completed above the final asphalt cover elevation. All soil cuttings will be appropriately drummed and disposed of as described in Section 4.6.

4.1.5.2 Equipment and Piping Installation

THERMAL will install the vapor recovery piping and ERH remediation equipment. Air and water discharge piping will be connected to header pipes leading to the water and air treatment systems. Details of these systems are provided in Sections 4.2.3.10 and 4.2.3.11.

A local electrical contractor will connect the ERH power supply to the existing transformer. THERMAL will connect the TMPs and electrodes in Area 1 to the ERH

PCU. This phase will require about three weeks to complete. Figures 4.1-9 and 4.1-10 show a preliminary layout of the vapor extraction lines and electrical lines, respectively.

4.1.5.3 Testing and Start-up

THERMAL will test all safety interlocks and then apply a low voltage (typically about 50 volts) to the on-service ERH electrodes. The induced voltage will be measured at locations throughout the ERH remediation area and along the border of the exclusion zone. Special attention is paid to locations where the possibility is highest for induced voltages to reach the surface. Locations with voltages in excess of one volt will be logged and noted on a plot plan. THERMAL will recheck these locations as the voltage applied to the ERH remediation area is slowly increased. THERMAL's policy will not allow a step-and-touch potential greater than 15 volts at any point outside the exclusion zone.

The testing and start-up phase will require about two weeks. Once the field is at operating voltage, THERMAL will periodically recheck the applied voltage at the surface, especially when on-service electrodes change or when significant applied voltage increases are planned.

THERMAL will prepare and submit an Operation and Maintenance Manual to USEPA for review and comment prior to startup of the ERH remediation system. The manual will be kept onsite along with maintenance logs and datasheets.

4.1.5.4 System Removal

Once remediation is completed and confirmation sampling affirms that the cleanup objectives have been met, the ERH electrodes will be removed from the subsurface and the former boreholes will be grouted. It is anticipated that the electrodes will be

physically removed and the boreholes overdrilled to remove any remaining conductive materials. TMPs will be abandoned in place with grout filling in the tops of each point.

4.1.6 Time Frame to Achieve Remedial Objectives

Treatment Area 1 will be remediated first, followed by Treatment Area 2. At initial ERH start-up, approximately half of the 43 ERH electrodes in Area 1 will be placed in service. The remaining electrodes in Area 1 will be brought on-line as the remediation progresses. Consecutive operation of the ERH remediation system in Area 1 followed by Area 2 was chosen to minimize the electrical usage at one time, the size of the transformer unit necessary for operation, and the potential for fugitive migration of vapors during remediation.

It will require about 25 to 30 days of operation to heat half of Area 1 to the boiling point of water (80 to 100° C, depending on the vacuum applied by the vapor recovery system). Heat-up of each half of Area 1 will be slowed slightly by the volatilization of TCE, which removes heat from the surface. By day 60 of operations, all electrodes in Area 1 will have been placed in service. It is estimated 170 to 180 days of total operation will be required to complete Area 1 remediation.

Once Area 1 has been completed, based on the results of confirmatory soil sampling, heating will start in Area 2. Because the treatment volume in Area 2 is less than the treatment volume in Area 1, all 40 electrodes in Area 2 will be placed in service at once. It will require about 40 to 50 days to heat Area 2 to the boiling point of water (80 to 100° C, depending on the vacuum applied by the vapor recovery system). It is estimated that 115 to 125 days of operation will be required to complete Area 2 remediation.

4.1.7 Project Management

THERMAL will complete the ERH remediation of the Lockformer property. Clayton Laboratory will perform all soil sample chemical analysis. Key individuals and their responsibilities are as follows:

Lockformer Project Manager

Mr. J.R. Svehla will be the Lockformer Project Manager for this project. He has general oversight and project management responsibilities. He is responsible for completing the project to the satisfaction of the Agency and meeting the remediation goals and objectives.

Clayton Project Coordinator

Mr. Ron St. John will serve as the overall Project Coordinator for Clayton. Mr. St. John will be responsible for the overall project and coordination between efforts. Mr. St. John will be responsible for all communication and reporting to USEPA on the Lockformer project.

Clayton Field Project Manager

Mr. William Elwell will serve as the Clayton Field Project Manager. In his role as Field Project Manager, Mr. Elwell will be responsible for coordination of the remediation activities. He will be responsible for implementation, scheduling, and integration of the various technical disciplines required during the remediation activities.

Clayton Project Quality Control Officer

Dr. Hank Mittelhauser will serve as the Project Quality Control Officer. Dr. Mittelhauser will provide general oversight and guidance to the Clayton management team. He will review the findings and evaluations of the project.

THERMAL Managers

Mr. Greg Beyke will be the lead engineer, Jerry Wolf will be the THERMAL Project Manager, and Tom Powell will be the Site Manager.

Analytical Laboratory Project Manager

Mr. William Mottashed will serve as the First Environmental Laboratories, Inc. (First) Project Manager. Mr. Mottashed will be responsible for coordinating laboratory analyses and will provide an overview of final analytical reports.

Analytical Laboratory QA/QC Officer

Ms. Lorrie Franklin will serve as the First Laboratory QA/QC Officer. Ms. Franklin will be responsible for overview of laboratory QA/QC procedures, overview of QA/QC documentation, conduct of detailed audits, approval of laboratory corrective actions (if required), technical representation of laboratory QA procedures, and overview and approval of final analytical reports.

4.1.8 Construction QA/QC

A Construction Quality Control Plan has been developed for the ERH remediation system construction and start-up. A copy is included as Attachment 4-A.

4.2 SOIL VAPOR EXTRACTION

This section describes the feasibility, installation, and operation of the SVE system to be used to remediate residual VOCs present in the Mass Waste Sand and Gravel. The use of SVE has been widely accepted by regulators and proven an effective in-situ remediation technology. This in-situ technology is very effective in removing contaminants with moderate-to-high vapor pressures in subsurface soils and bedrock with moderate-to-high

permeabilities. The use of SVE to remove the VOCs within the Mass Waste Sand and Gravel at the Lockformer property is the most practical and feasible remedial approach.

The completion of remediation will be based on evaluating the removal efficiency of VOCs and conducting confirmation sampling (Section 5.0). Confirmatory samples will be collected at various locations and depths to properly demonstrate RAOs have been met. Statistical methods will be used to demonstrate the 95 percent confidence level for confirmation data to meet the RAOs. If RAOs are not achieved, Lockformer will evaluate modifying the SVE system design to enhance performance or operate the SVE system in pulse mode for an extended period.

The design of the SVE system for the Mass Waste Sand and Gravel will be based on the performance of a pilot test. A pilot test will be performed for a period of one to two weeks to obtain design data for the full-scale system and air treatment system. Details of the pilot test and design, construction, operation, and maintenance of the full-scale SVE systems are described in the following sections.

4.2.1 Performance and Reliability of Technology

The process of SVE involves inducing a pressure gradient by withdrawing or injecting air through a well or network of wells to move air through the pore spaces within the unsaturated zone. Contaminants in the vapor phase are captured and removed by the advective transport of air through the subsurface. The process of SVE removes contaminants from the subsurface by causing dis-equilibrium between the various phases and transferring the mass of volatile contaminants adsorbed on soil particles, residual liquids (i.e., NAPLs and DNAPLs), and contaminants dissolved in pore water into the vapor phase. As time progresses, the contaminant mass is steadily decreased until contaminants are totally removed or concentrations are decreased below an established cleanup standard.

4.2.2 Feasibility of Implementation

The two most important factors for evaluating the feasibility of SVE are soil and chemical properties. Soil properties include texture, porosity, saturation (i.e., moisture content), wetting and non-wetting phases, residual water saturation, residual NAPL/DNAPL saturation, capillary pressure, and permeability. Permeability of the subsurface materials is the most important soil property when evaluating the feasibility of SVE. Chemical properties of the contaminants include vapor pressure, Henry's Law Constant, boiling point, soil adsorption coefficient, and solubility. The most important chemical properties for evaluating the feasibility of SVE include vapor pressure, Henry's Law Constant, and boiling point.

The vapor pressure of a contaminant is defined as its tendency to volatilize or evaporate. Contaminants that exhibit vapor pressures greater than 0.5 mm Hg can be expected to volatilize to a large degree. Henry's Law Constant is the tendency for a contaminant to partition and volatilize from water. Contaminants with Henry's Law Constants greater than 0.01 (dimensionless) exhibit a tendency to volatilize from water. The boiling point of a contaminant is defined as the temperature at which a chemical's vapor pressure is equal to the atmospheric vapor pressure under standard conditions. The boiling point of a contaminant will decrease when the pressure in the subsurface is decreased by the presence of a vacuum. Consequently, the boiling point of the contaminant will decrease, and its tendency to volatilize will increase.

The Mass Waste Sand and Gravel ranges in thickness from 14 to 20 feet and consists of deposits of fine- to coarse-grained sand and gravel. The silt and clay content of this unit is typically less than 10 percent. This stratigraphic unit contains concentrations of TCE, the primary VOC of concern, ranging from less than 0.005 mg/kg to 50.9 mg/kg. The vapor pressure, Henry's Law Constant, and boiling point for TCE are 57.8 mm Hg at 25° C, 0.422 (dimensionless) at 25° C, and 87° C, respectively. The thickness, geometry,

and permeability of the Mass Waste Sand and Gravel and the chemical properties for TCE suggest that implementation of SVE will successfully achieve RAOs for this portion of the site.

Although SVE has gained wide acceptance in the regulatory community as a proven remediation technology, a pilot test will be performed to obtain data for the design of the full-scale SVE system to be used to remediate the Mass Waste Sand and Gravel. The data obtained from the pilot test will be used to design the system configuration and air treatment system. Details of the pilot test and data used for the full-scale system design are described in the following section.

4.2.2.1 Pilot Test

A 1- to 2-week pilot test will be performed at the Lockformer site to obtain site-specific parameters and provide the basis of design for the full-scale SVE system used to remediate the Mass Waste Sand and Gravel. One vapor extraction well, four multi-point monitoring probes, and four single-point monitoring probes will be installed near the former fill port located on the western side of the facility building. The borings for the extraction well and multi-point monitoring probes will be drilled to the base of the Mass Waste Sand and Gravel (approximately 40 to 50 feet bgs) using hollow stem augers. Borings for the single-point monitoring probes will also be drilled to within 2 feet of the base of the Surficial Silty Clay Till and Fill. The monitoring probes will be installed at radial distances of 20, 50, 75, and 100 feet from the vapor extraction well. These probes will be used to measure the subsurface vacuum response during the pilot test and evaluate the radius of influence, well spacing, and number of extraction wells required for the full-scale remediation system. The probes completed in the Silty Clay Till will be used to evaluate the pneumatic connection between the lower portion of the Silty Clay Till and the Mass Waste Sand and Gravel.

The locations of the pilot test well and monitoring probes are shown in Figure 4.2-1. During installation of the system, each well and monitoring point will have a separate identification number. After the pilot test is completed, the extraction well and monitoring probes will be incorporated into the full-scale SVE design.

The vapor extraction well will be constructed of 4-inch-ID Schedule 80 CPVC pipe and well screen. CPVC materials are necessary to withstand heat generated by ERH remediation within the Surficial Silty Clay Till and Fill during full-scale remediation. The length of the well screen will be 15 to 20 feet to provide air withdrawal along the entire thickness of the Mass Waste Sand and Gravel. The well screen will consist of 0.020-inch slotted openings. The construction details of the vapor extraction well are shown in Figure 4.2-2. The multi-point monitoring wells will be constructed of 1-inch-diameter Schedule 80 CPVC pipe and well screen. The screen for each probe will be one foot in length with 0.010-inch slotted openings. Three monitoring probes will be placed in the borehole so that the well screens will be located in the upper, middle, and lower portions of the Mass Waste Sand and Gravel. The well screen for the single-point monitoring probes will be placed 2 feet above the elevation of the base of the Surficial Silty Clay Till and Fill. The construction details of the multi-and single-point monitoring probes are shown in Figure 4.2-3. Monitoring probes have been included in the Surficial Silty Clay Till and Fill unit to determine any interconnection between that unit and the Mass Waste Sand and Gravel unit.

The vapor extraction well and monitoring probes will be completed approximately 0.5 feet bgs. A flush-mounted cover will be placed over the extraction wells and monitoring probes. For the full-scale SVE system, the flush-mounted well covers for the pilot test SVE well and monitoring probes will be removed, and the well pipe extended above the design grade for the plenum and/or the ground surface.

A mobile or trailer-mounted SVE unit will be used for the pilot test. The SVE unit will be situated next to the extraction well and will consist of a low vacuum/high airflow vacuum blower, a condensation tank and automatic drain pump, a silencer, an air dilution valve (ADV), and ancillary piping and gauges. A telemetry system will monitor the operating parameters of the SVE system. An equalization tank will collect water discharged from the condensation tank. The exhaust stack of the SVE unit will be connected to a 1,800-pound carbon canister to treat the air discharge during the test. The vacuum blower for the SVE unit will generate maximum flow rates of 500 cfm and vacuum levels up to 10 inches of Hg. The ADV on the SVE unit will be adjusted to change the airflow conditions at various times during the test to evaluate the change in field parameters.

The power for the SVE unit will be obtained from a temporary electrical box connected to the facility power supply.

To limit noise generated during the pilot test, a silencer will be placed on the discharge stack, and bails of hay will be placed along the sides of the SVE unit.

Field and operating parameters will be monitored at regular intervals during operation of the pilot test SVE unit. The SVE unit will be operated at three different vacuum levels in order to measure the parameters under varying airflow conditions. The SVE unit will be operated at each vacuum level until operating and field parameters stabilize.

The operating and field parameters measured during the pilot test will include (1) vacuum and airflow rate at the SVE unit; (2) temperature and vapor concentration at the SVE exhaust pipe; (3) vacuum and airflow rate at each extraction well; and (4) vacuum response at each monitoring probe. The vapor concentration at the exhaust stack will be measured with a photoionization detector (PID). In addition, two air samples will be collected for laboratory analysis during each of the three test phases. The air samples will

be collected using a Summa-type canister and analyzed for VOCs by USEPA Method TO-15. All data will be recorded on data sheets and in the field logbook.

The pilot test data will be evaluated and summarized in a report. The vacuum level, total airflow rate, and exhaust temperature data will be used to evaluate the performance of the vacuum blower relative to the varying flow and subsurface conditions. The relative vapor concentration and air sample analytical data will be used to evaluate the mass removal rate of VOCs and loading of the carbon units. These data will also be used to determine the duration of remediation and modify the size and number of the GAC air treatment units, if required.

The vacuum response data will be analyzed to evaluate the airflow conditions in the Mass Waste Sand and Gravel, the radius of influence, and the well screen length of the extraction wells. The radius of influence will be used to determine the number and spacing of extraction wells for the full-scale remediation system. The vacuum response data measured at the multi-point monitoring probes will be used to evaluate if airflow is evenly distributed throughout the Mass Waste Sand and Gravel. If it is, the specified screen length of the extraction wells will be 15 to 20 feet. If airflow is not evenly distributed or heterogeneous conditions are encountered within the Mass Waste Sand and Gravel, the placement of discrete extraction wells with smaller screen intervals will be considered for the full-scale design.

4.2.3 Design and Technical Specifications

The SVE remediation system for the Mass Waste Sand and Gravel will consist of a network of vertical vapor extraction (VE) wells and monitoring probes, process piping, a manifold and main header pipe, a condensation tank, vacuum blower, fluid transfer pump, equalization tank, and silencer. Figure 4.1-8 is a process flow diagram showing the process components of the SVE remediation system. A conceptual layout of the full-

scale SVE system is shown in Figure 4.2-4. During installation of the system, each extraction well and monitoring point will be assigned a separate identification number. The final number of extraction wells and well spacing for the Mass Waste Sand and Gravel remediation system will be based on the results of the pilot test.

The SVE, air treatment, and water treatment units will be located within the southwestern portion of the facility building (Figure 4.2-4). This area will be designated the Remediation Equipment Area. To provide spill containment within the Remediation Equipment Area, a curbed area will be constructed around the perimeter and the floor sealed as necessary. The process piping for each extraction well will be connected to a manifold located outside the facility building. The piping and manifold will be housed in a building designated as the Valve Control Building. Details of the components for the SVE system are described in the following sections.

4.2.3.1 Vertical Vapor Extraction Wells

Vapor extraction (VE) wells must be designed to move air evenly through all soils in order to remediate them properly. The extraction wells used to remediate the Mass Waste Sand and Gravel must also be able to withstand the heat generated by the ERH remediation system. The final number and spacing of the VE wells will be based on the results of the pilot test (Section 4.2.1.1).

Each vapor recovery well will be constructed with 4-inch ID Schedule 80 CPVC pipe and slotted well screen, placed in a 12-inch-diameter borehole. The screened interval for the VE wells will range from 15 to 20 feet depending on the thickness of the Mass Waste Sand and Gravel and the results of the pilot test. A filter pack of appropriate grade will be placed from the base of the borehole to 1 foot above the well screen. A 2-foot bentonite seal consisting of bentonite pellets will be placed on top of the filter pack and

hydrated with water. The remaining annular space will be sealed with grout to the ground surface. A diagram of a typical VE well is shown in Figure 4.2-5.

The VE wells will be completed at least 3 feet above the design grade of the plenum and above the ground surface for wells located outside the plenum. For VE wells located within the plenum area, a 6-inch-diameter, Schedule 80 CPVC sleeve of appropriate length will be placed around the riser pipe for the VE well. This sleeve will be used to protect the VE well during placement of the asphalt cap for the plenum. After the asphalt cap is constructed, the annular space between the sleeve and the riser pipe for the VE well will be sealed with grout to prevent the off gases from escaping the ERH treatment zone.

The excess pipe above the plenum and/or ground surface will be cut, and a T-fitting will be attached to the top of the VE well. A threaded cap will be placed on top of the T-fitting, and a horizontal process pipe consisting of 4-inch ID, Schedule 80 PVC will be connected to a manifold located outside the facility building. Connecting the process lines to a centrally located manifold will allow the operator to easily adjust the vacuum levels and airflow rates of individual VE wells and observe the response of the entire system at one location. The process pipes on the plenum and ground surface will be wrapped with insulation to limit condensation and freezing during the winter months of operation.

The manifold for the SVE system will be constructed of 4-inch ID, Schedule 80 PVC pipe, ball valves, and fittings. A vacuum gauge, sample port, pitot tube, and differential flow meter will be installed on each SVE well manifold pipe, as well as the main header leading to the SVE unit. The manifold will be housed in a building designated the Valve Control Building where each SVE well will be valved individually. The final number of wells, process pipes, and the size of the manifold will be based on the results of the pilot test. The main header pipe for the manifold will be connected to the inlet of the SVE unit located in the Remediation Equipment Area.

4.2.3.2 Monitoring Probes

Several multi-point monitoring probes will be installed outside the extraction well array to monitor subsurface vacuum and the performance of the Mass Waste Sand and Gravel SVE unit. The total number of monitoring probes will be based on the results of the pilot test. Based on the preliminary design, nine multi-point monitoring probes will be installed around the perimeter of the SVE remediation area (see Figure 4.2-4).

The monitoring probes will be constructed of 1-inch-ID, Schedule 80 CPVC pipe and screen. The well screen will be 1 foot in length with 0.010-inch slotted openings. The well screens for the multi-point monitoring probe will be placed in the same borehole. The well screens will be placed in the upper, middle, and lower portions of the Mass Waste Sand and Gravel.

A filter pack consisting of an appropriate grade of sand will be placed along the screened interval up to 1 foot above the top of the well screen. A 2-foot seal consisting of bentonite pellets hydrated with water will be placed over the filter sand. This sequence will continue for the multi-point monitoring probe well screens up to the top of the Mass Waste Sand and Gravel. The remaining annular space along the Surficial Silty Clay Till and Fill will be filled with grout (Figure 4.2-3)

The multi-point monitoring probes will be completed 1 foot above the ground surface. Quick-connect fittings will be attached to the top of each monitoring probe to connect tubing to a vacuum gauge during monitoring.

4.2.3.3 Condensation Tank

The main header from the SVE manifold will be routed to a condensation tank where water is separated from the process air prior to entering the blower. The final capacity

and design specifications for the condensation tank will be based on the results of the pilot test. The preliminary estimate is that the amount of water generated will not exceed 0.5 gpm.

The condensation tank will include a mist eliminator to remove over 99 % of water droplets that exceed 10 microns. An automatic transfer pump will pump the water collected in each tank into an equalization tank. This water will then be pumped through a water treatment system prior to discharge to the sanitary sewer.

4.2.3.4 Vacuum Blower

A low vacuum/high airflow blower will be used for the Mass Waste Sand and Gravel SVE system. The specifications for the blower will be based on the results of the pilot test. A blower with an airflow rate of 500 to 1,000 cfm and a vacuum of less than 10 inches Hg will be adequate for the SVE system used to remediate the Mass Waste Sand and Gravel.

4.2.3.5 Transfer Pump

Transfer pumps will be used for the SVE system to remove water from the condensation tank and transfer water to an equalization tank. Activated by a series of float and relay switches in the condensation tank, water will be pumped into a 500-gallon equalization tank. A secondary pump located within or outside the equalization tank will discharge water to the water treatment unit when activated by a float switch.

4.2.3.6 Equalization Tank

A 500-gallon equalization tank for the combined discharge from the SVE condensation tanks and the ERH condenser will be constructed of polypropylene. The tank will be

used to temporarily store water prior to discharge to the water treatment unit. A discharge or sump pump will be placed in the equalization tank to transfer water for treatment. The equalization tank will be situated within a secondary containment structure. A process flow diagram is shown in Figure 4.1-8, and a preliminary layout is shown in Figure 4.2-6.

4.2.3.7 Silencer

A silencer will be placed on the air discharge stack of the SVE system and air treatment unit to limit the noise levels produced during operation. The silencers will be specified to reduce noise level below village ordinances.

4.2.3.8 SVE Power Supply

The power supply for the SVE unit will be obtained from the power supply at the facility. The SVE unit will require a power supply that is 3-Phase, 230/460 Volts, and a minimum of 200 amperes circuits. A separate circuit box will be installed for the SVE unit.

4.2.3.9 Water Treatment System

The water discharge pipes for the ERH remediation system and SVE units will be connected individually to the 500-gallon equalization tank. The water in the equalization tank will be discharged in batches to the water treatment system. A process flow diagram is shown in Figure 4.1-8.

The water treatment system will consist of two 200-pound liquid-phase GAC units placed in series. The discharge from the ERH remediation system and SVE unit will be treated by the carbon adsorption units prior to discharge to the sanitary sewer. Water samples will be collected from sample ports located before the first carbon unit, between the first and second carbon units, and after the last carbon unit – weekly for the first month of

operation and semi-monthly for the next three months. Afterward, the carbon system will be sampled monthly to determine the status for changing out the first carbon unit. The samples will be analyzed for VOCs to monitor discharge and contaminant breakthrough. Once breakthrough is detected in the first unit, the first carbon canister will be replaced with a new canister. Flow will then be redirected so that the secondary unit is now the primary unit, and the replaced unit is the secondary unit. Details of the water sampling are discussed in Section 4.4.

As previously stated, the maximum flow rates from the condensers in the ERH system are estimated at 1.7 gpm and 1.4 gpm from Areas 1 and 2, respectively. The maximum anticipated flow rate from the condensation tank in the SVE system is 0.5 gpm. The VOC concentrations in these waters will be low, based on experience at other sites. The use of two carbon canisters in series, plus periodic testing of the waters as described above, will insure removal of VOCs before discharge to the sewer system.

Clayton has met with representatives of the DuPage County Public Works Department, the facility that receives water from the Lockformer sanitary system. Mr. Kevin Buoy, Operations Manager, and Mr. Bill Kennedy, Chief Operator Region 9 West, Environmental Concerns stated that, after a review of the operations described above, they wished to receive copies of analytical reports. Clayton will provide the notification and reports.

4.2.3.10 Air Treatment System

The design of the vapor phase carbon treatment system is intended to accomplish the following objectives:

- Minimize the frequency of change outs, while maintaining the required removal of VOCs prior to atmospheric discharge.

- Insure that the system can handle well in excess of the maximum anticipated volumetric flow rate.
- Insure that excess carbon adsorbers are always available.

The calculations used to design the vapor phase carbon treatment system are provided below.

The mass of TCE present in soil in Area 1, the primary VOC of concern, is approximately 1,600 pounds. This estimate was obtained by using the analytical results from Area 1 and assuming each data point was representative of the volume around that data point. In order to establish a conservative design, the mass of TCE in Area 1 soils is assumed to be 1,800 pounds. This conservative number also allows for loading on the carbon units by other chlorinated solvents. Essentially all TCE liberated from the soils using ERH will go to the carbon units since THERMAL's experience shows very few organics are ever found in the condenser condensate.

The mass of TCE in Area 2 is significantly less than the mass of TCE in Area 1 since the volumes are approximately equal, while the maximum concentration of TCE in Area 2 is approximately 50 mg/kg, versus a maximum concentration of TCE in Area 1 of over 1,000 mg/kg. Therefore, a carbon system capable of handling TCE from Area 1 will be capable of handling TCE from Area 2.

A very conservative estimate of the mass of TCE to be liberated from the Mass Waste Sand and Gravel during SVE is expected to be 2,600 pounds. This estimate is based on the average TCE values shown on Figures 2.1-7 and 2.1-8 for the Mass Waste Sand and Gravel, using an average thickness of 15 feet and the area shown on Figure 4.2-4. The estimate is conservative since it is highly likely that TCE concentrations in the western portion of the treatment area will be significantly lower than the concentrations shown on Figures 2.1-7 and 2.1-8.

The remedial design provided by THERMAL specifies 25 to 30 days of heating to increase soil temperatures to the boiling point of water, followed by approximately another 150 days of heating at the boiling point of water. Based on THERMAL's experience, a conservative assumption is that 50% of the TCE mass (or up to 900 pounds) in Area 1 will be liberated during the first 30 days of operation. This is truly a maximum estimated loading, since the current plan is to operate only approximately half of the electrodes during initial start-up. If this procedure was followed, maximum loading would be approximately 450 pounds over a 30-day period.

The design flow rate of air to the carbon units from the ERH system in Area 1 is 120 scfm. Operation over 30 days will result in generation of 5.2×10^6 standard cubic feet of air. 900 pounds of TCE equals 4.1×10^5 grams of TCE. Therefore, the maximum loading into the first carbon unit is estimated to be 0.079 g/scf. This also corresponds to a maximum estimated loading into the first carbon unit of 1.25 pounds per hour, or approximately 500 PPM.

Based on the above calculations, four 1,800-pound carbon canisters will be used in parallel series. It is highly likely that one unit would be sufficient to adsorb all TCE released during the first 30 days of operation, since it is unlikely that the maximum estimated loading of 900 pounds will be achieved, for the reasons previously stated. However, if breakthrough occurs (defined as a hydrocarbon concentration exiting the first carbon units in series equal to or greater than 10 percent of the hydrocarbon concentration entering the unit), the flow from the primary adsorbers will be redirected such that the secondary adsorbers become the primary adsorbers, and the new units become the secondary adsorbers.

The combined capacity of these units exceeds all the TCE expected to be liberated from Area 1. In addition, Lockformer will continue to maintain two spare carbon adsorbers

until late in the remediation cycle when it becomes apparent the mass loading of TCE is so low that no more than one spare unit is required.

The flow rate from the SVE system (guesstimated at 500 scfm) will be controlled such that the combined mass loading of hydrocarbon from the ERH and SVE system never exceeds 800 pounds in a given month. It is highly unlikely that after the first three months of operation, the combined mass flow rates of hydrocarbons from the ERH system in Area 1 and the SVE system will exceed 500 pounds per month.

Once the remediation in Area 1 is complete, the ERH system will be moved to Area 2, while the SVE system continues to operate. For the reasons stated earlier, the mass loading from Area 1 to the carbon adsorbers will be significantly less than the loading from Area 2, so the system design will be more than adequate to handle the load on the system from Area 2.

The air discharge pipes for the ERH Remediation System and SVE unit will be connected to a single header leading to the air treatment system. A process flow diagram is shown in Figure 4.1-8.

The air treatment system will consist of two parallel systems each with two 1,800-pound vapor-phase GAC units placed in series. Air samples will be continuously collected at (1) a sample port located on the main header prior to the first carbon units, (2) a sample port located between one section of pipe between two carbon units in series, and (3) the main header pipe after the last carbon units. The air samples will be collected by an automatic hydrocarbon analyzer (see Section 4.5) and continuously analyzed for total hydrocarbons. Additionally, grab samples will be obtained for specific VOCs to monitor air discharge and verify that carbon breakthrough has occurred. Once breakthrough is verified, the first two carbon adsorption units will be changed out and replaced with new carbon units. As with the liquid-phase GAC units, the former secondary unit will be repiped as the primary

units, and replacement units will be repiped as the secondary units. Details of the air sampling are discussed in Section 4.5.

In the unlikely event fugitive emissions escape the plenum or any area outside of the plenum, a blower will be installed to capture the emissions. These emissions will be sent to the carbon adsorption system. Per the technical specification sheets, Figure 4.2-6 shows a detailed layout of the remediation area including the carbon adsorption system and the instrumentation to be used for measurement of gases into the carbon treatment system. The use of four carbon absorbers in parallel-series should result in a 99 % removal efficiency of the inlet VOC content.

4.2.4 SVE System Installation

4.2.4.1 Vapor Extraction Wells

The vertical extraction wells and monitoring probes will be installed first. The total number of vertical extraction wells and multi-point monitoring probes will depend on the results of the pilot test. SVE extraction well installation on the western side of the system (near the eastern side of Area 2) will require that benches or terraces be constructed along the ridge to facilitate the drilling rig. Soils removed for the construction of these benches will be characterized and properly disposed.

4.2.4.2 Process Piping, Manifold, and Equipment Installation

The process piping, manifold, and the remediation equipment will be installed by the remediation construction contractor. The SVE system, air treatment units, and water treatment unit will be located within the southwestern portion of the facility building as shown in Figure 4.2-6. The manifold and Valve Control Building will be located outside the southwestern portion of the facility building. The water and air discharge piping for

the ERH Remediation system and the SVE unit will be connected to individual headers for discharge to the water and air treatment units, respectively. All SVE piping will be installed aboveground and insulated. This configuration will allow for the installation of the ERH plenum prior to completion of the SVE piping and enable system maintenance as necessary. Each well will be individually connected to the air treatment manifold in the Valve Control building. Figure 4.2-7 shows a preliminary layout for the SVE vapor extraction piping.

After the wells, process piping, manifold, and Valve Control building are installed, the contractor will install an exclusion zone fence surrounding the ERH Remediation Area.

A local electrical contractor will install all electrical conduit and wiring, and connect the SVE system and ancillary components to the facility power supply.

4.2.4.3 Testing and Start-up

The remediation construction and electrical contractor will test all components and electrical connections. After the initial system check is complete, the SVE unit will be operated with the ADVs in the open position. Ambient air will be drawn through the SVE unit. After the equipment, components, and connections are checked out, the ADVs will be closed. Clayton personnel will monitor the operating parameters of the SVE unit and vacuum levels at the monitoring probes. After the parameters stabilize, Clayton will adjust the valves at each extraction well to ensure the entire extent of VOCs in the subsurface soils is within the radius of influence of the wells.

During start-up testing, air samples will be collected using Summa-type canisters prior to and after the air treatment units. The samples will be submitted for laboratory analysis of VOCs to determine initial vapor concentrations of TCE.

4.2.5 Operation and Maintenance

The SVE unit will be operated on a continuous basis until the removal rate of the unit becomes asymptotic and ERH remediation is completed. At a minimum, the SVE system will operate at all times during the ERH remedial activities. Clayton will begin pulsed operation of the SVE system once the contaminant removal rate of the system becomes asymptotic. The pulsed operation of the SVE system will be approved by the USEPA. Pulsed operation is more efficient in removing the final portion of residual contaminants from the subsurface soils than operating the SVE system continuously. The pulsed mode of operation allows residual contaminants adsorbed to the soil particles to volatilize and re-equilibrate with contaminants in the pore vapor. When the SVE system is restarted for a limited period, the pore vapor is removed, and the SVE system is turned off. This process will be repeated in stages until remediation is complete.

The operation of the Mass Waste Sand and Gravel SVE unit will be decreased in stages (i.e., 75%, 50%, and 25%) prior to confirmation sampling. After the removal rate of VOCs becomes asymptotic, the operation of the SVE unit will be decreased to 75 %. That is, the SVE system will be operated at least three weeks for every month of operation. After removal rates of VOCs become asymptotic, the data will be evaluated to decide if the SVE system can be operated at a lower time interval. This process will be continued until the SVE system is operated at 25% or one week for every month of operation. After removal rates become asymptotic or negligible during the 25% operating stages, the data will be evaluated to decide if the SVE system should be shut off and when to begin confirmation sampling.

Lockformer personnel will perform surveillance on the SVE unit on a daily basis during the first 6 months of operation. Pressure monitoring will occur daily upon startup, and will be performed weekly once the system has approximately reached steady-state conditions. The pressure monitoring will be performed according to SOP 340. Clayton

personnel will perform any maintenance necessary. After this time, Clayton personnel will perform maintenance on a weekly basis. Maintenance will also be performed to troubleshoot any unforeseen equipment malfunction(s). The maintenance schedule will be coordinated with the air and water sampling schedules.

Maintenance will include checking the operation of the SVE system and electrical components, tightening belts, greasing bearings, and changing oil in blowers and transfer pumps, etc. Clayton will prepare and submit an Operation and Maintenance Manual to USEPA for review and comment prior to the start-up of the SVE unit. The manual will be kept onsite along with maintenance logs and datasheets.

4.2.6 Time Frame to Achieve Remedial Objectives

Based on experience with chlorinated solvents in permeable unsaturated soils, the recovery rate of the SVE will experience an asymptotic decline in contaminant removal within approximately 18 months of start-up. The exact time frame will depend on subsurface conditions (i.e., moisture content, the presence of DNAPL, etc.). The SVE system will be pulsed in stages (i.e., 75%, 50%, and 25%) after the initial asymptotic decline in VOC mass recovery occurs. The pulsed mode of operation will continue until confirmation sampling indicates RAOs have been achieved, or it is apparent that no appreciable further recovery of VOC mass will occur.

At that time, Lockformer will prepare a technical memo that outlines the recovery efforts, and requests the system be shut down due to the practical limitations of the technology being reached. Upon approval by USEPA, Lockformer will then perform confirmatory sampling in the mass waste sand and gravel.

4.2.7 Project Management

Clayton and a remediation construction contractor will complete the SVE remediation of the Lockformer property. Clayton's Laboratory in Novi, Michigan will perform chemical analysis of all soil samples. All air samples will be analyzed by Performance Analytical Inc. in Simi Valley, California. Key individuals and their responsibilities are as follows:

Lockformer Project Manager

Mr. J. R. Svehla will be the Lockformer Project Manager for this project. He has general oversight and project management responsibilities. He is responsible for completing the project to the satisfaction of the Agency and meeting the remediation goals and objectives.

Clayton Project Coordinator

Mr. Ron St. John, PG, will serve as the overall Project Coordinator for Clayton. Mr. St. John will be responsible for the overall project and coordination between efforts. Mr. St. John will be responsible for all communication and reporting to USEPA on the Lockformer project.

Clayton Field Project Manager

Mr. William Elwell, PG, will serve as the Project Field Manager. In his role as Field Project Manager, Mr. Elwell will be responsible for coordination of the remediation activities. He will be responsible for implementation, scheduling, and integration of the various technical disciplines that will be required during the remediation activities.

Project Quality Control Officer

Dr. Hank Mittelhauser (Clayton) will serve as the Project Quality Control Officer. Dr. Mittelhauser will provide general oversight and guidance to the Project Coordinator. He will review the findings and evaluations of the project.

Clayton Field Manager

Mr. John Wolski and the remediation construction supervisor will serve as the remediation Field Manager. Both managers will be responsible for overseeing field activities.

Analytical Laboratory Project Manager

Mr. William Mottashed will serve as the First Environmental Laboratories, Inc. (First) Laboratory Project Manager. Mr. Mottashed will be responsible for coordinating laboratory analyses and providing an overview of final analytical reports.

Analytical Laboratory QA/QC Officer

Ms. Lorrie Franklin will serve as the First Laboratory QA/QC Officer. Ms. Franklin will be responsible for overview of laboratory QA/QC procedures, overview of QA/QC documentation, conduct of detailed audits, approval of laboratory corrective actions (if required), technical representation of laboratory QA procedures, and an overview and approval of final analytical reports.

Air Monitoring Analytical Laboratory Project Manager

Ms. Kate Aguilera will serve as the Performance Analytical Inc. Project Manager. Ms. Aguilera will be responsible for coordinating laboratory analyses and providing an overview of final analytical reports.

Air Monitoring Analytical Laboratory QA/QC Officer

Ms. Lynn Fulks will serve as the Performance Analytical Inc. QA/QC Officer. Ms. Fulks will be responsible for overview of laboratory QA/QC procedures, overview of QA/QC documentation, conduct of detailed audits, approval of laboratory corrective actions (if required), technical representation of laboratory QA procedures, and overview and approval of final analytical reports.

4.2.8 Construction QA/QC

The Clayton Field Manager and remediation construction supervisor will be responsible for overall construction coordination, reporting to the Clayton Project Manager, scheduling, and equipment installation and testing. These field supervisors will also be responsible for field supervision, testing, and routine operations.

A Construction Quality Control Plan for the SVE remediation system installation is included as Attachment 4-B.

4.2.9 SVE System Removal

Once the remediation is complete and confirmation sampling affirms that the cleanup objectives have been met, the SVE wells and vacuum piezometers will be removed from the subsurface and the former boreholes will be grouted. At a minimum, these abandonment procedures will meet the substantive requirements of 77 IAC 920.120.

4.3 WATER DISCHARGE MONITORING

The water treatment system will consist of two 200-pound carbon units placed in series. The condensate from the SVE and ERH units will be transferred to a 500-gallon holding tank in the remediation area. The water from this tank will be discharged in batches through the treatment system. The treated water from this system will be discharged to the sanitary sewer after treatment. Water samples will be collected on a regular basis from sample ports located prior to, between, and after the carbon adsorption units. The water samples will be analyzed for VOCs (Method 8260) to evaluate the treatment efficiency of the carbon units, when to change out a carbon unit, and demonstrate compliance with any discharge permits.

Water samples will be collected weekly for the first month of operation and semi-monthly for the next three months. After that time, water samples will be collected monthly.

4.4 AIR MONITORING

The air monitoring program has two primary components. One component is monitoring air inside the plant, including worker exposure and operation of the activated carbon adsorbers. The other component is monitoring ambient air in the vicinity of the plant.

The purpose of the ambient air monitoring program is to demonstrate that emissions from the two sources (the stack and the plenum) do not exceed EPA-recommended ambient air quality standards in the community. The purpose of the air monitoring program within the plant is to demonstrate that Threshold Limit Values (TLVs) for 8-hour exposure to the chemicals of concern are not exceeded.

USEPA has recommended the following short-term screening values for ambient air standards in the residential community:

Chemical	Maximum Annual Exposure (ppb)
TCE	100
1,1-DCE	20
1,2-DCE (cis + trans)	200
Vinyl chloride	30
1,1,1-TCA	700
1,1-DCA	N/A
PCE	40

The corresponding TLV limits for the above chemicals, based on exposure for 8 hours, are as follows:

Chemical	Maximum (8-hr) Exposure (ppb)
TCE	50,000
1,1-DCE	5,000
1,2-DCE (cis + trans)	200,000
Vinyl chloride	1,000
1,1,1-TCA	350,000
1,1-DCA	100,000
PCE	25,000

4.4.1 Monitoring Worker Exposure and the Air Treatment Systems

Worker exposure and general site air monitoring will be performed through use of a Miran real time analyzer. Detection limits for this analyzer are provided in Attachment 4-E. Results from the Miran will be compared with the TLVs for the respective compounds. In the event a TLV is exceeded, EPA will be notified, and corrective actions will be implemented. The proposed corrective actions will be included with the notifications of exceedence. The most likely corrective action would be use of a vacuum system to direct plant air to the carbon treatment system.

A continuous Heated Total Hydrocarbon Analyzer will be used to monitor the air treatment system concentration of total hydrocarbons at the inlet to the first carbon units, the concentration between the first and second carbon units, and the emissions from the second carbon units. This instrument will also analyze air samples obtained from the plant air within the facility at a location approximately 100 feet north of the treatment area. The location of the hydrocarbon analyzer is shown in Figure 4.2-6. Lockformer proposes using a Model 51 Heated Total Hydrocarbon Analyzer manufactured by Thermo Environmental Instruments. A description of this instrument is provided in Attachment 4-C to this section. The instrument has five sample inlets. The fifth sample inlet will be used for calibration of the instrument. Output from the five sample inlets will go to a data logger.

Supplementary information on plant air quality can be obtained using the results from the hydrocarbon analyzer. However, this instrument measures only total hydrocarbons. At the same time as samples are obtained for the total hydrocarbon analyzer, grab samples for laboratory analysis will be obtained from sampling ports on the treatment system and in the plant in order to develop correlations between total hydrocarbons and individual constituents.

The hydrocarbon analyzer will switch streams approximately every 15 minutes. Sampling data will be recorded after sufficient time has elapsed to purge the sampling line five times. Readings will then be made every 15 seconds and averaged over a one-minute time interval. The data logger will be accessed to determine the hydrocarbon concentration recorded on the hydrocarbon analyzer at the time the samples were obtained for TO-15 samples.

The hydrocarbon analyzer will be used to collect samples from the inlet to the carbon treatment system, between the two carbon units, and after the last carbon unit. Analyses of the Summa canisters will be made by Performance Analytical, Inc. The TO-15 samples will be collected twice a week until the soil temperature reaches 50° C. Once the soils reach 50° C, daily samples will be obtained only from the stack exhaust. Daily sampling of the exhaust from the last carbon unit will continue as long as the concentrations exceed 10% of the maximum allowable emissions, as defined in the next section. Daily sampling will occur for a minimum of 30 days. After this time, if no increase in total hydrocarbon emissions is observed, weekly sampling will be performed. If an increase in total hydrocarbon emissions is observed that would result in estimated individual species equaling 10% of the allowable emissions, daily sampling would resume. This protocol will be followed for both remediation areas. This schedule is proposed since significant emissions will not be observed until the soil temperature reaches approximately 50° C. Sampling using Summa canisters will follow the USEPA SOP No. 1704, dated July 27, 1995 (revision No. 0.1).

Once the ERH system raises the soil temperature of each of the two soil remediation areas (Area 1 and Area 2) to 80° C, an emissions stack test from the remediation system carbon units will be performed. This stack test will require acquisition of stack gases using tedlar bags and laboratory analyses using EPA Method 18. Stack tests using Method 18 techniques will be run annually on the anniversary of the last test for as long as the soil ERH remediation system operates.

When "breakthrough" is detected (the outlet concentration from the first carbon units equals or exceeds 20 percent of the inlet concentration to the first set of carbon units), the first set of carbon units will be replaced. The second set of carbon units will then become the first set of carbon units, and a new set of carbon units will then be installed to become the second set of carbon units.

4.4.2 Ambient Air Monitoring

The ambient air monitoring program consists of determining background VOC concentrations, if any, and ambient VOC concentrations during operation of the remediation systems.

The ambient air monitoring program has the following main components. They are:

- Installation of a meteorological station. Instrumentation to measure wind speed, wind direction, temperature, relative humidity, barometric pressure, rainfall, and light intensity will be installed at the Lockformer facility at a location removed from any obstructions. A description of the instrumentation and sensor specifications is provided in Attachment 4-D to this section. The instrumentation will be installed and tested before operation of the remediation systems. Installation will be done by AWS. AWS provides meteorological stations for the National Weather Service and has a contract with the Homeland Security Agency to provide meteorological data throughout the country using over 6,000 of the weather stations they have installed. The instrumentation is calibrated before delivery to the site. The only parameter that cannot be calibrated before shipment is the barometric pressure. Once the instrumentation is installed onsite, AWS will be contacted by modem, and the

barometric pressure reading will be compared to other weather stations in the area, using triangulation. The reading will be adjusted, if required. On a weekly basis, Clayton will contact AWS, and the readings will be checked by AWS. AWS has assured Clayton that the installation will follow EPA-454/R-99-005, "Meteorological Monitoring Guidance for Regulatory Modeling Applications," Section 3.2, including the 10X rule.

- Dispersion modeling will be performed using either the EPA Screen 3 model or the EPA ISCST model to calculate the allowable emissions from the stack and the allowable concentrations at the facility perimeter that would not result in exceedance of the annual standards shown in Section 4.4.

- Installation of four fixed monitoring stations at the four corners of the perimeter of the facility. Once the ERH system is turned on, a Summa canister will be placed in the monitoring station that is most downwind from the remediation area, based on the wind direction shown on the meteorological station. The Summa canister will collect samples over an 8-hour time period. Results from performing TO-15 analysis on samples from the Summa canisters will be compared to the ambient screening standards presented in Section 4.4. Sampling will be performed twice a week until the temperature reaches 50° C, and then daily for 30 days. Based on the results of analysis of these samples, Lockformer will recommend a sampling strategy for future days.

- Until such time that EPA decides that the sampling frequency can be reduced, one Summa canister sample will be acquired in the residential neighborhood each day the ERH system is operated. The canister will collect 24-hour samples. The locations will be based on using the modeling to indicate the location of highest anticipated impact. Access for placement in the residential neighborhood will be made by EPA.

- Use of the Miran infrared analyzer to determine the concentration of the VOCs identified above. Instantaneous readings for each chemical will be made three times per day during normal business hours, at four locations along the perimeter of the remediation area fence.

4.4.2.1 Determination of Background VOC Concentrations

Before start-up of the ERH System, a minimum of four background samples will be obtained using Summa canisters, using the protocol described above. Should any VOCs

be detected during this background determination, the USEPA will be immediately notified.

4.4.3 Corrective Actions

If stack emissions exceed 20% of the calculated allowable emissions, the second carbon units will be replaced.

If exceedances of allowable concentrations of constituents at the property perimeter or in the community are observed due to releases from the plenum, a cover will be placed over the area where the emissions are occurring, and a vacuum source will be applied to direct air to the carbon treatment system. Provisions have been made in the design of the carbon system to accept this air.

The modeling described in Section 4.4.1 will be used to determine acceptable 8-hour and 24-hour concentrations that would not result in exceedence of the annual standards presented in Section 4.4.

4.4.4 QA/QC

Before start-up of the ERH system, if the ambient air sampling program shows the presence of organic constituents of concern, Summa canisters will be used to obtain samples of ambient air not affected by the ERH system. The frequency of background sampling will be determined by the levels of constituents detected.

When the Miran real time analyzer and Summa canisters are used, the information will be recorded in a hard-cover, numbered field logbook. The logbook will contain information on the time and date of installation and retrieval of each Summa canister, the canister number, the station at which the Summa canister was placed, and any difficulties

encountered. The logbook will also be used to record all information such as date, time, weather conditions, station, and monitored value for analyses performed with the Miran analyzer. The meteorological parameter during the sampling time will be obtained from the meteorological station. Samples for TO-15 analyses will be shipped to Performance Analytical, using the chain of custody form presented as Attachment 4-F.

4.5 TREATMENT SYSTEM INSTALLATION-DERIVED WASTES

The installation of the ERH remediation and SVE system will generate the following treatment-derived wastes: soil from drill cuttings and benching, decontamination water, water from soil moisture (extracted as water vapor), and non-hazardous miscellaneous waste. Secondary waste generated during the treatment of the air emissions and condensate water from both the ERH remediation and SVE systems will include GAC.

4.5.1 Soil Cuttings and Decontamination Water

Soil cuttings and decontamination water generated during the installation of the treatment system will be managed as described in Section 1.5.6 of the QAPP, provided as Volume III.

4.5.2 Water from Soil Moisture

A portion of the inherent moisture content of the surficial silty clay till/fill and the mass waste sand and gravel unit will be removed by the ERH remediation and SVE process. The infiltration of water in the mass waste sand and gravel unit should not interfere with the performance of the SVE system. The majority of the precipitation will be removed as surface runoff into storm sewers. Infiltration through the surficial silty clay till/fill into the mass waste sand and gravel should be negligible.

Moisture in the mass waste sand and gravel will be removed as water vapor as it travels through the network of extraction wells, process piping, and SVE condensate separator. As collected steam and air pass through the ERH condensers and SVE condensation tanks, water will collect and be transferred via a transfer pump into a 500-gallon equalization tank. This water will then be pumped through two 200-pound carbon adsorption units placed in series, as previously described.

4.5.3 VOC Vapor Emissions

Air emissions from the combined ERH remediation system and SVE unit will be connected to one discharge header and treated by four 1,800-pound GAC units placed in parallel-series. The emissions from the GAC treatment system will be designed to remove 99 % of the emissions from the remediation systems.

4.5.4 Used Carbon

When the adsorptive capacity of the carbon unit is no longer available, the carbon unit will be replaced, and the used carbon will be transported offsite as a hazardous waste for disposal or regeneration.

4.5.5 Non-Hazardous Miscellaneous Waste

Site remediation will also generate non-hazardous waste such as empty material bags (sand, Bentonite, and Portland cement), scrap CPVC piping, and miscellaneous debris. This non-hazardous waste will be managed and disposed in accordance with appropriate state and local solid waste requirements.

4.6 SOIL REMEDIATION – FORMER VAPOR DEGREASER AREA

Investigations at the site have identified VOC concentrations exceeding RAOs in the soil located in vicinity of the former vapor degreaser. Section 2.0 discusses the results of the investigation activities to date. The vapor degreaser was taken out of service in February 2001, and subsequently disassembled and removed from the site in December 2001. Additional investigations to further define the extent of soil exceeding RAOs are discussed in the Field Sampling Plan (FSP), which is included in the QAPP presented as Volume III.

