0000005

R E P O R T

The Lockformer Company
711 Ogden Avenue
Lisle, Illinois

5 Installed 1995 depth
MW 101 227 2" [illegible]
104 43.6 dry
105 36.75 9" [illegible]
120 55.75 30 [illegible]
123 15 23 [illegible]
126 [illegible] 77.7 40 [illegible]
MW 401 55.55
402 50.75
403 60' 2.5 g

Sand between
25-35' deep
[illegible]
do not want to
[illegible]

Lockformer Facility
Lisle, Illinois

26249-XC

February 24, 1998

February 24, 1998

Mr. James Heitt
The Lockformer Company
711 Ogden Avenue
Lisle, IL 60532

RE: Lockformer Facility, Lisle, Illinois – STS Project No. 26249-XC

Dear Mr. Heitt:

STS has completed a soil and groundwater site investigation at the above-referenced site. The draft Focused Site Investigation and Remedial Objectives Report is enclosed for your review and comments. The report provides a summary of the soil and groundwater investigation results, calculation of Tier 2 remediation objectives and recommendations for site cleanup as required by the IEPA. The report addresses the following sections of the Site Remediation Program:

- 1.0 Executive Summary - Section 740.435.b.1
- 2.0 Site Characterization - Section 740.435.b.2
- 3.0 Response Actions - Section 740.435.b.3
- 4.0 Site Specific Sampling Plan - Section 740.435.b.4
- 5.0 Documentation of Field Activities - Section 740.435.b.5
- 6.0 Endangerment Assessment - Section 740.435.b.6
- 7.0 Tier 2 Evaluation - Sections 740.440 and 740.445

Upon the completion of your review, we would like to schedule a meeting to discuss the report prior to submittal to the IEPA. In the meantime, if you have any questions or concerns regarding this information, please do not hesitate to contact us.

Respectfully,

STS CONSULTANTS, LTD.

Cynthia Bonczkiewicz, P.E.
Senior Project Engineer

Richard G. Berggreen
Principal Geologist

Nancy Zolidis
Hydrogeologist

Attachment

cc: Daniel Biederman, Hinshaw & Culbertson

k:\26249\xc\r149c002.doc

STS Consultants Ltd.
Consulting Engineers

1415 Lake Cook Road
Deerfield, Illinois 60015
847.267.8010/Fax 847.267.8040

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FOCUSED SITE INVESTIGATION/ REMEDIATION OBJECTIVES REPORT THE LOCKFORMER COMPANY FACILITY LISLE, ILLINOIS

1.0 EXECUTIVE SUMMARY

STS Consultants, Ltd. (STS) has conducted several exploration/analysis programs at the Lockformer facility located at 711 Ogden Avenue in Lisle, Illinois since 1992 when soil impacted with trichloroethene (TCE) was encountered during repair work to a water line located along the west side of the building.

Based on data gathered to date from soil borings, gas probes and groundwater monitoring wells, the extent of volatile organic compound (VOC) contamination in shallow fill soil, intermediate clay, intermediate sand, perched groundwater and deep groundwater has been estimated.

The method for developing remediation objectives for contaminated soil and groundwater is set forth in Illinois EPA's Tiered Approach to Corrective Action Objectives (TACO). A Tier 1 evaluation involves a comparison of site contaminant concentrations to established baseline remediation objectives presented in Tier 1 tables. For contaminants that exceed the Tier 1 remediation objectives, a Tier 2 evaluation considering site-specific data and institutional controls may be completed including the calculation of alternative remediation objectives that may be higher than the Tier 1 remediation objectives but are still protective of human health. A No Further Remediation (NFR) letter will be issued by the Illinois EPA's Bureau of Land (BOL) after all program requirements and applicable TACO remediation objectives have been met.

Exceedances of the Tier 1 Remediation Objectives for industrial/commercial site use were documented for the following contaminants: trichloroethylene (TCE), tetrachloroethene (PCE), 1,1,1 trichloroethane (1,1,1-TCA) and 1,1,2 trichloroethane (1,1,2-TCA) in soil; TCE, PCE, vinyl chloride, 1,1 dichloroethene (1,1-DCE), methylene chloride, trans 1,2

dichloroethene (trans 1,2-DCE), cis 1,2 dichloroethene (cis 1,2-DCE), chloroform, 1,1,1 trichloroethene (1,1,1-TCA), and 1,1,2 trichloroethane (1,1,2-TCA) in perched groundwater; and TCE and cis 1,2-DCE in deep groundwater.

A Tier 2 evaluation including the calculation of Tier 2 Remediation Objectives was performed to determine corrective actions that will be protective of human health and the environment as required by the Site Remediation Program. The proposed corrective actions include the excavation and treatment of soil, treatment of perched groundwater, the installation of an engineered barrier, land-use restriction and the prohibition of on-site potable well installation.

2.0 SITE CHARACTERIZATION

2.1 Site Description

The subject site is located at 711 Ogden Avenue in Lisle, Illinois as shown on Figure 1. The approximately 6.4 acre property is occupied by The Lockformer Company manufacturing facility. Metal part fabrication equipment is manufactured at the facility. Offices are also located within the Lockformer building. The areas of concern are based upon indications of past releases from a storage tank of trichloroethylene (TCE) on the roof of the facility and a vapor degreaser which used TCE inside of the facility.

The subject site has a grassed front lawn along the Odgen Avenue frontage and an asphalt/ gravel employee parking lot on the west side of the building. The TCE roof tank is near the west wall of the facility where a metal fill pipe extends from the roof to near ground level, adjacent to the employee parking lot. The grassed area on the south side of the building has been filled with clay fill. A narrow (less than 45 feet) strip of land exists between the east wall of the facility and the eastern property line. A loading dock and a mounded 200,000 gallon water storage reservoir are located on the front, north side of the facility. The water is used for non-consumptive industrial processing at the facility and is pumped from the on-site bedrock well.

The topography is relatively flat throughout the site except at the south edge where the property line is at the upper edge of a gully approximately 10 to 20 feet deep. Also, there is a 3 to 5 foot increase in elevation from the west property line to the adjacent west lot. The factory building, office space, utilities and the site boundaries are shown on Figure 2. The locations of the TCE roof tank, fill pipe and degreaser are also shown.

2.2 Site History

The site and surrounding lands were undeveloped until 1940 when the Lockformer facility was constructed. Some soil excavated during the construction of Odgen Avenue was reportedly used as fill on this site and the adjacent west lot in the 1960s. The facility has been

surrounded by residential and/or agricultural land since 1940 except that the west lot has been vacant since 1986. The west lot has recently been sold by the Lockformer Company and remains vacant.