4.6.1 Former Vapor Degreaser Area Soil Excavation

Soil excavation will be conducted in the vicinity of the former vapor degreaser to remove soils accessible exceeding RAOs. Due to the proximity of the subject area to vital operational areas of the facility, the lateral limits of the excavation were determined in cooperation with the USEPA OSC Steve Faryan in an effort to remove the maximum amount of soil exceeding RAOs without impeding facility operations to the point of shutdown or creating structural problems with the facility building. The lateral limits of the excavation are illustrated in Figure 4.7-1. The vertical limits of the excavation will be determined upon receipt of the results of the additional investigation activities proposed for the subject area. However, the excavation sidewalls will be sloped to provide adequate stability to the nearby support columns and stationary operational equipment. Sloping of the excavation sidewalls will be determined once excavation is initiated and field conditions are determined. It is unlikely that the sidewall excavations will exceed a 2:1 slope.

The material will be excavated from the subject area and transferred to rolloff boxes staged outside the site building. The soils will be transferred using a carrier box capable

of being moved by a forklift. During transfer from the exclusion area to the rolloff boxes, these carrier boxes will be covered to reduce VOC emissions.

Prior to accepting any soil, the rolloff boxes will be lined with plastic sheeting and covered at the end of each work shift. Due to the interior nature of the excavation area and the presence of facility personnel, a conservative approach to minimizing exposure to potential vapors and particulates resulting from the excavation activities has been developed. This approach will include the following components in addition to the procedures established in the Health and Safety Plan developed for the site:

- Prior to any soil removal activities, a negative air containment zone will be constructed around the limits of the proposed excavation. The containment zone will be constructed using plastic sheeting arranged in a canopy fashion to enclose an area that will include the entire surface of the excavation in addition to the excavation equipment. Air exchange fans will be used to create the negative air pressure environment within the containment zone and discharge air from within the containment zone to the site's existing vapor exhaust system. The proposed limits of the negative air containment zone are illustrated in Figure 4.7-1.
- All excavation and loading of contaminated soil inside the facility will occur within the negative air containment zone.
- Continuous air monitoring for VOCs will be conducted within and outside the containment zone throughout the duration of the soil removal activities.
- Contaminated soil will be covered (plastic sheeting, etc.) during transfer from the exclusion zone to transport boxes staged outside the facility.

4.6.2 Waste Characterization

Prior to initiation of excavation activities, waste characterization profiles will be established for the contaminated material. Due to the applicable land disposal restrictions, waste profiles will be established in such a manner that will allow the

material to be directly landfilled as hazardous waste in a Subtitle C cell, or treated through a chemical-oxidation process prior to disposal in a Subtitle C cell.

4.6.3 VOC Characterization

When a rolloff box is filled, the VOC concentration of its contents will be evaluated to determine if the material meets applicable land disposal requirements. The evaluation will include the collection and analysis of one soil sample from each rolloff box of excavated soil. The soil sample will be submitted for rush VOC analysis by Method 8260. The results of the VOC analysis will be compared to the land disposal requirements for applicable VOCs established in 35 IAC Part 728 for constituents in a soil matrix.

4.6.4 Transportation/Disposal

Each rolloff box of soil will be transported offsite under manifest for treatment and/or disposal as hazardous waste. Material that does not meet land disposal requirements as determined by the methods discussed in Section 4.6.3 will be transported offsite to a chemical-oxidation treatment facility. This material will be treated to acceptable levels and landfilled as hazardous waste in a Subtitle C cell. Soil that meets land disposal requirements will be transported offsite and directly landfilled as hazardous waste in a Subtitle C cell.

4.6.5 Confirmation Sampling

Soil confirmation samples will be collected from the final limits of the excavation base and sidewalls. Sample locations will be determined using a 20-foot sampling grid. The soil samples will be submitted for VOC analysis using Method 5035/8260B.

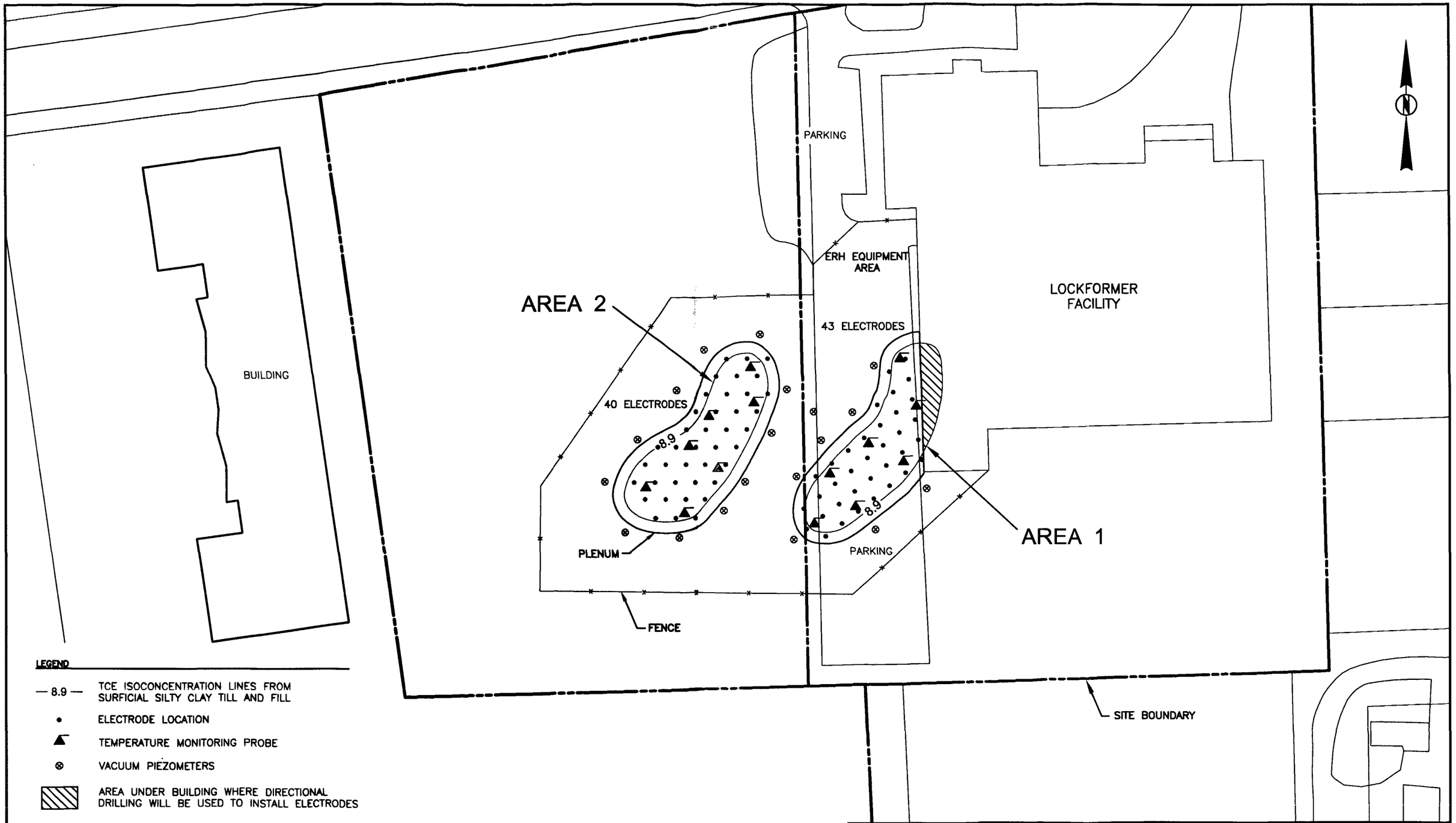
4.6.6 Backfilling

The excavation will be backfilled to approximately 1 foot below floor grade with clean soil and compacted in lifts. The excavation will be finished with an 8-inch reinforced concrete surface that will be pinned into the existing slab flooring.

4.6.7 Equipment Decontamination

Prior to exiting the exclusion zone, the excavation equipment will be decontaminated. The residual decontamination materials will be containerized along with the exclusion zone canopy materials and managed in accordance with methods discussed in Section 1.5.6 of the QAPP, presented as Volume III. Additional information regarding decontamination procedures is established in SOP No. 500.

FIGURES



LEGEND

— 8.9 — TCE ISOCONCENTRATION LINES FROM SURFICIAL SILTY CLAY TILL AND FILL

• ELECTRODE LOCATION

▲ TEMPERATURE MONITORING PROBE

⊗ VACUUM PIEZOMETERS

▨ AREA UNDER BUILDING WHERE DIRECTIONAL DRILLING WILL BE USED TO INSTALL ELECTRODES

NOTES:

1. PLENUMS EXTEND 10 FEET BEYOND THE ACTIVE REMEDIATION AREA. VACUUM PIEZOMETERS EXTEND 10' BEYOND THE PLENUM.
2. EACH AREA WILL BE REMEDIATED TO THE RAOs FOR ALL VOCs. THE ISOCONCENTRATION LINE FOR TCE HAS BEEN SHOWN SINCE IT WILL BE THE CONSTITUENT DRIVING MOST OF THE REMEDIATION.

SCALE IN FEET

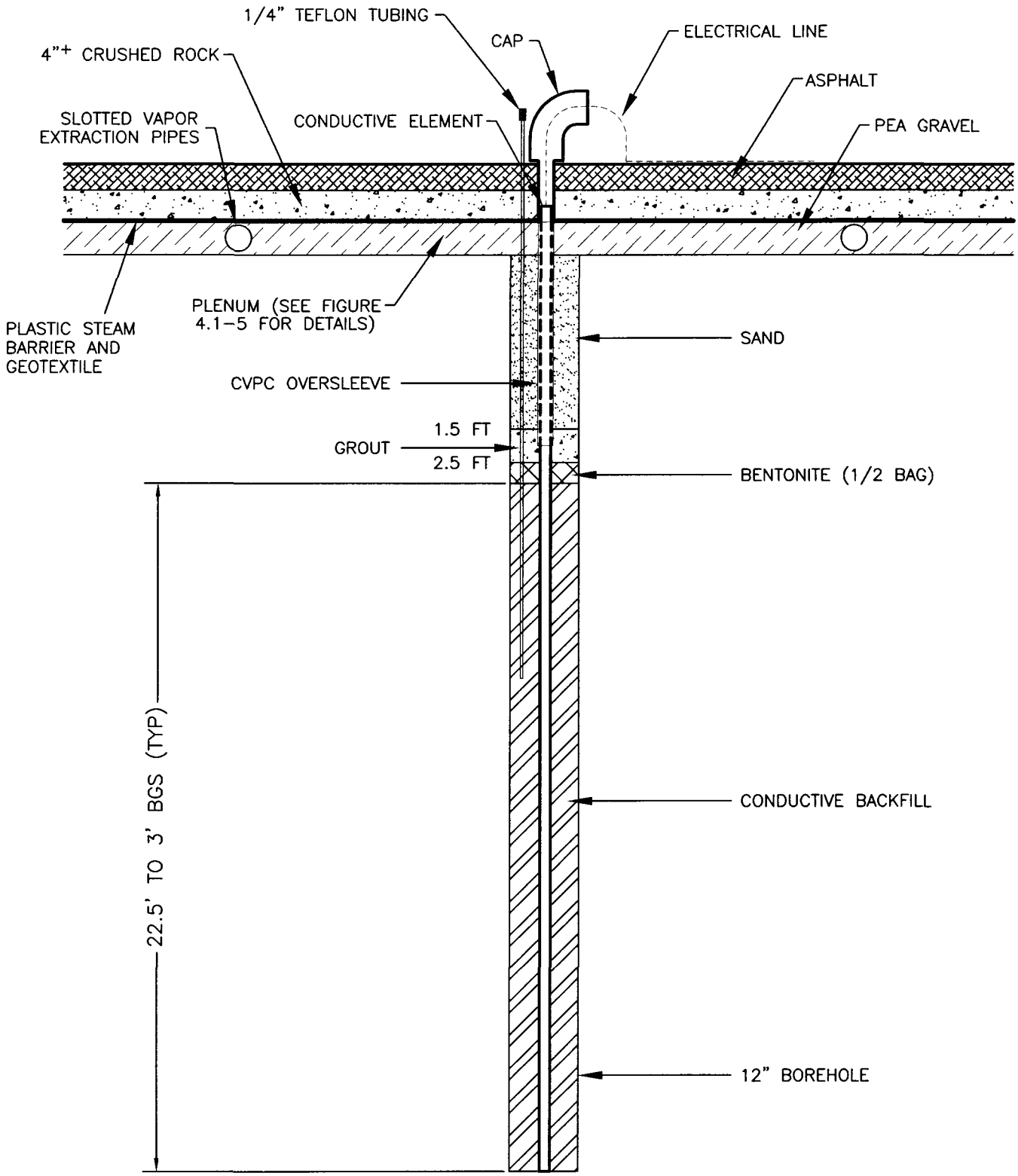
0 40 80 160

CHECK BY	
DRAWN BY	BCP/OS
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	6526303A2
PRJ NO.	15-65263

PRELIMINARY LOCATIONS OF ELECTRODES, TEMPERATURE MONITORING PROBES, PLENUMS & VACUUM PIEZOMETERS FOR THE ERH SYSTEM
THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.1-1



NOTE: FINAL DEPTH OF ELECTRODES WILL BE BASED ON ACTUAL DEPTH OF SURFICIAL SILTY CLAY TILL/FILL UNIT AT THE SITE

** NOT TO SCALE **

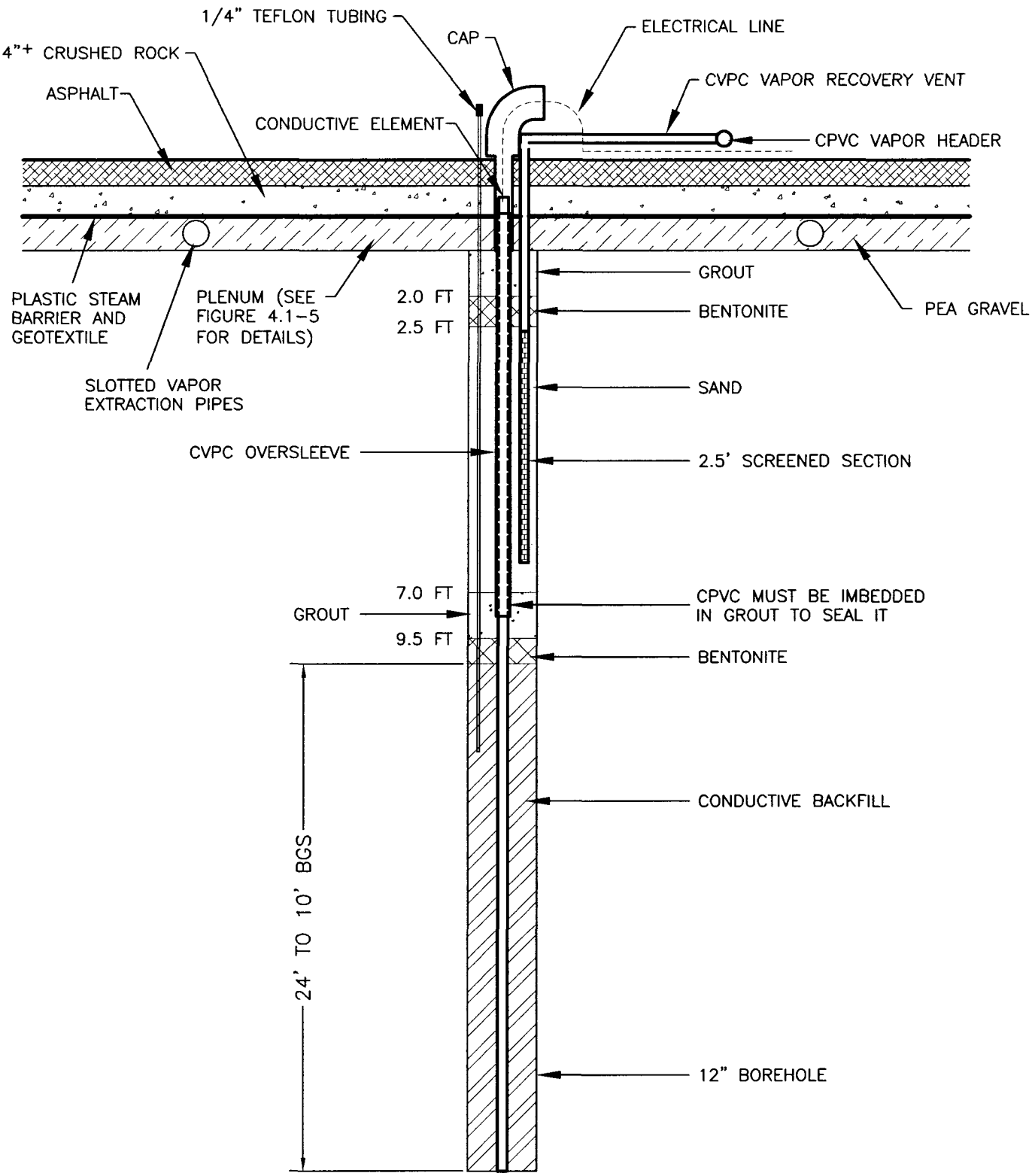
CHECK BY	JLP
DRAWN BY	OS
DATE	6-21-02
SCALE	NONE
CAD NO.	6526308E
PRJ NO.	15-65263.01

AREA 1
CONCEPTUAL ELECTRODE

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.1-2

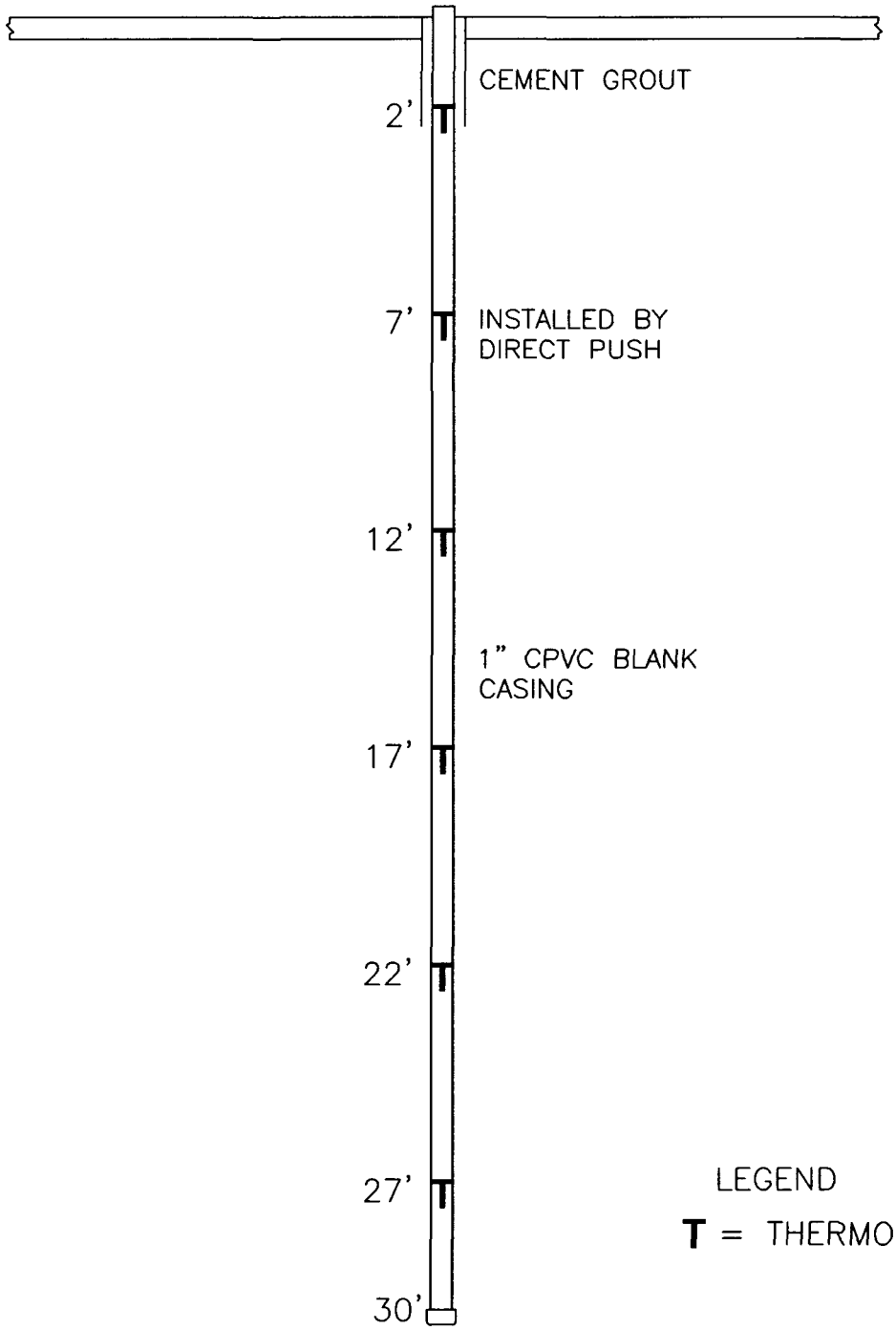


NOTE: FINAL DEPTH OF ELECTRODES WILL BE BASED ON ACTUAL DEPTH OF SURFICIAL SILTY CLAY TILL/FILL UNIT AT THE SITE

** NOT TO SCALE **

CHECK BY DJL	AREA 2 CONCEPTUAL ELECTRODE	Clayton GROUP SERVICES
DRAWN BY OS		
DATE 6-21-02		
SCALE NONE	THE LOCKFORMER COMPANY 711 W. OGDEN AVENUE LISLE, ILLINOIS	FIGURE
CAD NO. 6526308F		4.1-3
PRJ NO. 15-65263.01		

TEMPERATURE MONITORING POINT (TMP)



LEGEND

T = THERMOCOUPLE

DRAWING PROVIDED BY:

1100 LAUREL CREST WAY
MARIETTA, GA 30064-3978
(770) 794-1168 FAX: 421-8188

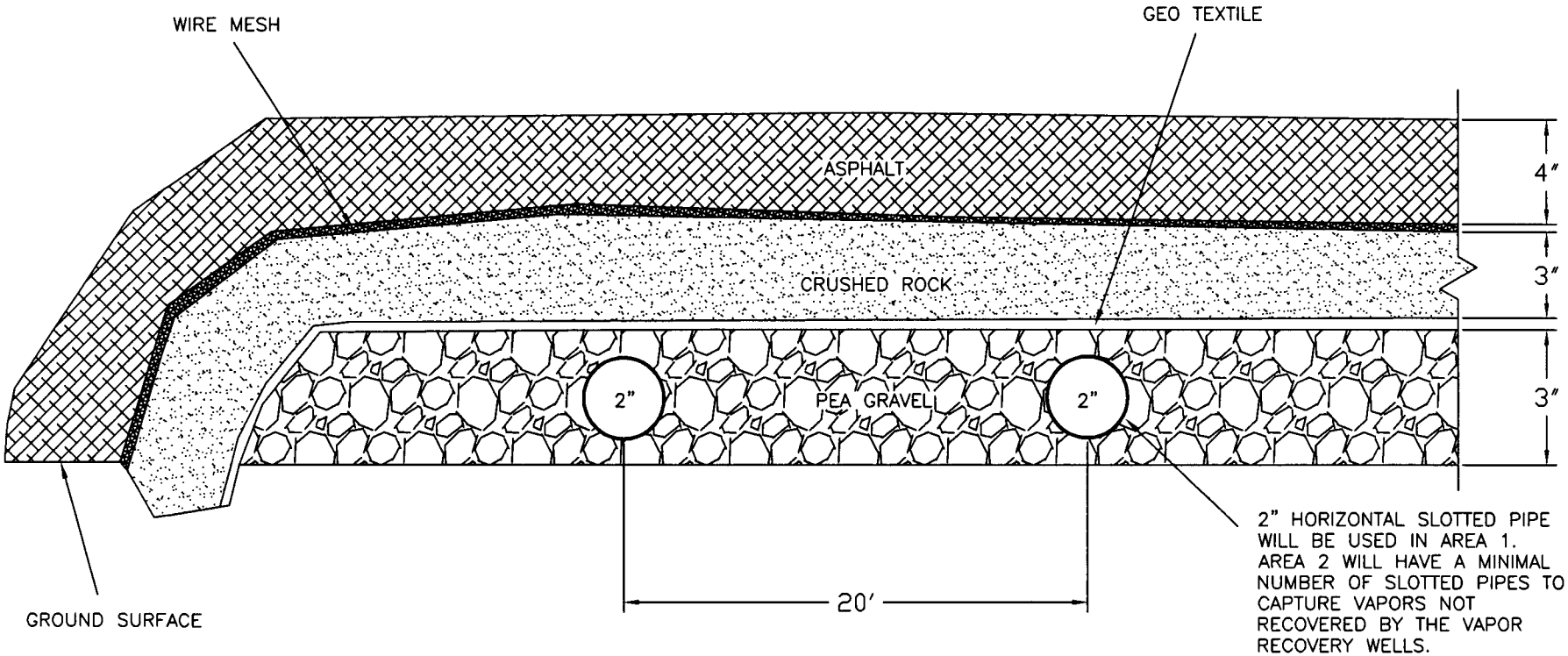
CHECK BY	
DRAWN BY	TRS
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308J
PRJ NO.	15-65263

TEMPERATURE MONITORING POINT DETAIL
ERH REMEDIATION

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LILSE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.1-4



NOT TO SCALE

NOTE: 2" CPVC PIPE IS SLOTTED UP TO THE SOLID CPVC HEADER CONNECTED TO THE TREATMENT SYSTEM

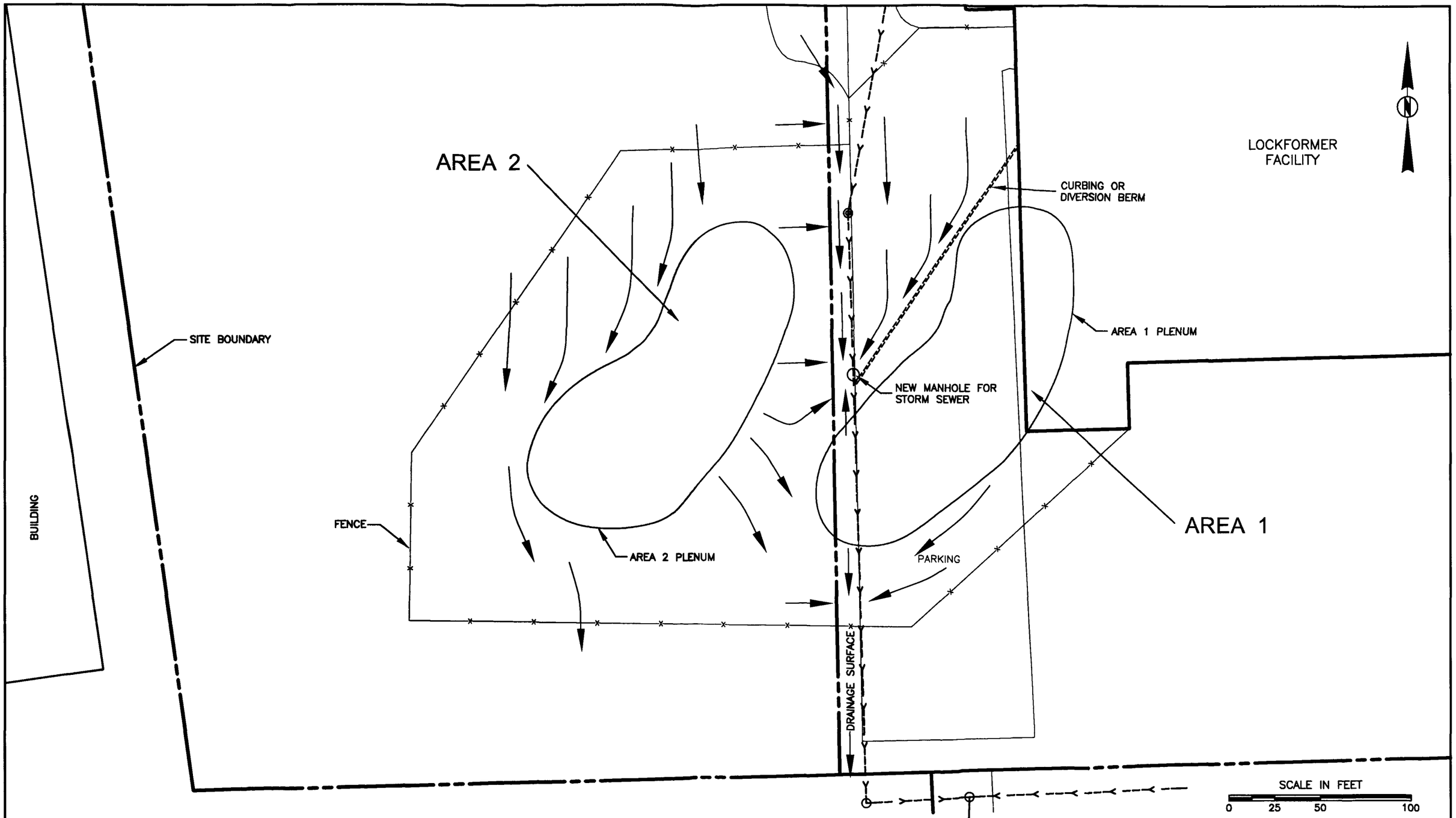
CHK BY	JLP
DWN BY	OS
DATE	4-12-02
SCALE	NONE
CAD NO.	6526308i1
PRJ NO.	15-65263.01

PLENUM DESIGN FOR
AREAS 1 AND 2

THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.1-5



LEGEND

- NEW UNDERGROUND STORM SEWER
- EXISTING STORM SEWER
- STORMWATER FLOW PATTERN

NOTE: THE AREA WEST OF AREA 2 PLENUM WILL BE GRADED TO ALLOW ANY SURFACE FLOW TO DIVERT AROUND PLENUM AS SHOWN

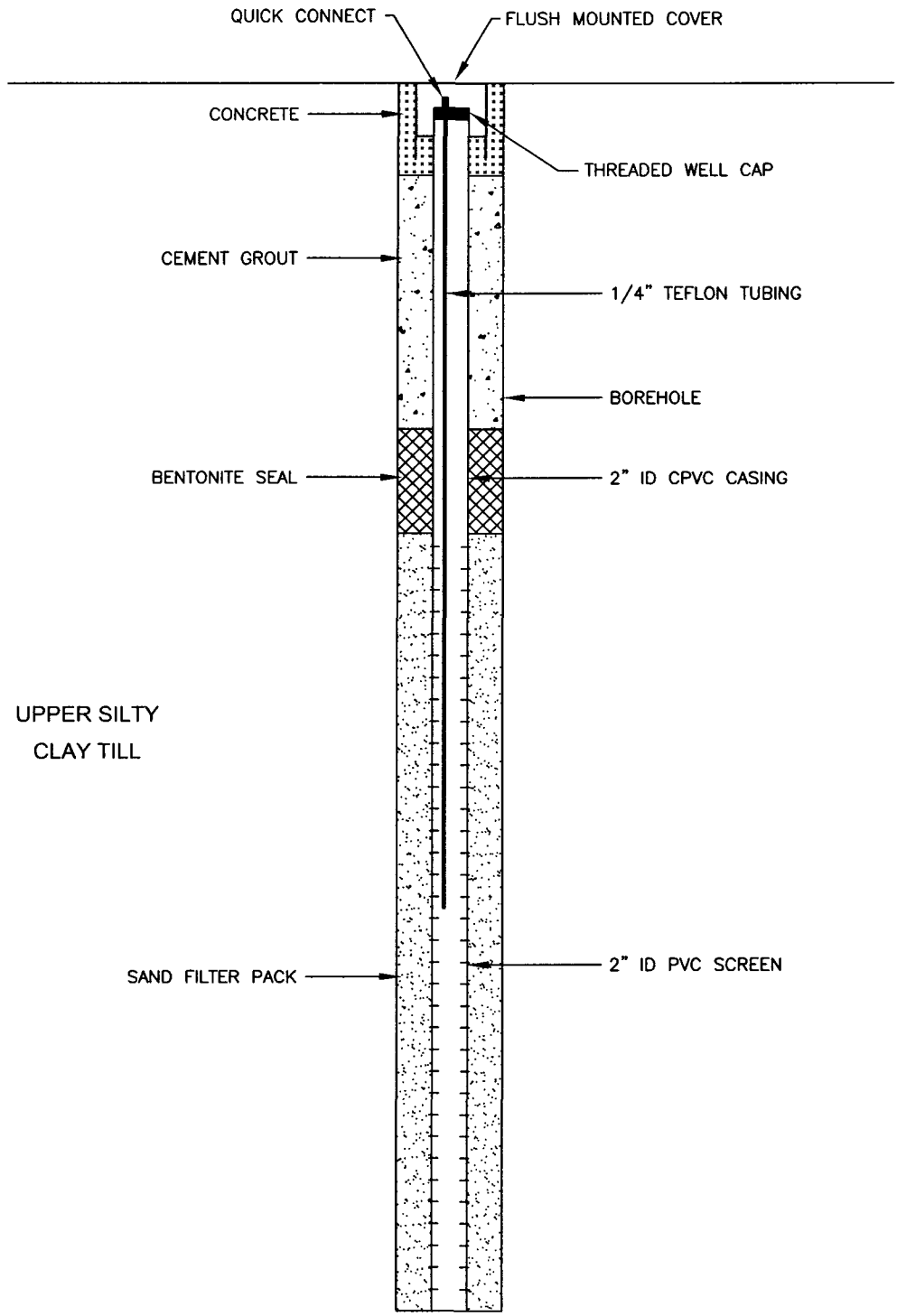
CHECK BY	JLP
DRAWN BY	BCP/OS
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308o-2
PRJ NO.	15-65263

PROPOSED SURFACE WATER CONTROL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.1-6



** NOT TO SCALE **

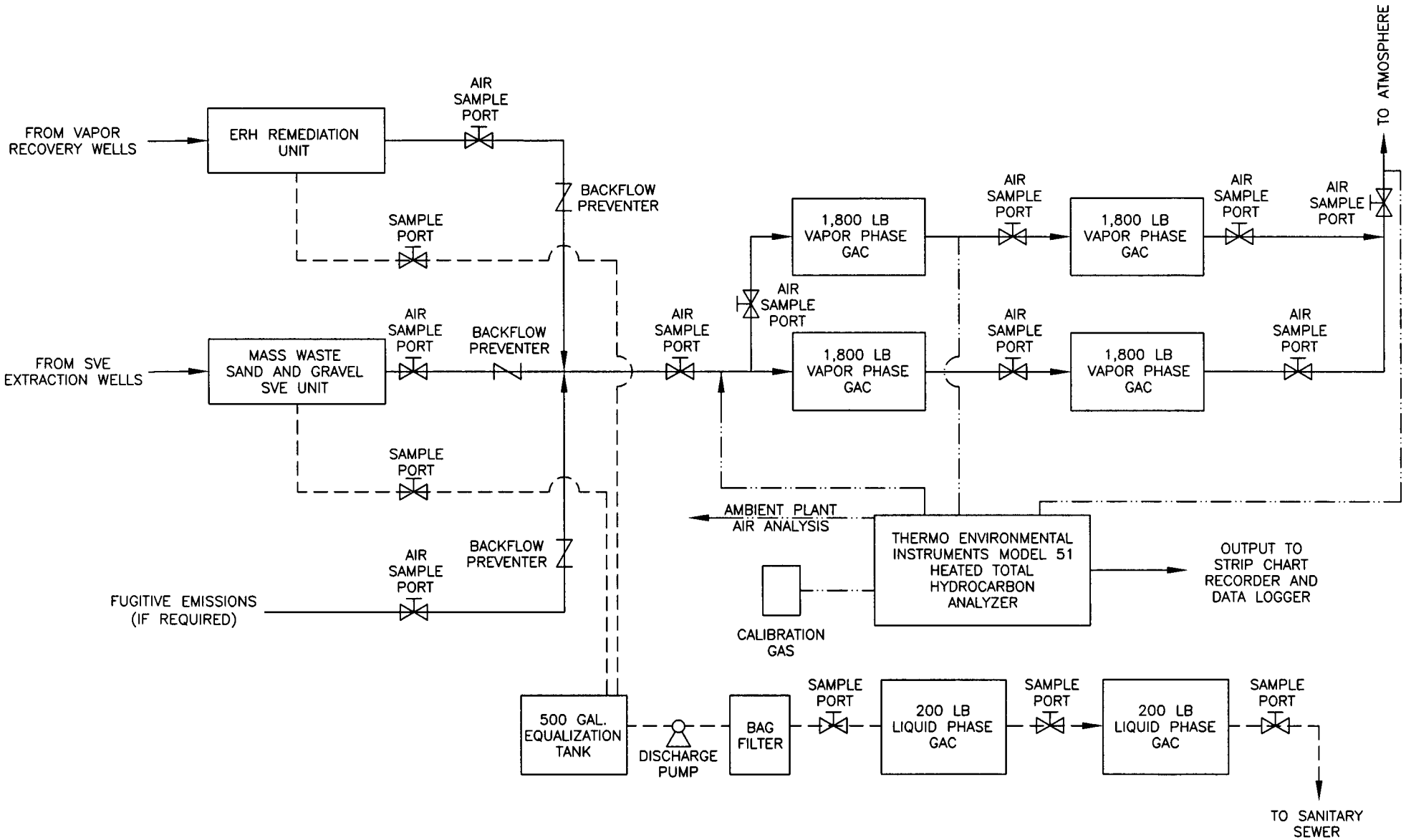
CHECK BY	JLP
DRAWN BY	OS
DATE	4-12-02
SCALE	NONE
CAD NO.	6526308M
PRJ NO.	15-65263

VACUUM PIEZOMETER

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.1-7



LEGEND

- AIR EFFLUENT
- WATER/CONDENSATE EFFLUENT
- AIR SAMPLING LINE

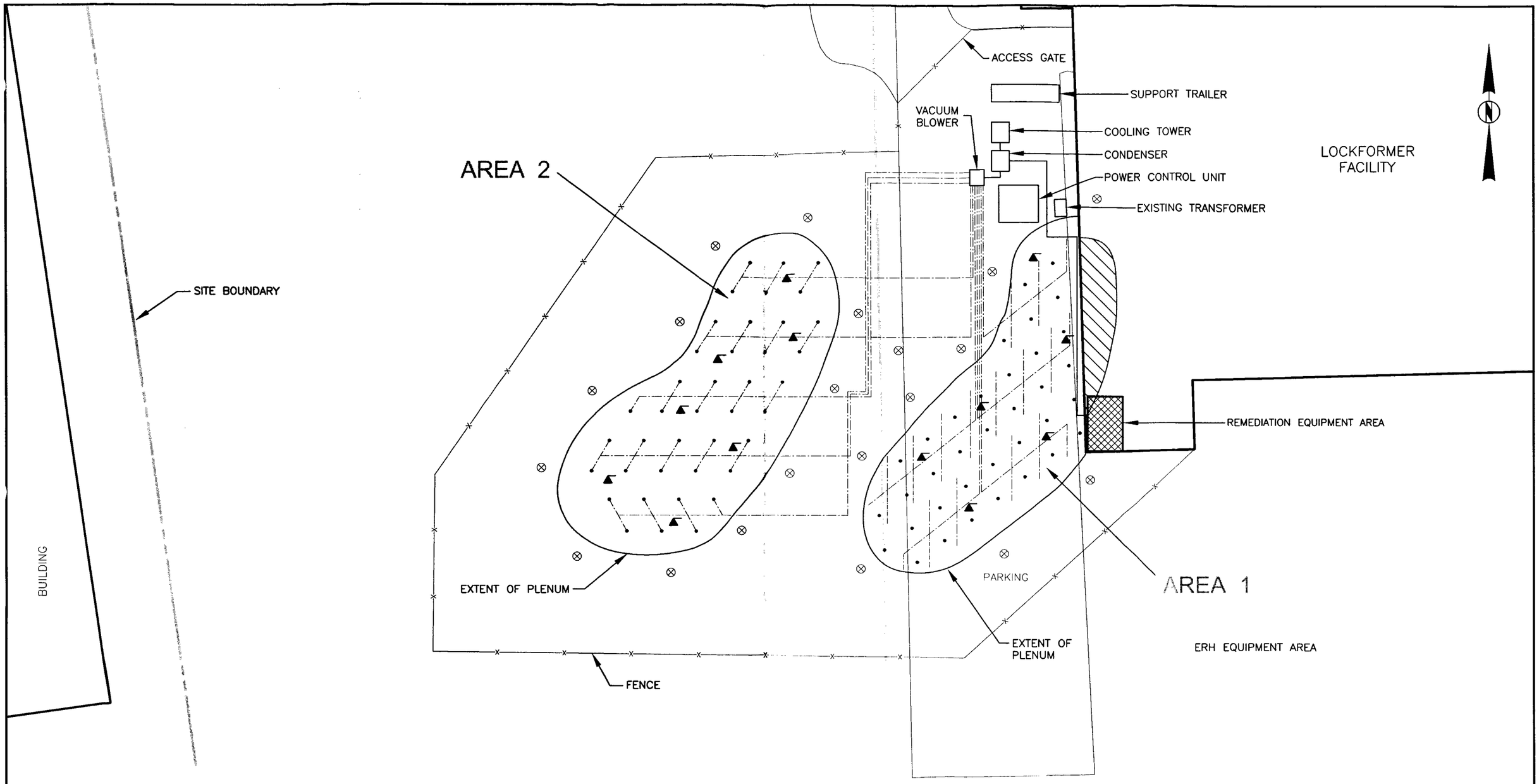
CHK BY	JLP
DWN BY	OS/BCP
DATE	4-12-02
SCALE	NONE
CAD NO.	6526308G1
PRJ NO.	15-65263

REMEDIATION PROCESS FLOW DIAGRAM

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.1-8



LEGEND

- VAPOR EXTRACTION LINES
- ELECTRODE LOCATION
- TEMPERATURE MONITORING PROBE
- VACUUM PIEZOMETERS
- AREA UNDER BUILDING WHERE DIRECTIONAL DRILLING WILL BE USED TO INSTALL ELECTRODES

SCALE IN FEET

0 25 50 100

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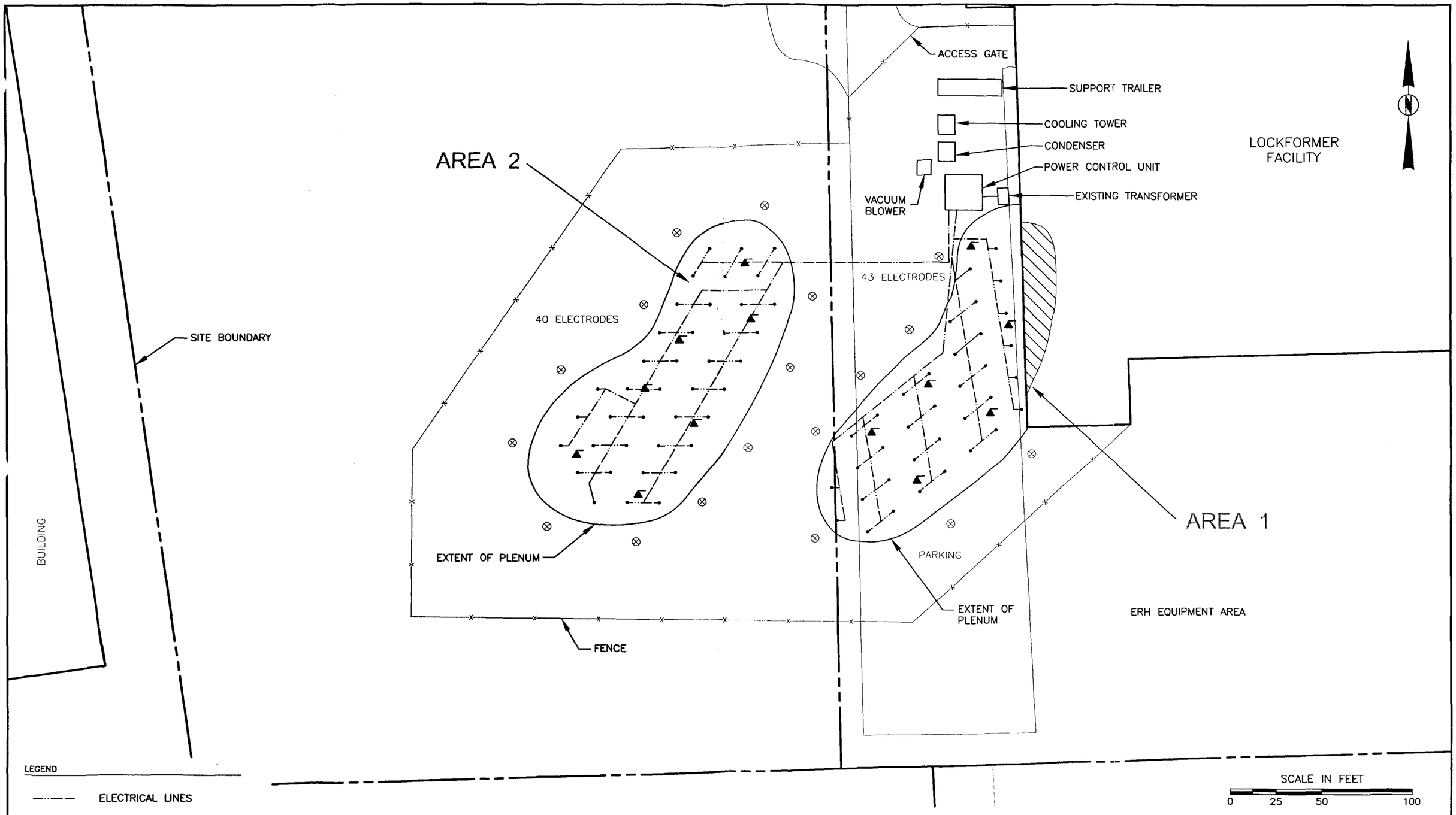
DRAWN BY	BCP/OS
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	6526308N
PRJ NO.	15-65263

PRELIMINARY VAPOR LINES
LAYOUT FOR THE ERH SYSTEM

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.1-9



LEGEND

- ELECTRICAL LINES
- ELECTRODE LOCATION
- TEMPERATURE MONITORING PROBE
- VACUUM PIEZOMETERS
- AREA UNDER BUILDING WHERE DIRECTIONAL DRILLING WILL BE USED TO INSTALL ELECTRODES

NOTE: ELECTRICAL LINES WILL BE PLACED ON THE ASPHALT SURFACE OF PLENUM IN THE APPROXIMATE LAYOUT SHOWN

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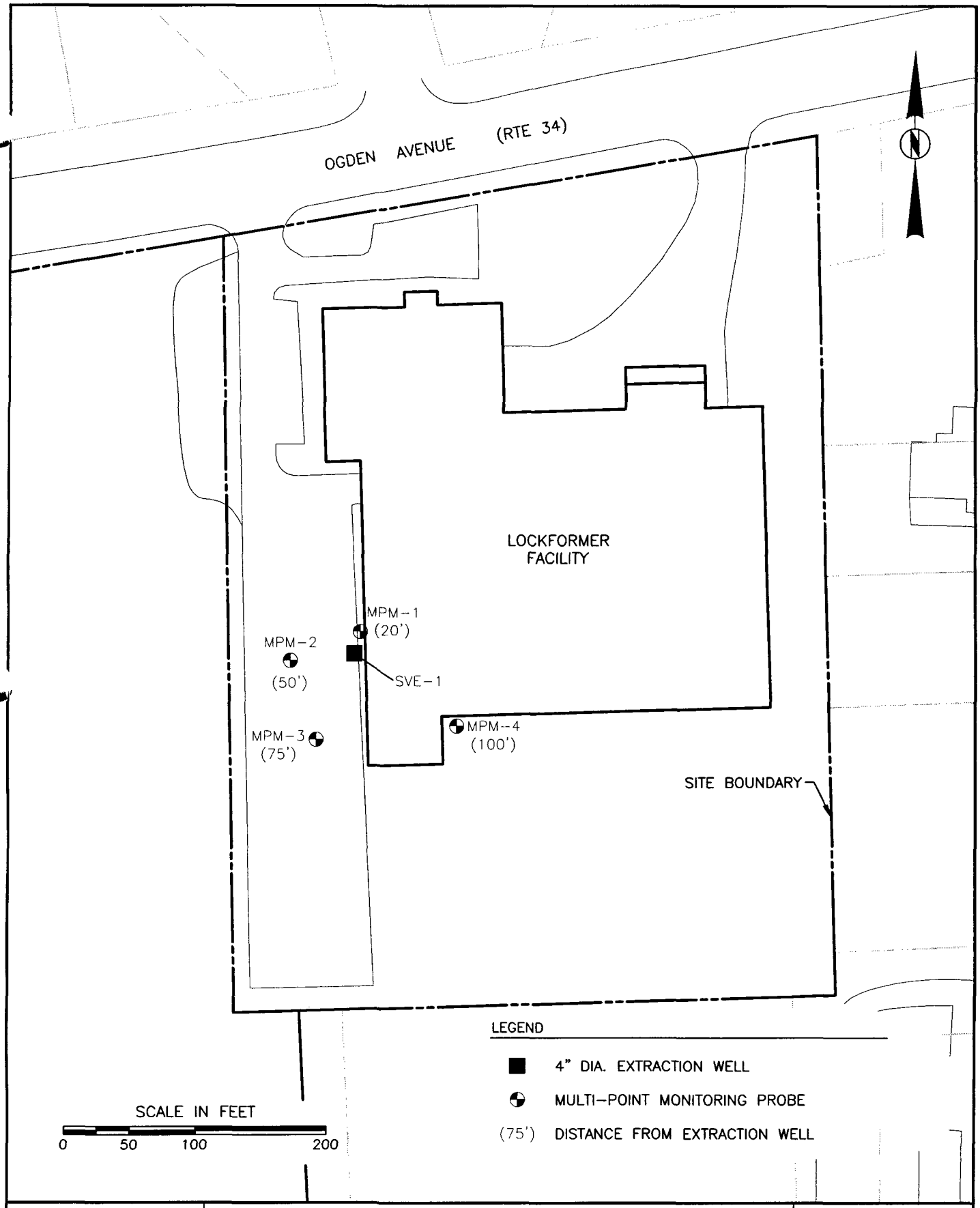
DRAWN BY	BCP/OS
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308L
PRJ NO.	15-65263

PRELIMINARY ELECTRICAL LINES LAYOUT FOR THE ERH SYSTEM

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.1-10



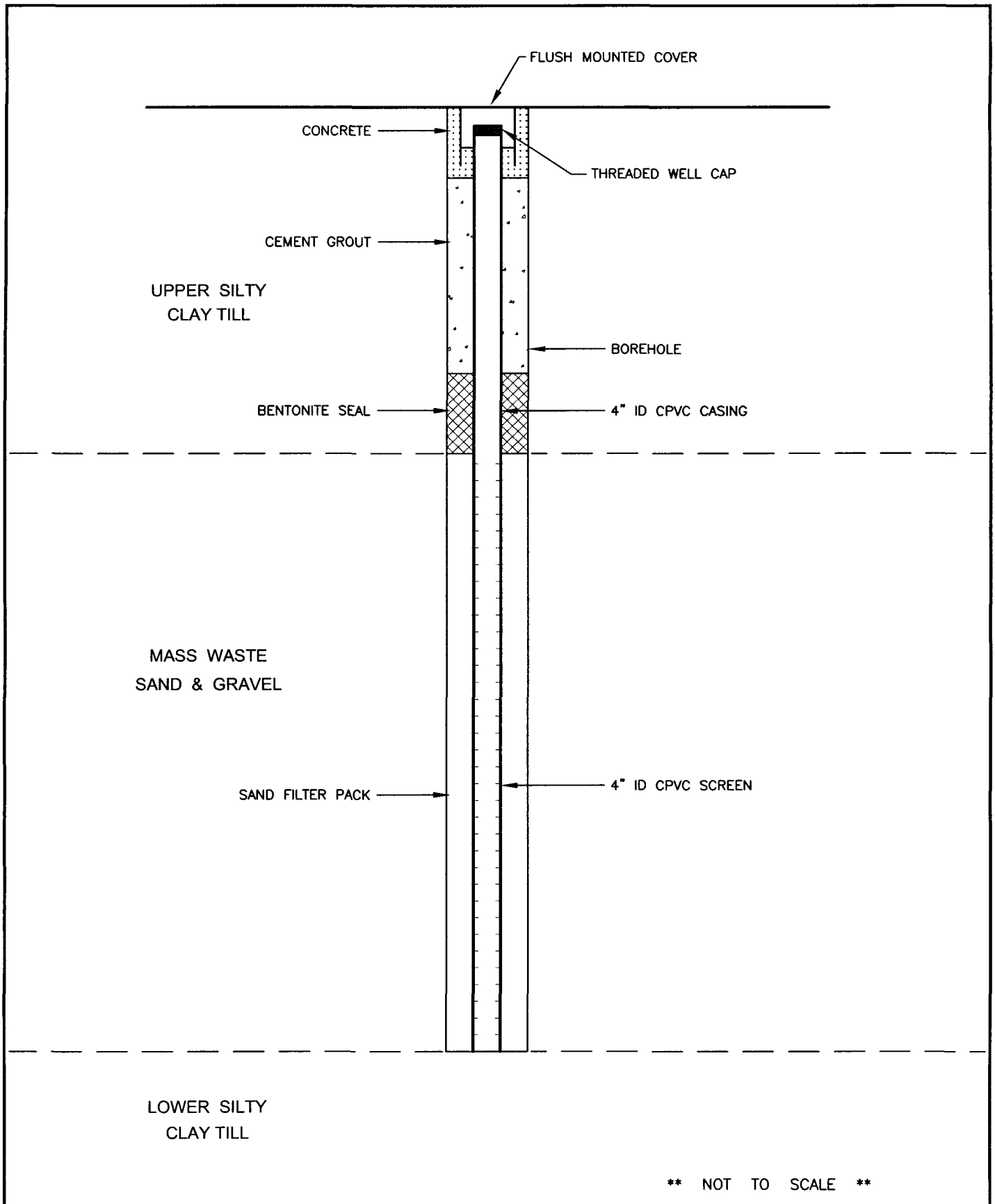
CHECK BY	DJL
DRAWN BY	BCP/OS
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526307R
PRJ NO.	15-65263

SVE PILOT TEST LAYOUT

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.2-1



CHECK BY	DJL
DRAWN BY	BCP/OS
DATE	4-12-02
SCALE	NONE
CAD NO.	6526307S
PRJ NO.	15-65263

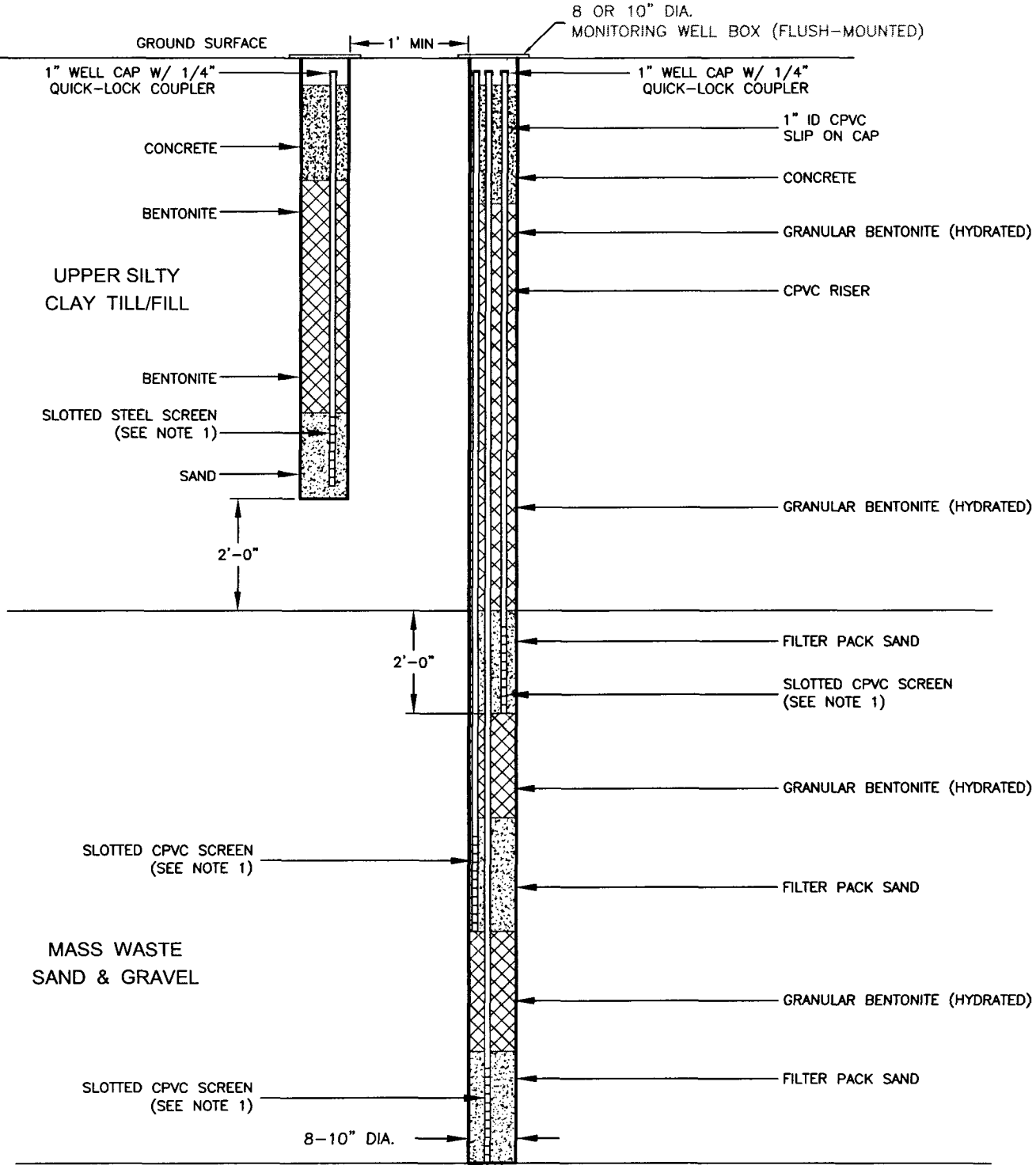
DESIGN FOR SVE PILOT TEST EXTRACTION WELL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.2-2

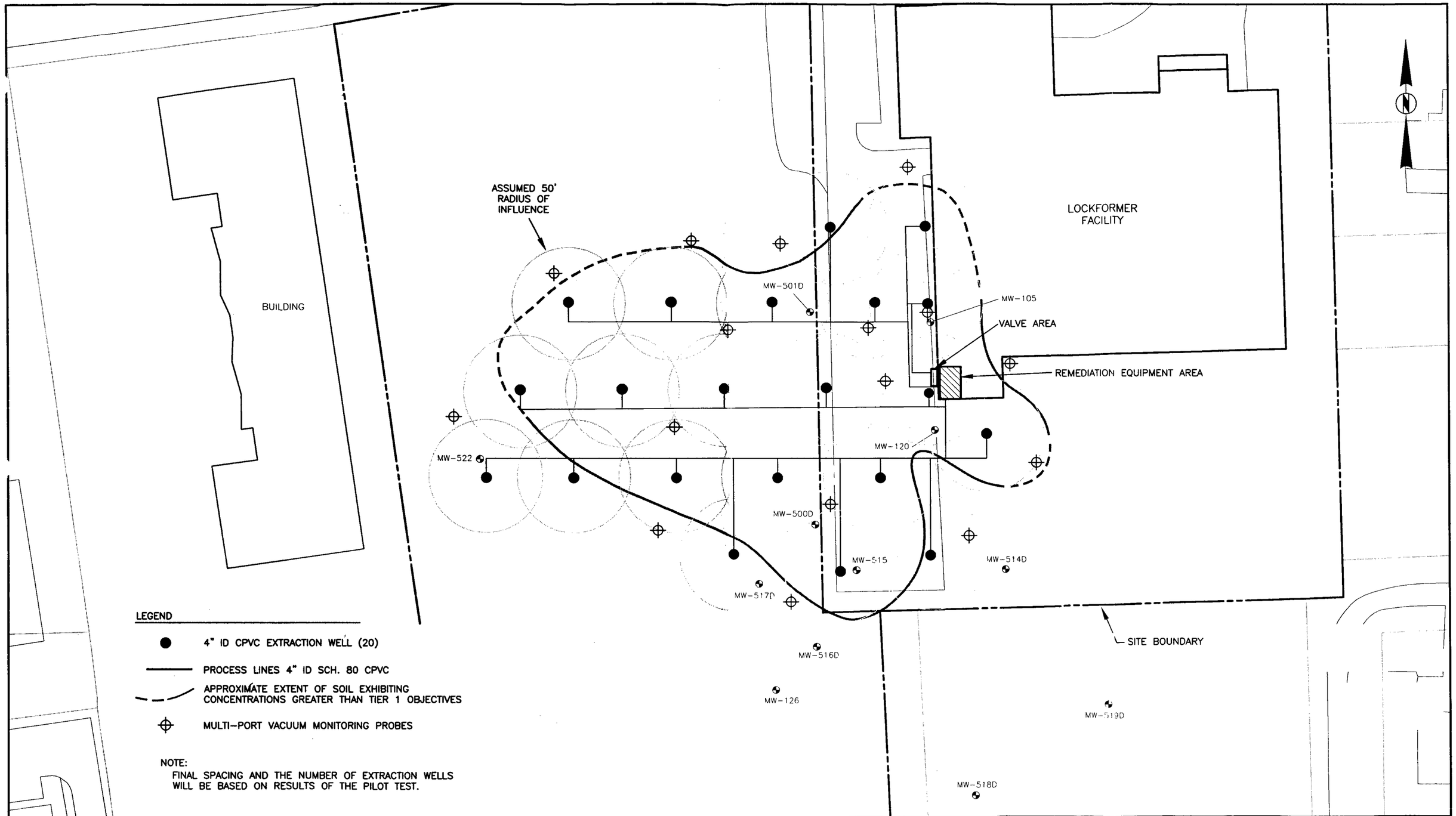
TYPICAL MULTI-POINT MONITORING PROBE DESIGN



NOTES:

1. PROVIDE 1.0' LONG, 0.010" SLOTTED CPVC SCREEN WITH SAND FILTER PACK.
2. DEPTH OF BOREHOLE AND PLACEMENT OF WELL SCREEN MAY BE MODIFIED BASED ON SUBSURFACE CONDITIONS.

CHECK BY DJL	TYPICAL MULTI-POINT MONITORING PROBE CONSTRUCTION DETAILS	Clayton GROUP SERVICES
DRAWN BY BCP		
DATE 4-12-02		FIGURE
SCALE AS SHOWN	THE LOCKFORMER COMPANY	4.2-3
CAD NO. 6526307q	711 W. OGDEN AVENUE	
PRJ NO. 15-65263	LISLE, ILLINOIS	



LEGEND

- ● 4" ID CPVC EXTRACTION WELL (20)
- PROCESS LINES 4" ID SCH. 80 CPVC
- APPROXIMATE EXTENT OF SOIL EXHIBITING CONCENTRATIONS GREATER THAN TIER 1 OBJECTIVES
- MULTI-PORT VACUUM MONITORING PROBES

NOTE:
FINAL SPACING AND THE NUMBER OF EXTRACTION WELLS WILL BE BASED ON RESULTS OF THE PILOT TEST.

SCALE IN FEET
0 40 80 160

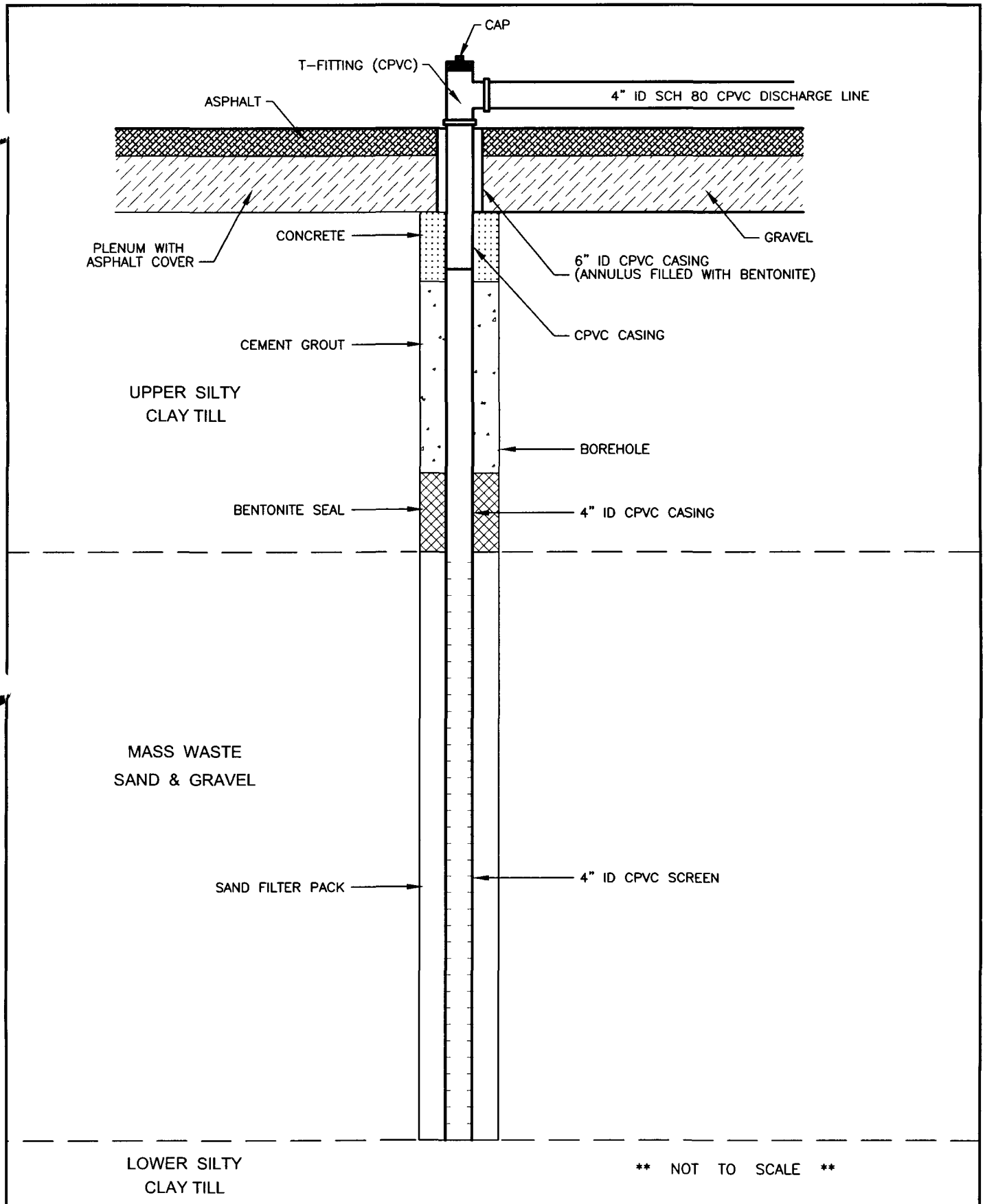
CHECK BY	DJL
DRAWN BY	BCP
DATE	6-21-02
SCALE	AS SHOWN
CAD NO.	6526302X
PRJ NO.	15-65263

CONCEPTUAL SOIL VAPOR EXTRACTION SYSTEM DESIGN IN MASS WASTE SAND AND GRAVEL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.2-4



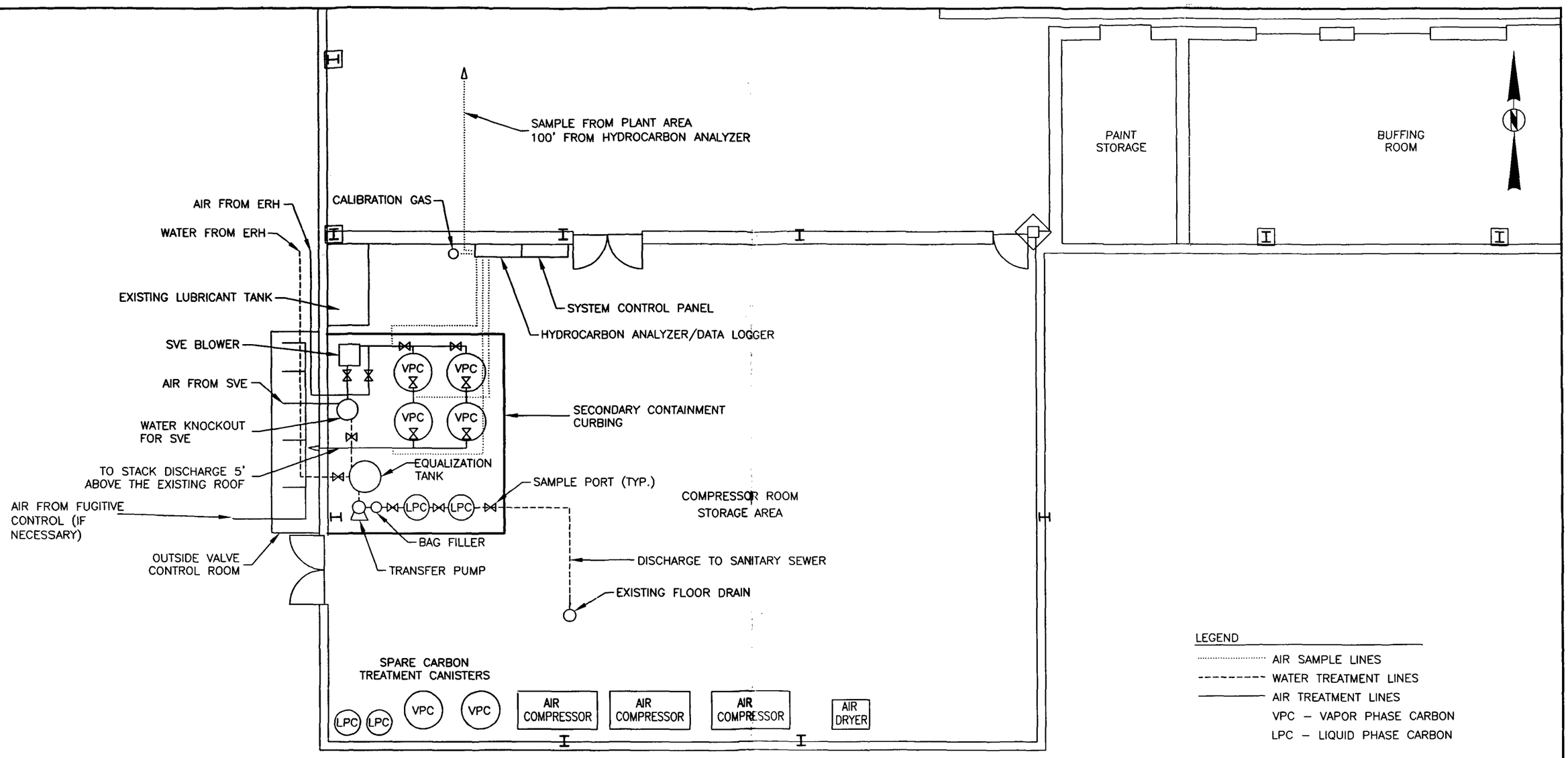
CHECK BY	DJL
DRAWN BY	BCP/OS
DATE	4-12-02
SCALE	NONE
CAD NO.	6526307t
PRJ NO.	15-65263

TYPICAL DESIGN FOR VERTICAL VAPOR EXTRACTION WELL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.2-5



LEGEND

- AIR SAMPLE LINES
- WATER TREATMENT LINES
- AIR TREATMENT LINES
- VPC – VAPOR PHASE CARBON
- LPC – LIQUID PHASE CARBON

SCALE: 1/8" = 1'-0"

SCALE IN FEET

0 4 8 16

CHECK BY	JLP
DRAWN BY	BCP
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308H2
PRJ NO.	65263.01

APPROXIMATE LAYOUT OF REMEDIATION EQUIPMENT

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

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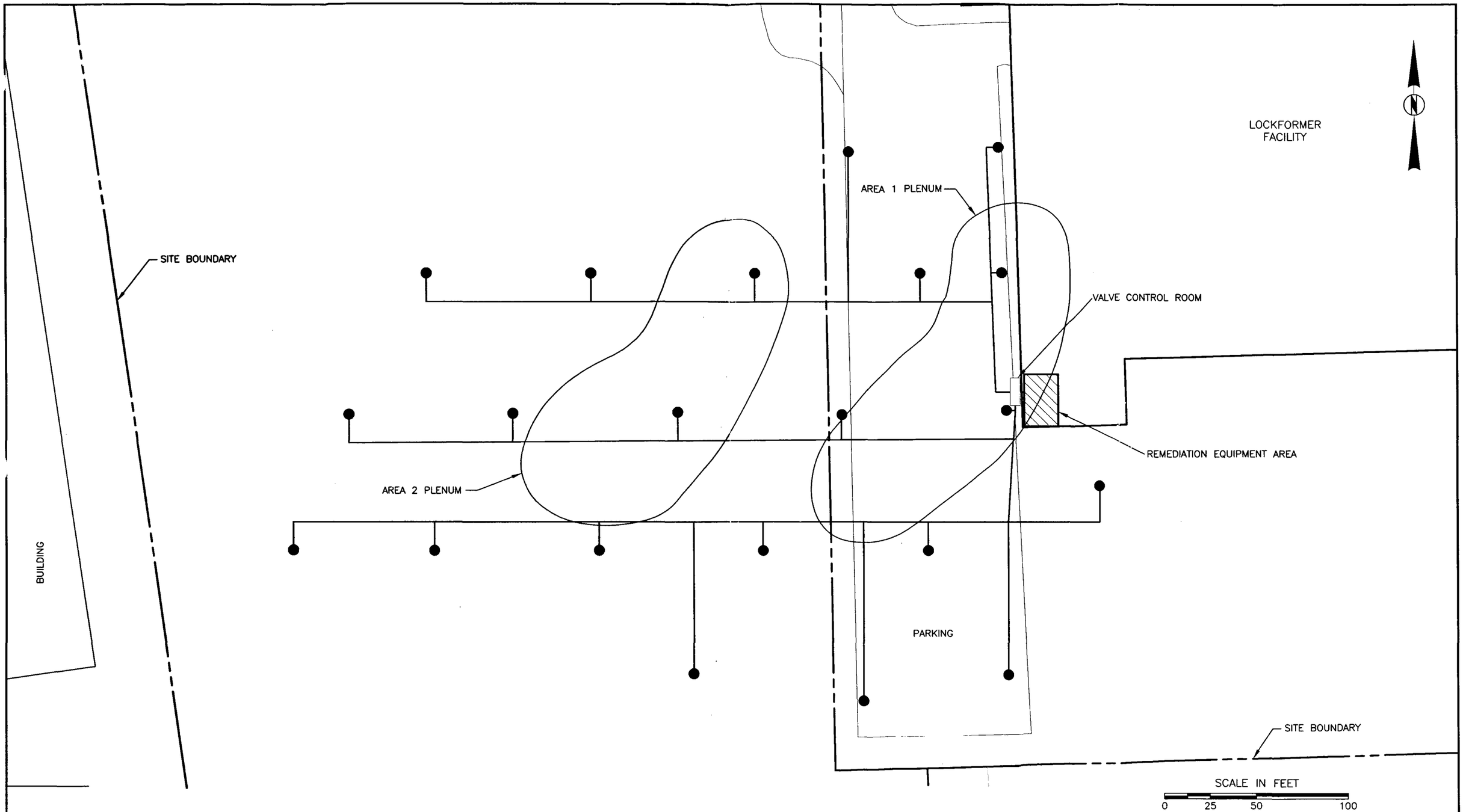
FIGURE 4.2-6



LEGEND

● 4" ID CPVC EXTRACTION WELL (20)

PROCESS LINES 4" ID SCH. 80 CPVC

NOTE: EACH EXTRACTION WELL WILL HAVE AN INDIVIDUAL EXTRACTION LINE TERMINATING IN THE VALVE CONTROL ROOM. EXTRACTION PIPING WILL BE PLACED ABOVE GROUND AND ON TOP ERH PLENUM

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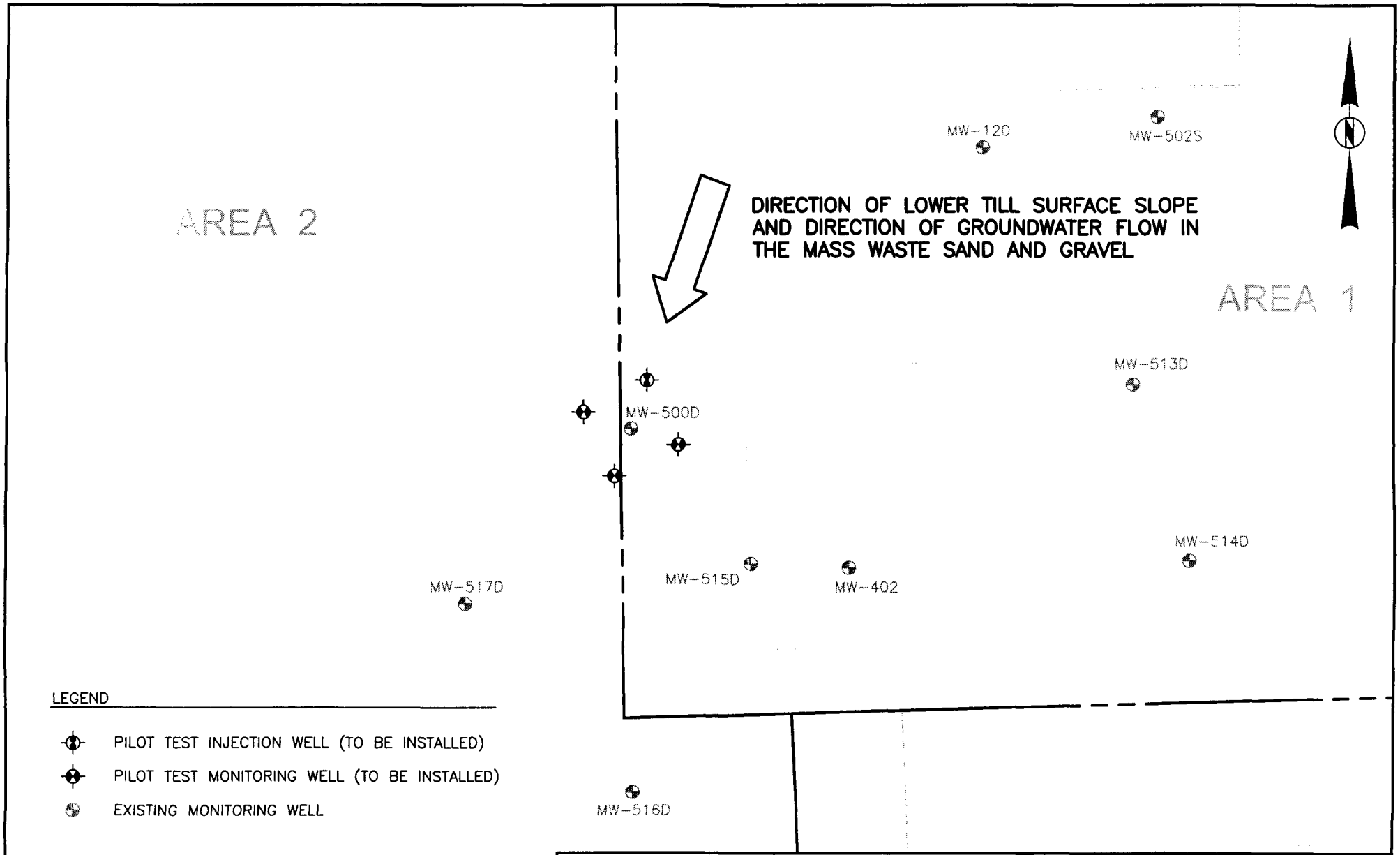
DRAWN BY	BCP
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308k
PRJ NO.	15-65263

CONCEPTUAL SOIL VAPOR EXTRACTION SYSTEM LAYOUT IN MASS WASTE SAND AND GRAVEL

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.2-7



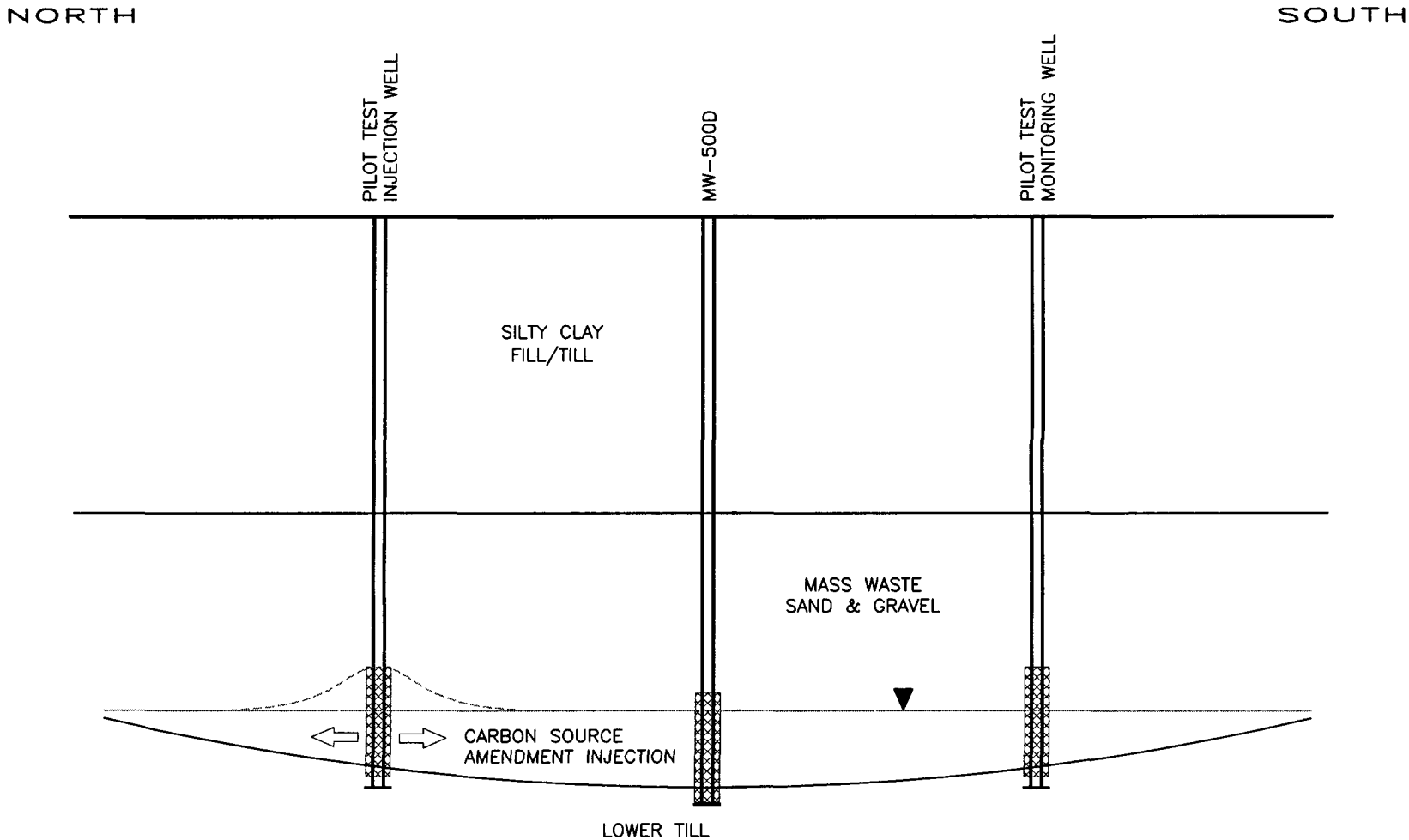
CHK BY	---
DWN BY	BCP
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308Q
PRJ NO.	65263.01

PLAN VIEW OF CARBON SOURCE ADDITION
PILOT TEST INJECTION AND MONITORING WELLS

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.3-1



NOTE: CONCEPTUAL DESIGN

CHK BY	
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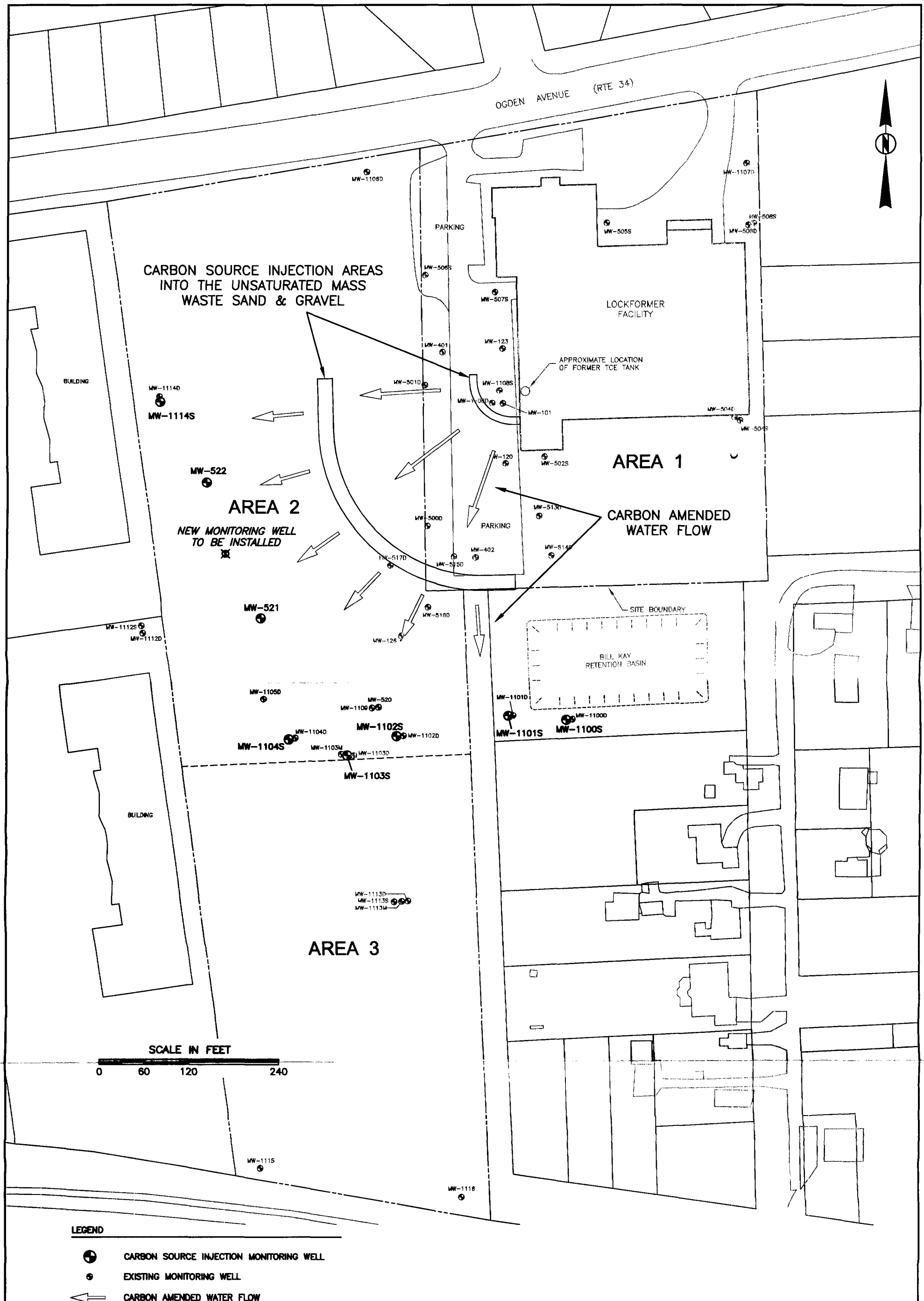
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308T
PRJ NO.	65263.01

CROSS SECTION OF
PILOT TEST INJECTION WELLS

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.3-2



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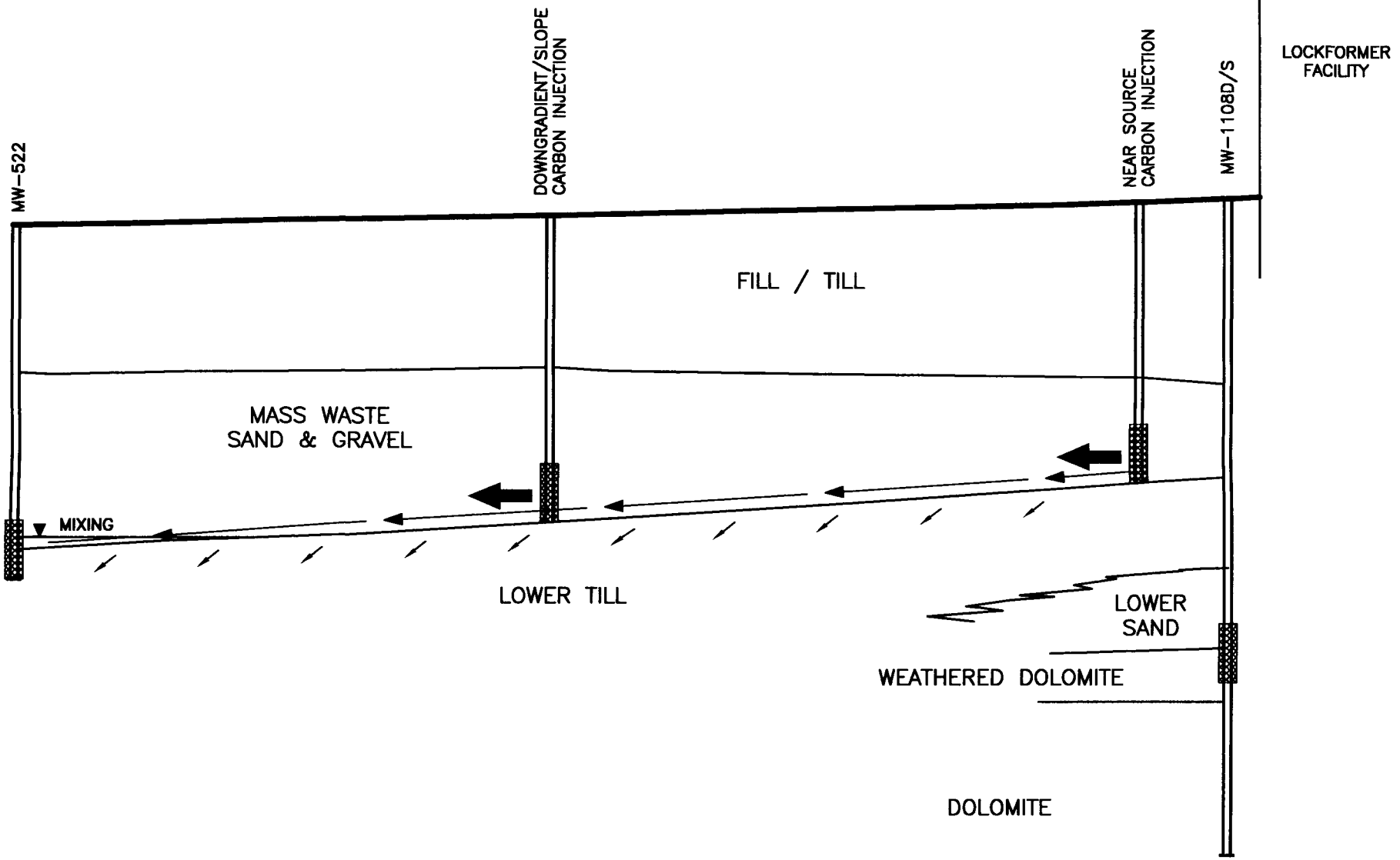
DRAWN BY	BCP / OS
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308R
PRJ NO.	65263.01

CONCEPTUAL DESIGN OF FULL SCALE
CARBON SOURCE INJECTION SYSTEM

LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.3-3



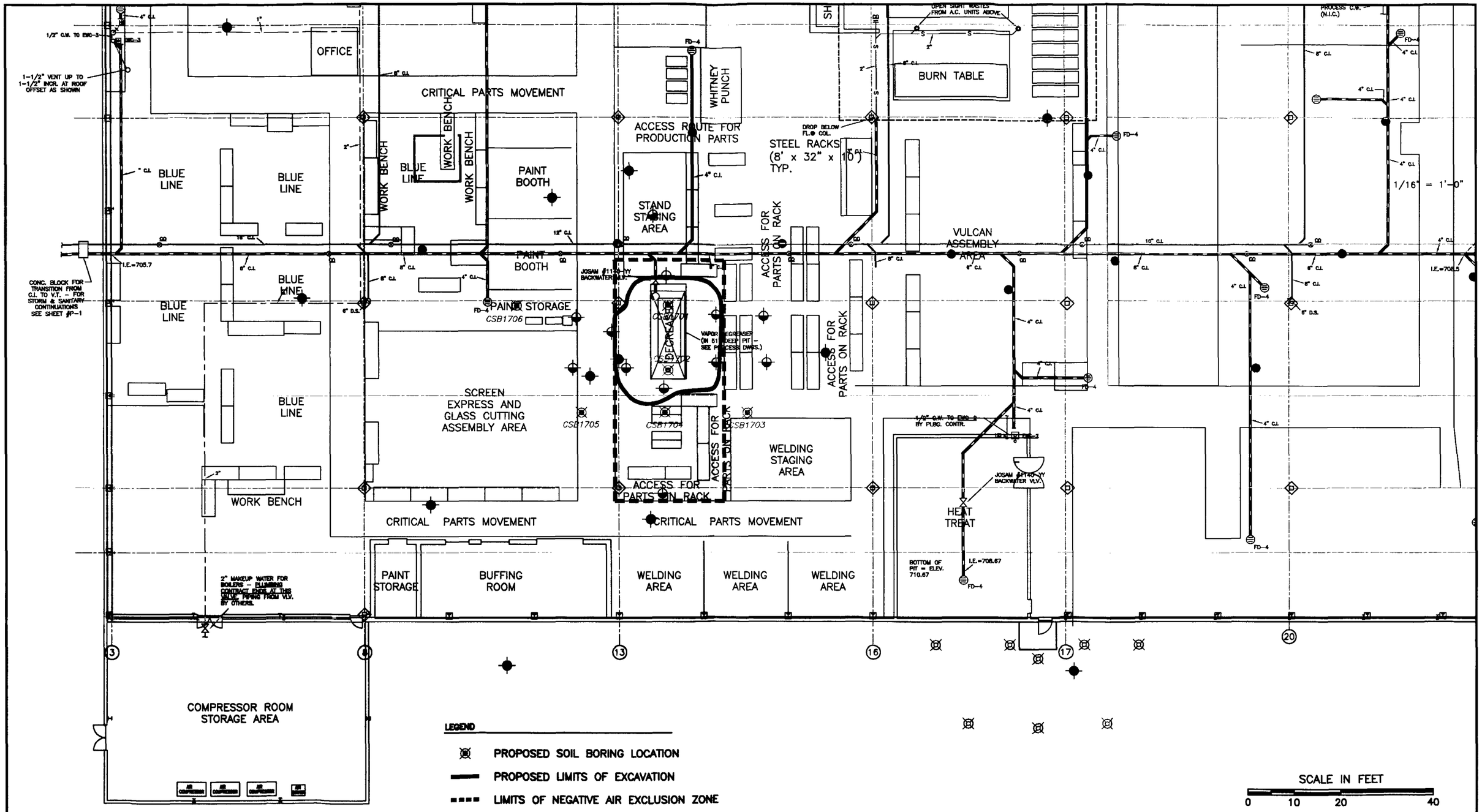
CHK BY	
DWN BY	BCP
DATE	4-12-02
SCALE	NONE
CAD NO.	6526308S
PRJ NO.	65263.01

CROSS SECTION OF CONCEPTUAL
FULL SCALE CARBON SOURCE ADDITION SYSTEM

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
4.3-4



LEGEND

- PROPOSED SOIL BORING LOCATION
- PROPOSED LIMITS OF EXCAVATION
- LIMITS OF NEGATIVE AIR EXCLUSION ZONE
- SEWER SYSTEM INVESTIGATION SOIL BORINGS BY CLAYTON
- VAPOR DEGREASER INVESTIGATION SOIL BORING BY CLAYTON
- SOUTH DOOR INVESTIGATION SOIL BORINGS BY CLAYTON
- SOIL BORING OF GEOPROBE COMPLETED BY STS (1997)

FACTORY PLAN

SCALE 1" = 20'-0"

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DRAWN BY	BCP
DATE	4-12-02
SCALE	AS SHOWN
CAD NO.	6526308P
PRJ NO.	65263.01

PROPOSED SOIL EXCAVATION LAYOUT MAP
FORMER DEGREASER AREA

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE 4.7-1

ATTACHMENT 4-A

ELECTRICAL RESISTIVE HEATING REMEDIATION SYSTEM CONSTRUCTION QUALITY CONTROL PLAN

Clayton
GROUP SERVICES

Construction Quality Control Plan
for
Electrical Resistive Heating

Lockformer Site
Lisle, Illinois

September 20, 2002

Prepared for:

Clayton Group Services, Inc.
3140 Finley Road
Downers Grove, Illinois 60515

CONTENTS

Section — Page

ABBREVIATIONS AND ACRONYMS v
EXECUTIVE SUMMARY vi

1.0 TECHNOLOGY DESCRIPTION 1

2.0 PROJECT AND PLAN DESCRIPTION 4
2.1 PROJECT DESCRIPTION 4
2.2 PROJECT OBJECTIVES 4
2.3 INSTALLATION PHASES 4
2.4 PLAN DESCRIPTION 5

3.0 QUALITY ASSURANCE TEAM 7
3.1 RESPONSIBILITIES AND AUTHORITIES 8
3.1.1 Regulatory Agencies 8
3.1.2 Clayton 8
3.1.3 Clayton QA Manager 8
3.1.4 Clayton Project and Field Managers 9
3.1.5 THERMAL's QA Manager 9
3.1.6 THERMAL Project and Field Managers 10
3.2 PROJECT MEETINGS 11
3.2.1 Pre-Construction Meeting 11
3.2.2 Progress Meetings 12
3.2.3 Field Meetings 12
3.2.4 Problem Resolution Meetings 12

4.0 QUALITY CONTROL ACTIVITIES 13
4.1 ENVIRONMENTAL HEALTH AND SAFETY 14
4.2 WASTE MANAGEMENT 14
4.3 FIELD ACTIVITIES 14

5.0 DOCUMENTATION 16
5.1 MATERIALS AND EQUIPMENT 16
5.2 FIELD LOGBOOK 16
5.3 DATA FORMS 17
5.4 QC FORMS 17
5.5 AS-BUILT DRAWINGS 17
5.6 WEEKLY PROGRESS REPORTS 18

CONTENTS
(Continued)

Section		Page
6.0	**PROCUREMENT**	19
6.1	SUPPLIER QUALIFICATIONS	19
6.2	PROCUREMENT DOCUMENTS	20
6.3	INSPECTIONS	21
6.4	SUPPLIER PERFORMANCE MONITORING	21
6.5	SUPPLIER DOCUMENTS	22
6.6	PROCUREMENT RECORDS	22
7.0	**FREQUENCY OF ACTIVITIES**	23
7.1	MATERIALS	23
7.2	SYSTEM EQUIPMENT	24
7.3	CONSTRUCTION EQUIPMENT	25
7.4	DRILLING LOCATIONS	25
7.5	DATA GATHERING DEVICES	26
7.6	SAMPLING AND LABORATORY SERVICES	26
8.0	**NOTIFICATION AND CORRECTION PROCESS**	27
9.0	**PERSONNEL QUALIFICATIONS AND TRAINING**	29
10.0	**MATERIALS AND EQUIPMENT**	30
10.1	MATERIALS	30
10.2	WELL CONSTRUCTION MATERIALS	30
10.3	SYSTEM EQUIPMENT	31
10.4	CONSTRUCTION EQUIPMENT	35
10.5	DATA GATHERING INSTRUMENTS	35
10.6	VR SYSTEM	37
10.7	ELECTRICAL SYSTEMS	39
11.0	**REFERENCES**	41

CONTENTS
(Continued)

Appendices

A Quality Control Checks
B Project Forms

Figures

1 Quality Assurance Team Organization Chart 7

Tables

1 QC Requirements for Installation of Critical System Components 15
2 Summary of Personnel Training and Certifications 29
3 Electrode and VR Well Construction Materials 32
4 Temperature Monitoring Point Construction Materials 33
5 Equipment Specifications 34
6 Summary of Soil Boring Requirements 35
7 Data Gathering Instrumentation 36
8 Maximum CPVC Pipe Support Distances 38

ABBREVIATIONS AND ACRONYMS

ACI	American Concrete Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
bgs	below ground surface
CFR	Code of Federal Regulations
Clayton	Clayton Group Services
CPVC	chlorinated polyvinyl chloride
CQCP	Construction Quality Control Plan
ERH	Electrical Resistive Heating
EPA	U.S. Environmental Protection Agency
GAC	granular activated carbon
gpm	gallons per minute
HAZWOPER	Hazardous Waste Operations and Emergency Response
Hg	mercury
HP	horsepower
kV	kilovolt
kVA	kilovolt-amps, similar to kilowatts
MSDS	Material Safety Data Sheet
NIST	National Institute of Standards and Technology
NSF	NSF International, formerly National Sanitation Foundation
PCU	power control unit
ppmv	parts per million volumetric
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RH	relative humidity
scfm	standard cubic feet per minute
SSHSP	Site Specific Health and Safety Plan
TCE	trichloroethene
THERMAL	Thermal Remediation Services, Inc.
VOCs	volatile organic compounds
V	volt
VR	vapor recovery

EXECUTIVE SUMMARY

This Construction Quality Control Plan (CQCP) has been prepared for the installation of the Electrical Resistive Heating (ERH) system at the Lockformer site. ERH systems operate by applying electricity to electrodes placed at specified depths in the subsurface. As power is applied to the electrodes, the soil matrix resists the flow of electricity between the electrodes, causing the subsurface to be heated. Subsurface temperatures are increased to the boiling point of groundwater and targeted contaminants, including volatile organic compounds (VOCs) and, particularly, trichloroethene (TCE) in this case. Once subsurface temperatures reach the boiling point of groundwater, steam and volatilized contaminants migrate upward to be collected in the vadose zone by vapor recovery wells and routed to vapor and condensate treatment systems.

The Lockformer site remediation will include the design, installation, and operation of an ERH system to enhance the vapor extraction of VOCs – in particular, TCE. ERH systems consist of electrodes, an electrical power control unit (PCU), temperature and pressure monitoring systems, a vapor recovery system, and vapor and condensate treatment systems.

The CQCP presents the quality assurance (QA) and quality control (QC) requirements and procedures to be followed during installation of the ERH system. The objective of the CQCP is to ensure that the finished system adheres to the technical specifications for the ERH remediation. QA activities include all those actions which provide confidence that quality is achieved. The overall QA program for the ERH remediation establishes responsibilities and authorities, defines polices and requirements, and provides for the performance and assessment of the work. QC activities include those actions that involve the use of appropriate policies and procedures in the performance of the work scope. The CQCP identifies the procedures to be followed during installation of the ERH system to ensure that construction materials are of suitable quality, that system components are

capable of meeting the ERH design and operating criteria, that proper installation methods and techniques are followed, that installation quality checks are performed, and approvals obtained before the system is operated. The CQCP identifies the installation QA/QC team members and outlines their responsibilities; it also describes or references the frequency of quality control activities, standards for documentation, and methods for resolving deficiencies and exceptions.

1.0 TECHNOLOGY DESCRIPTION

The selected remediation technology uses electrical resistive heating (ERH) in saturated or unsaturated soil to raise subsurface temperatures. Subsurface heating may be used for several remedial purposes, including contaminant volatilization, in-situ steam stripping, enhancing soil vapor extraction rates, and increasing biological degradation rates. Subsurface heating also increases the rates of chemical reactions that destroy chlorinated hydrocarbons in accordance with the Arrhenius Law.

To implement ERH, electrodes are placed into the ground so they surround a targeted contaminated region. Each electrode then is connected to a separate power supply transformer to provide it with a unique phase of electrical current.

The ERH power electrodes conduct electrical energy to the subsurface and are designed to input that energy only at selected subsurface depth intervals. In the resistively heated intervals, the electrode construction materials are un-insulated, and the electrode borehole annulus is packed with a conductive material to increase the effective diameter of the electrode. In those portions of the subsurface where ERH is not desired, the electrode construction materials are insulated, and the borehole annulus is filled with non-conductive materials such as sand, bentonite, or cement. At strategic depths in the electrode borings, sand filters are installed to assist the vapor recovery (VR) process, or impermeable seals are installed to prevent heated fluids or vapors from migrating up the borehole.

An ERH power control unit (PCU) is used to condition standard three-phase electrical power for use in subsurface heating. Electrodes are connected to the PCU so they are out of phase with adjacent electrodes. Thus, each electrode will conduct current to the out-of-phase electrodes surrounding it. Resistance by the subsurface environment to this flow of electrical current uniformly heats the soil and groundwater between the electrodes.

Because electrically conductive intervals can be installed at multiple depth intervals, it is possible to heat separate subsurface depths independently or in unison.

As the subsurface is resistively heated, contaminants are volatilized, and soil moisture and groundwater are converted to steam. The production of steam during ERH operations effectively provides in-situ steam stripping of volatile organic compounds (VOCs) from the soil matrix. By raising subsurface temperatures above the boiling point of the mixture of targeted contaminants and groundwater, ERH significantly enhances the speed and effectiveness of physical contaminant removal. On its own, ERH technology does not necessarily remove contaminants from the subsurface. Rather, it provides the physical conditions necessary to release the contaminants from groundwater and the soil matrix, allowing them to migrate up toward the surface where they are collected by a VR system.

The ERH process is self-correcting with regard to overheating. As the soil between the electrodes is heated to boiling, water is removed from the soil matrix. Once the residual water content reaches about 5%, the resistivity of the soil matrix increases rapidly, and electrical current no longer will flow through that portion of the treatment volume. Because of this phenomenon, only soil immediately adjacent (within inches) to the electrodes can be heated beyond the boiling point of groundwater at depth.

Once steam and volatile contaminants are collected by the VR system, steam condenses to water, and the volatile vapors are treated before release to the atmosphere. As the treatment area is cleaned, contaminant concentrations in the recovered soil vapors decrease. During an ERH cleanup, the results of interim soil vapor and soil sampling are used to track remediation progress. The concentrations of VOCs in the recovered soil vapors are used to establish schedules for interim sampling of the treated media. Once interim sampling indicates the cleanup goals established for the project are met or exceeded, confirmatory soil samples are collected.

The critical components required to implement ERH include the following:

- Electrodes
- VR wells
- Plenum
- A subsurface temperature monitoring system
- Vadose zone vacuum monitoring piezometers outside perimeter of the treatment area
- A ERH PCU to condition three-phase power for application to the subsurface
- An above-grade steam and vapor collection system, including piping, a blower, and a condenser.
- A vapor treatment system.
- Vapor sampling systems to measure VOC removal from the subsurface, determine the efficiency of the vapor treatment system, and measure the VOC concentration in the final system discharge.
- Data acquisition systems.
- A computer control system for continuous remote control of power.

2.0 PROJECT AND PLAN DESCRIPTION

2.1 PROJECT DESCRIPTION

See Section 4.0 of this Work Plan.

2.2 PROJECT OBJECTIVES

See Section 4.0 of this Work Plan.

2.3 INSTALLATION PHASES

Installation of the system will commence only when notice to proceed is given by Clayton. Clayton will be responsible for overall management of the system installation. While there will be some overlap of phases during system installation, the process will proceed through the following major phases.

- Clayton and Lockformer will perform general site preparation activities.
- An electrical power drop has already been installed in the area adjacent to the ERH remediation site.
- Staging locations for the larger system equipment components will be prepared.
- Specialty materials for constructing the electrodes and the ERH portions of the remediation system will be procured and mobilized to the site.
- Drilling services will be procured, and the drilling subcontractor will mobilize standard drilling materials and equipment to the site. Standard drilling materials will include well casing, bentonite, grout, and sand.
- The drilling subcontractor will perform the installation of the electrodes, VR wells, vacuum monitoring piezometers, and temperature monitoring points (TMPs) under the supervision of Clayton.

- The ERH PCU and condenser will be mobilized to the site and placed on the previously prepared staging locations.
- The VR system components will be procured and mobilized to the site. The VR piping system will be constructed and connected to the VR wells.
- The vapor treatment system components will be procured, mobilized to the site, and placed on the previously prepared staging locations.
- The ERH PCU will be connected to the electrodes, the VR piping system to the condenser, and the condenser to the vapor treatment system.
- The plenum will be placed over Areas 1 and 2.
- The electrical connections to the system components will be completed, and the interlock control wiring between system components will be installed.
- Shakedown testing of the ERH PCU, the condenser, the VR system, and the vapor treatment system will be performed. Appropriate testing work guides and worker training will control these testing activities.
- Shakedown testing of the complete ERH remediation system will be performed. Appropriate testing work guides and worker training will control these testing activities.
- The ERH remediation system will be placed into operation only when the notice to proceed is given by Clayton.

2.4 PLAN DESCRIPTION

The CQCP presents the QA and QC requirements and procedures to be followed during installation of the ERH remediation system. QA activities include all those actions which provide confidence that quality is achieved. The overall QA program for the remediation establishes responsibilities and authorities, defines polices and requirements, and provides for the performance and assessment of the work. QC activities include those actions that involve the use of appropriate policies and procedures in the performance of the work scope.

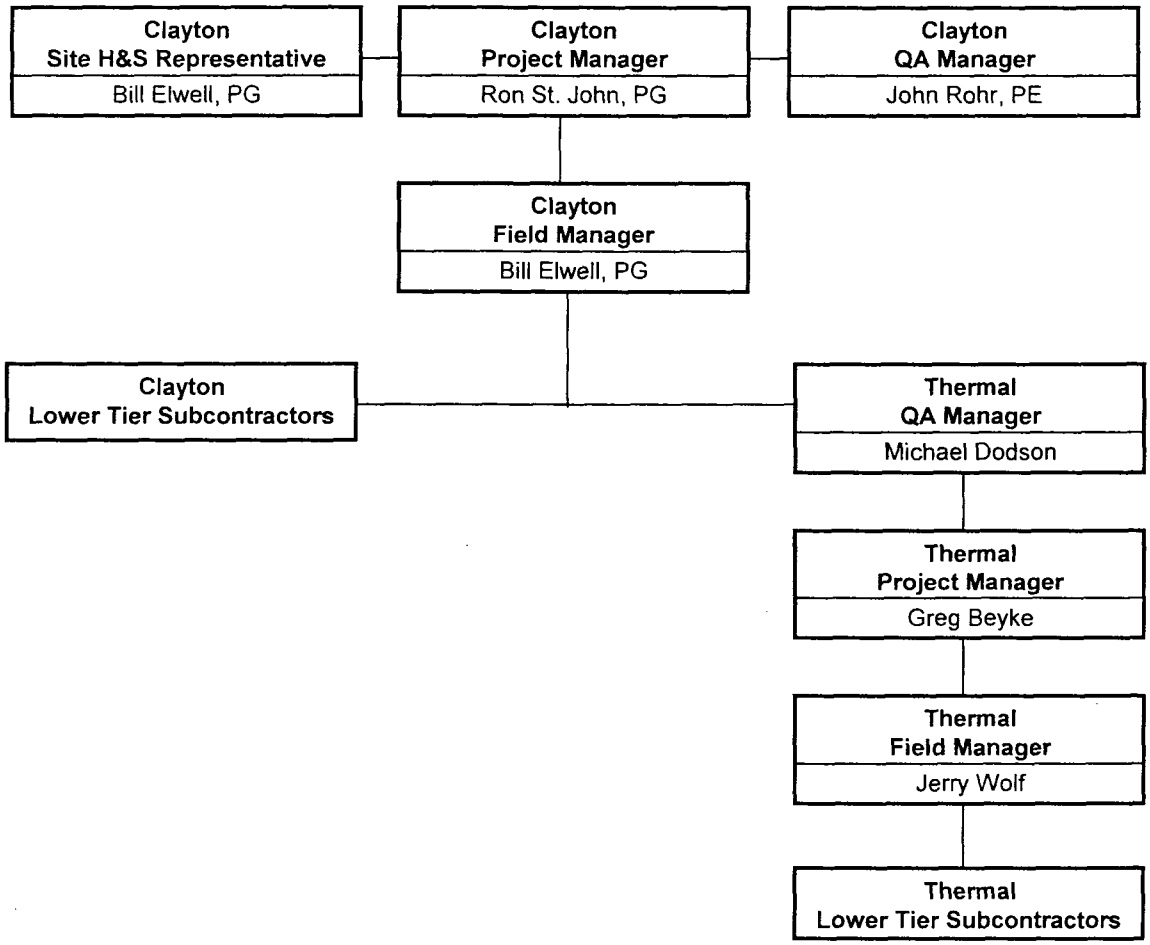
Quality issues are covered in various components of the Clayton QA/QC Program, the ERH design, and this CQCP.

The objective of the CQCP is to ensure that the finished system adheres to the ERH remediation system design. This CQCP identifies the procedures to be followed during installation of the ERH system to ensure construction materials are of suitable quality, system components are capable of meeting design operating criteria, proper installation methods and techniques are followed, and installation quality checks are performed before the system is operated. The CQCP identifies the installation QA/QC team members and outlines their responsibilities; it also describes or references the frequency of quality control activities, standards for documentation, and methods for resolving deficiencies and exceptions.

3.0 QUALITY ASSURANCE TEAM

The implementation of QC systems during the installation phase of the remediation includes the involvement of personnel from Clayton and THERMAL. The QA team members represent qualified individuals with strong professional training and prior work experience in implementing QA activities and a demonstrated ability to perform their required QA functions. The structure of the QA team is shown graphically in Figure 1.

Fig. 1. Quality Assurance Team Organization Chart



3.1 RESPONSIBILITIES AND AUTHORITIES

The principal parties involved in QA activities for the installation of the ERH remediation system include leaders of the Clayton project team and leaders of the THERMAL project team.

3.1.1 Regulatory Agencies

Clayton will perform oversight of the project and is responsible for communications with the United States Environmental Protection Agency (USEPA). It is expected that the USEPA will review and comment on documents produced for the performance of this remediation project.

3.1.2 Clayton

Clayton is directly responsible for the overall quality of the project and for ensuring that project goals and objectives are met in a high-quality manner. Clayton is responsible for communications with the regulatory agencies. This responsibility includes submission of required documentation demonstrating that design and QA specifications and system performance standards were achieved.

3.1.3 Clayton QA Manager

The Clayton QA Manager is responsible for verifying implementation of the QA program by the project teams during the installation of the remediation system, approving nonconformance reports and corrective actions, and reviewing and approving any project-specific procedures. Some specific QA tasks for which the QA Manager is responsible are the following:

- Review conformance of materials and equipment to design specifications
- Conduct periodic inspections of site during construction
- Administer the construction QA program
- Certify the Construction Completion Report

3.1.4 Clayton Project and Field Managers

The Clayton Project and Field Managers are responsible for overseeing the ERH remediation (including all plans and field activities) and communicating with the Clayton QA Manager, client, and appropriate regulatory agencies. The Clayton Field Manager reports to the Clayton Project Manager and performs the following responsibilities:

- Completely understands the ERH design documents and CQCP.
- Recognize and immediately report deviations from design documents or CQCP to the Clayton Project Manager.
- Be available at all times work is ongoing and prepare any field change orders.
- Communicate with subcontractors and other involved parties during system installation activities.
- Record, maintain, and forward progress reports and other project data to the appropriate parties.
- Secure and maintain documents that identify changes to the ERH design and the CQCP.
- Review work product for acceptance, rejection, or further evaluation.

3.1.5 THERMAL'S QA Manager

The THERMAL QA Manager will report to the Clayton Field Manager and is responsible for ensuring that all QA aspects of the ERH design and the CQCP, which are assigned to THERMAL, are implemented. The THERMAL QA Manager provides direction to the

THERMAL staff on QA issues and interfaces with the Clayton QA personnel. The THERMAL QA Manager will perform the following QA functions:

- Completely understands the ERH design and CQCP.
- Recognize and immediately report deviations from the design or CQCP to the Clayton Field Manager.
- Communicate with the Clayton Field Manager, the THERMAL Project Manager, and other involved parties during system installation activities.
- Secure and maintain documents that approve changes to the ERH design or CQCP.
- Ensure that those QA and QC procedures, as well as project-specific procedures for health and safety, personnel training, waste management, and work activities assigned to THERMAL are implemented.
- Ensure that detailed field notes documenting all field activities are created and that these notes are properly maintained and retrievable.

3.1.6 THERMAL Project and Field Managers

The THERMAL Project and Field Managers are responsible for implementing those aspects of the remediation installation contracted to THERMAL. They also are responsible for fulfilling the QA/QC tasks assigned to them by the THERMAL QA Manager. The THERMAL Project and Field Managers will provide direction to their field staff and lower-tier subcontractors and will interface with the Clayton field personnel. The THERMAL Project and Field Managers will perform QA and QC functions and activities assigned to them and are responsible for the following.

- Completely understands the ERH design, CQCP, and all controlling field procedures.
- Recognize and immediately report deviations from the ERH design or CQCP to the Clayton Field Manager.

- Be onsite, or immediately available, at all times work is ongoing and have the authority to implement corrective actions during field activities.
- Communicate with field personnel, lower-tier subcontractors, and other involved parties during the system installation activities.

The THERMAL Field Manager will also perform the following functions:

- Participate in work planning meetings as well as site-specific health and safety, work process, or QA/QC training activities.
- Prepare and maintain a set of as-built drawings during system construction and installation.
- Prepare and maintain detailed field notes documenting all field activities.
- Direct and review THERMAL's Health and Safety, QA/QC, and the work efforts of THERMAL's lower-tier subcontractors.

3.2 PROJECT MEETINGS

Meetings will be held to achieve a high degree of communication among members of the project teams. These meetings will help to minimize errors and promote quality performance during the system installation phase of the project.

3.2.1 Pre-Construction Meeting

A Pre-Construction meeting will be held with key project personnel to ensure that the entire team has a clear understanding of the project objectives, the ERH design, health and safety issues, QA/QC requirements, and work procedures. This meeting will allow key team members to meet and develop solutions to any potential problems known to the team prior to the initiation of installation activities.

3.2.2 Progress Meetings

Progress meetings will be held with key project members and other appropriate parties to discuss progress and planned activities.

3.2.3 Field Meetings

During the course of the system installation, the field team will meet daily (before work activities begin) to discuss, plan, and coordinate the work, health and safety, and QA/QC activities to be performed that day.

3.2.4 Problem Resolution Meetings

Special meetings will be held when and if a problem or work deficiency occurs (or may occur) that could impact safety, quality, cost, or the project schedule. All parties involved will attend to discuss the problem or deficiency, review possible solutions, and implement a plan of action to resolve the problem or deficiency.

4.0 QUALITY CONTROL ACTIVITIES

During installation of the ERH remediation system, adherence to the ERH design and health-and-safety requirements and procedures will be required. The measures required to verify the quality of work performed and compliance with the specified project requirements include: successful completion of the readiness reviews; inspection of materials, equipment, and workmanship before and during the performance of each task comprising the ERH system installation effort; and resolution of all reported deficiencies.

Preparatory activities will include the following:

- Review contract documents and design specifications with the project team.
- Review the site-specific hazard analysis and Health and Safety Plan (SHSP).
- Ensure that the field team has reviewed and discussed work procedures to be followed.
- Review procurement specifications and tracking procurements.
- Successfully complete the readiness review process.
- Ensure that materials and equipment are properly received, inspected, tested, inventoried, and stored.

Progress monitoring activities will include the following:

- Check work quality to ensure design specifications are met.
- Verify site activities are in accordance with the SHSP.
- Check that QA provisions are in place and QC activities are completed in compliance with QA requirements and procedures.
- Check that nonconformance issues are recorded, tracked, and resolved.

- Check that QC reporting is accurate, timely, complete, and complies with QA requirements and procedures.

Follow-up and completion activities will include:

- Resolution of all nonconformance issues.

4.1 ENVIRONMENTAL HEALTH AND SAFETY

Health and Safety procedures and requirements are provided in the SHSP. The SHSP describes the health and safety-related QA and QC activities that will be performed during installation of the ERH system and provides the roles, responsibilities, and authorities of the various team members.

4.2 WASTE MANAGEMENT

Waste management procedures and requirements are provided in Section 4.0 of the Work Plan.

4.3 FIELD ACTIVITIES

The project documents containing the QC requirements for the installation of each critical system component are listed in Table 1.

Table 1. QC Requirements for Installation of Critical System Components

System Component	Location of Applicable QC requirements
Electrodes and Wells	ERH Design Document and SSHSP CQCP Section 7.1, 7.3, 7.4, 10.1, 10.2, 10.4, and Appendix A
Power Control Unit	ERH Design Document and SSHSP CQCP Section 7.2, 10.3, 10.7, and Appendix A
Remote Control System	ERH Design Document CQCP Section 7.1, 7.2, 7.5, 10.1, 10.5, and 10.7
Vapor Recovery System	ERH Design Document SSHSP CQCP Section 7.1, 7.2, 7.3, 10.1, 10.3, 10.4, 10.6, 10.7, and Appendix A
Vapor Treatment System	ERH Design Document and SSHSP CQCP Section 7.1, 7.2, 10.1, 10.3, 10.6, and 10.7
Data Acquisition Systems	ERH Design Document and SSHSP CQCP Section 7.1 and 10.5

5.0 DOCUMENTATION

The ERH design documents and this CQCP identify system installation activities that should be monitored, describe the varying level of monitoring required, and assign responsibility for monitoring. To be effective, these QA/QC monitoring activities must be documented.

5.1 MATERIALS AND EQUIPMENT

QA/QC documents for materials, equipment, and services will be traceable to purchase orders or requests. The QC documentation for materials and equipment purchased may include some, if not all, of the following: engineering documents, drawings, inspection procedures, and inspection reports. Quality verification documents may include some, if not all, of the following: material verification reports, material test reports, inspection verification reports, performance testing reports, and summary reports that cover procurement requirements, approved changes, waivers, or deviations.

5.2 FIELD LOGBOOK

The THERMAL Field Manager will maintain a field logbook. Entries will be dated and initialed by the personnel making the entry. In addition to other project requirements, the logbook will contain a diary of events and progress, and a record of site meetings and visitors. The logbook will contain any observations of unusual or previously unnoticed site conditions. QA/QC activities to be recorded in the logbook include:

- Inspections of materials, supplies, and equipment (both construction and system equipment).
- Inspections of work quality, including the quality of lower-tier subcontractors.

- Field data and information for which a recording form has not previously been prepared.

5.3 DATA FORMS

Prior to the start of installation activities, the THERMAL QA Manager will ensure that those forms necessary for recording field data and information are produced. The THERMAL Project and Field Managers are responsible for ensuring that these forms are available to field personnel and are used to properly record data and information. They also are responsible for the safekeeping, filing, retrieval, and retention of all completed data forms in THERMAL's possession.

5.4 QC FORMS

The THERMAL QA Manager is responsible for reviewing the QA/QC requirements for the project and ensuring that all required QC data and information recording forms are produced. The THERMAL Field Manager is responsible for ensuring that QC data and information are recorded on the proper forms and for the safekeeping, filing, retrieval, and retention of these data forms.

5.5 AS-BUILT DRAWINGS

The THERMAL Field Manager is responsible for ensuring that as-built drawings for the ERH remediation system are prepared and updated, as well as the safekeeping, filing, retrieval, and retention of these drawings.

5.6 WEEKLY PROGRESS REPORTS

The THERMAL Project Manager is responsible for preparing weekly progress update reports for the Clayton Field Manager. These reports will contain a summary of work completed during the week. These reports will highlight any potential problems that could compromise safety, work quality, or project schedule.

6.0 PROCUREMENT

The procurement process shall ensure the following:

- Design requirements are met throughout the procurement process.
- Materials, supplies, equipment, and services are obtained from qualified suppliers.
- Design and end-user requirements are accurately, completely, and clearly communicated to suppliers and subcontractors.
- The proper product or service is delivered on time and maintained in satisfactory condition until used.
- The procurement process is documented, and documentation is properly controlled.
- QC certificates will accompany the material, as necessary.

6.1 SUPPLIER QUALIFICATIONS

Prior to initiating the process of procuring materials, equipment, or service, the THERMAL QA and Project Managers are responsible for providing the Clayton Field Manager with a list of lower-tier suppliers for approval. Lower-tier subcontractors providing onsite services must meet SSHSP criteria as well as applicable federal and state requirements.

If appropriate, the following activities may be used, on a graded approach, to evaluate lower-tier suppliers (depending on how the purchased items or services relate to safety and the successful completion of the project):

- Review supplier's history for providing identical or similar items or services.
- Review supplier's information regarding product or service quality.

- Evaluate supplier's certifications or registrations as awarded by accredited third parties.

- Evaluate supplier's health and safety qualifications to ensure consistency with site requirements.

6.2 PROCUREMENT DOCUMENTS

THERMAL and Clayton will produce requests for proposals and quotations or purchase orders for qualified suppliers that clearly state any design requirements, acceptance criteria, and any test/inspection requirements for purchased items and services. Specifications and requirements will be drawn from the ERH design and this CQCP. Procurement documents will include any specifications, standards, or other documents referenced in the controlling design or QA/QC documents.

Critical requirements that must be fulfilled by the supplier will be clearly specified in requests for proposals and quotations or on purchase orders. Some requirements that must be met may include the following:

- Delivery schedules
- Packaging requirements
- Production of engineering documents
- Specific pre-acceptance inspection procedures
- Specific pre-acceptance testing procedures
- Pre-acceptance manufacturing drawings
- Delivery of Material Safety Data Sheets (MSDS)
- Production of Operating Manuals
- Documentation of personnel qualifications and site-specific training

These supplier documents will be traceable to the purchase order or purchase requirements.

6.3 INSPECTIONS

In all instances, items obtained from lower-tier suppliers will be inspected upon delivery by the QA Manager, the Field Project Manager, or their designees to verify that the order was completely filled, the delivered items match the ordered items, and no items were damaged in shipping. Completed deliveries will be so documented. Deliveries containing orders not completely filled, items not meeting specifications, or damaged items will be tracked until the discrepancies have been resolved. The inspection and nonconformance resolution processes will include verification that the supplier has provided all specified documentation, including MSDS and Operating Manuals.

If the ERH design or CQCP call for special post-delivery inspections, testing, or calibrations, these activities will be performed in a timely manner and will be adequate to ensure conformance with the controlling requirements.

Materials, supplies, and equipment belonging to lower-tier subcontractors will be inspected using the same procedure applied to similar items supplied by offsite vendors.

6.4 SUPPLIER PERFORMANCE MONITORING

During the life of the project, the THERMAL and Clayton Project Managers are responsible for periodically monitoring and evaluating the performance of suppliers and subcontractors to confirm that acceptable items or services are produced and schedule requirements are met. Performance monitoring will be applied on a graded basis and may include:

- Surveillance of work activities and preparation of nonconformance reports.
- Review supplier plans and progress reports.

- Monitor supplier's progress and costs.
- Process change order information.
- Review and dispose of progress and nonconformance reports.
- Evaluate supplier's QC/QA programs.
- Evaluate supplier's personnel training and procedures.
- Evaluate supplier's training certification records for personnel performing critical functions affecting project quality.

Throughout the project, the THERMAL and Clayton Field Managers will perform inspections on materials and equipment being stored onsite to ensure that quantities are adequate, that quality is not impacted by storage, and that storage locations and methods will not interfere with project flow, schedule, or safety. The scope and frequency of these inspections will be determined utilizing a graded approach based upon the possible impact to safety and project success that the inspected items represent.

6.5 SUPPLIER DOCUMENTS

THERMAL and Clayton will ensure that supplier-generated documents, including MSDS, are controlled, maintained, and retrievable.

6.6 PROCUREMENT RECORDS

The THERMAL and Clayton Project Managers will ensure that procurement records are routed to the appropriate project team members and end-users, and that copies of these records are maintained and retrievable.

7.0 FREQUENCY OF ACTIVITIES

The frequency of QC checks for materials, equipment, and installation processes will be determined utilizing a graded approach based upon the items or process inspected and how they relate to safety or the successful completion of the project. The QA Manager or his designee is responsible for these checks. Both THERMAL and Clayton will perform checks and inspections, but Clayton is responsible for ensuring that any required checks and inspections are completed.

7.1 MATERIALS

Quality checks will be performed by the QA Manager, the Field Project Manager, or their designees upon the delivery of all project materials, including those provided by lower-tier subcontractors and vendors. Checks will be made to ensure that the correct products have been delivered to meet project specifications, and that QC certification will be reviewed to ensure that materials and supplies are in conformance with specifications. These checks will be consistent with the procurement procedures specified for the products. At a minimum, a visual examination of all material deliveries will be performed to review the bills of lading, ensure that the correct quantity has been received, verify the labeling of the materials, check for possible damage, and examine MSDS. The soundness of the packaging will be determined, and the materials will be properly stored.

Periodic inspections will be made to verify the quantity and integrity of materials in storage. These checks will assess the continued safekeeping of remaining materials and ensure that storage practices are both safe and not a hindrance to current or planned work activities.

7.2 SYSTEM EQUIPMENT

System equipment will be clean upon arriving onsite and before leaving the site.

QA requirements for procurement, receiving, and inspection will apply to system equipment. Immediately upon arrival onsite, system equipment will be inspected by the QA Manager or his designee. Although system equipment cannot be inspected under operating conditions before installation, visual inspections will be performed. Delivery documentation will be collected and checked against the procurement specifications. A check will be made to note if the model of the equipment matches the procurement specifications. The equipment will be examined to ensure there are no signs of damage to the equipment or of incipient hazardous conditions such as fluid leaks or missing safety guards. Components such as belts, hoses, and cables will be inspected for misalignment or wear and tear, and repaired or replaced as necessary, before the equipment is placed into use.

If system equipment cannot be immediately placed in its proper staging location, it will be stored in a safe manner and in accordance with manufacturers' instructions. Equipment storage locations will be selected so the equipment will not interfere with current or planned work activities, and additional moves will be minimized. Equipment will be checked periodically to ensure it has not been damaged by work activities.

Once it is possible to test system equipment under operating conditions, performance testing shall be completed. All required QC documents intended to indicate how the equipment performs against the specification requirements will be completed, and justification or resolution of any deviations will be provided.

7.3 CONSTRUCTION EQUIPMENT

Construction equipment necessary for system installation activities will be clean when arriving onsite and when leaving the site. Down-hole equipment and tooling will have gone through a decontamination process before being allowed onsite. Before leaving the site, construction equipment will be decontaminated. Waste generated from the decontamination process will be handled in accordance with Section 4.0 of this Work Plan.

Construction equipment will be inspected immediately upon delivery to the site and before it is used. The inspection will note the type and model of equipment and determine if it is appropriate for its intended use as defined by the design and procurement specifications. A visual examination will be performed to ensure there are no signs of debilitating damage or hazards and incipient failures such as fluid leaks or worn components. If any of these conditions are discovered, they will be corrected before the equipment is put into use. At all times, safe storage, proper positioning, set-up, and use of construction equipment will be enforced, and the performance of preventive maintenance verified daily.

7.4 DRILLING LOCATIONS

Drilling locations will be verified and marked before setup of equipment on the site, and all utilities will be cleared. Drilling locations will be reconfirmed before drilling equipment penetrates the soil. Locations will be established by civil survey after construction activities have been completed, and surveyed locations will be shown on the as-built drawings. Waste generated from drilling activities will be handled in accordance with Section 4.0 of this Work Plan.

7.5 DATA GATHERING DEVICES

Data gathering devices will be inspected upon delivery in the same manner as other project materials and checked to ensure appropriate design and procurement specifications are met. Additionally, calibration certifications for devices that are delivered calibrated by the manufacturer will be collected, reviewed, and retained. Once calibration has been established, a calibration label will be attached to the device in accordance with appropriate QA procedures.

Data gathering devices that require calibration prior to use, or periodic calibration, will be labeled "Do Not Use - Not Calibrated." Data gathering devices will not be used until calibration requirements are met, and a calibration label attached to the device. All equipment requiring calibration will be calibrated in accordance with the manufacturer's specifications.

7.6 SAMPLING AND LABORATORY SERVICES

The Field Sampling Plan specifies the types and frequency of field QC samples. All QC samples will be shipped according to standard chain-of-custody protocol. Analytical laboratory QC samples will be analyzed as required by the analytical method specified for the parameters of interest, and the results will be included in the analytical report.

8.0 NOTIFICATION AND CORRECTION PROCESS

All problems associated with materials, supplies, equipment, and service suppliers will be documented, and corrective actions taken immediately. In those instances where a potential for impact to safety or project success exists, the THERMAL Project Manager will immediately notify the Clayton Field Manager of the nonconformance situation.

The THERMAL Project Manager is responsible for implementing, at a minimum, the following activities.

All nonconforming shipments, materials, supplies, equipment, or subcontractor services will be documented and reported to the Clayton Project Manager. Documentation will include date of inspection, items inspected, nature of the nonconformance, any immediate corrective actions taken, and name of the person performing the inspection.

The THERMAL Project Manager will immediately inform the Clayton Field Manager of any nonconformance situations that could possibly impact safety, quality, or the success of the project.

The THERMAL Field Manager will maintain a log of all nonconformance reports and will document corrective actions through final resolution. Resolved nonconformance reports will be so indicated on the log with a description of the corrective actions and final resolution. Nonconformance resolution will be documented and communicated to all parties.

The THERMAL Project Manager will provide the Clayton Field Manager with an update of nonconformance issues in THERMAL's routine update reports.

- Nonconforming materials, supplies, and equipment will be immediately tagged as being "out of conformance" and repaired, calibrated, or removed from the site as soon as reasonably possible. Tags used for this purpose will be easily recognizable and marked to indicate a contact person who can provide information on the status of the tagged items. Where possible, nonconforming items awaiting repair, calibration, or replacement will be stored together in designated areas.

- Lower-tier subcontractors who have failed to provide requested qualifications documentation, are in violation of health and safety procedures, or are found to be performing nonconforming work, will be immediately notified of the nature of nonconformance and instructed how to correct the nonconformance. If the nature of the nonconformance involves a health and safety violation, or threatens safety or project success, the activities of the subcontractor may be immediately suspended until the nonconformance can be successfully resolved.

- The THERMAL Project Manager will perform follow-up inspections, as necessary, to ensure that the prescribed resolutions for nonconformance situations are implemented. These follow-up inspections will be properly documented.

9.0 PERSONNEL QUALIFICATIONS AND TRAINING

The qualifications of site personnel are summarized in Table 2. All personnel will have training as specified in the ERH design document and SSHSP.

The specific activities performed during ERH remediation system installation do not require special certifications, but do require specific skills and training. The THERMAL Project Manager will have direct experience as the lead design engineer and project manager on a minimum of three previous ERH projects. The THERMAL Field Manager will have direct experience in the same role on a minimum of three previous ERH projects. The THERMAL Field Technicians will have direct experience on a minimum of one previous ERH project.

Table 2. Summary of Personnel Training and Certifications

Task	Required certification
All Onsite Workers	HAZWOPER Standard, 29 CFR 1910.120, 40-hr training, and current 8-hr refresher. Supervisors shall additionally have HAZWOPER 8-hr Supervisor Training. Medical Monitoring General Site Training
ERH Project Manager	Design Engineer and Project Manager on a minimum of three previous ERH projects
ERH Field Manager	Field Manager on a minimum of three previous ERH projects
ERH Field Technicians	Field Technician on a minimum of one previous ERH project
Electricians	State of Illinois License
Forklift Operations	Power Industrial Truck Training, CFR 1910.178 (RAAS-030)

10.0 MATERIALS AND EQUIPMENT

10.1 MATERIALS

The ERH remediation system will be constructed of the materials and components specified in the final version of the ERH design document.

10.2 WELL CONSTRUCTION MATERIALS

Installation of the ERH remediation system will require the construction of approximately 63 electrodes (with those electrodes in Area 2 having exposed VR wells), and 14 temperature monitoring points. Construction details for each of these system components are presented in the ERH design document. If supplemental working guides are appropriate for electrode installation, they will be prepared prior to initiating construction activities. THERMAL will provide a training program for any site-specific work guidelines prepared for electrode construction activities.

The materials and critical specifications necessary to construct the electrodes/VR wells are identified in Table 3, and the temperature monitoring points are identified in Table 4. Material specifications in this document are based upon the ERH design documents, and materials identified in the final version of the ERH design document will have precedence over those listed in this document.

QA and QC activities associated with construction materials will include inspections for damage and compliance with design and purchasing specifications. Inspections will be performed when the materials arrive onsite. Any discrepancies will be noted and resolved through the notification and correction process.

10.3 SYSTEM EQUIPMENT

The ERH remediation system will consist of the large-scale components described in Table 5. System equipment will be manufacturers' prefabricated units matching the ERH design criteria. QA and QC activities associated with system equipment will include inspection of equipment for damage when it arrives onsite and compliance with design and purchasing specifications. Additionally, system equipment will be tested as soon as possible to verify that it can perform to ERH design requirements, as configured. Any discrepancies will be noted and resolved through the notification and correction process.

Table 3. Electrode and VR Well Construction Materials

Material	Approximate Quantity	Specifications
Steel Shot	Calculated from ERH design	SAE J444
Hydrating Solution	Calculated from ERH design	Epson Salt, USP grade
Neat Type 1 Portland Cement Grout	Calculated from ERH design	ACI code
3/8 inch Bentonite Pellets *	Calculated from ERH design	ANSI/NSF Std 60
Sand filter pack	Calculated from ERH design	10-20 sieve
Metal Electrodes	63	THERMAL's design
Electrode Cable, 1/O	Calculated from ERH design	THERMAL's design, similar to type KK or M16878/12
Electrode Cable, 4/O	Calculated from ERH design	THERMAL's design, similar to type KK or M16878/12
Cable Lugs	Calculated from ERH design	UL9809
Teflon Shrink Tubing	Calculated from ERH design	MIL-I-23053/12
Epoxy Insulating Resin	Calculated from ERH design	Scotchcast 4
CPVC Well Screen	Calculated from ERH design	ASTM F441
CPVC Well Casing	Calculated from ERH design	ASTM F441
Teflon Steam Tubing	Calculated from ERH design	ASTM D3295
1/2½ inch Bolt Sets	Calculated from ERH design	Grade 5, ASTM A449

NOTES:

* Bentonite will be free-flowing, high-swelling, sodium-based, Wyoming-type bentonite. High-density bentonite slurry will be a mixture of powered bentonite and water. Bentonite will be mixed in a batch plant, and the slurry will have a minimum of 30% solids by weight. Bentonite slurry will be placed with a side discharge tremie pipe.

The use of bentonite has been reduced as much as possible. However, it will be necessary to use bentonite slurry in the construction of the electrodes to provide some of the annulus seals and to prevent cement grout from migrating into lower intervals filled with sand or electrically conductive materials.

Table 4. Temperature Monitoring Point Construction Materials

Material	Approximate quantity	Specifications
1-inch-diameter CPVC pipe	Calculated from ERH design	ASTM F441
3/8-inch Bentonite pellets *	Calculated from ERH design	ANSI/NSF Std 60
Sand	Calculated from ERH design	10-20 sieve
Grout	Calculated from ERH design	Type I Portland Cement, ASTM C150

NOTES:

* Bentonite will be free flowing, high swelling, sodium-based, Wyoming-type bentonite. High-density bentonite slurry will be a mixture of powered bentonite and water. Bentonite will be mixed in a batch plant, and the slurry will have a minimum of 30% solids by weight. Bentonite slurry will be placed with a side discharge tremie pipe.

The use of bentonite has been reduced as much as possible. However, it will be necessary to use bentonite slurry in the construction of the electrodes to provide some of the annulus seals and to prevent cement grout from migrating into lower intervals filled with sand or electrically conductive materials.

Table 5. Equipment Specifications

Component	Type	Specifications
Condenser	Thermal design, water-cooled plate and frame heat exchanger with inlet and outlet separation	Inlet capacity: 900 scfm steam, 300 scfm air, 10 gpm liquid water, 100°C, 20-inch Hg Outlet conditions: 300 scfm air @ 100% RH <5°F above ambient, dP<1 inch Hg
VR Blower	Rotary lobe	10 HP, 200 scfm, 12-inch Hg
Vapor Treatment	VOC adsorption by vapor phase GAC	2 GAC vessels in series, change-out vessel onsite. Minimum vessel size: 1,800 lbs. Minimum Flow Capacity: 1,000 scfm TCE removal efficiency: > 95%.
ERH Power Control Unit	Thermal Design	500 kVA, 480 kV input, 75V-1100V output, remote monitoring and control of electrical power and remote monitoring of temperature

NOTES:

Scfm = standard feet per minute

Hg = Mercury

Dp = differential pressure

Ppmv = parts per million by volume

kVA = kilovolt-amps, similar to kilowatts

10.4 CONSTRUCTION EQUIPMENT

Drill rigs capable of producing the boreholes necessary to install the electrodes/VR wells and the temperature monitoring points will be required. Table 6 provides the summary of the drilling capabilities required for the ERH system installation.

Table 6. Summary of Soil Boring Requirements

Activity	Boring Diameter	Maximum Boring Depth	Drilling Method
Electrodes/VR wells	12 inches	25 feet	10 1/4-inch Auger

An all-terrain forklift with an 8,000-pound capacity rating is required to receive the condenser, the electrode, and well construction materials. A crane with a 20,000-pound capacity rating is required to receive the PCU.

QA and QC activities associated with construction equipment will include inspections for damage, proper decontamination, safe operating conditions, and the absence of fluid leaks. These inspections will be performed as soon as the equipment arrives onsite. The equipment, including accessories and tooling, will be inspected to ensure that it is capable of performing to design and purchasing specifications. Any discrepancies will be noted and resolved through the notification and correction process.

10.5 DATA GATHERING INSTRUMENTS

Data gathering instruments will be used to assist the installation process and will be installed into the system to monitor and record operating parameters. These instruments, their required accuracy, and method of calibration are summarized in Table 7.

QC activities associated with data gathering instruments will include inspections for damage and compliance with design and purchasing specifications. These inspections will be performed when the instruments arrive onsite. If specified by design requirements, data gathering equipment will be tested and calibrated prior to use. Once installed, all data gathering and reporting instruments and systems, including remote access and alarm notification systems, will be tested against the ERH design specifications as part of system startup. Any discrepancies will be noted and resolved through the notification and correction process.

Table 7. Data Gathering Instrumentation

Instrumentation	Accuracy	Calibration
Type T Thermocouples	1°C	Factory calibration accuracy per ANSI specification
Vacuum Gauges	0.3 inch Hg	Factory calibration accuracy per ANSI specification
Thermometers	1.4°C	Factory calibration accuracy per ANSI specification
Water Manometers	0.05 inch H_2O	Water manometers are primary standards
Digital Manometers	2.5%	Weekly calibration to primary standard (water manometer)
Averaging Pitot Tube	equals gage accuracy	Calibration is not applicable to pitot tubes. Pitot tubes are read with water manometers or calibrated digital manometers.
Portable Multimeters	0.3%	Factory calibrated with NIST Traceable Calibration Certificate
Portable Ammeters	>40A: 12A <40A: 0.8A	N/A Connected to calibrated multimeter
Installed Voltmeters, Ammeters, Power Meters	0.5%	Calibrated using NIST-calibrated portable multimeter
Remote Monitoring Indications	0.5%	Calibrated using NIST-calibrated portable multimeter

NOTES:
ANSI = American National Standards Institute
H_2O = Water
NIST = National Institute of Standards and Technology
Ppmv = parts per million by volume
A = amperes (amps)

10.6 VR SYSTEM

Plastics, like other piping materials, expand when heated. In most cases, piping should be allowed to move unrestrained between desired anchor points (e.g., VR wells and the condenser) without abrasion, cutting, or restriction of the piping. The installation of expansion loops, offsets, changes in direction, or a Teflon-bellows expansion joint may be required to minimize stresses between anchor points.

Specifications from the Harrington Industrial Plastics Engineering Handbook for Industrial Plastic Piping Systems (Harrington Industrial Plastics 2000) indicate that as chlorinated polyvinyl chloride (CPVC) pipe is heated from ambient conditions to the operating temperatures of a ERH system (approximately 100 °C), it expands at a rate of about 4.5 inches per 100 feet. If adjacent equipment or improper pipe clamping and support systems restrain movement from thermal expansion, the resultant stresses may cause damage to the equipment or piping.

In application to ERH, design rules for thermal expansion can usually be simplified to "do not connect a long straight run of piping to a well; an offset or change of direction is required before the wellhead connection."

When CPVC piping is installed above ground, it must be properly supported to avoid unnecessary stresses and possible sagging. At ERH temperatures, the maximum distance between supports is shown in Table 8.

Table 8. Maximum CPVC Pipe Support Distances

Pipe Diameter	Maximum Support Spacing *
2-inch or less	1.5-m (5 feet)
4-inch	2.1-m (7 feet)
6-inch	2.7-m (9 feet)

NOTES: * Harrington Industrial Plastics, 2000

However, the requirements for piping support run counter to the requirement for unrestrained thermal expansion, and it can be difficult to design a piping support system that does not restrain piping expansion, especially if there are many side branches such as typically found in VR systems.

The best solution is simply to lay the vapor recovery piping on the ground. The inherent flexibility of CPVC pipe allows it to conform to minor surface variations, providing the pipe with essentially continuous support without the binding that might lead to thermal expansion stresses. At-grade piping is less of a tripping hazard. At-grade piping will be used in Area 2, and the area around Area 1 not covered by the plenum.

CPVC undergoes surface oxidation and embrittlement when exposed to sunlight over a period of several years. The surface oxidation is visible as a piping color change from gray to white. While oxidized piping does not lose any of its pressure or vacuum capability, it does become more susceptible to impact damage. Where polyvinyl chloride (PVC) or CPVC pipe is expected to provide several years of service, it should be painted with a latex paint. Painting is not required due to the short duration of this remediation.

If required by design specifications, heat tracing and insulation can be applied to PVC and CPVC pipe by normal methods. Because plastic pipe is a very poor heat conductor, the use of aluminized tape to attach the heat tracing is recommended. Heat tracing of pipe will not be employed during this project.

Plastics expand more quickly than metals as they are heated. If a female CPVC threaded fitting is mated with a male metal fitting, it is likely to leak as the system is brought up to operating temperature. If the pipe size is greater than 2 inches, the use of male CPVC threads with female metal threads is appropriate for heated systems. If the pipe size is greater than 2 inches, a flanged plastic to metal transition is recommended.

Neither CPVC nor PVC is rated for contact with pure solvents. However, PVC is commonly used in vapor extraction systems to convey recovered chlorinated and petroleum hydrocarbon vapors from the subsurface. During ERH, conditions within the vapor recovery piping system are identical to those in a standard vapor extraction system except for the elevated temperatures. Solvents are present in the vapor recovery piping system in the vapor phase only, and CPVC is selected over PVC because of its superior performance at temperature. Tens of thousands of feet of CPVC have been used in construction of the vapor recovery systems for previous ERH projects without failure from solvent attack.

10.7 ELECTRICAL SYSTEMS

To the maximum extent possible, electrical connections will be accomplished in accordance with the applicable provisions of American Nations Standards Institute (ANSI) C2, National Electrical Manufactures Association WC-7, National Fire Protection Association 70. Exceptions will be made for prefabricated equipment and those components of the ERH system that operate on the principle of putting energy to ground.

Prior to acceptance, an operational test of all electrical, electrical data gathering, and equipment control systems will be performed to determine if the systems meet the purpose and intent of the ERH Design Package. Testing shall demonstrate that the systems are not electrically, mechanically, structurally, or otherwise defective, are in safe and satisfactory condition, and conform to specified operating characteristics. If any

deficiencies to pertinent components are revealed during these tests, they will be corrected, and the tests will be repeated until all deficiencies have been resolved.

11.0 REFERENCES

EPA (United States Environmental Protection Agency) 1983. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80 (1983).

Harrington Industrial Plastics 2000, *Engineering Handbook for Industrial Plastic Piping Systems*, Chino, California.

Thomas & Betts 2000. TAO1978B, Thomas & Betts Corporation, Memphis, TN, 2000.

Weast et al. 1976. *Handbook of Chemistry and Physics*, 56th Edition, CRC Press, Cleveland, Ohio.

APPENDIX A

QUALITY CONTROL CHECKS

QUALITY CONTROL CHECKS

Field documentation will be maintained throughout the system installation process. Activity-specific field data sheets will be generated to record all QC data collected during system installation.

Electrode Cable Assembly Checks:

Each electrode element has two cables for redundancy. The following electrode cable assembly checks will be performed on all electrode cables:

- Inspect electrode cables for nicks or damage.
- After crimping the cable lugs per the specifications of Thomas & Betts Corporation's Technical Advisory No. TA01978B (Thomas & Betts 2000), pull on the cables to check for any "give."
- Inspect the shrink tube and epoxy filling at the cable lugs for gaps or holes.
- Measured electrical resistance between electrode cables at their upper end should be less than 0.5 Ohm as read with a factory-calibrated portable multimeter.
- Verify that the voltage tattletales and drip tubes are secured to the cable at a maximum of 10-foot intervals. Voltages are read with a factory-calibrated portable multimeter.

Electrode Installation Checks:

- Each electrode zone: calculate and then verify desired conductive material type and amount. If hydrating solution is required, verify desired volume.
- As each electrode zone is installed: calculate and then verify that the electrical resistance between the electrode cables and the backfill tattletales is less than 0.5 Ohm.

Initial Start-up Checks:

Initial start-up checks are made with a factory-calibrated portable multi-meter. Verify that electrode tattletale voltage is within 5 volts (V) of applied voltage

Equipment Foundation Checks:

- Verify that equipment is properly level during installation.

Field Piping Installation Checks:

- Verify that piping is not constrained against thermal expansion except at VR wells and the condenser.
- Optional Verification: Vacuum leak test piping between well valves and condenser inlet (apply 15 in. Hg, maintain 10 in. Hg after 16 hrs). Record data using a factory-calibrated vacuum gauge.
- Optional Verification: Hydrostatic test electrode drip hoses (apply 60 psi, maintain 50 psi after 16 hours). Record data using a factory-calibrated pressure gauge.

Thermocouple Checks:

- Check temperature readings at computer versus a hand-held thermocouple reader (within 2 degrees).
- Mark temperature monitoring point thermocouple wire at 1.5 m-(5-foot) intervals.

ERH Power Control Unit Checks:

- Check for loose connections by tugging on all power cable connections.
- Inspect all compartments for foreign objects and damaged components.
- Visually inspect all cables for physical integrity.

- Hi Pot (high potential) test primary side of transformers at 15 kV. Hi Pot testing is performed by a state of Illinois-certified sub-tier subcontractor.

- Meggar secondary side of transformers at 500V. Meggar testing is performed by a state of Illinois-certified sub-tier subcontractor.

- Verify remote operation.

Equipment Interlock Checks:

- Verify that condenser fault shuts down the VR system blower and the vapor treatment system if a GAC system is not used.

- Verify that, if used, discharge tank high level shuts down the VR system blower vapor treatment system.

- Verify that a shutdown of the VR system blower shuts down the condenser.

- Verify that a shutdown of the condenser shuts down the PCU.

Vapor Recovery System Checks:

- Adjust each VR well or plenum lateral in Area 1 and Area 2 to extract 5-25 scfm (0.1 to 2.7 inch w.c. d.p.), if possible. Measurements are made using averaging pitot tubes read with water manometers or calibrated digital manometers. The measurement ports will be located at the system piping from each VR well or plenum lateral near the valve provided for each VR well or plenum lateral prior to the manifold.

- Verify that differential pressure from blower inlet to furthest well is less than 2 in. Hg.

- Perform vacuum influence and temperature checks. Vacuum measurements are made using averaging pitot tubes (read with water manometers or calibrated digital manometers) or with factory-calibrated vacuum gauges. Temperature measurements are made with type T thermocouples read with calibrated thermocouple readers.

- Record baseline temperatures at each thermocouple in all temperature monitoring points.

Induced Voltage Survey:

When energy is first applied to the electrode field, induced voltage surveys are performed across the surface of the electrode field, around the perimeter of the electrode field, and at objects protruding from the subsurface. Where possible, induced voltage checks also are performed at the terminal ends of utilities passing through or within 20 feet of the electrode field(s). During induced voltage surveys, data is recorded with a factory calibrated portable multimeter.

- Connect the electrode to the PCU, apply a low voltage (50-150 V), and perform an induced voltage survey.
- Verify that tattletale voltage is within 5 V of applied voltage; record on "Electrode Checks" sheet.
- Increase power to greater than 500 kW and perform an induced voltage survey.

CPVC Installation:

Solvent cementing is the preferred method of joining CPVC pipe and fittings, providing a chemically fused joint. The following basics should be clearly understood by the installer.

- Pipe must be cut square and saw burrs completely removed.
- The joining surfaces must be clean and dry, then softened with a primer to make them semi-fluid.
- Sufficient cement must be applied to fill the gap between pipe and fittings.
- Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.
- Joint strength develops as the cement dries. In the tight part of the joint, the surfaces will tend to fuse together. In the loose part, the cement will bond to both surfaces.

- Penetration and priming should be achieved with a suitable primer. Primer will penetrate and soften the surfaces more quickly than cement alone. This priming step is especially important in cold weather.

- More than sufficient cement to fill the loose part of the joint must be applied. Besides filling the gap, adequate cement layers will penetrate the surface more deeply before drying, providing a stronger joint.

For a proper joint to be developed between CPVC pipe and pipefittings, cutting, cleaning, and preparation of the joint is of primary importance. The installer should follow the following basics:

1. Condition pipe and fitting to the same temperature.

2. Cut pipe square to the desired length.

3. Remove burrs and chamfer the end of the pipe at a 10°-15° angle for 1/16 inch.

4. Clean the pipe and fitting of all dirt, moisture, and grease.

5. Using a proper applicator, apply primer freely with a scrubbing motion to the fitting socket, keeping the surface and applicator wet until the surface has been softened. This usually requires 5 to 15 seconds, more in cold weather.

6. Prime the pipe as for the fitting.

7. Quickly apply primer to the fitting a second time.

8. Apply a liberal coat of cement to the pipe. Flow the cement on with the applicator. Do <u>not</u> brush the cement out to a thin paint-like layer.

9. Apply a medium layer of solvent cement to the fitting socket.

10. Fully insert the pipe into the socket. Give the pipe a quarter-turn during insertion, if possible. Hold the joint together until both soft surfaces are firmly gripped (usually less than 15 seconds for small-diameter piping – larger sizes or cold weather might require more time). Care must be used because the fitting sockets are tapered, and the pipe will try to push out of the fitting just after insertion.

11. After assembly, a properly made joint will show a thin ring or bead of cement completely around the junction of the pipe and fitting. Any gaps in this bead may indicate a defective assembly job.

12. Handle newly assembled piping carefully until initial set time shown in Table A.1 has taken place. Set times are provided for various ambient temperatures and pipe diameters.

Table A.1. CPVC Cement Set Times

Temperature	Set Time * Diameters < 1.5 in.	Set Time * Diameters of 1.5 to 3 in.	Set Time * Diameters >3 in.
> 60°F	15 minutes	30 minutes	1 hour
40°- 59°F	1 hour	2 hours	4 hours
< 39°F	3 hours	6 hours	12 hours

NOTES: * Harrington Industrial Plastics 2000

13. Allow adequate time for the joint to cure before pressure testing. Table A.2 shows joint cure times for various ambient temperatures and pipe diameters.

Table A.2. CPVC Cement Cure Times

Ambient Temperature	Cure Time * Diameters < 1.5 in.	Cure Time * Diameters of 1.5 to 3 in.	Cure Time* Diameter > 3 in.
>60°F	1 hour	2 hours	6 hours
40°-59°F	2 hours	4 hours	12 hours
<39°F	8 hours	16 hours	48 hours

NOTES: * Harrington Industrial Plastics 2000

APPENDIX B

PROJECT FORMS

EQUIPMENT ARRIVAL INSPECTION/CERTIFICATION

Date	Expected Arrival Date	Component Description	Transported By	Vendor	Is component damaged?	Describe damage	Shipper Notified?	Indicate Resolution	Date Resolved	Inspector's Initials

Clayton GROUP SERVICES

ELECTRODE INSTALLATION CHECKS

This form shall be used to record details of each electrode installation.

			Zone 6 27.7 to 29.6 m 91 ot 97 ft. bgs		Zone 5 23.98 to 27.1 m 78 to 89 ft. bgs		Zone 4 17.7 to 23.3 m 58 to 76 ft. bgs		Zone 3 11.9 to 17.1 m 39 to 56 ft. bgs		Zone 2 5.2 to 11.3 m 17 to 37 ft. bgs		Zone 1 2.5 to 4.5 m 8 to 15 ft bgs		Neutral Zone	
Date	Supervisor's Name	Electrode Designator	Shot (1,200~ 1,550 lb)	Hydrating Solution (6 gal)	Shot (1,600~ 2,600 lb)	Hydrating Solution (11 gal)	Shot (2,100~ 3,500 lb)	Hydrating Solution (18 gal)	Shot (2,250~ 3,000 lb)	Hydrating Solution (17 gal)	Shot (1,700~ 2,800 lb)	Hydrating Solution (20 gal)	Shot (700 ~ 1,200 lb)	Hydrating Solution (7 gal)	Shot (150 ~ 250 lb)	Hydrating Solution (NONE)

Clayton GROUP SERVICES

ELECTRODE CABLE ASSEMBLY CHECKS

Use this form to record result of inspection and testing of each electrode cable assembly.

Date	Inspector's Name	Electrode Cable Designator (e.g. E1-depth"A")	Is cable nicked or insulation damaged?	Do lugs "give" when pulled?	Does shrink tube/epoxy have any gaps or damage?	Are voltage tattletales and drip tubes secured at 10 ft. intervals?	Indicate actions taken to correct problems.

Clayton GROUP SERVICES

INTER-ELECTRODE CABLE RESISTANCE CHECKS

Use this form to record resistance between electrode cables following installation.

Date	Inspector's Name	Electrode Cable Designator (e.g. E1-depth"A")	Record resistance between each cable and other electrode cable at similar depths. (Req'd <0.5 ohms)								

Clayton GROUP SERVICES

ELECTRODE TATTLETALE VOLTAGE CHECKS

Use this form to record voltage between each electrode cable and it's tattletale after initial startup.

Date	Inspector's Name	Electrode Cable Designator (e.g. E1-depth"A")	Record voltage between each cable and it's tattletale. (Should be within 5 volts of applied voltage)								

Clayton GROUP SERVICES

Clayton GROUP SERVICES

SITE VOLTAGE SURVEY CHECKS

Use this form to record step-step and step-touch voltages following initial startup.

1. On initial startup of the system, set the Power Control Unit output to between 50 and 150 volts.
2. On a site map, enter the location number from this sheet.
3. Briefly describe the test location below indicating the points contacted with the voltage probes.

Maximum allowable step-step voltage is 30V
Maximum allowable step-touch voltage is 15V

Date/Time: _____ Inspector's Name: _____

PCU Output Voltage: _____ **VAC**

Location Number	Voltage Detection Points		Voltage Reading
	Red Probe	Black Probe	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

Use this form as a continuation for Page 1 of the Site Voltage Survey Check.

Location Number	Voltage Detection Points		Voltage Reading
	Red Probe	Black Probe	

Clayton GROUP SERVICES

THERMOCOUPLE READING CHECKS

Use this form to record computer versus hand-held thermocouple readings. Design specification w/in 2 Degrees.

Date	Inspector's Name	Thermocouple Number	Depth: _____Bgs		Depth: _____Bgs		Depth: _____Bgs		Depth: _____Bgs	
			PC	H-H	PC	H-H	PC	H-H	PC	H-H

ERH POWER CONTROL UNIT CHECKS

This form is used to complete inspection of ERH Power Control Units prior to initial startup.

1. Are all power cable connections tight at their terminations? _____yes _____no

2. Complete a visual inspection of all compartments for foreign objects or foreign materials, and for damaged components.

   Are all compartments clear of foreign objects and materials? _____yes _____no

   Are all components found to be free from physical damage? _____yes _____no

3. Perform a visual inspection of all power cables for physical integrity, including nicks, abrasions, and indication of excessive heat.

   Are all power cables found to be free from physical deformities? _____yes _____no

4. A "Hi Pot" test must be completed on the primary side of the main power transformers at 15 kV by a sub-tier contractor certified in the state in which the work is being performed. Upon completion, attach the Hi Pot inspection form to this page.

   Has the Hi Pot test been completed? _____yes _____no

   Is the Hi Pot inspection form attached to this page? _____yes _____no

5. A meggar test must be completed on the secondary side of the main power transformers at 500 V by a sub-tier contractor certified in the state in which the work is being performed. Upon completion, attach the contractor's inspection form to this page.

   Has the meggar test been completed? _____yes _____no

   Is the meggar test form attached to this page? _____yes _____no

If the answer to any question above is "No," list each discrepancy and describe the actions taken to correct the discrepancy, then re-perform this checklist.

_____
_____
_____
_____
_____
_____
_____

Completed By: _____ Date: _____

Inspector's Name: _____

ATTACHMENT 4-B

SOIL VAPOR EXTRACTION REMEDIATION SYSTEM CONSTRUCTION QUALITY CONTROL PLAN

Construction Quality Control Plan
for
Soil Vapor Extraction

Lockformer Site
Lisle, Illinois

September 20, 2002

Prepared by:

Clayton Group Services, Inc.
3140 Finley Road
Downers Grove, Illinois 60515

CONTENTS

Section Page

ABBREVIATIONS AND ACRONYMS v

EXECUTIVE SUMMARY vi

1.0 TECHNOLOGY DESCRIPTION 1

2.0 PROJECT AND PLAN DESCRIPTION 2
2.1 PROJECT DESCRIPTION 2
2.2 PROJECT OBJECTIVES 2
2.3 INSTALLATION PHASES 2
2.4 PLAN DESCRIPTION 3

3.0 QUALITY ASSURANCE TEAM 4
3.1 RESPONSIBILITIES AND AUTHORITIES 5
3.1.1 Regulatory Agencies 6
3.1.2 Clayton 5
3.1.3 Clayton QA Manager 5
3.1.4 Clayton Project and Field Managers 6
3.2 PROJECT MEETINGS 6
3.2.1 Pre-Construction Meeting 7
3.2.2 Progress Meetings 7
3.2.3 Field Meetings 7
3.2.4 Problem Resolution Meetings 7

4.0 QUALITY CONTROL ACTIVITIES 8
4.1 ENVIRONMENTAL HEALTH AND SAFETY 9
4.2 WASTE MANAGEMENT 9
4.3 FIELD ACTIVITIES 9

5.0 DOCUMENTATION 11
5.1 MATERIALS AND EQUIPMENT 11
5.2 FIELD LOGBOOK 11
5.3 DATA FORMS 12
5.4 QC FORMS 12
5.5 AS-BUILT DRAWINGS 12
5.6 WEEKLY PROGRESS REPORTS 13

6.0 PROCUREMENT 14
6.1 SUPPLIER QUALIFICATIONS 14
6.2 PROCUREMENT DOCUMENTS 15

CONTENTS
(Continued)

Section		Page
6.3	INSPECTIONS	16
6.4	SUPPLIER PERFORMANCE MONITORING	16
6.5	SUPPLIER DOCUMENTS	17
6.6	PROCUREMENT RECORDS	17
7.0	**FREQUENCY OF ACTIVITIES**	19
7.1	MATERIALS	18
7.2	SYSTEM EQUIPMENT	18
7.3	CONSTRUCTION EQUIPMENT	19
7.4	DRILLING LOCATIONS	20
7.5	DATA GATHERING DEVICES	20
7.6	SAMPLING AND LABORATORY SERVICES	22
8.0	**NOTIFICATION AND CORRECTION PROCESS**	23
9.0	**PERSONNEL QUALIFICATIONS AND TRAINING**	24
10.0	**MATERIALS AND EQUIPMENT**	25
10.1	MATERIALS	25
10.2	WELL CONSTRUCTION MATERIALS	25
10.3	SYSTEM EQUIPMENT	26
10.4	CONSTRUCTION EQUIPMENT	28
10.5	DATA GATHERING INSTRUMENTS	28
10.6	SVE SYSTEM	30
10.7	ELECTRICAL SYSTEMS	32
11.0	**REFERENCES**	33

Appendices

A Quality Control Checks
B Project Forms

Figures

1 Quality Assurance Team Organization Chart 4

CONTENTS
(Continued)

Tables

1 QC Requirements for Installation of Critical System Components 10
2 Summary of Personnel Training and Certifications 24
3 SVE Well Construction Materials 26
4 Monitoring Probe Construction Materials 27
5 Equipment Specifications 27
6 Summary of Soil Boring Requirements 28
7 Data Gathering Instrumentation 29
8 Maximum CPVC Pipe Support Distances 31

ABBREVIATIONS AND ACRONYMS

ACI	American Concrete Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
bgs	below ground surface
CFR	Code of Federal Regulations
cfm	cubic feet per minute
Clayton	Clayton Group Services, Inc.
CPVC	chlorinated polyvinyl chloride
CQCP	Construction Quality Control Plan
USEPA	U.S. Environmental Protection Agency
GAC	granular activated carbon
gpm	gallons per minute
HAZWOPER	Hazardous Waste Operations and Emergency Response
Hg	mercury
HP	horsepower
MSDS	Material Safety Data Sheet
NIST	National Institute of Standards and Technology
NSF	NSF International, formerly National Sanitation Foundation
ppmv	parts per million volumetric
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
scfm	standard cubic feet per minute
SHSP	Site Health and Safety Plan
SVE	Soil Vapor Extraction
TCE	trichloroethene
VE	Vapor Extraction
VOCs	volatile organic compounds

EXECUTIVE SUMMARY

This Construction Quality Control Plan (CQCP) has been prepared for the installation of the Soil Vapor Extraction (SVE) system at the Lockformer site. The use of SVE has been widely accepted by regulators and proven as an effective in-situ remediation technology. This in-situ technology is very effective in removing contaminants with moderate-to-high vapor pressures and subsurface soils and bedrock with moderate-to-high permeabilities. The design of the SVE system for the Mass Waste Sand and Gravel Unit will be based on the performance of a pilot test. A pilot test will be performed for a period of one to two weeks to obtain design data for the full-scale system and air treatment system. Details of the pilot test and design, construction, operation, and maintenance of the full-scale SVE systems are described in the Work Plan.

The process of SVE involves inducing a pressure gradient by withdrawing or injecting air through a well or network of wells to move air through the pore spaces within the unsaturated zone. Contaminants in the vapor phase are captured and removed by the advective transport of air through the subsurface. The process of SVE removes contaminants from the subsurface by causing dis-equilibrium between the various phases and transferring the mass of volatile contaminants adsorbed on soil particles, residual liquids (i.e., non-aqueous phase liquids [NAPLs] and dense non-aqueous phase liquids [DNAPLs]), and contaminants dissolved in pore water into the vapor phase. As time progresses, the contaminant mass is steadily decreased until contaminants are totally removed or concentrations are decreased below an established cleanup standard.

The CQCP presents the quality assurance (QA) and quality control (QC) requirements and procedures to be followed during installation of the SVE system. The objective of the CQCP is to ensure that the finished system adheres to the technical specifications for the SVE remediation. QA activities include all those actions that provide confidence that quality is achieved. The overall QA program for the SVE remediation establishes

responsibilities and authorities, defines polices and requirements, and provides for the performance and assessment of the work. QC activities include those actions that involve the use of appropriate policies and procedures in the performance of the work scope.

The CQCP identifies the procedures to be followed during installation of the SVE system to ensure that construction materials are of suitable quality, that system components are capable of meeting the SVE design and operating criteria, that proper installation methods and techniques are followed, and that installation quality checks have been performed and approvals obtained before the system is operated. The CQCP identifies the installation QA/QC team members and outlines their responsibilities; it also describes or references the frequency of quality control activities, standards for documentation, and methods for resolving deficiencies and exceptions.

1.0 TECHNOLOGY DESCRIPTION

The selected remediation technology uses Soil Vapor Extraction (SVE) to remove Volatile Organic Compounds (VOCs) from the unsaturated portion of the Mass Waste Sand and Gravel. SVE is a proven and accepted remedial technology for removing volatile contaminants from permeable subsurface materials. To implement SVE, a network of vapor extraction (VE) wells is placed in the subsurface soils so that they encompass the extent of the contaminated region. Each VE well is connected to a process line connected to a vacuum blower to move air through the pore spaces within the unsaturated zone. Contaminants in the vapor phase are captured and removed by the advective transport of air through the subsurface. The process of SVE removes contaminants from the subsurface by causing dis-equilibrium between the various phases and transferring the mass of volatile contaminants adsorbed on soil particles, residual liquids (i.e., non-aqueous phase liquids [NAPLs] and dense non-aqueous phase liquids [DNAPLs]), and contaminants dissolved in pore water into the vapor phase. As time progresses, the contaminant mass is steadily decreased until contaminants are totally removed or concentrations are decreased below an established cleanup standard.

The critical components required to implement SVE include the following:

- Vapor extraction wells.
- Multi- and single-point vacuum monitoring probes.
- Manifold and vacuum blower unit.
- Vapor phase activated carbon for air treatment prior to discharge.
- Condensate tank to remove entrained water.
- Vapor sampling systems to measure VOC removal from the subsurface, determine the efficiency of the vapor treatment system, and measure the VOC concentration in the final system discharge.
- Water treatment system with granular activated carbon for treatment of water separated from air stream prior to air treatment.

2.0 PROJECT AND PLAN DESCRIPTION

2.1 PROJECT DESCRIPTION

See Section 4.0 of this Work Plan.

2.2 PROJECT OBJECTIVES

See Section 4.0 of this Work Plan.

2.3 INSTALLATION PHASES

Installation of the system will commence upon notice to proceed from Lockformer. Clayton will be responsible for the overall management of the system installation. While there will be some overlap of phases during system installation, the process will proceed through the following major phases.

- Clayton and Lockformer will perform general site preparation activities.
- An electrical power connection will be made within the remediation system area.
- Drilling services will be procured, and the drilling subcontractor will mobilize standard drilling materials and equipment to the site. Standard drilling materials will include well casing, bentonite, grout, and sand.
- The drilling subcontractor will perform the installation of the VE wells and monitoring probes under the supervision of Clayton.
- The SVE system components will be procured and mobilized to the site. The SVE piping system will be constructed and connected to the VE wells.
- A manifold and Valve Control Building will be constructed on the outside of the Lockformer building near the remediation system area.
- The vapor treatment system components will be procured, mobilized to the site, and placed on the previously prepared staging locations.

- Shakedown testing of the SVE system and the vapor treatment system will be performed. Appropriate testing work guides and worker training will control these testing activities.
- Shakedown testing of the complete SVE remediation system will be performed. Appropriate testing work guides and worker training will control these testing activities.
- The SVE remediation system will be placed into operation only when the notice to proceed is given by Lockformer.

2.4 PLAN DESCRIPTION

The CQCP presents the QA and QC requirements and procedures to be followed during installation of the SVE remediation system. QA activities include all those actions that provide confidence that quality is achieved. The overall QA program for the remediation establishes responsibilities and authorities, defines polices and requirements, and provides for the performance and assessment of the work. QC activities include those actions that involve the use of appropriate policies and procedures in the performance of the work scope.

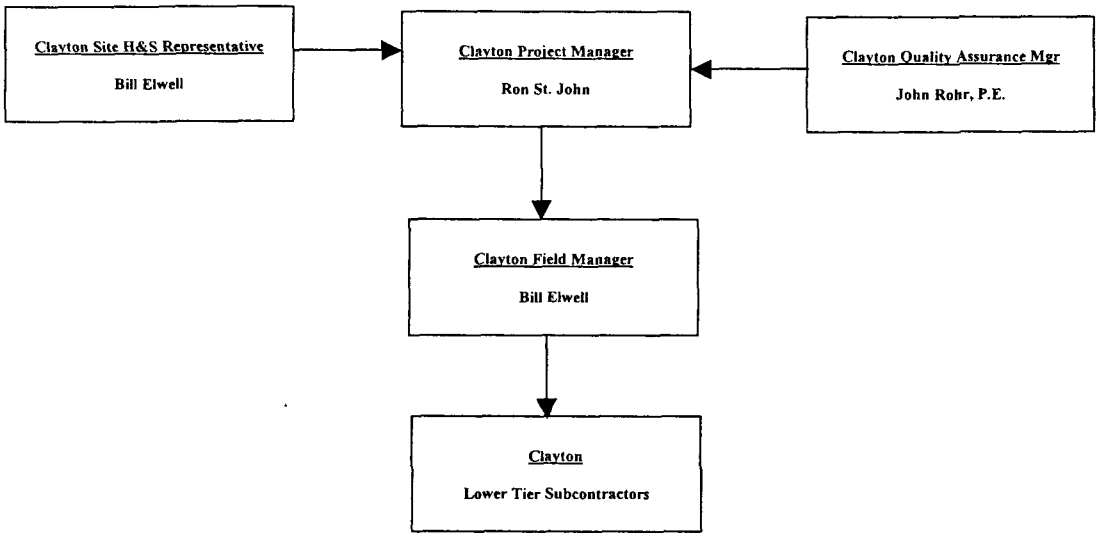
Quality issues are covered in various components of the Clayton QA/QC Program, the SVE design, and this CQCP.

The objective of the CQCP is to ensure that the finished system adheres to the SVE remediation system design. This CQCP identifies the procedures to be followed during installation of the SVE system to ensure that construction materials are of suitable quality, that system components are capable of meeting design operating criteria, that proper installation methods and techniques are followed, and that installation quality checks have been performed before the system is operated. The CQCP identifies the installation QA/QC team members and outlines their responsibilities; it also describes or references the frequency of QC activities, standards for documentation, and methods for resolving deficiencies and exceptions.

3.0 QUALITY ASSURANCE TEAM

The implementation of QC systems during the installation phase of the remediation will include the involvement of Clayton personnel. The QA team members represent qualified individuals with strong professional training and prior work experience in implementing QA activities and a demonstrated ability to perform their required QA functions. The structure of the QA team is shown graphically in Figure 1.

Figure 1. Quality Assurance Team Organization Chart



3.1 RESPONSIBILITIES AND AUTHORITIES

The principal parties involved in QA activities for the installation of the SVE remediation system include leaders of the Clayton project team.

3.1.1 Regulatory Agencies

Clayton will perform oversight of the project and is responsible for communications with the United States Environmental Protection Agency (USEPA). It is expected that the USEPA will review and comment on documents produced for the performance of this remediation project.

3.1.2 Clayton

Clayton is directly responsible for the overall quality of the project and for ensuring that project goals and objectives are met in a high-quality manner. Clayton is responsible for communications with the regulatory agencies. This responsibility includes submission of required documentation demonstrating that design and QA specifications and system performance standards were achieved.

3.1.3 Clayton QA Manager

The Clayton QA Manager is responsible for verifying implementation of the QA program by the project teams during the installation of the remediation system, approving nonconformance reports and corrective actions, and reviewing and approving any project specific procedures. Some specific QA tasks for which the QA Manager will be responsible are the following:

- Review the conformance of materials and equipment to design specifications
- Conduct periodic inspections of site during construction
- Administer the construction QA program
- Certify the Construction Completion Report

3.1.4 Clayton Project and Field Managers

The Clayton Project and Field Managers are responsible for overseeing the SVE remediation, including all plans and field activities, and for communicating with the Clayton QA Manager, client, and appropriate regulatory agencies. The Clayton Field Manager reports to the Clayton Project Manager and will perform the following QA responsibilities:

- Completely understands the SVE design documents and CQCP.
- Recognize and immediately report deviations from the design documents or CQCP to the Clayton Project Manager.
- Be available at all times work is ongoing and prepare any field change orders.
- Communicate with subcontractors and other involved parties during system installation activities.
- Record, maintain, and forward progress reports and other project data to the appropriate parties.
- Secure and maintain documents that identify changes to the SVE design and CQCP.
- Review work product for acceptance, rejection, or further evaluation.

3.2 PROJECT MEETINGS

Meetings will be held to achieve a high degree of communication among members of the project teams. These meetings will help to minimize errors and promote quality performance during the system installation phase of the project.

3.2.1 Pre-Construction Meeting

A Pre-Construction meeting will be held with key project personnel to ensure that the entire team has a clear understanding of the project objectives, the SVE design, health and safety issues, QA/QC requirements, and work procedures. This meeting will allow key team members to meet and develop solutions to any potential problems known to the team prior to the initiation of installation activities.

3.2.2 Progress Meetings

Progress meetings will be held with key project members and other appropriate parties to discuss progress and planned activities.

3.2.3 Field Meetings

During the course of the system installation, the field team will meet daily (before work activities begin) to discuss, plan, and coordinate the work, health and safety, and QA/QC activities to be performed that day.

3.2.4 Problem Resolution Meetings

Special meetings will be held when and if a problem or work deficiency occurs (or may occur) that could impact safety, quality, cost, or the project schedule. All parties involved will attend to discuss the problem or deficiency, review possible solutions, and implement a plan of action resolving the problem or deficiency.

4.0 QUALITY CONTROL ACTIVITIES

During installation of the SVE remediation system, adherence to the SVE design and health-and-safety requirements and procedures will be required. The measures required to verify the quality of work performed and compliance with the specified project requirements include: successful completion of the readiness reviews; inspection of materials, equipment, and workmanship before and during the performance of each task comprising the SVE system installation effort; and resolution of all reported deficiencies.

Preparatory activities will include the following:

- Review contract documents and design specifications with the project team.
- Review the site-specific hazard analysis and Health and Safety Plan.
- Ensure that the field team has reviewed and discussed the work procedures to be followed.
- Review procurement specifications and tracking procurements.
- Successfully complete the readiness review process.
- Ensure that materials and equipment are properly received, inspected, tested, inventoried, and stored.

Progress monitoring activities will include the following:

- Check work quality to ensure that design specifications are met.
- Verify site activities are in accordance with the site-specific Health and Safety Plan.
- Check that QA provisions are in place and that QC activities are completed in compliance with QA requirements and procedures.
- Check that nonconformance issues are recorded, tracked, and resolved.

- Check that QC reporting is accurate, timely, complete, and complies with QA requirements and procedures.

Follow-up and completion activities will include:

- Resolution of all nonconformance issues.

4.1 ENVIRONMENTAL HEALTH AND SAFETY

Health and safety procedures and requirements are provided in the SHSP Plan. The SHSP describes the health and safety-related QA and QC activities that will be performed during installation of the SVE system and provides the roles, responsibilities, and authorities of the various team members.

4.2 WASTE MANAGEMENT

Waste management procedures and requirements are provided in Section 4.0 of the Work Plan.

4.3 FIELD ACTIVITIES

The project documents containing the QC requirements for the installation of each critical system component are listed in Table 1.

Table 1. QC Requirements for Installation of Critical System Components

System Component	Location of Applicable QC requirements
Extraction Wells and Monitoring Probes	SVE Design Document and SHSP CQCP Section 7.1, 7.3, 7.4, 10.1, 10.2, 10.4, and Appendix A
SVE System	SVE Design Document SHSP CQCP Section 7.1, 7.2, 7.3, 10.1, 10.3, 10.4, 10.6, 10.7, and Appendix A
Vapor Treatment System	SVE Design Document and SHSP CQCP Section 7.1, 7.2, 10.1, 10.3, 10.6, and 10.7
Data Acquisition Systems	SVE Design Document and SHSP CQCP Section 7.1 and 10.5
Telemetry System	SVE Design Document CQCP Section 7.1, 7.2, 7.5, 10.1, 10.5, and 10.7

5.0 DOCUMENTATION

The SVE design documents and this CQCP identify system installation activities that should be monitored, describe the varying level of monitoring required, and assign responsibility for monitoring. To be effective, these QA/QC monitoring activities must be documented.

5.1 MATERIALS AND EQUIPMENT

QA/QC documents for materials, equipment, and services will be traceable to purchase orders or requests. The QC documentation for materials and equipment purchased may include some, if not all, of the following: engineering documents, drawings, inspection procedures, and inspection reports. Quality verification documents may include some, if not all, of the following: material verification reports, material test reports, inspection verification reports, performance testing reports, and summary reports that cover procurement requirements, approved changes, waivers, or deviations.

5.2 FIELD LOGBOOK

The Clayton Field Manager will maintain a field logbook. Entries will be dated and initialed by personnel making the entry. In addition to other project requirements, the logbook will contain a diary of events and progress, and a record of site meetings and visitors. The logbook also will contain any observations of unusual or previously unnoticed site conditions. QA/QC activities to be recorded in the logbook include:

- Inspections of materials, supplies, and equipment (both construction and system equipment).
- Inspections of work quality, including the quality of lower-tier subcontractors.

- Field data and information for which a recording form has not previously been prepared.

5.3 DATA FORMS

Prior to the start of installation activities, the Clayton QA Manager will ensure that those forms necessary for recording field data and information are produced. The Clayton Project and Field Managers are responsible for ensuring that these forms are available to field personnel and are used to properly record data and information. They also are responsible for the safekeeping, filing, retrieval, and retention of all completed data forms in Clayton's possession.

5.4 QC FORMS

The Clayton QA Manager is responsible for reviewing the QA/QC requirements for the project and ensuring that all required QC data and information recording forms are produced. The Clayton Field Manager is responsible for ensuring that QC data and information are recorded on the proper forms and for the safekeeping, filing, retrieval, and retention of these data forms.

5.5 AS-BUILT DRAWINGS

The Clayton Field Manager is responsible for ensuring that as-built drawings for the SVE remediation system are prepared and updated, and for ensuring the safekeeping, filing, retrieval, and retention of these drawings.

5.6 WEEKLY PROGRESS REPORTS

The Clayton Field Manager is responsible for preparing weekly progress update reports for the Clayton Project Manager. These reports will contain a summary of work completed during the week. These reports also will highlight any potential problems that could compromise safety, work quality, or project schedule.

6.0 PROCUREMENT

The procurement process shall ensure the following:

- Design requirements are met throughout the procurement process.
- Materials, supplies, equipment, and services are obtained from qualified suppliers.
- Design and end-user requirements are accurately, completely, and clearly communicated to suppliers and subcontractors.
- The proper product or service is delivered on time and maintained in satisfactory condition until used.
- The procurement process is documented, and documentation is properly controlled.

6.1 SUPPLIER QUALIFICATIONS

The Clayton QA and Project Managers are responsible for maintaining a list of lower-tier suppliers for approval prior to initiating the process of procuring materials, equipment, or services. Lower-tier subcontractors providing onsite services must meet SHSP criteria as well as applicable federal, state, and site-specific health and safety training requirements.

If appropriate, the following activities may be used, on a graded approach, to evaluate lower-tier suppliers depending on how the purchased items or services relate to safety and the successful completion of the project:

- Review supplier's history for providing identical or similar items or services.
- Review supplier's information regarding product or service quality.
- Evaluate supplier's certifications or registrations as awarded by accredited third parties.

- Evaluate supplier's health and safety qualifications to ensure consistency with site requirements.

6.2 PROCUREMENT DOCUMENTS

Clayton will produce requests for proposals and quotations or purchase orders for qualified suppliers that clearly state any design requirements, acceptance criteria, and any test/inspection requirements for purchased items and services. Specifications and requirements will be drawn from the SVE design and this CQCP. Procurement documents will include any specifications, standards, or other documents referenced in the controlling design or QA/QC documents.

Critical requirements that must be fulfilled by the supplier will be clearly specified in requests for proposals and quotations or on purchase orders. Some requirements that must be met may include the following:

- Delivery schedules
- Packaging requirements
- Production of engineering documents
- Specific pre-acceptance inspection procedures
- Specific pre-acceptance testing procedures
- Pre-acceptance manufacturing drawings
- Delivery of Material Safety Data Sheets (MSDS)
- Production of Operating Manuals
- Documentation of personnel qualifications and site-specific training

These supplier documents will be traceable to the purchase order or purchase requirements.

6.3 INSPECTIONS

In all instances, items obtained from lower-tier suppliers will be inspected upon delivery to verify that the order was completely filled, that the delivered items match the ordered items, and that no items were damaged in shipping. Completed deliveries will be so documented. Deliveries containing orders not completely filled, items not meeting specifications, or damaged items will be tracked until the discrepancies have been resolved. The inspection and nonconformance resolution processes will include verification that the supplier has provided all specified documentation, including MSDS and Operating Manuals.

If the SVE design or CQCP call for special post-delivery inspections, testing, or calibrations, these activities will be performed in a timely manner and will be adequate to ensure conformance with the controlling requirements.

Materials, supplies, and equipment belonging to lower-tier subcontractors will be inspected using the same procedure applied to similar items supplied by offsite vendors.

6.4 SUPPLIER PERFORMANCE MONITORING

During the life of the project, the Clayton Project Manager is responsible for periodically monitoring and evaluating the performance of suppliers and subcontractors to confirm that acceptable items or services are produced and that schedule requirements are being met. Performance monitoring will be applied on a graded basis and may include:

- Surveillance of work activities and preparation of nonconformance reports.
- Review supplier plans and progress reports.
- Monitor supplier's progress and costs.

- Process change order information.
- Review and dispose of progress and nonconformance reports.
- Evaluate suppliers' QC and QA programs.
- Evaluate suppliers' personnel training and procedures.
- Evaluate suppliers' training certification records for personnel performing critical functions affecting project quality.

Throughout the project, the Clayton Field Manager will perform inspections on materials and equipment being stored onsite to ensure that quantities are adequate, that quality is not impacted by storage, and that storage locations and methods will not interfere with project flow, schedule, or safety. The scope and frequency of these inspections will be determined utilizing a graded approach based upon the possible impact to safety and project success that the inspected items represent.

6.5 SUPPLIER DOCUMENTS

Clayton will ensure that supplier-generated documents, including MSDS, are controlled, maintained, and retrievable.

6.6 PROCUREMENT RECORDS

The Clayton Project and Field Managers will ensure that procurement records are routed to the appropriate project team members and end-users, and that copies of these records are maintained and retrievable.

7.0 FREQUENCY OF ACTIVITIES

The frequency of QC checks for materials, equipment, and the installation processes is determined by utilizing a graded approach based upon the items or process inspected and how they relate to safety or the successful completion of the project. Clayton is responsible for ensuring that any required checks and inspections are completed.

7.1 MATERIALS

Quality checks will be performed upon the delivery of all project materials, including those provided by lower-tier subcontractors and vendors. Checks will be made to ensure that the correct products have been delivered to meet project specifications. These checks will be consistent with procurement procedures specified for the products. At a minimum, a visual examination of all material deliveries will be performed to review the bills of lading, ensure the correct quantity has been received, verify the labeling of the materials, check for possible damage, and examine MSDS. The soundness of the packaging will be determined, and the materials will be properly stored.

Periodic inspections will be made to verify the quantity and integrity of materials in storage. These checks also will assess the continued safekeeping of remaining materials and ensure that storage practices are both safe and not a hindrance to current or planned work activities.

7.2 SYSTEM EQUIPMENT

System equipment will be clean upon arriving onsite and before leaving the site.

QA requirements for procurement, receiving, and inspection will apply to system equipment. System equipment will be inspected immediately upon arrival to the site. Although system equipment cannot be inspected under operating conditions before it is

installed, visual inspections will be performed. Delivery documentation will be collected and checked against the procurement specifications. A check will be made to note that the model of the equipment matches the procurement specifications. The equipment will be examined to ensure there are no signs of damage to the equipment, or of incipient hazardous conditions such as fluid leaks or missing safety guards. Components such as belts, hoses, and cables will be inspected for misalignment or wear and tear, and repaired or replaced as necessary, before the equipment is placed into use.

If system equipment cannot be immediately placed in its proper staging location, it will be stored in a safe manner and in accordance with manufacturers' instructions. Equipment storage locations will be selected so that the equipment will not interfere with current or planned work activities, and additional moves will be minimized. Equipment will be checked periodically to ensure that it has not been damaged by work activities.

Once it is possible to test system equipment under operating conditions, performance testing shall be completed. All required QC documents intended to indicate how the equipment performs against the specification requirements will be completed, and justification or resolution of any deviations will be provided.

7.3 CONSTRUCTION EQUIPMENT

Construction equipment necessary for system installation activities will be clean when arriving onsite and when leaving the site. Down-hole equipment and tooling will have gone through a decontamination process before being allowed onsite. Before leaving the site, construction equipment will be decontaminated. Waste generated from the decontamination process will be handled in accordance with Section 4.0 of this Work Plan.

Construction equipment will be inspected immediately upon delivery to the site and before use. The inspection will note the type and model of equipment and determine if it is appropriate for its intended use as defined by the design and procurement specifications. A visual examination will be performed to ensure that there are no signs of debilitating damage or hazards, or incipient failures such as fluid leaks or worn components. If any of these conditions are discovered, they will be corrected before the equipment is put into use. At all times, safe storage, proper positioning, set-up, and use of construction equipment will be enforced, and the performance of preventive maintenance will be verified daily.

7.4 DRILLING LOCATIONS

Drilling locations will be verified and marked before setup of equipment on the site. A "One-Call" utility locating service will locate all underground utilities in the remediation area. Clayton, with the assistance of Lockformer management, will locate all onsite underground utilities. Drilling locations will be reconfirmed before drilling equipment penetrates the soil. After construction activities are complete, locations will be established by civil survey, and surveyed locations will be shown on the as-built drawings. Waste generated from drilling activities will be handled in accordance with Section 4.0 of this Work Plan.

7.5 DATA GATHERING DEVICES

Data gathering devices will be inspected upon delivery in the same manner as other project materials, and will be checked to ensure that appropriate design and procurement specifications are met. Additionally, calibration certifications for devices that are delivered calibrated by the manufacturer will be collected, reviewed, and retained. Once calibration has been established, a calibration label will be attached to the device in accordance with appropriate QA procedures.

Data gathering devices that require calibration prior to use, or periodic calibration, will be labeled "Do Not Use - Not Calibrated." Data gathering devices will not be used until the calibration requirements have been met, and a calibration label has been attached to the device.

7.6 SAMPLING AND LABORATORY SERVICES

The types and frequency of field QC samples are specified in the Field Sampling Plan. All QC samples will be shipped according to standard chain-of-custody protocol. Analytical laboratory QC samples will be analyzed as required by the analytical method specified for the parameters of interest, and the results will be included in the analytical report.

8.0 NOTIFICATION AND CORRECTION PROCESS

All problems associated with materials, supplies, equipment, and service suppliers will be documented, and corrective actions taken immediately. In those instances where a potential for impact to safety or project success exists, the Clayton Field Manager will immediately notify the Clayton Project Manager of the nonconformance situation.

The Clayton Field Manager is responsible for implementing, at a minimum, the following activities.

- All nonconforming shipments, materials, supplies, equipment, or subcontractor services will be documented and reported to the Clayton Project Manager. Documentation will include the date of the inspection, the items inspected, the nature of the nonconformance, any immediate corrective actions taken, and the name of the person performing the inspection.
- Immediately inform the Clayton Project Manager of any nonconformance situations that could possibly impact safety, quality, or the success of the project.
- Maintain a log of all nonconformance reports and document corrective actions through final resolution. Resolved nonconformance reports will be so indicated on the log with a description of the corrective actions and final resolution. Nonconformance resolution will be documented and communicated to all parties.
- Provide the Clayton Project Manager with an update of nonconformance issues in Clayton's routine update reports.
- Nonconforming materials, supplies, and equipment will be immediately tagged as being "out of conformance" and repaired, calibrated, or removed from the site as soon as reasonably possible. Tags used for this purpose will be easily recognizable and marked to indicate a contact person who can provide information on the status of the tagged items. Where possible, nonconforming items awaiting repair, calibration, or replacement will be stored together in designated areas.
- Lower-tier subcontractors who have failed to provide requested qualification documentation, are in violation of health and safety procedures, or are found to be performing nonconforming work will be immediately notified of the nature of nonconformance and instructed how to correct the nonconformance. If the nature of

the nonconformance involves a health and safety violation, or threatens safety or project success, the activities of the subcontractor may be immediately suspended until the nonconformance can be successfully resolved.

- Perform follow-up inspections, as necessary, to ensure that the prescribed resolutions for nonconformance situations are implemented. These follow-up inspections will be properly documented.

9.0 PERSONNEL QUALIFICATIONS AND TRAINING

The qualifications of site personnel are summarized in Table 2. All personnel will have training as specified in the SVE design document and SHSP.

The specific activities performed during SVE remediation system installation do not require special certifications, but do require specific skills and training. The Clayton Project Manager will have direct experience as the lead design engineer and project manager on a minimum of three previous SVE projects. The Clayton Field Manager will have direct experience in the same role on a minimum of three previous SVE projects. The Clayton Field Technicians will have direct experience on a minimum of one previous SVE project.

Table 2. Summary of Personnel Training and Certifications

Task	Required Certification
All Onsite Workers	HAZWOPER Standard, 29 CFR 1910.120, 40-Hour training, and current 8-hr refresher. Supervisors shall additionally have HAZWOPER 8-hr Supervisor Training. Medical monitoring General Site Training
SVE Project Manager	Design Engineer and Project Manager on a minimum of three previous SVE projects
SVE Field Manager	Field Manager on a minimum of three previous SVE projects
SVE Field Technicians	Field Technician on a minimum of one previous SVE project
Electricians	State of Illinois License
Forklift operators	Power Industrial Truck Training, CFR 1910.178 (RAAS-030)

10.0 MATERIALS AND EQUIPMENT

10.1 MATERIALS

The SVE remediation system will be constructed of the materials and components specified in the final version of the SVE design document.

10.2 WELL CONSTRUCTION MATERIALS

Installation of the SVE remediation system will consist of a network of VE wells connected to a SVE unit. The number and spacing of the VE wells will be based on the results of the pilot test. Construction details for each of these system components are presented in the SVE design document. If supplemental working guides are appropriate for electrode installation, they will be prepared prior to initiating construction activities. Clayton will provide a training program for any site-specific work guidelines prepared for electrode construction activities.

The materials and critical specifications necessary to construct the VE wells are identified in Table 3, and the monitoring probes are identified in Table 4. Material specifications in this document are based upon the SVE design documents, and materials identified in the final version of the SVE design document will have precedence over those listed in this document.

QA and QC activities associated with construction materials will include inspections for damage and compliance with design and purchasing specifications. Inspections will be performed when the materials arrive onsite. Any discrepancies will be noted and resolved through the notification and correction process.

10.3 SYSTEM EQUIPMENT

The SVE remediation system will consist of the large-scale components described in Table 5. System equipment will be a manufacturer's prefabricated unit matching the SVE design criteria. QA and QC activities associated with system equipment will include inspection of the equipment for damage when it arrives onsite and compliance with design and purchasing specifications. Additionally, system equipment will be tested as soon as possible to verify that it can perform to the SVE design requirements, as configured. Any discrepancies will be noted and resolved through the notification and correction process.

Table 3. SVE Well Construction Materials

Material	Approximate Quantity	Specifications
CPVC pipe	Calculated from SVE design	4-inch ID, Schedule 80
CPVC well screen	Calculated from SVE design	4-inch ID, Schedule 80 w/ 0.020-inch slots
CPVC fittings	Calculated from SVE design	4-inch ID, Schedule 80
3/8-inch bentonite pellets *	Calculated from SVE design	ANSI/NSF Std 60
Sand filter pack	Calculated from SVE design	10-20 sieve
Grout	Calculated from SVE design	Type I Portland Cement, ASTM C150
Concrete	Calculated from SVE design	Sakrete

Notes:

*Bentonite will be free flowing, high swelling, sodium-based, Wyoming-type bentonite. High-density bentonite slurry will be a mixture of powered bentonite and water. Bentonite will be mixed into a slurry that will have a minimum of 30% solids by weight. Bentonite slurry will be placed with a side discharge tremie pipe.

Table 4. Monitoring Probe Construction Materials

Material	Approximate quantity	Specifications
CPVC Pipe	Calculated from SVE design	1-inch ID, Schedule 80
CPVC Well Screen	Calculated from SVE design	1-inch ID, Schedule 80 w/ 0.020-inch slots
CPVC Fittings	Calculated from SVE design	1-inch ID, Schedule 80
3/8 inch Bentonite Pellets *	Calculated from SVE design	ANSI/NSF Std 60
Sand Filter Pack	Calculated from SVE design	10-20 sieve
Grout	Calculated from SVE design	Type I Portland Cement, ASTM C150
Concrete	Calculated from SVE design	Sakrete

Notes:

* Bentonite will be free flowing, high swelling, sodium based, Wyoming-type bentonite. High-density bentonite slurry will be a mixture of powered bentonite and water. Bentonite will be mixed in a batch plant and the slurry will have a minimum of 30% solids by weight. Bentonite slurry will be placed with a side discharge tremie pipe.

Table 5. Equipment Specifications

Component	Type	Specifications
Condensation tank	Air inlet/outlet with drain port and valve	Size based on results of pilot test
SVE blower	Rotary lobe	Size based on results of pilot test
Vapor treatment	VOC adsorption by vapor phase GAC	4 GAC vessels in parallel-series, 2 change-out vessels onsite. Minimum vessel size: 1,800 pounds. Minimum Flow Capacity: 1,000 scfm. TCE removal efficiency: >99%.
SVE Power Control Unit	Clayton design	500 kVA, 480 kV input, 75V-1100V output, remote monitoring and control of electrical power and remote monitoring of temperature

Notes:

Scfm = standard feet per minute
dP = differential pressure
kVA = kilovolt-amps, similar to kilowatts
Hg = Mercury
ppmv = parts per million by volume

10.4 CONSTRUCTION EQUIPMENT

Drill rigs capable of producing the boreholes necessary to install the VE wells and monitoring probes will be required. The summary of the drilling capabilities required for the SVE system installation is provided in Table 6.

Table 6. Summary of Soil Boring Requirements

Activity	Boring Diameter	Maximum Boring Depth	Drilling Method
VE Wells	10 to 12 inch	50 feet	6 ¼-inch Auger
Monitoring Probes	6 inch	50 feet	4 ¼-inch Auger

QA and QC activities associated with construction equipment will include inspections for damage, proper decontamination, safe operating conditions, and the absence of fluid leaks. These inspections will be performed as soon as the equipment arrives onsite. The equipment, including accessories and tooling, will be inspected to ensure that it is capable of performing to design and purchasing specifications. Any discrepancies will be noted and resolved through the notification and correction process.

10.5 DATA GATHERING INSTRUMENTS

Data gathering instruments will be used to assist the installation and operation process and will be installed into the system to monitor and record operating parameters. These instruments, their required accuracy, and method of calibration are summarized in Table 7.

QC activities associated with data gathering instruments will include inspections for damage and compliance with design and purchasing specifications. These inspections will be performed when the instruments arrive onsite. If specified by design

requirements, data gathering equipment will be tested and calibrated prior to use. Once installed, all data gathering and reporting instruments and systems, including remote access and alarm notification systems, will be tested against the SVE design specifications as part of system startup. Any discrepancies will be noted and resolved through the notification and correction process.

Table 7. Data Gathering Instrumentation

Instrumentation	Accuracy	Calibration
Vacuum Gauges	0.1 inch H_2O	Factory calibration accuracy per ANSI specification
Thermometers	1.4°C	Factory calibration accuracy per ANSI specification
Oil-Filled Manometers	0.05 inch H_2O	Oil-filled manometers are primary standards
Digital Manometers	2.5%	Weekly calibration to primary standard (oil manometer)
Averaging Pitot Tube	Equals gage accuracy	Calibration not applicable to pitot tubes. Pitot tubes are read with water manometers or calibrated digital manometers.
Portable Multi-meters	0.3%	Factory calibrated with NIST Traceable Calibration Certificate
Portable Ammeters	>40A: 12A <40A: 0.8A	N/A Connected to calibrated multi-meter
Remote Monitoring Indications	0.5%	Calibrated using NIST-calibrated portable multi-meter

Notes:

ANSI = American National Standards Institute
H_2O = Water
NIST = National Institute of Standards and Technology
ppmv = parts per million by volume
A = amperes (amps)
C = Centigrade

10.6 SVE SYSTEM PIPING

Plastics, like other piping materials, expand when heated. In most cases, piping should be allowed to move unrestrained between desired anchor points (e.g., SVE wells and the manifold) without abrasion, cutting, or restriction of the piping. The installation of expansion loops, offsets, changes in direction, or a Teflon-bellows expansion joint may be required to minimize stresses between anchor points.

Specifications from the Harrington Industrial Plastics *Engineering Handbook for Industrial Plastic Piping Systems* (Harrington Industrial Plastics 2000) indicate that as chlorinated polyvinyl chloride (CPVC) pipe is heated from ambient conditions to the operating temperatures of a SVE system (approximately 100 °C), it expands at a rate of about 4.5 inches per 100 ft. If adjacent equipment or improper pipe clamping and support systems restrain movement from thermal expansion, the resultant stresses may cause damage to the equipment or piping.

In application to SVE, design rules for thermal expansion can usually be simplified to "do not connect a long straight run of piping to a well; an offset or change of direction is required before the wellhead connection."

When CPVC process piping will be installed above ground, it must be properly supported to avoid unnecessary stresses and possible sagging. At SVE temperatures, the maximum distance between supports is shown in Table 8.

Table 8. Maximum CPVC Pipe Support Distances

Pipe Diameter	Maximum Support Spacing *
2-inch or less	1.5-m (5 feet)
4-inch	2.1-m (7 feet)
6-inch	2.7-m (9 feet)

Notes:

* Harrington Industrial Plastics, 2000

CPVC undergoes surface oxidation and embrittlement when exposed to sunlight over a period of several years. The surface oxidation is visible as a piping color change from gray to white. While oxidized piping does not lose any of its pressure or vacuum capability, it does become more susceptible to impact damage. Where polyvinyl chloride (PVC) or CPVC pipe is expected to provide several years of service, it should be painted with a latex paint. Painting is not required due to the short duration of this remediation.

If required by design specifications, heat tracing and insulation can be applied to CPVC pipe by normal methods. Because plastic pipe is a very poor heat conductor, the use of aluminized tape to attach the heat tracing is recommended. Heat tracing of pipe will not be employed during this project.

Plastics expand more quickly than metals as they are heated. If the pipe size is 2 inches or less, the use of male CPVC threads with female metal threads is appropriate for heated systems. If the pipe size is greater than 2 inches, a flanged plastic to metal transition is recommended.

Neither CPVC nor PVC is rated for contact with pure solvents. However, PVC is commonly used in vapor extraction systems to convey recovered chlorinated and petroleum hydrocarbon vapors from the subsurface. Solvents are present in the vapor

recovery piping system in the vapor phase only, and CPVC is selected over PVC because of its superior performance at temperature.

10.7 ELECTRICAL SYSTEMS

To the maximum extent possible, electrical connections will be accomplished in accordance with the applicable provisions of American Nations Standards Institute (ANSI) C2, National Electrical Manufactures Association WC-7, National Fire Protection Association 70. Exceptions will be made for prefabricated extraction and treatment equipment.

Prior to acceptance, an operational test of all electrical, electrical data gathering, and equipment control systems will be performed to determine if the systems meet the purpose and intent of the SVE Design. Testing shall demonstrate that the systems are not electrically, mechanically, structurally, or otherwise defective, are in safe and satisfactory condition, and conform to specified operating characteristics. If any deficiencies to pertinent components are revealed during these tests, they will be corrected, and the tests repeated until all deficiencies have been resolved.

11.0 REFERENCES

EPA (U.S. Environmental Protection Agency) 1983. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80 (1983).

Harrington Industrial Plastics 2000, *Engineering Handbook for Industrial Plastic Piping Systems*, Chino, California.

Thomas & Betts 2000. *TAO1978B*, Thomas & Betts Corporation, Memphis, Tennessee, 2000.

Weast et al. 1976. *Handbook of Chemistry and Physics, 56th Edition,* CRC Press, Cleveland, Ohio.

APPENDIX A

QUALITY CONTROL CHECKS

QUALITY CONTROL CHECKS

Field documentation will be maintained throughout the system installation process. Activity-specific field data sheets will be generated to record all QC data collected during system installation.

Initial Start-up Checks:

Conduct initial start-up of the SVE blower. Begin operation with the Air Dilution Valve (ADV) wide open. Run system and conduct initial start-up checks of system components, equipment, gauges, etc. Verify integrity of all process and electrical connections. After initial checks are completed, slowly close the ADV to begin generating vacuum at the VE wells. Perform other checks as summarized below.

Equipment Foundation Checks:

- Verify that equipment is properly level during installation.

Field Piping Installation Checks:

- Verify that piping is not constrained against expansion except at VE wells and manifold connections.
- Optional Verification: Vacuum leak test piping between well valves and manifold inlets (apply 15 in. Hg, maintain 10 in. Hg after 16 hrs). Record data using a factory calibrated vacuum gauge.
- Optional Verification: Hydrostatic test electrode water discharge pipes (apply 60 psi, maintain 50 psi after 16 hrs). Record data using a factory calibrated pressure gauge.

SVE Power Control Panel Checks:

- Tug on power cable to check for loose connections.

- Inspect all compartments for foreign objects and damaged components.
- Visually inspect all conduits for physical integrity.

Equipment Interlock Checks:

- Verify that condensation tank float-switch shuts down the SVE system blower and the vapor treatment system if a GAC system is not used.
- Verify that, if used, discharge tank high level shuts down the SVE system blower vapor treatment system.
- Verify that a shutdown is indicated on the telemetry system monitor.

Vapor Recovery System Checks:

- Adjust each manifold valve to generate the design airflow rate at the VE well, if possible. Measurements are made using averaging pitot tubes read with water manometers or calibrated digital manometers.
- Perform vacuum influence checks. Vacuum measurements are made using averaging pitot tubes (read with water manometers or calibrated digital manometers) or with factory calibrated vacuum gauges.
- Record baseline temperatures at each thermocouple in all temperature monitoring points.

CPVC Installation:

Solvent cementing is the preferred method of joining CPVC pipe and fittings, providing a chemically fused joint. The following basics should be clearly understood by the installer.

1. Pipe must be cut square and saw burrs completely removed.
2. The joining surfaces must be clean and dry, then softened with a primer to make them semi-fluid.

3. Sufficient cement must be applied to fill the gap between pipe and fittings.

4. Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.

5. Joint strength develops as the cement dries. In the tight part of the joint, the surfaces will tend to fuse together. In the loose part, the cement will bond to both surfaces.

6. Penetration and priming should be achieved with a suitable primer. Primer will penetrate and soften the surfaces more quickly than cement alone. This priming step is especially important in cold weather.

7. More than sufficient cement to fill the loose part of the joint must be applied. Besides filling the gap, adequate cement layers will penetrate the surface more deeply before drying, providing a stronger joint.

For a proper joint to be developed between CPVC pipe and pipefittings, cutting, cleaning, and preparation of the joint is of primary importance. The installer should follow the following basics.

1. Condition pipe and fitting to the same temperature.

2. Cut pipe square to the desired length.

3. Remove burrs and chamfer the end of the pipe at a 10°-15° angle for 1/16 inch.

4. Clean the pipe and fitting of all dirt, moisture, and grease.

5. Using a proper applicator, apply primer freely with a scrubbing motion to the fitting socket, keeping the surface and applicator wet until the surface has been softened. This usually requires 5-15 seconds, more in cold weather.

6. Prime the pipe as for the fitting.

7. Quickly apply primer to the fitting a second time.

8. Apply a liberal coat of cement to the pipe. Flow the cement on with the applicator. Do <u>not</u> brush the cement out to a thin paint-like layer.

9. Apply a medium layer of solvent cement to the fitting socket.

10. Fully insert the pipe into the socket. Give the pipe a quarter-turn during insertion, if possible. Hold the joint together until both soft surfaces are firmly gripped (usually less than 15 seconds for small diameter piping, larger sizes or cold weather might require more time). Care must be used because the fitting sockets are tapered and the pipe will try to push out of the fitting just after insertion.

11. After assembly, a properly made joint will show a thin ring or bead of cement completely around the junction of the pipe and fitting. Any gaps in this bead may indicate a defective assembly job.

12. Handle newly assembled piping carefully until initial set time shown in Table A.1 has taken place. Set times are provided for various ambient temperatures and pipe diameters.

Table A.1. CPVC Cement Set Times

Temperature	Set Time * Diameters <1.5 in.	Set Time * Diameters of 1.5 to 3 in.	Set Time * Diameters >3 in.
>60°F	15 minutes	30 minutes	1 hour
40°-59°F	1 hour	2 hours	4 hours
<39°F	3 hours	6 hours	12 hours

Notes: * (Harrington Industrial Plastics 2000)

13. Allow the joint to cure for adequate time before pressure testing. Joint cure times are shown in Table A.2 for various ambient temperatures and pipe diameters.

Table A.2. CPVC Cement Cure Times

Ambient Temperature	Cure Time * Diameters < 1.5 in.	Cure Time * Diameters of 1.5 to 3 in.	Cure Time * Diameter > 3 in.
>60°F	1 hour	2 hours	6 hours
40°-59°F	2 hours	4 hours	12 hours
<39°F	8 hours	16 hours	48 hours

Notes: * (Harrington Industrial Plastics, 2000)

APPENDIX B

PROJECT FORMS

EQUIPMENT ARRIVAL INSPECTION/CERTIFICATION

Date	Expected Arrival Date	Component Description	Transported By	Vendor	Is component damaged?	Describe damage	Shipper Notified?	Indicate Resolution	Date Resolved	Inspector's Initials

Clayton GROUP SERVICES

ATTACHMENT 4-C

THERMO ENVIRONMENTAL INSTRUMENTS

Model 51 Heated Total Hydrocarbon Analyzer

Thermo Environmental Instruments

MODEL 51

Heated Total Hydrocarbon Analyzer

Powerful Yet Simple

The microprocessor based design provides capabilities not available in conventional analog based Flame Ionization Detector Analyzers, including, system diagnostics (checkout) upon power-up, bidirectional RS-232 communications and auto-ranging over the entire 0-10,000 ppm concentration range.

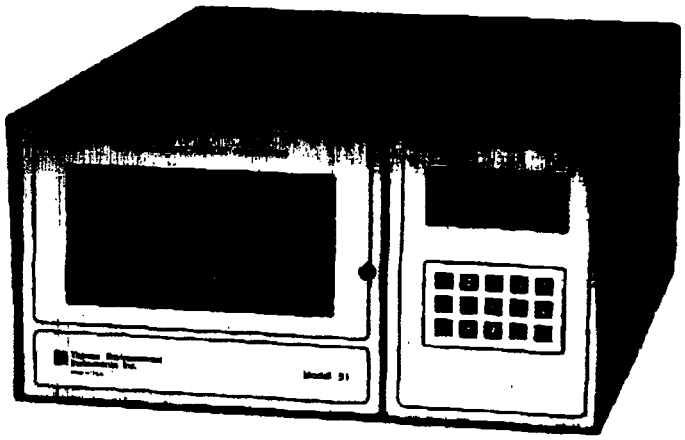
However, Thermo Environmental Instruments engineers were careful not to sacrifice simplicity and ease-of-use at the cost of these powerful feature. The *Model 51* design focuses on ease-of-operation to reduce personnel attention.

For example, the analyzer can perform automatic calibration routines at user prescribed time interval. This eliminates the need for periodic time-consuming manual calibration operation. Additionally, an auto ignition routine is provided for the hydrogen flame. This eliminates manual ignition procedures and minimizes unnecessary downtime due to unknown flameout conditions.

The highly visible Vacuum Fluorescent Display provides continuous display of current sample concentration as well as high, low and average concentration readings. Service (FAULT) reports are readily available for operator diagnosis.

KEY APPLICATIONS

- **EPA Method 25A Compliance Monitoring**
- **Continuous Emission Monitoring (CEM) of Source Hydrocarbons**
- **Carbon Bed Breakthrough Detection**
- **Fenceline (Perimeter) Monitoring**
- ***Industrial Hygiene Monitoring***

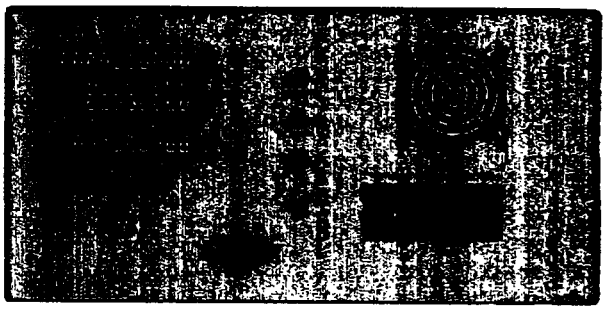


THERMO 51 SPECIFICATIONS

Measurements	
Technique	Flame Ionization Detection (FID) of mostorganic vapors
Ranges	Vacuum Fluorescent Display (VFD)- Auto Ranging Over 0 - 10,000 ppm concentration range 0 - 100 ppm (resolution to 0.1 ppm) 0 - 1,000 ppm (resolution to 1.0 ppm) 0 - 10,000 ppm (resolution to 1.0 ppm)
Min. Detectable	0.1 ppm methane in air matrix
Sensitivity	0.1 ppm methane on 0 - 100 ppm range
System Time Constant	1.0 seconds at 3 LPM sample flow
Sample Rate	2.0 LPM
Detector Sample Flow Rate	30 ml/min
Power Requirements	115/220 VAC, 60/50 Hz
Gases	
Combustion	130 ml/min at 30 psig
Fuel	25 ml/min at 30 psig
Span Gas	Same as Sample Flow; flow controlled via metal frit restrictor
Zero Air	Same as Sample Flow; flow controlled via metal frit restrictor
Physical Dimensions	
Case Size	HWD 9.2" x 16.9" x 22" inches
Weight	51 lbs.
Communications	25 pin RS - 232 port 0 - 1, 5, 10V Analog Signal (selectable) 4 - 20 mA Output (optional)

FLEXIBLE COMMUNICATIONS

- Analog Output (0-10V full scale) Standard; 4-20 mA option available
- Bidirectional RS-232 Communication
- 3 Amp contact closure provides mechanism for external alarm activation
- Drivers (24 VDC) offer activation of external solenoids for calibration of entire sampling system
- Remote instrument calibration made available via Control Lines
- Driver circuit for Initiation of stack probe purge air (blow back) functionally



Superior Flow Design

A key objective in the development of the *Model 51* Heated THC Analyzer was centralization of all flow parameters. Metal frit flow restrictors have been implemented, allowing all required support and calibration gas flows to be established at the Flow Panel This eliminates the requirement for external needle valves. Additionally, pressure gauges providing information relative to hydrogen, combustion air, and sample flow are located on the front panel and visible at all times.

The *Model 51* can be calibrated via the sample port or via internal zero and span solenoids. Drivers (24 VDC) are available for activation of solenoids external to the *Model 51*, enabling calibration gases to be introduced at the point of sampling (typically the stack probe). This serves as a calibration check of the entire system which is often required by source monitoring regulations. Alternatively, the *Model 51* can be calibrated via independent span and zero ports with accompanying solenoids. A rotameter is located on the front panel allowing the operator to verify sufficient span and zero gas flow is being provided for proper calibration of the *Model 51*.

The Heated Zone

Of principle concern in any detector FID based analysis is condensation of the high molecular weight sample stream constituents as they exit the elevated temperature environment of the stack. Condensation not only results in low reporting of total hydrocarbon (THC) emissions but can result in plugging of sample pump, sample filters and flow control devices due to particulate deposits results from analyzer "cold spots".

The *Model 51* utilizes a temperature controlled HEATED ZONE to eliminate condensation problems. As illustrated in the following diagram, all instrument components which come into contact with the sample stream are maintained to above 150°C via cartridge heaters. These components include flame ionization detector, pump head, micron filter, transport lines and back pressure regulator. Additionally, a RTD based feedback mechanism ensures proper temperature control and provides the operator with current oven temperature data.

For Price and Delivery Information, Contact:

Thermo Environmental Instruments

8 West Forge Parkway
Franklin, MA 02038 USA

Tel: 508 520-0430 Fax: 508 520-1460
E-mail:thermo@thermoei.com Web Site: www.thermoei.com

MODEL 50

MULTIPOINT SAMPLER

INSTRUCTION MANUAL
P/N 11184

THERMO ENVIRONMENTAL INSTRUMENTS INC.
8 WEST FORGE PARKWAY
FRANKLIN, MASSACHUSETTS 02038

TELEPHONE: (508) 520-0430
FACSIMILE: (508) 520-1460

08-14-95

The Model 50 is a multipoint sampler, or multiplex system designed to extend the capabilities of other air sampling instruments. This device allows a single air monitoring instrument to be to be connected to five sampling lines. At any given time, the flow from one sample line will be directed to the monitoring instrument through the "SAMPLE OUT" port while the remaining lines will be connected to the Model 50 "VENT" port. Lines directed to the vent can be continuously flushed by an external pump connected at that point. The Model 50 can be controlled manually from the front panel or can be remotely controlled by the monitor's internal processor or by an external device such as a data logger.

Electrical and gas connections for the Model 50 are presented here along with a brief description of the unit's internal design and suggested operating guidelines.

ELECTRICAL AND GAS CONNECTIONS:

All electrical and gas connections are made on the rear panel as shown in Figures 1 and 2.

Sample Connections

Up to five sampling lines may be connected to the fittings located across the lower right side of the rear panel. Inlet lines should be 1/4" O.D. and connections should be made with standard compression fittings. Note that because the inlet connections are numbered from the front of the instrument, connection number 1 is located on the far right when viewed from the rear, and the numbers increase from right to left. For applications using fewer than five sample lines, the inlet connections that are not being used should be capped.

The Model 50's "SAMPLE OUT" port is connected to the monitoring instrument inlet using 1/4" O.D. tube and compression fittings. The tube connecting the two instruments should be as short as possible to reduce carry-over between channels. The tube material should be selected on the basis of sample composition. In most cases Teflon or stainless steel will be the most appropriate choice.

For most applications, the Model 50 "VENT" port should be connected to an external pump, which will continuously flush all lines that are not being monitored. Again, 1/4" O.D. tubing and compression fittings will be required. If the sample gases are potentially hazardous, the pump outlet must be properly vented. The pump should be selected for compatibility with the sample and to provide adequate flow to keep all lines flushed. The exact flow rate is not necessarily important, but for most applications a flow rate of about 1 liter per minute per sample line should provide good results.

Electrical Connections:

The Model 50 is powered by 110 volts at 60 Hz or by 220 volts at 50 Hz. Check the test data sheet shipped with your instrument to be sure it is set for the proper voltage in your location. Power is supplied through the receptacle on the rear panel which includes an integral fuse holder.

In addition to the power cord and the gas line connections, the rear panel also provides three electrical connectors labeled "CONTROL", "STATUS 1" and "STATUS 2". Connections on both strips are numbered 1 through 8 from left to right and are made using the special connectors that are included with the instrument. The upper strip, labeled "CONTROL", receives inputs from the air monitoring instrument or data logger and the two lower strips labeled "STATUS" provide feedback concerning which sampling channel is currently active. If the air monitoring instrument is being used to provide direct control of the Model 50, the "STATUS" connections may not be needed. However, this arrangement allows the Model 50 to be controlled by the analyzer while being monitored by a data logger or PLC.

A 5 volt (TTL) input signal controls which sample line is connected to the monitor at any given time. For example, if a potential of +5 volts is applied to connection 3 on the Model 50 control strip, sample line number 3 will be connected to the "SAMPLE OUT" port. When the applied voltage is removed, the valve will close and sample line three will again be connected to the "VENT" port.

If the Model 50 is being used with a TEI Model 51 or 52 analyzer, the appropriate 5 volt output signals are located at connector positions 1 through 5 on the top terminal strip located on the analyzer rear panel. A typical wiring diagram is shown in Figure 2. When the 51 or 52 is running in the multipoint mode, the current channel is indicated on the digital display and the corresponding contact is energized with a +5 volt potential.

Positions 6 and 7 on the Model 51 or 52 top terminal strip and 20 on the center strip are also associated with control of the multipoint sampler and have the following functions:

Position 6:	Status (not required)
Position 7:	+ 5 volts reference
Position 20:	Ground

If the Model 50 will be controlled by a data logger or other device that provides contact closures rather than 5 volt outputs, then a 5 volt source must be included in the circuit.

To facilitate operation of the Model 50 with Data Loggers and PLCs, status lines are also provided. These are located on the two rear connectors labeled "STATUS" and are numbered 1 through 8 from left to right. Internally, the status lines are connected to a set of contact closures or relays. One side of each relay is connected to a pin on the output and the other leg of each relay is connected to common on pin number 2.*

In operation, when a voltage is applied to an input line, the corresponding solenoid valve is activated which connects the incoming sample line to the "SAMPLE OUT" port. At the same time, the corresponding relays, which are connected to "STATUS 1" and "STATUS 2" close. When the input is returned to ground potential, the valve closes and the corresponding contact closures return to the open position. The two sets of status lines are identical in function, and in most applications only one set will be used. However the second set can be used to route the analyzer's analog output to a muti-pen chart recorder or data logger.

OPERATION OF THE MODEL 50:

The front panel, shown in Figure 3, includes the power switch, the channel selector switch, five flow meters and six LED type status lights. The channel selector is a six position rotary switch. When set to "REMOTE" the Model 50 will be under the control of an external device which should be connected as described earlier. If the channel selector is set on any other position (labeled 1-5), the corresponding inlet line will be connected to the port labeled "SAMPLE OUT." The remaining lines will be connected to port labeled "VENT."

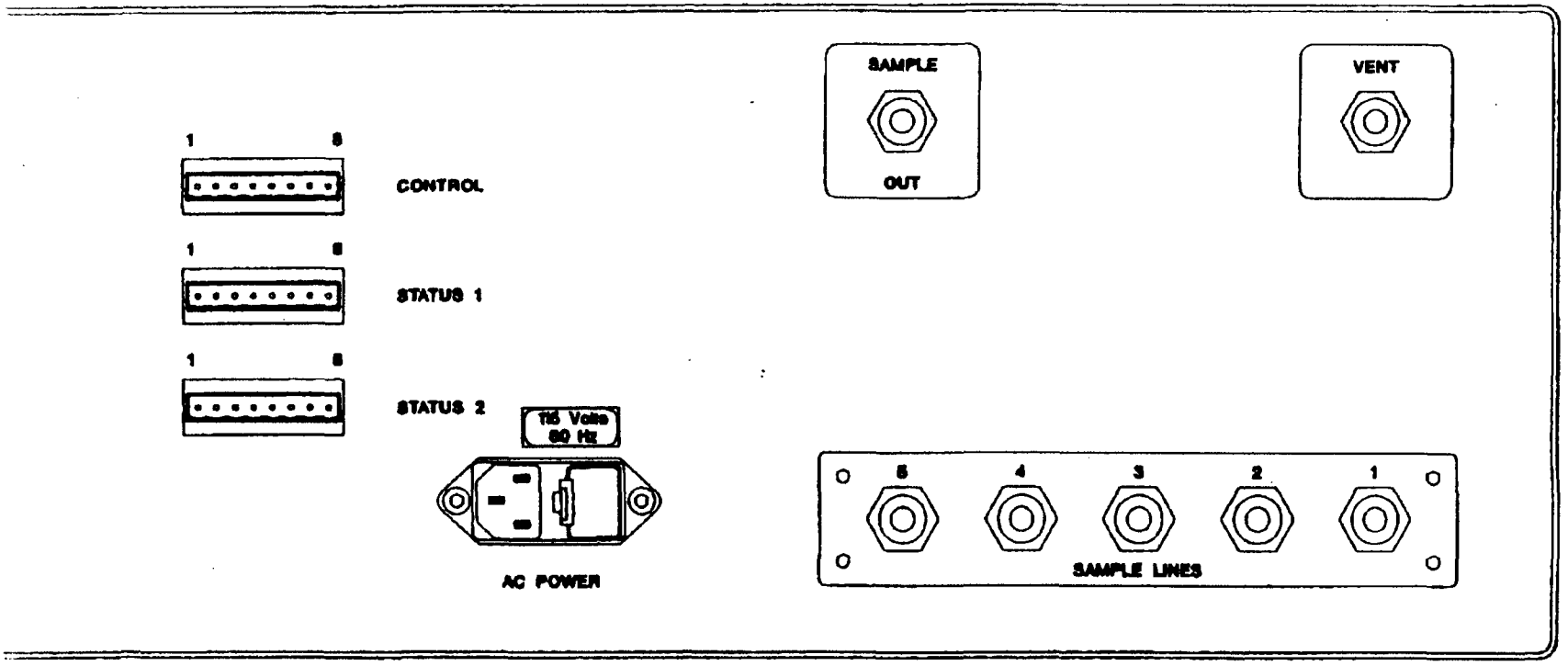
The front panel status lights labeled 1-5 indicate which channel is currently connected to the "SAMPLE OUT" port. If all five sampling valves are closed, the sixth LED will be lit. This indicates that an internal by-pass valve has opened, connecting the SAMPLE OUT port to an open vent inside the Model 50. The by-pass valve prevents the analyzer pump from being connected to a closed system, or from being pressurized during calibration of the analytical instrument.

When operating under manual controls, only one inlet can be sampled at any given time. However, while operating under remote control, it is possible to activate multiple channels at the same time. If multiple channels are opened to collect a pooled sample, the user must be aware of the sampling rate through each line and compensate for any differences in flow.

A flow schematic illustrating the basic operation of the unit is presented in Figure 4.

* Note that status pin 3 corresponds to sample channel 1, pin 4 to channel 2 etc.

FIGURE 1


SAMPLE
OUT
VENT
1
8
CONTROL
1
8
STATUS 1
1
8
STATUS 2
115 Volts
60 Hz
AC POWER
5
4
3
2
1
SAMPLE LINES

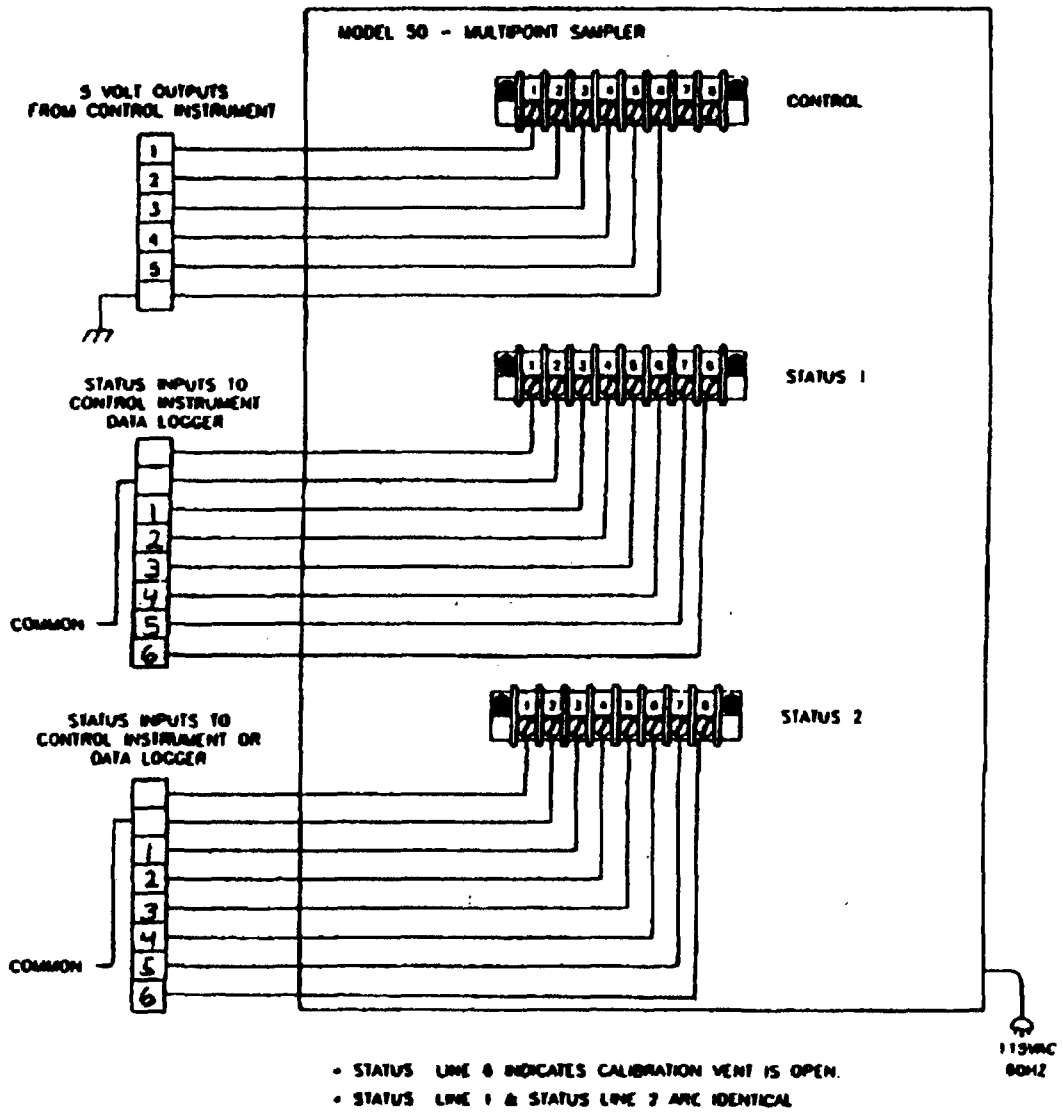
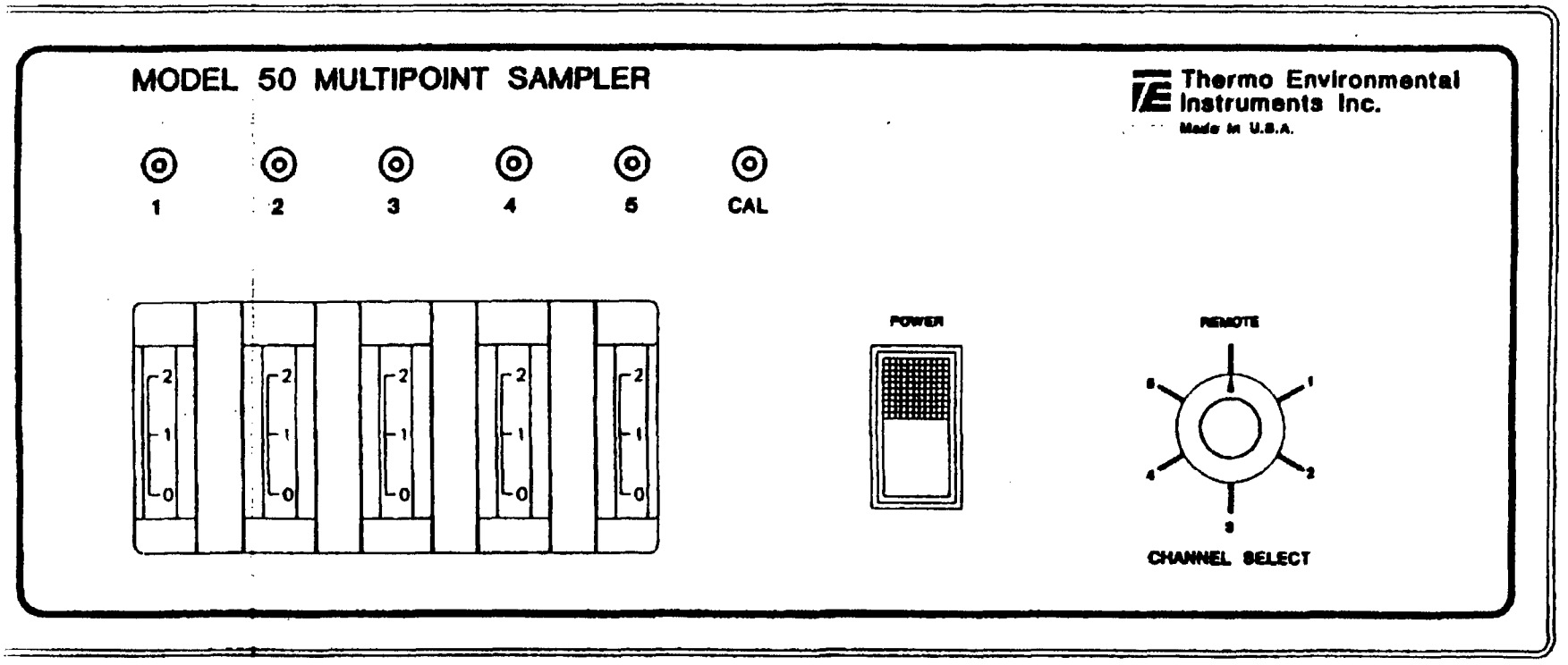

MODEL 50 - MULTIPOINT SAMPLER
5 VOLT OUTPUTS FROM CONTROL INSTRUMENT
CONTROL
STATUS INPUTS TO CONTROL INSTRUMENT DATA LOGGER
STATUS 1
COMMON
STATUS INPUTS TO CONTROL INSTRUMENT OR DATA LOGGER
STATUS 2
COMMON
119VAC 60HZ
• STATUS LINE 0 INDICATES CALIBRATION VENT IS OPEN.
• STATUS LINE 1 & STATUS LINE 2 ARE IDENTICAL

FIGURE 2

FIGURE 3


MODEL 50 MULTIPOINT SAMPLER
Thermo Environmental Instruments Inc.
Made in U.S.A.
1
2
3
4
5
CAL
POWER
REMOTE
CHANNEL SELECT

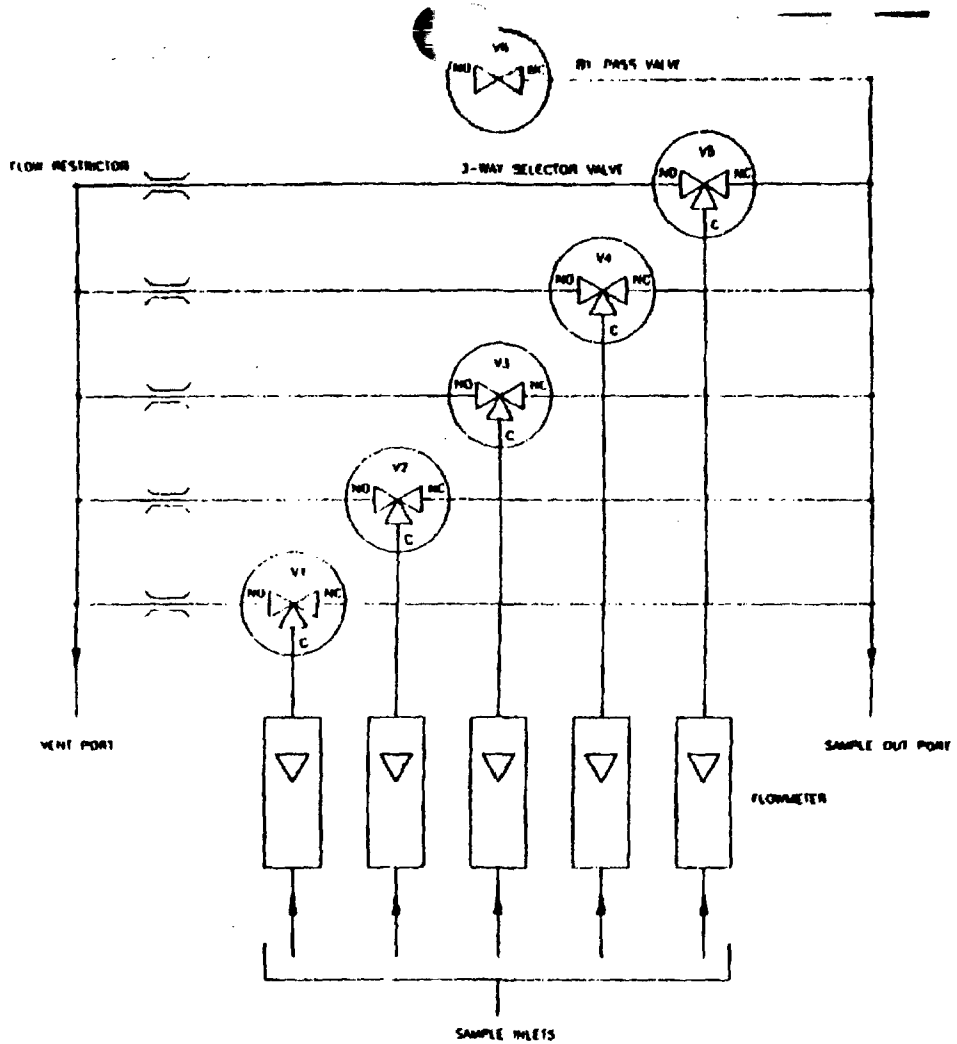

V6
NO
NC
BY PASS VALVE
FLOW RESTRICTOR
3-WAY SELECTOR VALVE
V8
V4
V3
V7
V1
C
VENT PORT
SAMPLE OUT PORT
FLOWMETER
SAMPLE INLETS

FIGURE 4

ATTACHMENT 4-D

COMMERCIAL WEATHERNET SYSTEM

Commercial WeatherNet System

Help your business work smarter, safer and more effectively!

Complete WeatherNet System

We know all too well how weather can impact your daily life. And, unless your business is at the airport, your weather information is an hour-old and coming from miles away.

The WeatherNet System is a great opportunity for your business to get noticed on the WeatherBug Network and in your local community.

Besides getting a state-of-the-art WeatherNet System...

•Your business is connected to the AWS Weather Network (5,600 weather stations)

•You become a part of the desktop application in every WeatherBug home
(8 million users and increasing daily)

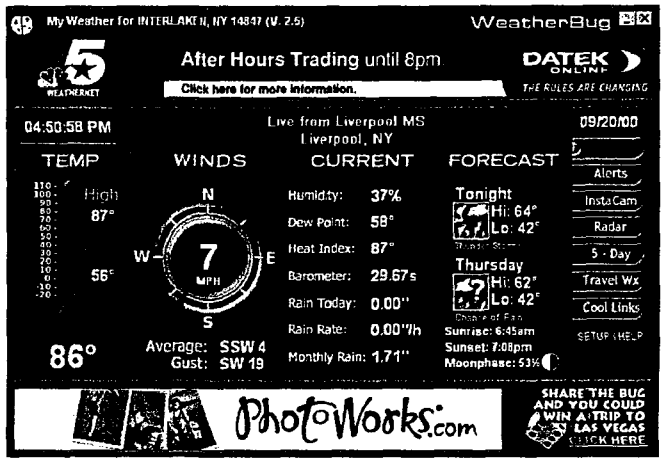
•You can access real-time live, local weather for business and emergency planning

•You will be a community service leader

WeatherBug Desktop Alert System

The WeatherNet System can help your planning efforts...

•Project Management
•Resource Allocation
•Increase Worker Safety
•Equipment Deployment
•Scheduling
•Cost Management
•Improve Communications
•Preparedness and Evacuation Management
•On-site emergency treatment (heat exposure)
•Emergency dispatch
•Increase distribution effectiveness
•Natural disaster prevention Management and Recovery
•Efficient Medical Transportation
•HAZMAT
•Route Planning
•Increase on-time delivery efficiency
• And much more...



WeatherBug.com Network

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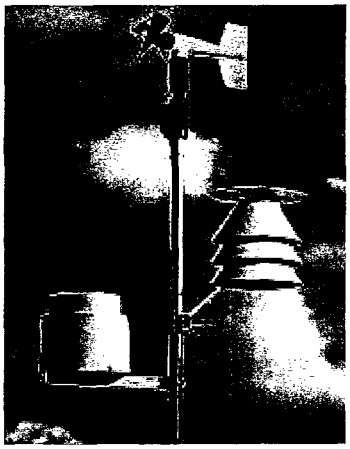
800-544-4429 and press 4 or email **commsales@aws.com**

Commercial WeatherNet System

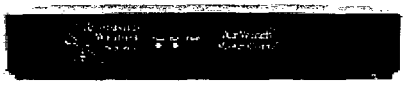
Delivers live, local weather from your business to your entire community

WeatherNet Weather Station



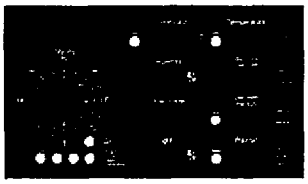
Wind Speed and Direction
Temperature & Relative Humidity
Rainfall
Light Intensity
Barometric Pressure
Auxiliary Temperature Probe

Master Control



Processes all Data
Modem and Internet Connections
Stores 4 Months of Data
Internal Battery Backup

Digital Display

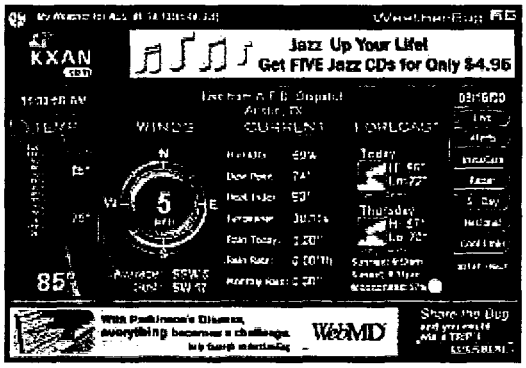


Indoor Temperature
Large, Easy to Read Digits
Real-Time Data for all Sensors
Min/Max/Rate Buttons
English/Metric Units
Fits Nicely on a Standard Shelf

Provide instant access to live, local weather data directly from your site to your customers and community. Imagine the benefits of accessing real-time conditions, forecasts, storm warnings and weather alerts twenty-four hours a day, right from your computer!

The Commercial WeatherNet System integrates commercial grade weather monitors and WeatherNet Camera equipment with meteorological software and Internet technology to accurately measure and archive up to twenty-seven weather parameters, including temperature, wind speed and direction, humidity, barometric pressure, heat index, wind chill and much more.

WeatherBug Web Page



Live Weather Conditions
Local Zone Forecasts
Storm Warnings and Alerts
Live WeatherNet Camera Images
Links to Local Radar
Weather and News Information

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or email **commsales@aws.com**

- Sensor Specifications
- Camera Specifications
- Software Requirements
- FAQ's
- Contact

Sensor Specifications

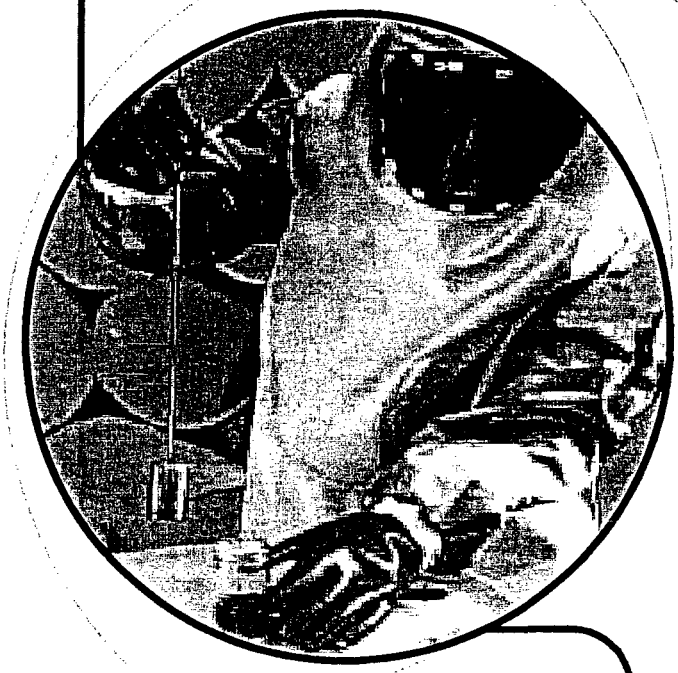
Sensor	Range (English)	Accuracy (English)
Temperature	-55F - 150F	+/- 1F
Relative Humidity	0 - 100%	+/- 2%
Wind Speed	0 - 125 mph	+/- 2 mph
Wind Direction	0 - 360 deg	+/- 3 deg.
Barometric Pressure	28.00 - 32.00"Hg	+/- 0.05 "Hg
Rainfall	Unlimited	+/- 2%
Light Intensity	0 - 100%	N/a
Aux Temperature	-55F - 150F	+/- 2F

ATTACHMENT 4-E

THERMO ENVIRONMENTAL INSTRUMENTS

MIRAN SapphIRE Portable Infrared Ambient Air Analyzer

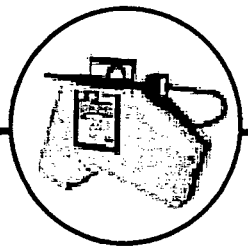
Thermo Environmental Instruments



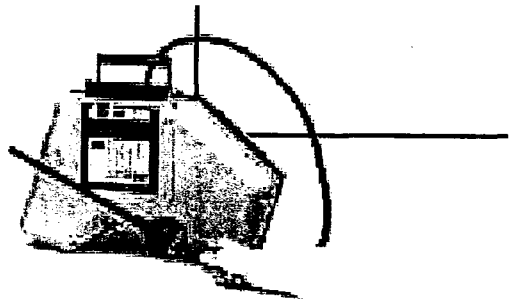
- Industrial Hygiene Monitoring
- Emergency Response Analysis
- Indoor Air Quality Studies
- Hospital Gas Monitoring
- Fume Hood / Tracer Gas Testing
- Leak Detection

MIRAN SapphIRe®

Portable Infrared
Ambient Air Analyzer



Easy to use
Selective
Sensitive for sub-ppm detection
Versatile and upgradable
Lightweight and portable



The *MIRAN SapphIRe* Series of Ambient Air Analyzers is the most versatile gas detection system on the market today.

Use of infrared spectroscopy provides the *MIRAN SapphIRe* Analyzers with the unique ability to specifically and accurately measure many gases with a single unit. The Analyzer's wavelength generator has a unique design that allows accurate and fast wavelength selection. This feature alone separates the *MIRAN SapphIRe* Analyzer from other gas analyzers.

The *MIRAN SapphIRe* Analyzer is available in three models with gas calibrations from one to over 100 gases. Any model can be easily upgraded to another model in the series, allowing you to economically meet both current requirements and future increased needs.

Three Models to Fit Your Needs

The *MIRAN SapphIRe XL*. Offers optimal measurement capabilities for high-end users who need to measure a wide variety or mixed atmosphere of gases. Contains over 120 single gas applications with customization capability. Ideal for consultants, industrial hygienists, regulatory agencies, research scientists and emergency response professionals.

The *MIRAN SapphIRe SL*. Provides flexibility for users who perform similar measurements on a routine basis. Contains over 50 single gas applications with customization capability. Popular with indoor air quality specialists and anesthetic gas monitoring technicians.

The *MIRAN SapphIRe DL*. Designed for users who regularly encounter a limited number of air monitoring applications. Features quick and easy operation for enforcement agencies and specified compound measurement projects.

Note: A list of compounds contained in the *SL* and *XL* Fixed Library is available on a separate application sheet.Please contact us or visit our Web site for more information.

Training and Support

Need technical assistance? Our experienced team of laboratory specialists is available to help you determine the right system for your application. And... we back it up with the technical support you need.

Industrial Hygiene

Real-time detection of vapors in job environments promotes safe work habits. *MIRAN SapphIRe* analyzers monitor at typical government-regulated levels.

Emergency Response Analysis

The *MIRAN SapphIRe* assists emergency response personnel in qualifying hazardous spills and emissions.

Indoor Air Quality Studies

The *MIRAN SapphIRe* makes precise spot measurements for compounds such as CO_2, CO, formaldehyde, or organic vapors.

Waste Anesthetic Gases

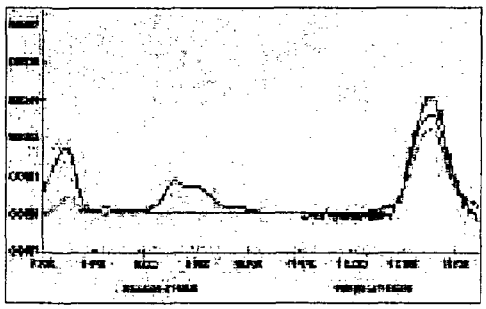
Service technicians can identify leaks on anesthetic delivery systems by using the *MIRAN SapphIRe* Ambient Air Analyzer as a part of Preventative Maintenance (PM) work.

Fume Hood / Tracer Gas Analysis

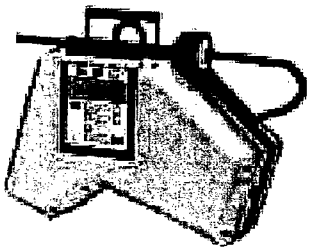
When the handling of toxic substances is performed in fume hoods, worker safety can be jeopardized. The *MIRAN SapphIRe* serves as an effective monitor for evaluating fume containment of laboratory hoods.

Leak Detection for process maintenance

Using a leak detection probe you can set up the *MIRAN SapphIRe* to check for leaks around many types of process equipment.



Spectral Scanning upgrade permits collection of spectral fingerprint of unknowns, allowing for further in-depth analysis and identification.



MIRAN SapphIRe Summary Specifications

Detector Type	Single beam infrared spectrophotometer
Optics	Linear Variable Filter (LVF) from 7.7 to 14.1μ seven Fixed Band Pass Filters 1.8, 3.3, 3.6, 4.0, 4.2, 4.5, and 4.7μ
Pump Flow Rate	15l/min
Analysis Time	After power up: 20 seconds minimum; three minutes maximum
Alarms	User Definable
Readout	8 line x 40 Character LCD
Response time	18 seconds to 90% of final reading
Pathlength	0.5m & 12.5m
Sample Cell Vol.	2.23 liters
Battery	Internal, Rechargeable NiCad. 7.2 V nominal; 5.7 Ah capacity. Discharge time 4 hrs; recharge time 4 to 6 hrs.
Output	0-1VDC, Parallel, Serial
Dimensions	Approximately 553mm (21.8in) wide x 365 mm (14.4 in) high x 193 mm (7.6 in) deep
Mass	Approximately 10 kg (24 lbs.)
Intrinsic Safety Certifications	User specified models are certified for CENELEC, Groups IIC, Zone 1and 2; ETL (Class I, Div. 1. Groups B,C & D, Temp. Class T4) ETL-C (Class I, Div. 1. Groups B,C & D, Temp. Class T4) CENELEC (EEx ib d IIB + H2 T4)

Accessories

Leak Detection/Sampling Wand P/N CR014QC

15 3/4" (40cm) long, and is composed of anodized aluminum tubing and chemically stable plastic.

Transportation / Carrying Case P/N CR013XM

Wheeled case with telescoping handle doubles as a sturdy shipping case which will hold a spare battery, battery charger, cables, sample wand, carrying strap and filters.

Field Performance Check Kit P/N CR014LG

CE

ISO-9001 Certified

Thermo Environmental Instruments
8 West Forge Parkway, Franklin, MA 02038 USA
tel: (508) 520-0430 fax: (508) 520-1460
thermo@thermoei.com www.thermoei.com

MIRAN is a registered trademark of Thermo Environmental Instruments Inc. Doc# 0011

Thermo Environmental Instruments Inc.
MIRAN SapphIRe Portable Ambient Air Analyzer
Standard Compound Library

Compounds included in SL library are highlighted.
All compounds are including highlighted are in XL library.
Updated 2/2001

Compound Name	Library	Measurement Range (0 - ppm)	Detection Limit (ppm)
1,1,1,2-TETRAFLUOROETHANE		200	0.17
1,1,1–TRIFLUOROETHANE		25	0.05
1,1,2,2-TETRACHLOROETHANE		20	0.25
1,1,2-TRICHLORETHANE		30	0.25
1,1-DICHLORO-1-FLUOROETHANE		200	0.17
1,1-DICHLOROETHANE		200	0.4
1,1-DIFLUOROETHANE		25	0.06
1,2-DICHLOROETHYLENE		500	0.6
1,2-DICHLOROTETRAFLUOROETHANE	SL	1000	1.50
1,2-DICHLOROTETRAFLUOROETHANE	SL	1000	2.00
1,3-BUTADIENE	SL	100	0.7
1,3-BUTADIENE	SL	50	0.35
1-CHLORO-1,1,2,2-TETRAFLUOROETHANE	SL	500	3.00
1-CHLORO-1,1,2,2-TETRAFLUOROETHANE	SL	500	1.40
1-CHLORO-1,1,2,2-TETRAFLUOROETHANE	SL	100	0.20
1-CHLORO-1,1,2,2-TETRAFLUOROETHANE	SL	100	0.05
ACETALDEHYDE		400	0.8
ACETIC ACID	SL	100	0.5
ACETIC ACID	SL	30	0.15
ACETONE	SL	2000	5
ACETONE	SL	2000	5
ACETONITRILE		500	11
ACETOPHENONE		100	0.4
ACETYLENE		200	0.5
ACRYLONITRILE		50	0.6
AMMONIA	SL	500	0.70
AMMONIA	SL	500	0.70
ANILINE		50	0.5
BENZALDEHYDE		500	0.9

BENZENE	SL	200	2
BROMOTRIFLUOROMETHANE		1000	1.00
BUTANE		2000	5
BUTYL CELLOSOLVE	SL	100	0.25
CARBON DIOXIDE (absolute)	SL	1000	30
CARBON DIOXIDE (absolute)	SL	1000	1
CARBON DIOXIDE (differential)	SL	2000	40
CARBON DIOXIDE (differential)	SL	2000	1.5
CARBON DISULFIDE		50	1
CARBON MONOXIDE	SL	250	0.9
CARBON TETRACHLORIDE	SL	100	0.05
CARBON TETRACHLORIDE	SL	5	1.2
CELLOSOLVE	SL	500	2.3
CELLOSOLVE	SL	50	0.1
CELLOSOLVE ACETATE	SL	200	0.15
CHLOROBENZENE		150	0.4
CHLOROBROMOMETHANE		500	0.4
CHLORODIFLUOROMETHANE	SL	1000	2.50
CHLORODIFLUOROMETHANE	SL	1000	1.00
CHLOROFORM	SL	100	1.7
CHLOROFORM	SL	100	0.5
CHLOROFORM	SL	10	0.07
CHLOROFORM	SL	10	0.5
CUMENE		100	1
CYCLOHEXANE	SL	500	6
CYCLOHEXANE	SL	500	6
CYCLOPENTANE		500	6
DESFLURANE	SL	100	0.7
DESFLURANE	SL	100	0.7
DESFLURANE	SL	10	0.04
DESFLURANE	SL	10	0.04
DICHLORODIFLUOROMETHANE	SL	1000	1.40
DICHLORODIFLUOROMETHANE	SL	1000	1.50
DICHLOROETHYLETHER		50	0.12
DICHLOROFLUOROMETHANE	SL	1000	1.50
DICHLOROFLUOROMETHANE	SL	1000	2.00
DICHLOROPENTAFLUOROPROPANE		100	0.10
DICHLOROTRIFLUOROETHANE	SL	200	1.50

DICHLOROTRIFLUOROETHANE	SL	200	1.30
DICHLOROTRIFLUOROETHANE	SL	10	0.07
DICHLOROTRIFLUOROETHANE	SL	10	0.09
DIETHYLAMINE		50	0.35
DIMETHYLACETAMIDE		30	0.4
DIMETHYLAMINE		50	0.6
DIOXANE		100	0.08
ENFLURANE	SL	100	0.2
ENFLURANE	SL	100	0.6
ENFLURANE	SL	10	0.2
ENFLURANE	SL	10	0.03
ETHANE		1000	0.3
ETHANOLAMINE		50	0.7
ETHYL ACETATE		500	1.1
ETHYL ALCOHOL		2000	5
ETHYL BENZENE		200	1.2
ETHYL CHLORIDE		1500	1
ETHYL ETHER		500	1.8
ETHYL LACTATE	SL	100	0.08
ETHYLENE		100	0.4
ETHYLENE DICHLORIDE		100	0.7
ETHYLENE OXIDE	SL	100	0.35
ETHYLENE OXIDE	SL	100	0.6
FORMALDEHYDE	SL	10	0.11
FORMIC ACID		30	0.12
GEN HALOCARBONS (Chloroform)	SL	100	1.70
GEN HALOCARBONS (Chloroform)	SL	10	0.07
GEN HYDROCARBONS (Hexane)	SL	500	0.25
GEN HYDROCARBONS (Methane)	SL	20	1.50
HALOTHANE	SL	100	1.50
HALOTHANE	SL	100	0.09
HALOTHANE	SL	10	0.25
HALOTHANE	SL	10	0.09
HEPTANE		1000	10.00
HYDRAZINE		50	0.80
ISOBUTANE		250	2.50
ISOFLURANE	SL	100	0.50
ISOFLURANE	SL	100	0.70

ISOFLURANE	SL	10	0.50
ISOFLURANE	SL	10	0.04
ISOPROPYL ALCOHOL	SL	1000	10.00
ISOPROPYL ALCOHOL	SL	1000	4.00
ISOPROPYL ALCOHOL	SL	100	0.50
ISOPROPYL ALCOHOL	SL	100	0.30
ISOPROPYL ETHER		1000	3.00
m-CRESOL	SL	10	0.40
m-DICHLOROBENZENE		150	0.35
METHANE	SL	100	1.50
METHYL ACETATE	SL	500	1.30
METHYL ACETATE	SL	500	6.00
METHYL ACRYLATE		20	0.07
METHYL ALCOHOL		500	0.70
METHYL CELLOSOLVE	SL	100	0.15
METHYL CELLOSOLVE ACETATE	SL	100	0.14
METHYL CELLOSOLVE ACETATE	SL	100	0.15
METHYL CHLORIDE		200	1.70
METHYL CHLOROFORM		500	0.15
METHYL ETHYL KETONE	SL	1000	1.60
METHYL ETHYL KETONE	SL	1000	7.00
METHYL ISOBUTYL KETONE		100	0.35
METHYL METHACRYLATE	SL	250	0.40
METHYL METHACRYLATE	SL	250	0.70
METHYLACETYLENE		1000	1.20
METHYLAMINE		50	0.60
METHYLENE CHLORIDE	SL	200	4.00
N,N-DIMETHYLFORMAMIDE		20	0.2
n-BUTYL ACETATE		300	0.18
n-BUTYL ALCOHOL		200	0.25
n-HEXANE		500	0.25
NITROGEN TRIFLUORIDE		50	0.04
NITROUS OXIDE	SL	100	0.04
Notes:			
n-PROPANOL		500	0.60
OCTANE		1000	5.00
OCTANE		100	0.35
o-DICHLOROBENZENE		100	0.60

p-DICHLOROBENZENE		150	0.25
PENTANE		2000	6.00
PERCHLOROETHYLENE	SL	500	2.00
PERCHLOROETHYLENE	SL	50	0.09
PERCHLOROETHYLENE	SL	50	0.40
PGMEA		50	0.07
PHOSGENE		5	0.05
PROPANE		2000	20.00
PROPYLENE OXIDE		200	0.70
PYRIDINE		100	1.50
SEVOFLURANE	SL	100	0.70
SEVOFLURANE	SL	10	0.03
STYRENE	SL	1000	15.00
STYRENE	SL	200	0.60
STYRENE	SL	200	0.70
SULFUR DIOXIDE	SL	30	1.20
SULFUR HEXAFLUORIDE	SL	4	0.01
t-BUTYL ALCOHOL		100	0.3
t-BUTYL METHYL ETHER		50	0.15
TETRAHYDROFURAN		500	0.50
TOLUENE	SL	1000	18.00
TOLUENE	SL	1000	4.00
TOLUENE	SL	200	1.00
TRICHLOROETHYLENE	SL	1000	4.00
TRICHLOROETHYLENE	SL	1000	4.00
TRICHLOROMONOFLUOROMETHANE		1000	1.00
TRICHLOROTRIFLUOROETHANE	SL	1000	1.70
TRICHLOROTRIFLUOROETHANE	SL	1000	2.50
VINYL ACETATE		10	0.04
VINYL CHLORIDE	SL	20	0.60
VINYL CHLORIDE	SL	20	1.60
VINYLIDENE CHLORIDE		20	0.20
XYLENE	SL	2000	7.00
XYLENE	SL	2000	30.00
XYLENE	SL	200	1.30

ATTACHMENT 4-F

CHAIN OF CUSTODY RECORD

Performance Analytical Inc.

Performance Analytical Inc.
Air Quality Laboratory
A Division of Columbia Analytical Services, Inc.
An Employee Owned Company

2665 Park Center Drive, Suite D
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Chain of Custody Record
Analytical Services Request

Client / Address	Phone	Fax	ANALYSES	PAI Project No.
Client Project Name / Location	Client Project No.			
Contact	Sampler (Signature)	P. O. No.		

Client Sample ID	Date Collected	Time Collected	Lab Sample No.	Type of Sample	Container ID (Serial#)	Regulator ID (Serial#)					Expected Turnaround Time	Remarks

Relinquished by : (Signature)	Date	Time	Received by : (Signature)	Date	Time
Relinquished by : (Signature)	Date	Time	Received by : (Signature)	Date	Time
Relinquished by : (Signature)	Date	Time	Received by : (Signature)	Date	Time

White Copy : Accompanies Sampler Yellow Copy : Sampler

SECTION 5

5.0 CONFIRMATION SAMPLING

Once monitoring of emission discharges from the ERH system (for the upper fill/till) and the SVE system (for the mass waste sand and gravel) indicate concentrations in the soils have been reduced to below the RAOs, a technical memorandum will be issued to USEPA recommending confirmation sampling of soils in the impacted areas be undertaken. This technical memorandum will be issued after emissions monitoring from each individual remediation system indicates the emissions concentrations have asymptotically declined, and no further substantive contaminant removal is taking place from the subsurface. The SVE remediation system may be operated in a pulse mode for some time prior to the confirmation sampling program being recommended. The confirmation sampling technical memorandum will provide the justification for sampling at that time based on the progress of the remediation, and will describe the specific sampling locations and number of samples to be acquired from each lithologic unit in the areas being remediated. Specific sampling procedures will be similar to those identified in the QAPP with the exception of those specific confirmation sampling procedures identified below. Approval of the confirmation sampling technical memorandum by the USEPA On-Site Coordinator (OSC) will be necessary prior to the confirmatory sampling program taking place.

Once the confirmation soil sampling program is approved by the USEPA, the program will be implemented as soon as a drilling contractor can be mobilized. The confirmation soil samples will be obtained using Shelby tubes with the ends capped. Soil extraction and analyses of samples will be performed after the samples have been allowed to cool to ambient temperature. The confirmation sampling will be performed by utilizing a grid-sampling pattern over both the surficial silty clay till and fill and the Mass Waste Sand and Gravel Unit. The specific nature and locations of confirmation samples will be identified in the confirmation sampling technical memorandum submitted to the USEPA prior to initiating the sampling.

It is not possible at this time to show definitive confirmatory sampling locations, since further investigations are planned to determine the extent of contamination exceeding the RAOs in both the surficial silty clay till/fill and the mass waste sand and gravel.

The remainder of the discussion in this section describes the logic of the confirmatory sampling plan that will be employed after the investigations have been completed. Details will be provided in the confirmation sampling technical memorandum submitted to the USEPA for approval. The approach to be used in each treatment area is described below.

5.1 SURFICIAL SILTY CLAY TILL AND FILL

This area will be treated using the ERH technology to achieve the RAOs presented in Section 3.0. The preliminary locations of the electrodes used for ERH heating were shown on Figure 4.1-1. The conceptual confirmatory sampling program is based on the assumption that the electrode spacing shown on this figure will be the spacing actually employed. If, after the Area 1 and 2 investigations are complete, a different electrode layout is necessary, the confirmatory sampling program will be modified as appropriate using the approach described in this section.

The proposed confirmatory boring layout is shown below:

● ● ●
● X ● X ●
● X ● X ●

Where ● represents the electrodes and X represents the confirmatory boring location. Note that the confirmatory boring locations are as far removed from the electrodes as practical, thereby ensuring that the confirmatory sampling locations are not near the areas

of the highest degree of treatment. Confirmatory samples will also be obtained from outside the perimeter of the ERH treatment zone. The exact nature of the confirmatory sampling program, including the perimeter sampling, will be described in the confirmation sampling technical memorandum to be issued to the USEPA and approved by the OSC towards the end of the remedial system operation. The analytical data from confirmation samples collected outside the perimeter of the impacted areas will not be used in the statistical procedures to determine completion of remedial activities.

This approach results in the number of confirmatory boring locations being approximately equal to half the number of electrodes. Therefore, based on the layout shown in Figure 4.1-1, approximately 20 confirmatory boring locations would be located in Area 1, and approximately 20 confirmatory boring locations would be located in Area 2, for a total of 40 boring locations.

Confirmatory samples will be obtained at three depths at each boring location: one at the highest PID reading in the 0- to 10-foot interval, one at the highest PID reading in the 11- to 20-foot interval, and one at the highest PID reading in the 21- to 30-foot interval. Therefore, approximately 120 samples will be obtained from the 40 confirmatory borings. Approximately 60 of these samples will be obtained from Area 1, and approximately 60 samples will be obtained from Area 2.

A statistical approach, as described below, will be used to determine whether the RAOs have been met. It is not appropriate, however, to apply the statistical approach to the entire data set (120 samples) since a large number of low results in one portion of a treatment area could result in the statistical analysis concluding that the entire area was clean while a portion of the area still contained elevated VOC levels. Therefore, the confirmatory samples will be broken down into smaller sets representing a portion of each area that is remediated. Areas 1 and 2 will be divided into a total of ten sub-areas. Area 1 will be divided into five sub-areas, and Area 2 will be divided into five sub-areas.

Each sub-area will contain four boring locations. Since three samples will be obtained from each boring, 12 samples will be obtained from each of the 10 sub-areas, resulting in a total of 120 samples. The statistical analysis will be applied to the results of analysis of the 12 samples obtained from each sub-area. These sub-areas can be defined after the further investigation efforts in Areas 1 and 2 are complete and will be submitted as part of the technical memorandum to the USEPA with the remediation design package. If any confirmation samples for a sub-area exceed 10 mg/kg of TCE, that sub-area will continue to be heated.

The statistical approach that will be used is based on calculation of average values and confidence limits using the τ distribution, as described in SW-846 Chapter 9. However, as described below, Lockformer will use an even more conservative τ value than used in the SW-846 example.

The average value $(\overline{X})$ for the results in a sub-area containing 12 sample results is:

$$(\overline{X}) = \frac{X_1 + X_2 + X_3 + \ldots X_N}{N}$$

Where $X_1, X_2, \ldots X_N$ are the 12 individual values and N = 12. The spread of the data is called the standard deviation and is represented by the symbol σ. This value is calculated as follows:

$$\sigma = \sqrt{\frac{(X_1 - \overline{X})^2 + (X_2 - \overline{X})^2 + \ldots (X_N - \overline{X})}{N - 1}}$$

A fundamental statistical concept is that one can never be 100% sure that the average concentration of a set of analyses falls within a certain range. The most one can state is

that they are "80% confident that the average value falls within a certain range," or that they are "95% confident that the average concentration falls within a certain range," or some other degree of confidence. The "confidence limit" is used to define the range of values for the specified degree of confidence.

The confidence limit on the data is represented by the following equation:

$$\text{Confidence Limit} = \pm \frac{\tau \sigma}{\sqrt{N}}$$

τ values are provided in a variety of statistic texts and publications. The values depend on two factors: (1) the number of samples taken and (2) the degree of confidence the statistician wishes to apply. SW-846 uses a τ statistic (Table 9-2) based on a 80% confidence limit. As stated earlier, this means the statistician can say, with an 80% degree of confidence, the true average concentration is within the limit shown. For instance, if the average concentration is 5 mg/kg and the confidence limit is plus or minus 1 mg/kg, the statistician can be 80% sure the true average concentration is between 4 and 6 mg/kg. However, if the statistician wishes to be 95% confident of the range of the true average concentration, he/she must use the τ factor for a 95% confidence limit. Using this t value, the statistician can be 95% confident the true average concentration is between 3.38 and 6.68 mg/kg.

Lockformer has volunteered to use the more conservative 95% confidence interval to assure Lockformer and the USEPA that, at the 95% confidence level, RAOs have been met in each of the 10 sub-areas.

Two examples of hypothetical results of the sampling are provided below to show how the statistics will be applied. In both cases, the confidence limit is calculated using the τ statistic for 12 observations at the 95% confidence level.

Sample #	TCE Results (mg/kg)	
	Example 1	Example 2
1	5.6	6.8
2	8.2	7.5
3	3.0	9.8
4	4.0	7.9
5	9.6	10.6
6	8.2	8.8
7	5.3	7.5
8	4.0	3.8
9	7.8	9.8
10	6.3	4.8
11	9.0	7.9
12	7.9	8.6
Average	6.58	7.82
Confidence Limit	±1.38	± 1.27
Range of True Average Values at 95% Confidence	5.20-7.96	6.55-9.09

Even though the average TCE concentration is less than 8.9 mg/kg in both examples, there is a 95% confidence level that the true average concentration is less than 8.9 mg/kg only in Example 1. Therefore, the area represented by the 12 samples collected from the four confirmatory borings in Example 2 would undergo additional treatment, and a new set of confirmatory samples would be obtained after the additional treatment.

5.2 MASS WASTE SAND AND GRAVEL UNIT

The basic approach described in Section 5.1 will be followed for the Mass Waste Sand and Gravel Unit. After the further investigations are complete, the remediation area within the Mass Waste Sand and Gravel Unit will be defined, and the SVE remediation system will be installed appropriately. At a later time (to be approved by the USEPA), a confirmatory sampling program will be implemented. The exact nature of this confirmatory sampling program will be described in a technical memorandum submitted to USEPA and approved by the OSC. This confirmatory sampling technical

memorandum will include sampling outside the perimeter of the SVE treatment zone. The general nature of that confirmatory sampling program will be based on the approach described below.

For demonstration purposes, it will be assumed the area to be remediated is that shown in Figure 4.2-4. Forty confirmatory boring locations will be identified. These locations will be chosen so that they are as far from the SVE extraction wells as practical. The area shown on Figure 4.2-4 will be subdivided into approximately eight sub-areas. Each sub-area will encompass five boring locations. Two samples will be obtained from each boring: one at the highest PID reading in the upper half of the Unit and one at the highest PID reading in the lower half of the Unit. Each of the eight sub-areas will therefore contain 10 samples.

The same statistical approach used in Section 5.1 will be used to determine whether, at a 95% confidence level, the RAOs have been met in the Mass Waste Sand and Gravel Unit. Since the statistical analysis will be applied to sub-areas containing 10 samples, the values of $N = 10$ and $\tau = 2.26$ will be used.

If any of the eight sub-areas show VOC concentrations with an average concentration (at the 95% confidence level) exceeding the RAOs, that area will continue to be remediated until the RAOs are achieved.

5.3 Vapor Degreaser Excavation

The statistical procedures outlined in Sections 5.1 and 5.2 above will not be utilized for confirmation sampling related to the excavation of the area around the former vapor degreaser in the Lockformer facility building. Instead, sidewall and base sampling of the excavation will be performed. The sidewall and base samples will be acquired on

approximately 20-foot centers to develop a sampling grid over the exposed excavation sidewalls and base.

SECTION 6

6.0 PERMITTING

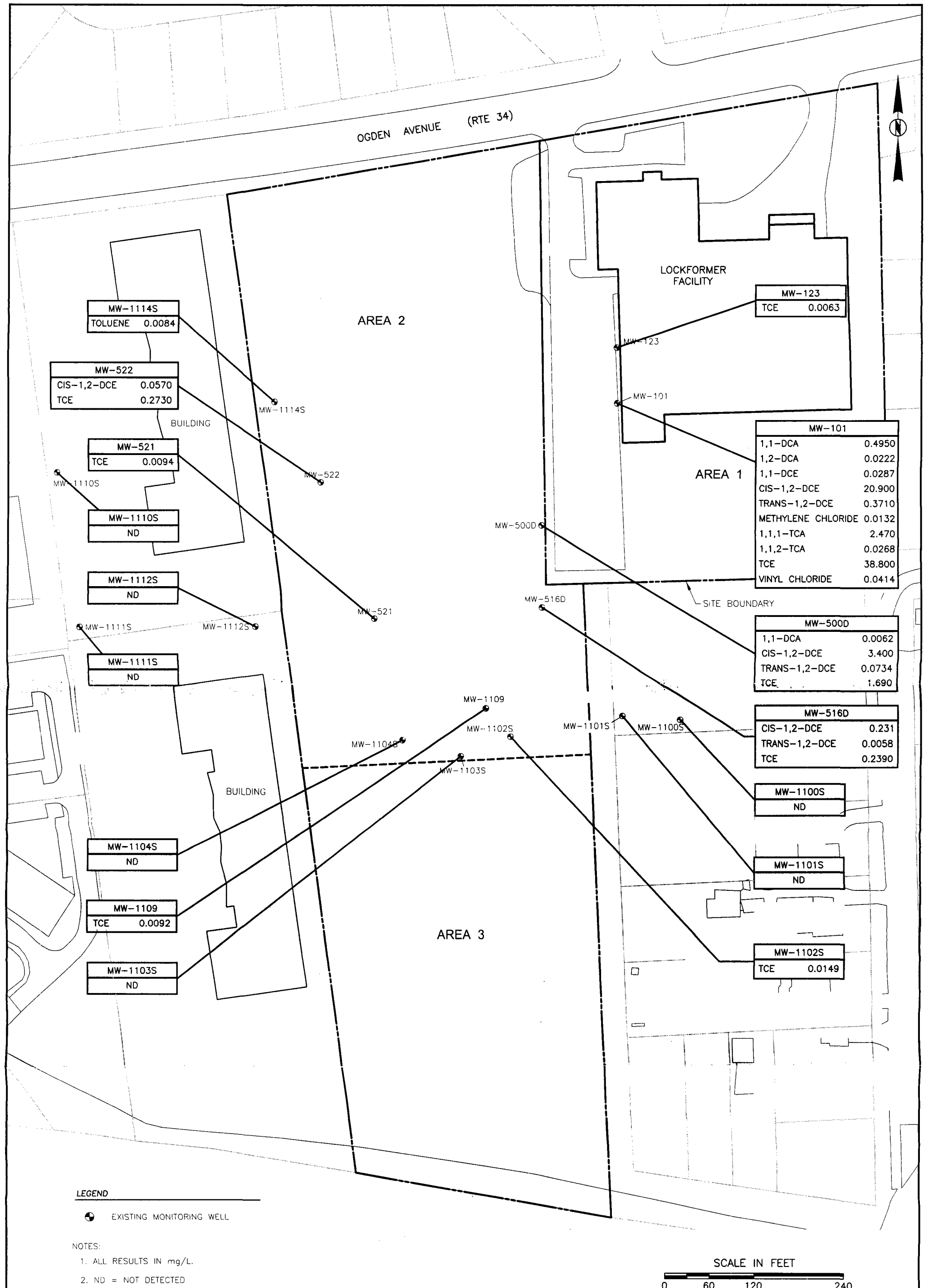
A State of Illinois Construction Permit (APC 200 Rev 8/99) will be prepared for the combined ERH and SVE system. The permit will include the data and information on the process emission source (APC 220 Rev 1/22/77).

Lockformer has approval from DuPage County Public Works for discharging water treated by activated carbon that is generated by either the ERH or SVE systems.

Lockformer will also check with the Village of Lisle to determine if any building or construction permits are required.

Copies of all permits and any other such approval letters will be provided to USEPA as they are received by Lockformer.

FIGURES



CHECK BY	
DRAWN BY	BCP
DATE	6-24-02
SCALE	AS SHOWN
CAD NO.	65263-08i
PRJ NO.	65263.01

MOST RECENT GROUNDWATER SAMPLING RESULTS FROM THE FILL/TILL AND MASS WASTE UNIT MONITORING WELLS IN AREAS 1 AND 2

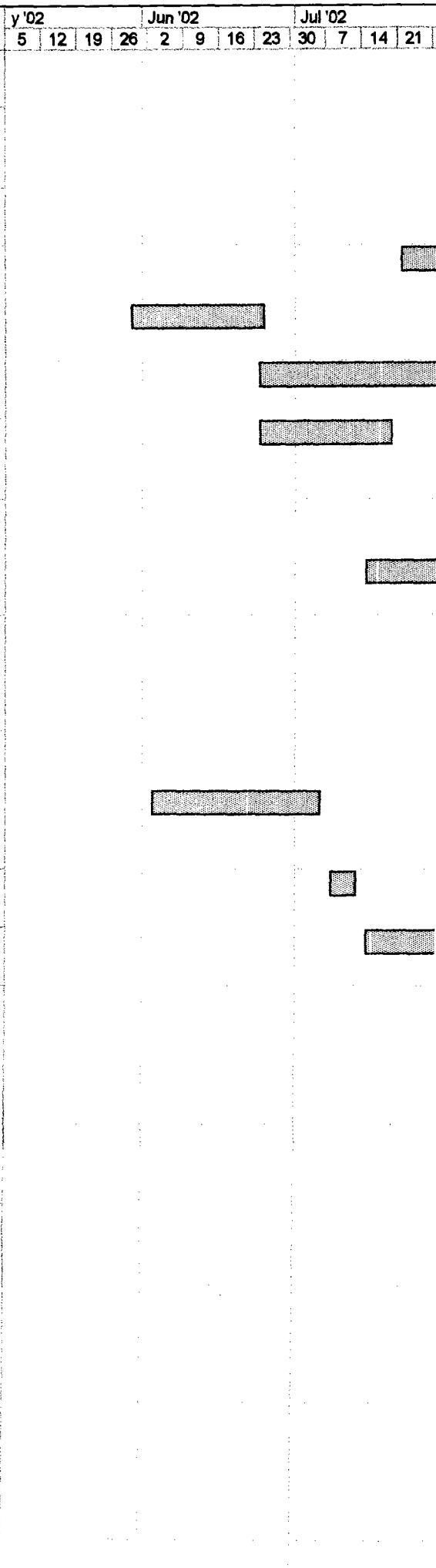
THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 6.1.2-1

SECTION 7

ID	Task Name	Start	Finish
1	**RAWP Approval by USEPA**	Tue 9/10/02	Tue 9/10/02
2	Revised Lockformer Work Plan Issued	Fri 9/20/02	Fri 9/20/02
3	**ADDITIONAL INVESTIGATIONS**	Mon 7/22/02	Mon 7/22/02
4	Additional Area 1 and 2 Soil Investigations	Mon 7/22/02	Fri 10/11/02
5	Prep Work for Area 3 Investigations	Thu 5/30/02	Mon 6/24/02
6	Additional Area 3 Soil Investigations	Mon 6/24/02	Fri 9/13/02
7	Additional Area 3 Groundwater Monitoring Well Installation	Mon 6/24/02	Fri 7/19/02
8	Additional Drainage Way Investigations	Mon 9/16/02	Fri 9/27/02
9	Area 3 Groundwater Monitoring Well Sampling	Mon 7/15/02	Fri 8/9/02
10	Delineation Sampling Results to EPA	Fri 9/27/02	Fri 9/27/02
11			
12	**SOIL VAPOR EXTRACTION SYSTEM**	Tue 9/10/02	Tue 9/10/02
13	SVE Pilot Test Extraction Well and Monitoring Probe Installation	Mon 6/3/02	Fri 7/5/02
14	SVE Pilot Test	Mon 7/8/02	Fri 7/12/02
15	SVE Pilot Test Analysis	Mon 7/15/02	Fri 8/9/02
16	Full-Scale SVE System Design	Mon 8/12/02	Fri 10/11/02
17	ERH and SVE Remediation System Design Technical Memorandum Issued to EPA	Fri 10/11/02	Fri 10/11/02
18	EPA Comment Period and Finalization of Design Technical Memorandum	Fri 10/11/02	Fri 10/25/02
19	Revise Health & Safety Plan to Include SVE Operational Concerns	Mon 10/28/02	Mon 11/4/02
20	Installation of SVE Extraction Wells	Mon 12/2/02	Fri 12/20/02
21	Equipment & Process Piping Installation	Mon 12/23/02	Fri 1/10/03
22	SVE System Testing and Startup	Mon 1/13/03	Fri 1/24/03
23	Area 1 & 2 SVE Remediation	Mon 1/27/03	Fri 8/27/04
24	**ELECTRICAL RESISTIVE HEATING**	Tue 9/10/02	Tue 9/10/02



SECTION 8

8.0 PROJECT MANAGEMENT

United States Environmental Protection Agency – On-Scene Coordinator

Mr. Steven Faryan will function as the On-Scene Coordinator for the USEPA on this project. All discussions, requests, and reporting, including monthly progress reports, technical memoranda, requests for completion approval, and final reports will be directed to Mr. Faryan or his designee.

Clayton Project Coordinator

Mr. Ron St. John will serve as the Project Coordinator for Lockformer. Mr. St. John will be responsible for Lockformer's project administration, and the overall project management, coordination and reporting to USEPA.

Lockformer Project Manager

Mr. J.R. Svehla will be the Lockformer Project Manager for this project. He has general oversight and project management responsibilities. He is responsible for completing the project to the satisfaction of the Agency.

Clayton Field Project Manager

Mr. William Elwell will serve as the Clayton Field Project Manager. In his role as Field Project Manager, Mr. Elwell will be responsible for coordination of all investigation and remediation activities. He will be responsible for implementation, scheduling, and integration of the various technical disciplines required during activities in the field.

Clayton Project Quality Control Officer

Dr. Hank Mittelhauser will serve as the Project Quality Control Officer. Dr. Mittelhauser will provide general oversight and guidance to the Clayton management team. He will review the findings and evaluations of the project.

THERMAL Managers

Mr. Greg Beyke will be the lead Engineer, Jerry Wolf will be the THERMAL Project Manager, and Tom Powell will be the Site Manager for the ERH phase of the project.

Analytical Laboratory Project Manager

Mr. William Mottashed will serve as the First Environmental Laboratories, Inc. (First) Project Manager. Mr. Mottashed will be responsible for coordinating laboratory analyses and will provide an overview of final analytical reports.

Analytical Laboratory QA/QC Officer

Ms. Lorrie Franklin will serve as the First Laboratory QA/QC Officer. Ms. Franklin will be responsible for overview of laboratory QA/QC procedures, overview of QA/QC documentation, conduct of detailed audits, approval of laboratory corrective actions (if required), technical representation of laboratory QA procedures, and will provide an overview and approval of final analytical reports.

SECTION 9

Clayton
GROUP SERVICES

Health and Safety Plan

Lockformer
711 W. Ogden Avenue
Lisle, Illinois

William S. Elwell Site Health and Safety Officer	4-15-02 Date
Russell J. Chadwick Office Health and Safety Officer	4.15.02 Date
Darren W. Lamsma Alternate Site Health and Safety Officer	4-15-02 Date

CONTENTS

Section		Page
Acronyms		9-v
1.0	**GENERAL INFORMATION AND SCOPE OF WORK**	9-1
1.1	PROJECT DESCRIPTION	9-2
1.2	SITE LOCATION, HISTORY, AND CURRENT CONDITIONS	9-2
1.3	PROJECT SAFETY REQUIREMENTS	9-4
1.3.1	Personnel	9-4
1.3.2	OSHA-Required Training and Medical Surveillance	9-6
1.3.3	First Aid	9-7
1.4	GENERAL GUIDELINES	9-7
1.5	SITE SAFETY MEETING	9-8
2.0	**HAZARD EVALUATION**	9-10
2.1	SIGNS AND SYMPTOMS OF ACUTE EXPOSURE	9-10
2.2	COLD STRESS	9-11
2.3	HEAT STRESS	9-12
2.4	HEAVY MACHINERY	9-13
2.5	NOISE	9-14
2.6	LOCK OUT / TAG OUT PROCEDURES	9-15
2.7	EARTH MOVING / EXCAVATION	9-15
3.0	**SITE MONITORING AND ACTION LEVELS**	9-17
3.1	MONITORING FREQUENCY	9-17
3.2	ACTION LEVELS	9-18
4.0	**ONSITE CONTROL**	9-19
4.1	SITE COMMUNICATION	9-19
4.2	SAFETY ZONES AND ACCESS CONTROL	9-19
4.3	PERSONAL PROTECTIVE EQUIPMENT	9-20
4.4	ADDITIONAL EMERGENCY AND SAFETY EQUIPMENT	9-21
4.5	DECONTAMINATION	9-21
5.0	**CONTINGENCY AND EMERGENCY PROCEDURES**	9-23
5.1	MEDICAL EMERGENCY RESPONSE PLAN	9-23
5.2	FIRE AND EXPLOSIONS	9-25
5.3	CHEMICAL EXPOSURE FIRST AID	9-26
5.4	UNFORESEEN CIRCUMSTANCES	9-27
5.5	LIST OF EMERGENCY TELEPHONE NUMBERS	9-27

CONTENTS
(Continued)

Section		Page
6.0	**CONFINED SPACE ENTRY**	9-29
7.0	**SPILL CONTAINMENT PROGRAM**	9-30
8.0	**REFERENCES**	9-31

FIGURES

1 Site Location Map
2 Site Layout Map
3 Emergency Route to Advocate Good Samaritan Hospital

TABLES

1 Recommended Work Breaks During Cold Weather for a Four-Hour Work Period
2 Recommended Minimum Breaks for Work Performed in Protective Clothing during Hot Weather
3 Levels of Personal Protective Equipment

ATTACHMENTS

A Tailgate Meeting Minutes Form
B MSDS and CHRIS Sheets
C Site Sign In Log
D Exclusion Zone Entry/Exit Log
E Bloodborne Pathogen Training Record

ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
CHRIS	Chemical Hazards Response Information System
Clayton	Clayton Group Services, Inc.
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
eV	Electron-volt
HASP	Health and Safety Plan
MSDS	Material Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
OHSO	Office Health and Safety Officer
OSHA	Occupational Safety and Health Administration
PHSO	Project Health and Safety Officer
PID	Photoionization detector
PM	Project Manager
PPE	Personal protection equipment
PPM	Parts per million
SHSO	Site Health and Safety Officer
SRH	Soil Resistive Heating
SVE	Soil Vapor Extraction
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	1,2-Dichloroethene
USCG	United States Coast Guard

1.0 GENERAL INFORMATION AND SCOPE OF WORK

The Lockformer Company (Lockformer) has retained Clayton Group Services, Inc. (Clayton) to conduct further site investigation and remediation activities at the Lockformer facility located at 711 W. Ogden Avenue in Lisle, Illinois (site). Figure 1 shows the location of the site.

This Health and Safety Plan (HASP) describes the general procedures that are to be implemented to protect Clayton and its subcontractors involved with field investigation activities (as described in the Lockformer Work Plan) to be conducted at the site. Additional health and safety procedures related to the remediation activities discussed in the Lockformer Work Plan will be addressed during the detailed design of the remediation systems, and attached to this HASP as technical memoranda prior to initiation of remediation activities.

Several chemical, physical, and biological hazards will be present during investigation activities. The primary chemical hazards may result from exposure to trichloroethene (TCE), tetrachloroethene (PCE), and 1,2-dichloroethane (DCE) soil or groundwater at the site. Physical hazards include, but are not limited to, heavy equipment noise, slips, trips, falls, utilities, and heat and cold stress. Routine field activities should not involve exposure to biological hazards, such as body fluids. However, exposure to biohazards such as spiders, bees, snakes, etc. is possible during some field activities. An evaluation of the hazards that will be present during field activities is presented in Sections 2.0 through 2.7.

1.1 PROJECT DESCRIPTION

The objective of the investigation phase of this project is to obtain additional information regarding the presence of volatile organic compound (VOCs) in the soil and groundwater at the site. The principal field activities to be conducted include:

- Drilling soil borings – Soil borings will be completed by direct-push, rotary hollow stem auger, and/or Rotasonic drilling techniques.
- Collecting soil samples from borings – Soil samples will be collected by placing an appropriate amount of soil into laboratory-supplied jars.
- Installing groundwater monitoring wells – Groundwater monitoring wells will be installed at the southern portion of the site to facilitate the collection of groundwater samples.
- Monitoring Well Development – Monitoring wells will be developed by using a submersible pump or disposable bailers.
- Collecting groundwater samples – Groundwater samples will be collected via low flow techniques.
- Surveying – A professional licensed surveyor will survey all soil boring and well locations.

Additional activities will include measuring water levels, equipment decontamination, and handing investigation-derived materials.

1.2 SITE LOCATION, HISTORY, AND CURRENT CONDITIONS

The site is located in south-central DuPage County, Illinois (Figure 1). The site comprises an east and west parcel that encompass a total of 18.5 acres (Figure 2). The east parcel, which has commonly been referred to as the Lockformer parcel, is identified as Area 1. Area 1 comprises approximately 6.54 acres and is occupied by a single

structure with associated landscaped and drive/parking areas. The structure is utilized by Lockformer as a manufacturing facility for production of sheet metal processing equipment and roll-forming machines. The west parcel, which has commonly been referred to as the MetCoil parcel, has been divided into two separate areas. The northern portion of the MetCoil property will be referred to as Area 2, and the southern portion will be referred to as Area 3. The west parcel comprises approximately 11.96 acres of undeveloped land. The site is located in a mixed area of industrial, commercial, and residential use, approximately 1,300 to 1,800 feet west of Interstate 355.

The site is bounded to the north by Ogden Avenue, beyond which exists a residential subdivision; to the east by the Bill Kay car dealership; to the south by a surface water retention basin servicing the Bill Kay property (beyond which exists single-family homes) and the Burlington Northern railroad (beyond which exists St. Joseph's Creek and residential homes); and to the west by a multi-unit commercial building.

Soil impacted by TCE was first discovered in the fall of 1991 during underground utility (water line) repair work conducted along the west side of the Lockformer manufacturing building. The TCE impacts to soil and groundwater in Areas 1 and 2 are believed to be the result of filling operations of the roof-mounted TCE tank formerly located along the west side of the manufacturing building. The location of this tank can be reviewed in Figure 2.

A great deal of data has been collected at the site to date. Recent investigations in Areas 1 and 2 have primarily focused on the releases that resulted from the manufacturing processes associated with (and potentially impacting the area under and around) the facility building and releases associated with the TCE fill pipe. The Area 3 investigations have been primarily focused along the drainage ways and the sanitary sewer system.

1.3 PROJECT SAFETY REQUIREMENTS

1.3.1 Personnel

All Clayton personnel and subcontractors involved in the field activities (see Section 1.1) are required to abide by the provisions of this Plan. All onsite operations are expected to comply with federal, state, and local regulations and, as a minimum, must meet requirements of 29 CFR Part 1910.120.

Clayton personnel responsible for the health and safety of Clayton employees on this project include:

- Office Health and Safety Officer (OHSO): Russell J. Chadwick
- Site Health and Safety Officer (SHSO): William S. Elwell
- Alternate SHSO: Darren W. Lamsma
- Project Manager: Ron St. John

The following individuals located onsite will have the authority and responsibility to change levels of protection and, when necessary, shut down the operation:

- Site Health and Safety Officer
- Alternate Site Health and Safety Officer

PERSONNEL ROLES

Office Health and Safety Officer:

The Office Health and Safety Officer (OHSO) has overall responsibility for establishing appropriate health and safety procedures. The OHSO is responsible for documenting that employees have received proper health and safety training and have participated in a

medical surveillance program. The OHSO will develop any new health and safety protocols and procedures necessary for new field operations or new situations.

Site Health and Safety Officer:

The Site Health and Safety Officer (SHSO) is responsible for documenting that the designated procedures and health and safety protocol are implemented in the field. The SHSO may be required to perform various types of area or personnel monitoring for purposes of verifying worker exposure and proper selection of personal protective equipment (PPE). The SHSO should be consulted before any changes in the recommended procedures or levels of protective clothing are made. The SHSO will conduct tailgate meetings to discuss and review site hazards and safety protocols at the beginning of each workweek, when a new field activity is initiated, or new personnel arrive onsite. The SHSO will be responsible for informing the OHSO of changes in field operations or conditions that might warrant new health and safety protocols or procedures. The SHSO will also maintain a copy of all field operating procedures, standard operating procedures (SOPs), site health and safety plans, sign-in/sign-out logs, and exclusion zone entry/exit logs onsite during field activities.

Alternate Site Health and Safety Officer:

The Alternate Site Health and Safety Officer (ASHSO) is responsible for performing the duties of the SHSO in his/her absence. The ASHSO is also responsible for any health and safety task delegated to him/her by the SHSO.

Project Manager:

The Project Manager (PM) has primary responsibility for fulfillment of the terms of the contract. He must oversee operations and ensure all legal and safety requirements are met. It is his duty to keep the project on schedule and within budget, and to communicate with the client regarding progress toward the specified project goals.

1.3.2 OSHA-Required Training and Medical Surveillance

Clayton employees and subcontractors who will be on the site will have received a minimum of 40 hours of hazardous waste site investigation health and safety training, an annual 8-hour Refresher Course (as required in 29 CFR 1910.120), and be a participant in a medical surveillance program.

Under the OSHA Blood Borne Pathogen (BBP) standard, Clayton evaluated the working conditions for the field activities and specific tasks where personnel may encounter human blood, body fluids, or tissues. Following categories outlined in OSHA's original proposal, the field activities associated with this project are classified as Category II. Category II includes tasks that routinely involve no exposure to human blood, body fluids, or tissues, but where, as part of their employment, personnel may encounter potential exposure to BBPs. Site-specific examples include, but are not limited to, sampling with the potential for exposure to body fluids (i.e., sampling along sanitary sewer lines) and situations where first-aid and CPR-trained employees would respond to an in-house emergency. Training for Category II personnel will include:

1. Copies of the OSHA BBP standard (29 CFR 1910.1030).

2. Explanations of

    - Epidemiology and symptoms of bloodborne diseases
    - Modes of transmissions
    - Different categories and tasks
    - Methods for recognizing potential exposures
    - Methods to prevent or minimize exposure
    - Labels required

3. Information on the types, proper use, location, removal, handling, decontamination, and disposal of PPE.

4. Information on the Hepatitis vaccine.

5. Actions to take in an emergency.
6. Procedures to follow in the event of an exposure incident, including spills.
7. Information on post-exposure evaluation and follow-up after an exposure incident.
8. Questions and answers.

Training will be conducted by a staff member knowledgeable in the subject. This individual will be appointed by the OHSO. Training records including dates of sessions, contents, name and qualifications of person(s) conducting training, and names and job titles of persons attending sessions will be maintained by the OHSO and provided as Attachment E.

1.3.3 First Aid

The Clayton SHSO will be immediately advised of any situation requiring more than minor first aid. A first aid kit that meets the requirements of 29 CFR 1926.50, as well as a biosafety kit, will be maintained in each Clayton vehicle onsite; supplies will be replenished by the SHSO as needed. Personnel aware of accidents or injuries will take immediate action to ensure that appropriate first aid is administered and will report the incident to the SHSO. The majority, if not all, of the Clayton personnel are certified and trained in first aid/CPR.

1.4 GENERAL GUIDELINES

The following personal hygiene and work conduct guidelines are intended to prevent injuries and adverse health effects. These practices establish general precautionary measures for reducing the risks associated with potentially hazardous work at site operations.

- All personnel are required to sign in upon arrival onsite and sign out at their time of departure in the daily sign in log. The daily sign-in log (Attachment C) will be located at the primary meeting location.

- Eating, drinking, chewing gum or tobacco, taking medications, and smoking are prohibited onsite during field activities.

- Avoid direct contact with potentially contaminated substances; to the extent possible do not walk through puddles, pools, drill cuttings, or mud; avoid kneeling, leaning, or sitting on drums or working equipment. Do not place monitoring or sampling equipment on potentially contaminated surfaces.

- Be alert to potentially changing exposure conditions, including changes in wind direction, perceptible odors, unusual appearances of soil or groundwater, etc.

- Be alert to fatigue, heat or cold stress (Tables 1 and 2, respectively), and other environmental factors influencing the normal caution and efficiency of personnel.

- Onsite personnel will establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment (equipment seriously impairs speech communications).

- Always use an appropriate level of personal protective gear. Lesser levels can result in unnecessary exposure; excessive levels of safety equipment can impair efficiency and increase the potential for accidents to occur. Alternative controls such as engineering controls and administrative controls will be considered prior to the use of PPE by the OHSO.

- The "buddy system" will be utilized for all work performed in exclusion zones. All personnel are required to sign in and out of exclusion zones using the exclusion zone entry/exit log (Attachment D). Prior to the commencement of field activities, and whenever the location changes, personnel will be notified of the location of the exclusion zone entry/exit log.

1.5 SITE SAFETY MEETING

Site safety orientation/training meetings (briefings) will be convened (1) before the field team begins work at the site; (2) when there are modifications to the HASP that are applicable to the field personnel; and (3) when additional personnel or subcontractors

begin work. Meetings will be attended by personnel involved in carrying out the project and will be presided over by the SHSO or his/her designee.

The meeting agenda will include the following minimum activities:

- Review HASP with attendees.
- Distribute any HASP modifications.
- Collect attendees' signatures acknowledging receipt and understanding of the site and HASP and their agreement to comply with the plan (Tailgate Meeting Minutes Form, Attachment A).

2.0 HAZARD EVALUATION

Available data for the site indicate that potential chemical hazards may be present in various environmental media onsite. The following summarizes the potential chemical and physical hazards associated with each of the planned field activities:

Field Activity/*Risk Level*	**Potential Hazard**
Soil Boring and Soil Sampling *Moderate*	CHEMICAL: Direct contact with contaminants in soil; inhalation or ignition of escaping vapors or gases; inhalation of windblown dust. PHYSICAL: Heat/cold stress; heavy machinery noise; trips, slips, and falls; contact of drill rig with underground lines and of drill rig mast with overhead electrical lines.
Installing and Developing Monitoring Wells *Moderate*	CHEMICAL: Direct contact with contaminants in soil, groundwater; inhalation or ignition of escaping vapors or gases; inhalation of windblown dust; PHYSICAL: Heat/cold stress; heavy machinery noise; trips, slips, and falls; contact of drill rig with underground lines and of drill rig mast with overhead electrical lines.
Groundwater Sampling *Moderate – Low*	CHEMICAL: Direct contact with contaminants in groundwater; inhalation or ignition of escaping vapors or gases in wells PHYSICAL: Heat/cold stress; trips, slips, and falls.
Surveying *Low*	CHEMICAL: Inhalation of windblown dust PHYSICAL: Trips, slips, and falls.

NOTES:

For additional information regarding the chemicals of concern, refer to the MSDS sheets included as Attachment B.

2.1 SIGNS AND SYMPTOMS OF ACUTE EXPOSURE

The majority of current tasks slated for this project involve collection of soil and groundwater. These tasks could involve possible exposure to substances that may be hazardous to the health of site personnel. The risk of exposure via inhalation and skin

contact is likely greater than ingestion. None of the suspected contaminants onsite are expected to volatilize in quantities great enough to permit dermal absorption of the gas.

The following chemicals of concern have been identified from previous subsurface investigations at the site. The signs and symptoms that may occur (function of concentration) as a result of exposure to these potentially hazardous constituents at the site are listed below:

- *Trichloroethene (TCE):* Symptoms of exposure include irritation of eyes and skin, headache, vertigo, visual disturbance, fatigue, giddiness, tremors, somnolence, nausea, vomiting, dermatitis, cardiac arrhythmias, paresthesia, and liver injury. The target organs include the eyes, skin, respiratory system, heart, liver, and central nervous system.

- *Tetrachloroethene (PCE):* Symptoms of exposure include irritation of eyes, nose, and throat, nausea, flushed face and neck, vertigo, dizziness, uncoordination, headaches, somnolence, skin erythema, and liver damage. The target organs include the eyes, skin, respiratory system, liver, kidneys, and central nervous system.

- *1,2-Dichloroethene (DCE):* Symptoms of exposure include irritation of eyes and respiratory system, and central nervous system depression. The target organs include eyes, respiratory system, and central nervous system.

The above information is from the *NIOSH Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services, June 1997.

2.2 COLD STRESS

When temperatures are expected to be in the 40s or lower, especially during high winds, cold stress will be considered. Cold stress presents several different syndromes: mild hypothermia and profound hypothermia, frostbite, and chilblains.

The signs and symptoms of hypothermia include shivering, poor coordination, slowed pace, irritability, slurred speech, fatigue, and poor judgement. More severe hypothermia can result in stupor, collapse, and eventually death.

The signs and symptoms of frostbite include stiffness and numbness in body parts (i.e., nose, ears, toes, fingers, etc.), and a noticeable grayish or whitish skin color.

Workers will be encouraged to wear layers of protective, insulated clothing; keep hands, head, and feet covered and warm; keep clothes dry; eat high energy foods; and drink plenty of water.

Warm shelter will be provided out of the wind for rest periods. Crews will be encouraged to get warm and dry during lunch periods. Warm liquids with caloric value will be provided, and ample water is essential. Dehydration is a factor in hypothermia and frostbite, and will be avoided.

Table 1 describes the recommended breaks for a four-hour work period during periods of cold weather.

The medical emergency response procedures for victims who may have developed cold stress are outlined in Section 5.0.

2.3 HEAT STRESS

When activities may require the use of coveralls and/or respirators, certain precautions will be required to reduce the likelihood of heat fatigue, heat exhaustion, and heat stroke. Heat stroke, in particular, is a life-threatening condition. All employees will be alert to the symptoms of heat exhaustion, which include extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating, and pale clammy skin.

Heat stroke or the stage immediately preceding it includes bright red skin, or a bluish face or conjunctiva, tremors leading to convulsions, delirium, struggling, bright red chest area, hot skin, headache, and vertigo. Collapse, unconsciousness, coma, and death may follow.

Workers will be encouraged to drink liquids from the time they wake up and frequently during the workday. Table 2 describes the recommended minimum breaks for work performed in protective clothing during hot weather.

The medical emergency response procedures for a victim who may have developed heat stress are described in Section 5.0.

2.4 HEAVY MACHINERY

Heavy machinery will be onsite during drilling activities, and particular care will be maintained to avoid accidents. The hazard is increased if personal protective gear that reduces mobility is required. Many opportunities for accidents exist while working near drilling rigs. In general, workers will be aware of the danger of:

- Falling or swinging objects suspended from winches or cables.
- Drilling hardware breaking and flying free, especially while the rig is operating near its limit.
- Contacting overhead electrical lines with the drill rig mast.
- Exploding hoses.
- Entangling personal protective equipment with moving machinery (i.e., spinning augers, etc.).
- Slips, trips, and falls on drilling equipment (e.g., augers, etc.).

Each drilling rig and drilling method presents different specific hazards. Drilling rig and drilling method specific hazards will be discussed in the site safety meeting prior to initiating work and/or if a new method or drilling rig will be used at the site.

The onsite drilling supervisor is responsible for ensuring that the drill rig and the drilling site are ready for safe work conditions. He/she is responsible for ensuring that safe working procedures are followed.

The area utility locator will be contacted prior to drilling to determine the location of all suspected utility lines onsite. The use of a drill rig in the vicinity of electrical power lines, either overhead or buried, requires that special precautionary measures be taken by all involved in site work operations.

2.5 NOISE

Excessive noise is typically encountered while working with heavy machinery such as drilling rigs. The effects of working in the vicinity of noise include:

- Workers being startled, annoyed, or distracted.
- Physical damage to the ear, pain, and temporary and/or permanent hearing loss.
- Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

Hearing protection will be required for drillers/personnel positioned near drill rigs or when in the immediate vicinity of these types of heavy equipment. Hearing protection will be available onsite (Section 4.4). The effect of occupational exposure to noise is monitored by Clayton or the subcontractor medical surveillance program. Since voice communication may be affected during excessive noise, hand signals may be used in conjunction with voice communication. Hand signals are discussed in Section 4.1.

2.6 LOCK OUT / TAG OUT PROCEDURES

Site personnel will not be in situations requiring the use of lock out / tag out procedures during field activities; therefore, a description of the procedures is not required.

2.7 EARTH MOVING / EXCAVATION

The current remedial design does not involve earthmoving/excavation activities, but in the instance that it may have to be utilized, particular care will be maintained to avoid accidents, and the contractor will comply with the requirements specified in 29 CFR 1926, Subparts "O" and "P."

The area utility locator will be contacted to determine the location of all suspected utility lines onsite. Earthwork/excavation in the vicinity of electrical power lines, either overhead or buried, requires special precautionary measures by all involved in site work operations.

The SHSO and earthmoving/excavation subcontractor's foreman are responsible for ensuring that the necessary equipment and work site are ready for safe working conditions. They are also responsible for ensuring that safe working procedures summarized below are followed:

- All earthmoving/excavation equipment will be operated by qualified personnel following general safe operating procedures in terms of equipment tolerance, clearance, capacities, etc.
- Equipment shall be maintained properly, and periodically inspected to ensure safe operation.
- No unauthorized persons will be allowed within the limits of operations while any earthmoving/excavation equipment activities are going on.

- Any open excavation area left unattended during the day or overnight will be properly secured with caution tape from casual access.

3.0 SITE MONITORING AND ACTION LEVELS

Air monitoring will be performed, based on the chemicals of concern identified during previous site investigations; in order to ensure that appropriate engineering controls and personal protective equipment are adequate for the tasks being performed. During activities in which atmospheric monitoring is required, a photoionization detector (PID) with a 10.6 electron-volt (eV) lamp will be used. Most potentially hazardous volatile organic compounds are readily detectable with a PID instrument. The PID will be calibrated at the beginning of each day.

3.1 MONITORING FREQUENCY

The following chart summarizes the initial frequency of air monitoring with the PID for each of the principal field activities.

Field Activities	Initial Location and Frequency of Monitoring
Soil boring and soil sampling	Check borehole and breathing zone periodically during drilling/augering for escaping vapors. Monitor during the handling of the sample.
Monitoring well installation and development.	Check borehole and breathing zone periodically during drilling for escaping vapors.
Groundwater sampling and measurement	Check well and breathing zone initially after opening well.

Air monitoring will be performed using a PID with an 10.6 eV probe, which exceeds the ionization potentials of the chemicals of concern. Air monitoring may be decreased or increased in frequency depending on the conditions identified during field activities.

3.2 ACTION LEVELS

Unless otherwise stated, the following PID action levels are for the breathing zone during the investigation and remediation system installation phase of the project. Action levels are based on the lowest Time Weighted Average (TWA) for the chemicals of concern identified during previous site investigations (Tetrachloroethene [PCE], trichloroethene [TCE], and 1,2-dichloroethylene [DCE]).

PID Reading (in ppm)	Personal Protection Level
Non-intrusive activity	Level D
Background < PID<25	Level D
25 < PID <250	Level C organic vapor cartridges
250 ≤ PID	Evacuate work area, allow to vent for 10 minutes, and then monitor again. If still above action level, evacuate area and contact SHSO.

NOTES:

The action levels were obtained from the *NIOSH Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services, June 1997.

ppm = parts per million

Readings taken in the breathing zone will be documented in a field logbook. Respirators will be donned if Level C action levels are exceeded; respirators may be removed once Level C action levels are no longer exceeded. If the action levels for evacuation of the work area are exceeded, work will be suspended in the immediate vicinity of the borehole for 10 minutes in order to allow the excavation to vent. After the 10-minute venting period, air in the breathing zone will be monitored by a Clayton field supervisor wearing a respirator and approaching the hole from the upwind direction. If the PID indicates organic vapor concentrations are less than the action levels, work will continue; otherwise, the hole will be allowed to vent for 10 additional minutes, and the process will be repeated. If air monitoring results in the breathing zone continue to exceed action limits, the work area will be evacuated.

4.0 ONSITE CONTROL

4.1 SITE COMMUNICATION

When voice communication is not possible, field investigators may utilize the following signals:

- Waving hand toward the body in a "come here" gesture – COME HERE.
- Pushing one or both hands away from the body in a "back up" gesture – BACK UP.
- Extending both arms, hands open, palms forward, and stopping them abruptly, directly in front of the torso at shoulder level – STOP RIGHT WHERE YOU ARE.
- Throwing the right clenched fist with extended right thumb abruptly over the right shoulder in a "let's get out of here" gesture – LET'S GET OUT OF HERE!
- Thumbs up – YES/EVERYTHING'S OKAY.
- Thumbs down – NO/THIS DOESN'T LOOK GOOD.
- Hands grasping throat – I'M CHOKING/OUT OF AIR.
- Hands of top of head – I NEED ASSISTANCE.

4.2 SAFETY ZONES AND ACCESS CONTROL

Control boundaries for site work will be established and will consist of the Exclusion Zone, the Decontamination Zone, and the Clean Zone. The following is a description of each control zone:

- The Exclusion Zone will be the area within 10 feet around an onsite monitoring well, borehole, or sampling point.

- The Decontamination Zone (contamination reduction where decontamination takes place) will be the area from the perimeter of the Exclusion Zone to a 15- to 20-foot radius.

- The Clean Zone (support area where workers should not be exposed to hazardous conditions) will be the area beyond the Decontamination Zone.

Movement of equipment and personnel among these zones should be minimized to prevent cross-contamination from contaminated areas to clean zones.

Site personnel will be briefed by the SHSO as to the location of work areas and Exclusion Zones, decontamination area, telephone(s), eye wash, fire extinguisher(s), prevailing wind direction, utility lines (if not marked onsite), and first aid kit(s).

Potable water for health and safety procedures and decontamination procedures will be brought to the site as needed by site personnel and will be available in the Decontamination Zone and in the Clean Zone.

4.3 PERSONAL PROTECTIVE EQUIPMENT

All site investigatory activities will begin and will likely be completed using Level D PPE. The PPE will be upgraded to Level C if breathing zone atmosphere exceeds Level C action levels. In instances of continued windblown dust, Level C 1 HEPA filters shall be used. The specific PPE required for Level C and D is outlined in Table 3. Hearing protection will be available and is recommended for use during drilling operations.

Where air-purifying respirators are deemed necessary, organic vapor cartridges appropriate for use with the substances and concentrations anticipated will be worn (Level C). The make of the respirator and cartridge varies for each person depending on

the results of individual fit-tests. Cartridges will be replaced at the start of each workday and if or when breakthrough occurs. Changes to the levels of protection will not be made without the knowledge and approval of the SHSO.

A respiratory protection plan is in effect at Clayton. Clayton field personnel have been properly trained in care and maintenance of respirators. Clayton field personnel have been properly fitted and fit-tested according to OSHA regulations. Clayton personnel have been medically evaluated and cleared for respiratory protection use by a licensed physician.

4.4 ADDITIONAL EMERGENCY AND SAFETY EQUIPMENT

Whenever work is conducted, the following equipment will be available at the job site (e.g., Clayton field vehicle, or at a designated location in the Clean Zone):

- Ear plugs, disposable
- An ABC fire extinguisher (inspected annually) for each activity
- First aid kit that meets the requirements of 1926.50
- Biohazard kit as part of bloodborne pathogen prevention and minimization
- Traffic cones, and/or caution tape

In addition, Material Safety Data Sheets (MSDS) or Chemical Hazards Response Information System (CHRIS) Sheets will be available at the site for substances that pose a reasonable health and safety risk to site personnel as listed in Section 2.1. MSDS and CHRIS Sheets are included as Attachment B.

4.5 DECONTAMINATION

All work will be performed in Level D personal protection, and no personal decontamination area will be set up. Should conditions change at the site causing an

upgraded level of protection, an area will be specified, and all workers will be informed of the necessary procedures.

All reusable sampling equipment that comes into contact with site soils, sediments, and surface water will either be steam cleaned or washed with a detergent solution and rinsed with distilled water.

While in Level D, all disposable protective clothing will be disposed of as general refuse. Decontamination of equipment will take place on designated areas onsite. If an upgrade to Level C occurs, all nondisposable protective equipment will be cleaned in a specified contaminant reduction zone prior to leaving the site. The protective equipment will be cleaned with a detergent wash and rinsed with distilled water. Rinsate water will be managed and remain onsite.

5.0 CONTINGENCY AND EMERGENCY PROCEDURES

The nearest telephone will be a Clayton mobile phone. Subcontractors may also have a mobile phone.

The following contingency plans have been developed to deal with major incidents that might occur during field activities. Clayton employees and subcontractors will familiarize themselves with the location of the nearest permanent phone and the designated medical facility. The location of Advocate Good Samaritan Hospital is shown on Figure 3, together with the shortest route (3.78 miles / 11 minutes) from the site to the hospital. The route is as follows:

1. Go east on Ogden Avenue to Main Street.
2. Take Main Street (becomes Highland Ave.) north to Advocate Good Samaritan Hospital.

A copy of the "List of Emergency Telephone Numbers" (Section 5.5) will be carried along with Clayton's and the subcontractors' (if available) mobile phones. Contingency response plans will be reviewed with onsite personnel weekly to promote timely implementation of the contingency plan should one of the events described in the following section occur.

5.1 MEDICAL EMERGENCY RESPONSE PLAN

Should any person visiting or working at the site be injured or become ill, notify the SHSO and initiate the following emergency response plan:

Note: *The anticipated nature of chemical contamination on this project does not present an immediate threat to human health. Other than removal of outer garments and gross contamination, immediate emergency treatment of injuries will take precedence over rigorous personal decontamination.*

1. If able, the injured person will proceed to the nearest available source of first aid. If necessary, wash the injured area with soap and water.

2. If the injury involves foreign material in the eyes, immediately flush the eyes with emergency eye wash solution, and rinse with copious amounts of water at the nearest emergency eye wash station. Obtain or administer first aid as required. If further medical treatment is required, seek medical assistance as discussed below.

3. If the victim is unable to walk, but is conscious, and there is no evidence of spinal injury, escort or transport the injured person to the nearest first aid facility. If the victim cannot be moved without causing further injury, such as in the case of a severe compound fracture, take necessary emergency steps to control bleeding and immediately call for medical assistance as discussed below.

   - If the victim is unconscious or unable to move, **Do Not Move the Injured Person Unless Absolutely Necessary to Save His or Her Life**, until the nature of the injury has been determined.

   - If there is any evidence of spinal injury, do not move the victim. Administer CPR if the victim is not breathing, control severe bleeding, and immediately contact the Advocate Good Samaritan Hospital Emergency Room at 630.275.5900 and advise them of the situation. Otherwise, seek medical assistance as discussed below.

4. If the injury to the worker is related to the physical hazards previously identified in Section 2.0, appropriate first-aid procedures will be instituted as follows:

   - *Hypothermia* - If a worker suffers from hypothermia, medical attention will be sought immediately. The employee will be moved out of the cold, and warm clothing or blankets will be provided. Warming will take place slowly; no food or beverage will be administered.

   - *Frostbite* - Any worker suffering from frostbite will be moved to a warm area immediately. Frostbitten areas of the body will be placed in warm (100 to 105 degrees) water, NOT hot water. Areas of concern will be handled gently and will not be rubbed or massaged. If toes or fingers are affected, gauze will be placed between them after warming them. The injured parts will be loosely bandaged. If the part has been thawed and refrozen, it will be re-warmed at room temperature. If necessary, medical assistance will be sought.

   - *Heat Stroke* - If a worker suffers a heat stroke, medical attention will be sought immediately. The victim will be moved out of the heat and into a cooler area. The victim will be cooled as quickly as possible by immersing him or her in a

cool bath, or wrapping wet sheets around the body. While waiting for an ambulance to arrive, the victim will be watched for symptoms of shock. Nothing will be given orally.

- *Heat Exhaustion* - If any worker suffers from heat exhaustion, he or she will be moved out of the heat and into a cooler place. The victim will lie down with his or her feet up. Clothing will be removed or loosened; cold packs, wet towels, or sheets will be used to cool the skin. One-half glass of water will be administered every 15 minutes if the victim is fully conscious and can tolerate it. During all of these procedures, the victim will be observed for symptoms of shock. If the victim has not recovered within a half hour, or if the victim's condition worsens, medical attention will be sought.

5. If further medical treatment is required and

   (a) The injury is not severe, contact Advocate Good Samaritan Hospital and take the injured party to the hospital by private automobile.

   (b) The injury is severe, immediately call EMS (911). In the interim, call the Advocate Good Samaritan Hospital Emergency Room (630.275.5900) and advise them of the situation.

6. The SHSO will accompany the injured person to the hospital to ensure prompt and proper medical attention. After proper medical treatment has been obtained, the SHSO will notify the OHSO and prepare a written report.

5.2 FIRE AND EXPLOSIONS

In the event of a fire or explosion the SHSO will take the following steps:

1. If the situation is readily controllable, take immediate action to do so.

2. If the situation is uncontrollable, clear personnel working in the immediate area and notify the local Fire Department (911).

3. Notify the OHSO.

Clayton personnel will remain at the scene of the fire until the local fire department arrives. Once professional fire fighting personnel have arrived, Clayton personnel will

remain at the disposal of the fire chief. The SHSO will function as liaison between response personnel in the incident.

If an emergency occurs which requires the evacuation of the site, a hand-held air horn will be activated/blow in several long, successive tones. Once the evacuation tone is sounded, all site personnel will expeditiously leave their work area and report to the primary meeting location. If the primary meeting location is determined to be unsafe, several short, successive tones will be sounded signaling egress to the secondary meeting location. All personnel will be informed of the primary and secondary meeting locations during the weekly tailgate meetings.

Primary Meeting Location:	West Site Entrance along Ogden Avenue
Secondary Meeting Location:	Main Entrance to the Bill Kay Car Dealership, adjacent to site.

5.3 CHEMICAL EXPOSURE FIRST AID

The following procedures will be followed in case of chemical exposure during field activities:

- *Eye contact*: Flush with clean water for 15 minutes or more. Try to flush under the lids. Get medical attention immediately.
- *Inhalation*: Get person to fresh air. Monitor for signs of exposure. Watch for signs of respiratory difficulty. Call EMS. Perform emergency rescue breathing, if appropriate, until relieved by an emergency unit.
- *Skin contact*: Flush area with clean water for at least 15 minutes. If burns are evident, get immediate medical attention. Do not use soap on affected area. BEWARE: Signs and symptoms may develop later due to dermal exposure.
- *Ingestion:* If contaminated materials are ingested, vomiting will not be induced. Medical attention will be sought immediately.

If anyone has been overexposed or has shown or is showing signs of exposure, he/she will be examined by a physician, according to OSHA's 1910.120 (f).

5.4 UNFORESEEN CIRCUMSTANCES

The Health and Safety procedures specified in this plan are based on available data that suggest minimal potential for worker exposure to significant levels of hazardous substances. If substantially higher levels of contamination are encountered in the soil or groundwater, and/or if situations arise that are obviously beyond the scope of the monitoring, respiratory protection, and decontamination procedures specified, work activities will be modified or, if necessary, halted pending discussion with the OHSO and implementation of appropriate protective measures.

5.5 LIST OF EMERGENCY TELEPHONE NUMBERS

Medical Services (EMS)	911
Police/ Fire Department	911 -- Emergency
Advocate Good Samaritan Hospital 3815 Highland Avenue Downers Grove, Illinois	630.275.5900
Poison Control Center	800.942.5969
National Response Center	800.424.8802
IEPA Emergency Response	800.782.7860
Clayton Group Services, Inc. Mr. Ron St. John or Mr. Russell J. Chadwick	630.795.3200
Lockformer Mr. Rian Scheel	630.964.8000
Drilling Company Contact Person (TBD)	To Be Determined

6.0 CONFINED SPACE ENTRY

Site personnel will not be entering any confined spaces during field activities; therefore, confined space entry procedures are not required.

7.0 SPILL CONTAINMENT PROGRAM

Spills requiring a written spill containment program are not anticipated for the proposed activities. Groundwater generated during development or purging of monitoring wells will be collected and staged in a secure area onsite in 55-gallon drums. All drums will be labeled as to their contents and date of origin. Upon receipt of analytical data, the water will be characterized, if necessary. The drummed waters will then be appropriately managed offsite. In the event the water does not require offsite disposal, it will be spread on the site.

8.0 REFERENCES

American Conference of Governmental Industrial Hygienists (ACGIH). *1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,* 1991.

Clayton Environmental Consultants. *Corporate Safety and Health Plan*, 1997.

40 CFR 300 National Contingency Plan.

National Institute for Occupational Safety and Health (NIOSH) / OSHA / United States Coast Guard (USCG) / Environmental Protection Agency (EPA). *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, October 1985.

Occupational Safety and Health Administration (OSHA). Construction Industry Standards 29 CFR 1926.

OSHA General Industry Standards 29 CFR 1910.120. *Hazardous Waste Operations and Emergency Response.*

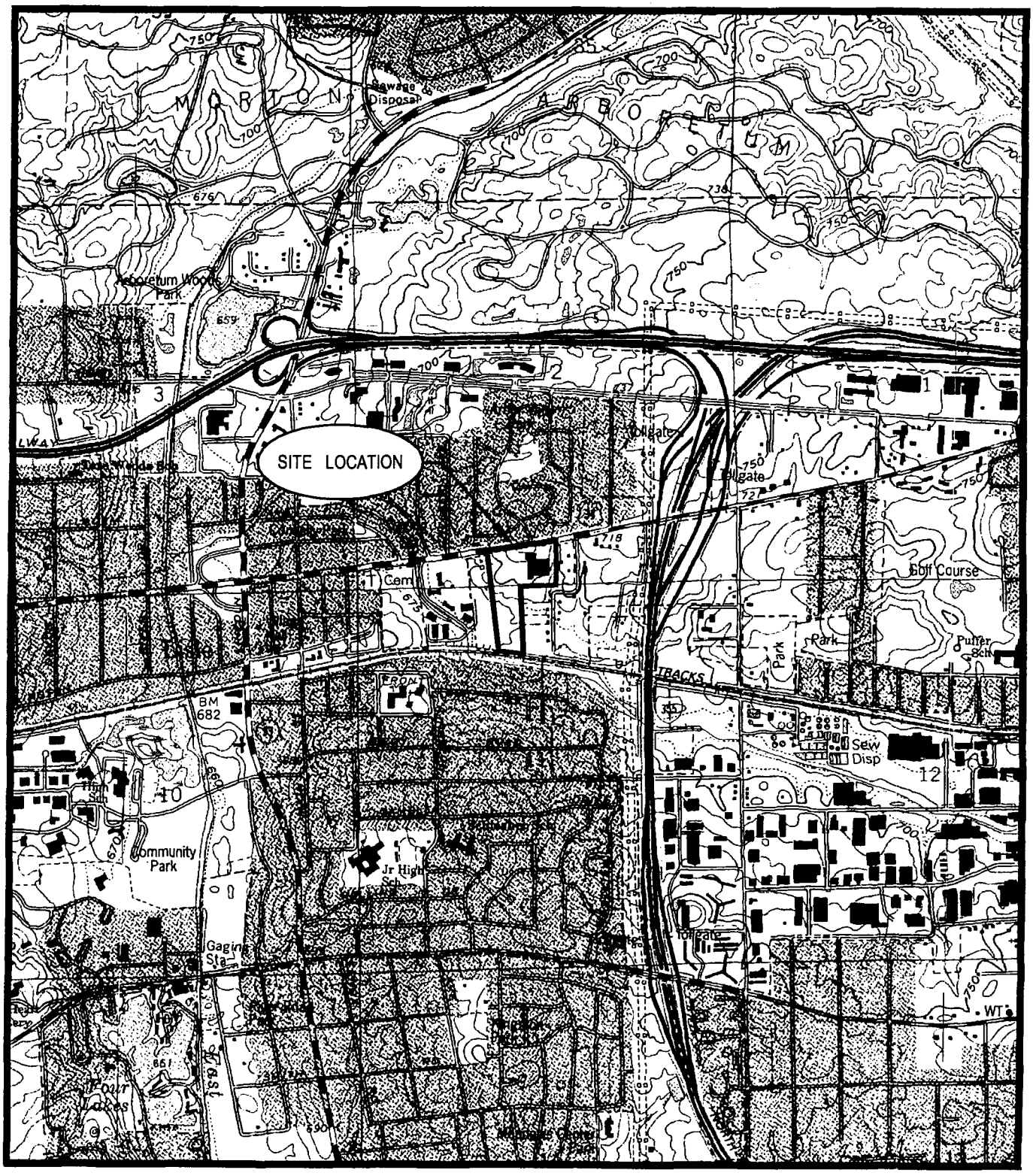
U.S. Department of Health and Human Services. *NIOSH Occupational Health Guidelines for Chemical Hazards*, January 1991.

U.S. Department of Health and Human Services. *NIOSH Pocket Guide to Chemical Hazards,* June 1997.

ISOPIA Guidance Document. *Standard Operating Safety Guides*, June 1992.

ISOPIA software. *Superfund Health and Safety Planner*, 1993.

FIGURES



Scale 1:24000

0 1/2 1 MILE

1000 0 1000 2000 3000 FEET

QUADRANGLE LOCATION

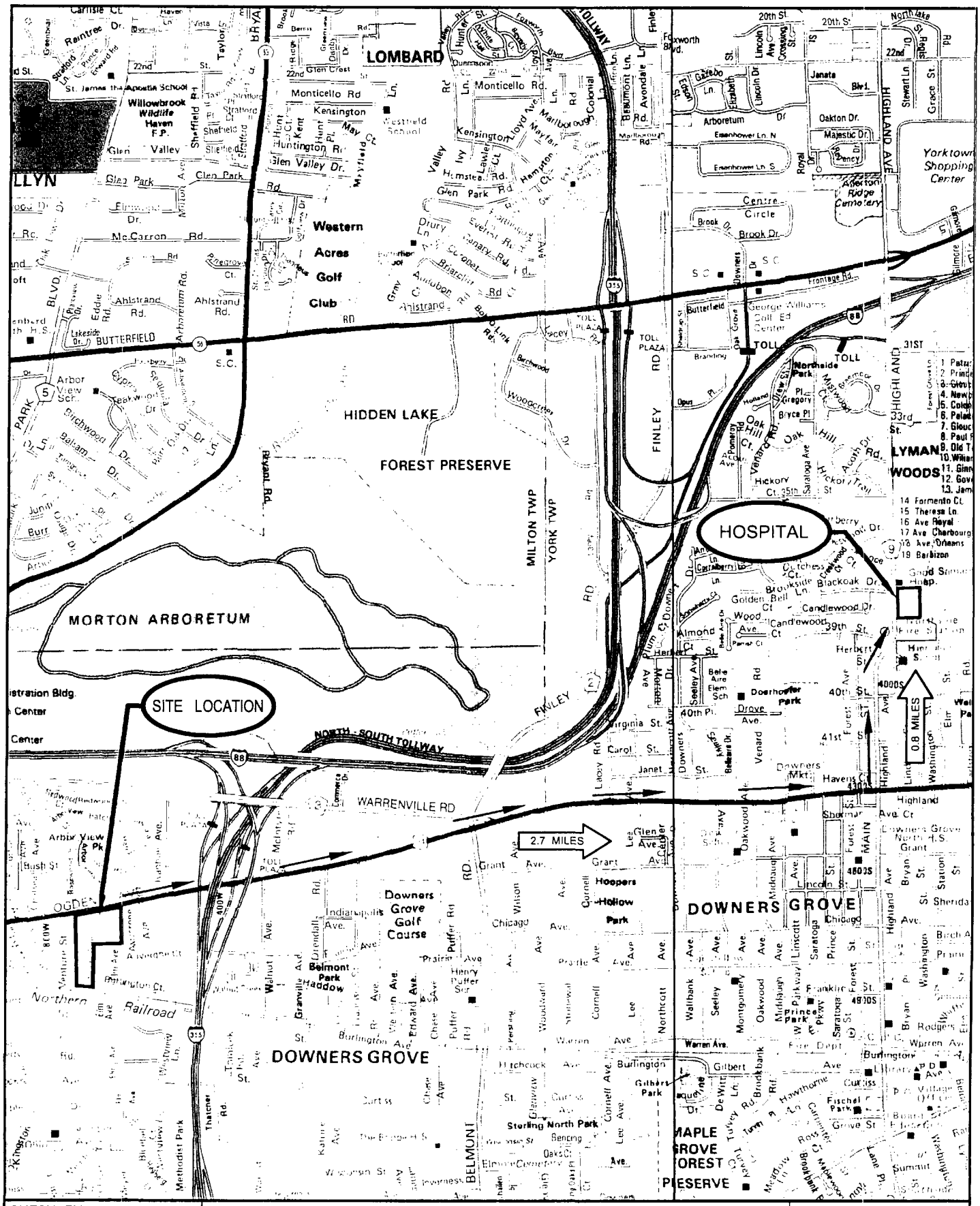
FIGURE 1

SITE LOCATION MAP

THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

CAD NO.: 65263010F

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAP, WHEATON, ILLINOIS)



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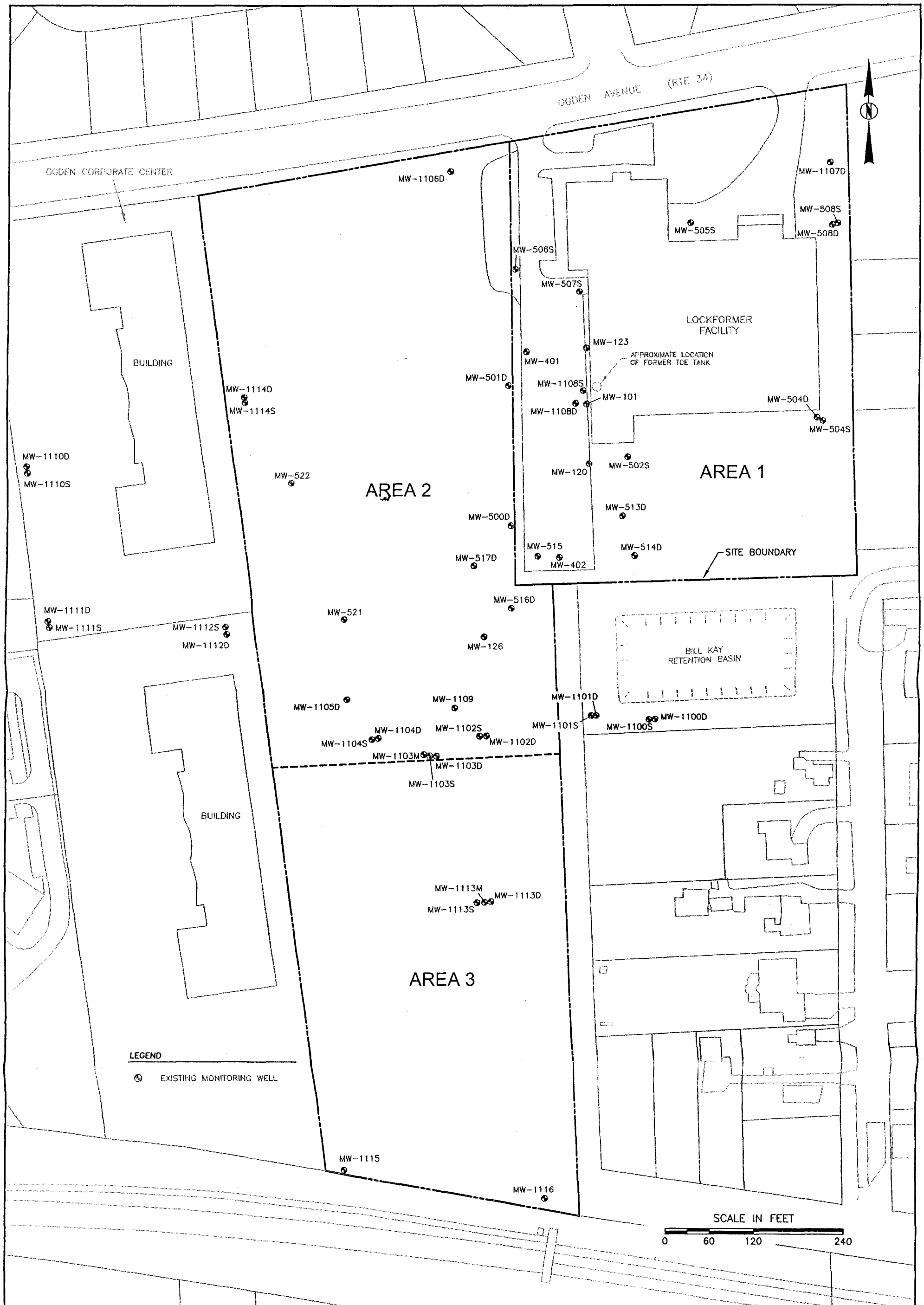
DATE	4-15-02
SCALE	AS SHOWN
CAD NO.	6526308A
PRJ NO.	65263.01

ROUTE TO HOSPITAL

THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

Clayton
GROUP SERVICES

FIGURE
3



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DATE	4-5-02
SCALE	AS SHOWN
CAD NO.	65263010E
PRJ NO.	65263.01

SITE MAP ILLUSTRATING AREAS 1, 2 AND 3

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 2

TABLES

TABLE 1

Recommended Work Breaks During Cold Weather For A Four-Hour Work Period

AIR TEMPERATURE SUNNY SKY (F)	NO WIND		5 MPH WIND		10 MPH WIND		15 MPH WIND		20 MPH WIND	
	Work Period	Breaks	Work Period	Breaks	Work Period	Breaks	Work Period	Breaks	Work Period	Breaks
-15 to -19	Normal	Normal	Normal	Normal	75 min.	2	55 min.	3	40 min.	4
-20 to -24	Normal	Normal	75 min.	2	55 min.	3	40 min.	4	30 min.	5
-25 to -29	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Stop Work	Stop Work
-30 to -34	55 min.	3	40 min.	4	30 min.	5	Stop Work	Stop Work	Stop Work	Stop Work
-35 to -39	40 min.	4	30 min.	5	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work
-40 to -44	30 min.	5	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work
-45 and	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work

Source: *1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH, 1991.*

TABLE 2

Recommended Work Breaks During Hot Weather

TEMPERATURE	WORK	REST	COMMENTS
70 to 75 F	3.0 hours	5 minutes	Review heat stress in a safety meeting. Schedule a beverage break every 2 hours at a minimum.
75 to 80 F	3.0 hours	15 minutes	Seated rest. Drink at least 8 ounces at each break. Monitor daily body weight changes. Have at least 10 instant ice packs or bags of ice available.
80 to 85 F	2.0 hours	10 minutes	As above, but rest area to be shaded. Take pulse before work, at beginning of lunch break, and at end of day.
85 to 90 F	1.5 hours	10 minutes	As above, and try to provide a shaded work area. More frequent breaks may be required.
90 and	1.5 hours	10 minutes	As above. Try to reschedule work to avoid mid-day heat.

TABLE 3

Properties of Potentially Hazardous Substances of Concern*

Chemical	IDLH (ppm)	REL (ppm)	PEL (ppm)	Skin Irritant	Eye Irritant	Respiratory Irritant	Flash Point (°F)	LEL (%)	UEL (%)	Vapor Pressure (mm Hg)	Ionization Potential (eV)
Tetrachloroethene	500	lowest feasible	25	Yes	yes	yes	none	none	none	14	9.32
Trichloroethene	1,000	25	50	Yes	yes	yes	90	8	10.5	58	9.45
1,2-dichloroethene cis-1,2-dichloroethene trans-1,2-dichloroethene	4,000	200	200	Yes	yes	yes	36	5.6	12.8	180-264	9.65

* NIOSH Occupational Health Guidelines for Chemical Hazards, U.S. Department of Health and Human Services, January 1991.

NOTES:
1. IDLH = Quantity that is rapidly fatal or likely to promote life-threatening disease.
2. REL = NIOSH's Recommended Exposure Limit
3. PEL = OSHA's Permissible Exposure Limit

ATTACHMENT A

TAILGATE MEETING MINUTES FORM

TAILGATE MEETING MINUTES

Project No.: _____ **Client:** _____

Location: _____ **Month:** _____

# of Employees: _____

Safety Topic #: _____ **Title:** _____

Other items discussed/listed:

_____

_____

Employee Safety Suggestions:

_____

_____

_____ / _____ _____

Supervisor's signature / Print Name **Date**

EMPLOYEE NAMES:

Print Name	**Signature**

COMPLETED FORM TO BE RETURNED TO H&S COORDINATOR

ATTACHMENT B

MSDS AND CHRIS SHEETS

TRICHLOROETHYLENE

TCL

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid	Colorless	Sweet odor
Chlorylen Gemalgene Trethylene Trichloran Triclene; algylen Trilene	Sinks in water. Irritating vapor is produced.		

Keep people away.
Avoid contact with liquid and vapor.
Call fire department.
Notify local health and pollution control agencies.
Protect water intakes.

Fire	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Pump

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 36; Halogenated hydrocarbon
2.2 Formula: $CHCl{=}CCl_2$
2.3 IMO/UN Designation: 9.0/1710
2.4 DOT ID No.: 1710
2.5 CAS Registry No.: 79-01-6
2.6 NAERG Guide No.: 160
2.7 Standard Industrial Trade Classification: 51132

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or vinyl gloves; chemical safety goggles; face-shield; neoprene safety shoes; neoprene suit or apron for splash protection.
3.2 Symptoms Following Exposure: INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation.
3.3 Treatment of Exposure: Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salts in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water.
3.4 TLV-TWA: 50 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: 100 ppm
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Currently not available
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 50 ppm
3.13 IDLH Value: 1,000 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: 300 ppm, 5 minute peak in any 2 hours.
3.16 OSHA PEL-Ceiling: 200 ppm
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 90°F C.C. practically nonflammable
4.2 Flammable Limits in Air: 8.0%-10.5%
4.3 Fire Extinguishing Agents: Water fog
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Toxic and irritating gases are produced in fire situations.
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: 770°F
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Not pertinent
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 9.5 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): No diluent: 9.0% at 100°C

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 660 mg/l/40 hr/daphnia/kill/fresh water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): Currently not available
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation:
Damage to living resources:
Human Oral hazard:
Human Contact hazard:
Reduction of amenities:

7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical; dry cleaning; degreasing; extraction
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Keep Away From Food
8.2 49 CFR Class: 6.1
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 100 pounds
8.7 EPA Pollution Category: B
8.8 RCRA Waste Number: U228
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 131.39
9.3 Boiling Point at 1 atm: 189°F = 87°C = 360°K
9.4 Freezing Point: −123.5°F = −86.4°C = 186.8°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.46 at 20°C (liquid)
9.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0293 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 34.5 dynes/cm = 0.0345 N/m at 24°C
9.10 Vapor (Gas) Specific Gravity: 4.5
9.11 Ratio of Specific Heats of Vapor (Gas): 1.116
9.12 Latent Heat of Vaporization: 103 Btu/lb = 57.2 cal/g = 2.4×10^5 J/kg
9.13 Heat of Combustion: Not pertinent
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 2.5 psia

NOTES

TRICHLOROETHYLENE

TCL

9.20 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
0	94.669
5	94.410
10	94.150
15	93.889
20	93.629
25	93.370
30	93.110
35	92.849
40	92.589
45	92.330
50	92.070
55	91.809
60	91.549
65	91.290
70	91.030
75	90.770
80	90.509
85	90.250
90	89.990
95	89.730
100	89.469
105	89.209
110	88.950
115	88.690
120	88.429
125	88.169

9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.220
10	0.221
20	0.223
30	0.225
40	0.226
50	0.228
60	0.230
70	0.231
80	0.233
90	0.235
100	0.236
110	0.238
120	0.240
130	0.241
140	0.243
150	0.245
160	0.246
170	0.248

9.22 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit inch per hour-square foot-F
	N O T P E R T I N E N T

9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
15	0.800
20	0.775
25	0.750
30	0.727
35	0.705
40	0.684
45	0.664
50	0.645
55	0.627
60	0.610
65	0.593
70	0.577
75	0.562
80	0.548
85	0.534
90	0.521
95	0.508
100	0.496
105	0.485
110	0.474
115	0.463
120	0.453

9.24 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
77	0.110

9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
40	0.508
50	0.678
60	0.894
70	1.166
80	1.507
90	1.929
100	2.448
110	3.081
120	3.846
130	4.765
140	5.862
150	7.163
160	8.695
170	10.490
180	12.588
190	15.010
200	17.810
210	21.028

9.26 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
40	0.01245
50	0.01628
60	0.02105
70	0.02695
80	0.03418
90	0.04296
100	0.05354
110	0.06619
120	0.08120
130	0.09891
140	0.11960
150	0.14380
160	0.17180
170	0.20390
180	0.24080
190	0.28280
200	0.33040
210	0.38420

9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.136
25	0.139
50	0.143
75	0.146
100	0.149
125	0.152
150	0.155
175	0.157
200	0.160
225	0.162
250	0.165
275	0.167
300	0.169
325	0.172
350	0.174
375	0.176
400	0.177
425	0.179
450	0.181
475	0.182
500	0.184
525	0.185
550	0.186
575	0.187
600	0.188

TETRACHLOROETHYLENE

TTE

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid	Colorless	Sweet odor
Perchloroethylene Perclene Perk Tetracap	Sinks in water. Irritating vapor is produced.		

Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire	Not flammable. Poisonous gases are produced when heated.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Pump
Clean shore line

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: $ClC{=}CCl_2$
2.3 IMO/UN Designation: 9.0/1897
2.4 DOT ID No.: 1897
2.5 CAS Registry No.: 127-18-4
2.6 NAERG Guide No.: 160
2.7 Standard Industrial Trade Classification: 51133

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.
3.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.
3.3 Treatment of Exposure: INHALATION: If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: Induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.
3.4 TLV-TWA: 25 ppm
3.5 TLV-STEL: 100 ppm
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: None
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or throat if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 5 ppm
3.13 IDLH Value: 150 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: 300 ppm, 5 minute peak in any 3 hours
3.16 OSHA PEL-Ceiling: 200 ppm
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: Not flammable
4.2 Flammable Limits in Air: Not flammable
4.3 Fire Extinguishing Agents: Not pertinent
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fires.
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: Not flammable
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Not flammable
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: Not pertinent.
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): None
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile: Not listed

7. SHIPPING INFORMATION

7.1 Grades of Purity: Dry cleaning and industrial grades: 95+%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: B
7.6 Ship Type: 3
7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Keep Away From Food
8.2 49 CFR Class: 6.1
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: Yes
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Instability (Yellow)	0

8.6 EPA Reportable Quantity: 100 pounds
8.7 EPA Pollution Category: B
8.8 RCRA Waste Number: U210/D039
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 165.83
9.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K
9.4 Freezing Point: -8.3°F = -22.4°C = 250.8°K
9.5 Critical Temperature: 656.6°F = 347°C = 620.2°K
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.63 at 20°C (liquid)
9.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.116
9.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10^5 J/kg
9.13 Heat of Combustion: Not pertinent
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: Currently not available

NOTES

TETRACHLOROETHYLENE

TTE

9.20 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	103.400
40	103.099
45	102.900
50	102.599
55	102.299
60	102.000
65	101.700
70	101.400
75	101.099
80	100.799
85	100.500
90	100.200
95	99.910
100	99.610
105	99.320
110	99.020
115	98.730
120	98.425
125	98.139
130	97.839
135	97.549
140	97.250
145	96.959
150	96.669
155	96.370
160	96.080

9.21 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.198
10	0.200
20	0.201
30	0.202
40	0.203
50	0.204
60	0.205
70	0.206
80	0.207
90	0.208
100	0.210
110	0.211
120	0.212
130	0.213
140	0.214
150	0.215
160	0.216
170	0.217
180	0.218
190	0.220
200	0.221
210	0.222

9.22 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit inch per hour-square foot-F
NOT PERTINENT	

9.23 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
55	0.958
60	0.929
65	0.900
70	0.873
75	0.848
80	0.823
85	0.800
90	0.777
95	0.756
100	0.736
105	0.716
110	0.698
115	0.680
120	0.663
125	0.647
130	0.631
135	0.616
140	0.601
145	0.588
150	0.574
155	0.561
160	0.549
165	0.537
170	0.526
175	0.515

9.24 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68	0.016

9.25 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
60	0.236
70	0.318
80	0.425
90	0.561
100	0.732
110	0.945
120	1.217
130	1.548
140	1.953
150	2.446
160	3.042
170	3.756
180	4.607
190	5.616
200	6.805
210	8.199
220	9.824
230	11.710
240	13.890
250	16.390
260	19.260
270	22.520
280	26.230

9.26 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
60	0.00702
70	0.00929
80	0.01216
90	0.01575
100	0.02022
110	0.02571
120	0.03242
130	0.04055
140	0.05032
150	0.06199
160	0.07583
170	0.09215
180	0.11130
190	0.13360
200	0.15940
210	0.18910
220	0.22330
230	0.26230
240	0.30660
250	0.35680
260	0.41330
270	0.47680
280	0.54790

9.27 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.108
25	0.110
50	0.113
75	0.116
100	0.118
125	0.120
150	0.122
175	0.125
200	0.127
225	0.129
250	0.131
275	0.132
300	0.134
325	0.136
350	0.138
375	0.139
400	0.141
425	0.142
450	0.143
475	0.144
500	0.146
525	0.147
550	0.148
575	0.148
600	0.149

1,2-DICHLOROETHYLENE

DEL

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Sweet pleasant odor
Acetylene dichloride trans-1,2-Dichloroethylene cis-1,2-Dichloroethylene sym-Dichloroethylene Dioform	Sinks in water. Flammable, irritating vapor is produced.		

Evacuate.
Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources. Call fire department.
Notify local health and pollution control agencies.
Protect water intakes.

Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	Call for medical aid. VAPOR If inhaled will cause dizziness, nausea, vomiting, or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Collection Systems: Pump
Collection Systems: Dredge
Do not burn

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: ClCH = CHCl
2.3 IMO/UN Designation: 3.2/1150
2.4 DOT ID No.: 1150
2.5 CAS Registry No.: 540-59-0
2.6 NAERG Guide No.: 132P
2.7 Standard Industrial Trade Classification: 51138

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Rubber gloves; safety goggles; air supply mask or self- contained breathing apparatus.
3.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis.
3.3 Treatment of Exposure: INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and cathartics.
3.4 TLV-TWA: 200 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; oral LD_{50} = 770 mg/kg (rat)
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Produces liver and kidney injury in experimental animals.
3.10 Vapor (Gas) Irritant Characteristics: Currently not available
3.11 Liquid or Solid Characteristics: Currently not available
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: 1,000 ppm
3.14 OSHA PEL-TWA: 200 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 37°F C.C.
4.2 Flammable Limits in Air: 9.7%-12.8%
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Phosgene and hydrogen chloride fumes may form in fires.
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 860°F
4.8 Electrical Hazards: Currently not available
4.9 Burning Rate: 2.8 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 9.5 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Will not occur under ordinary conditions of shipment. The reaction is not vigorous.
5.6 Inhibitor of Polymerization: None used

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): Currently not available
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 1
Human Oral hazard: 1
Human Contact hazard: 1
Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: Currently not available
7.6 Ship Type: Currently not available
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Instability (Yellow)	2

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: U079
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 97.0
9.3 Boiling Point at 1 atm: cis: 140°F = 60°C = 333°K trans: 118°F = 48°C = 321°K
9.4 Freezing Point: cis: −114°F = −81°C = 192°K trans: −58°F = −50°C = 223°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.27 at 25°C (liquid)
9.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C
9.9 Liquid Water Interfacial Tension: (est.) 36 dynes/cm = 0.036 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: 3.34
9.11 Ratio of Specific Heats of Vapor (Gas): 1.1468
9.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0 X 10^5 J/kg
9.13 Heat of Combustion: −4,847.2 Btu/lb = −2,692.9 cal/g = −112.67 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: Currently not available

NOTES

1,2-DICHLOROETHYLENE

DEL

9.20 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	81.020
40	80.820
45	80.610
50	80.400
55	80.190
60	79.980
65	79.780
70	79.570
75	79.360
80	79.150
85	78.940
90	78.740
95	78.530
100	78.320
105	78.110
110	77.900
115	77.690
120	77.490
125	77.280
130	77.070
135	76.860
140	76.650

9.21 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
35	0.193
40	0.196
45	0.198
50	0.200
55	0.202
60	0.204
65	0.207
70	0.209
75	0.211
80	0.213
85	0.216
90	0.218
95	0.220
100	0.222
105	0.224
110	0.227
115	0.229
120	0.231
125	0.233
130	0.236
135	0.238
140	0.240

9.22 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit inch per hour-square foot-F
65	0.907
70	0.894
75	0.882
80	0.869
85	0.857
90	0.844
95	0.832
100	0.819
105	0.807
110	0.794
115	0.782
120	0.769
125	0.757
130	0.744

9.23 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
40	0.475
50	0.454
60	0.432
70	0.411
80	0.393
90	0.375
100	0.360
110	0.345
120	0.331
130	0.319
140	0.307
150	0.296
160	0.286
170	0.276
180	0.267
190	0.259
200	0.251
210	0.244

9.24 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68	0.630

9.25 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
55	2.969
60	3.396
65	3.824
70	4.297
75	4.817
80	5.386
85	6.016
90	6.702
95	7.453
100	8.272
105	9.164
110	10.130
115	11.190
120	12.330
125	13.560
130	14.900
135	16.340
140	17.890

9.26 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
55	0.05254
60	0.05906
65	0.06587
70	0.07330
75	0.08141
80	0.09023
85	0.09968
90	0.11020
95	0.12140
100	0.13360
105	0.14680
110	0.16070
115	0.17590
120	0.19220
125	0.20960
130	0.22830
135	0.24820
140	0.26960

9.27 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.150
20	0.153
40	0.156
60	0.159
80	0.162
100	0.165
120	0.167
140	0.170
160	0.173
180	0.176
200	0.179
220	0.182
240	0.185
260	0.188
280	0.191
300	0.194
320	0.197
340	0.200
360	0.203
380	0.205
400	0.208
420	0.211
440	0.214

ATTACHMENT C

SITE SIGN IN LOG

LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME IN	TIME OUT	TIME IN	TIME OUT	PURPOSE OF VISIT

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
SUP = Supplier COU = Courier VIS = Visitor

ATTACHMENT D

EXCLUSION ZONE ENTRY/EXIT LOG

LOCKFORMER COMPANY
EXCLUSION ZONE ENTRY / EXIT LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Level of Protection	TIME				TASK / ASSIGNMENT
			IN	OUT	IN	OUT	

ATTACHMENT E

BLOODBORNE PATHOGEN TRAINING

Bloodborne Pathogen (BBP) Training Record

CLAYTON GROUP SERVICES, INC.

Prepared for Site Activities at:

Lockformer Company, 711 W. Odgen Avenue, Lisle, Illinois

Clayton Project No. 15-65263

I, the undersigned, certify that I:

- Received a copy of the OSHA Bloodborne Pathogen Standard (29 CFR 1910.1030)
- Understand the topics listed above.
- Understand my responsibilities in regards to prevention and minimization of exposure to BBPs

Signature	Company	Title

Additional comments, concerns, or other information may be listed on the back side of this form.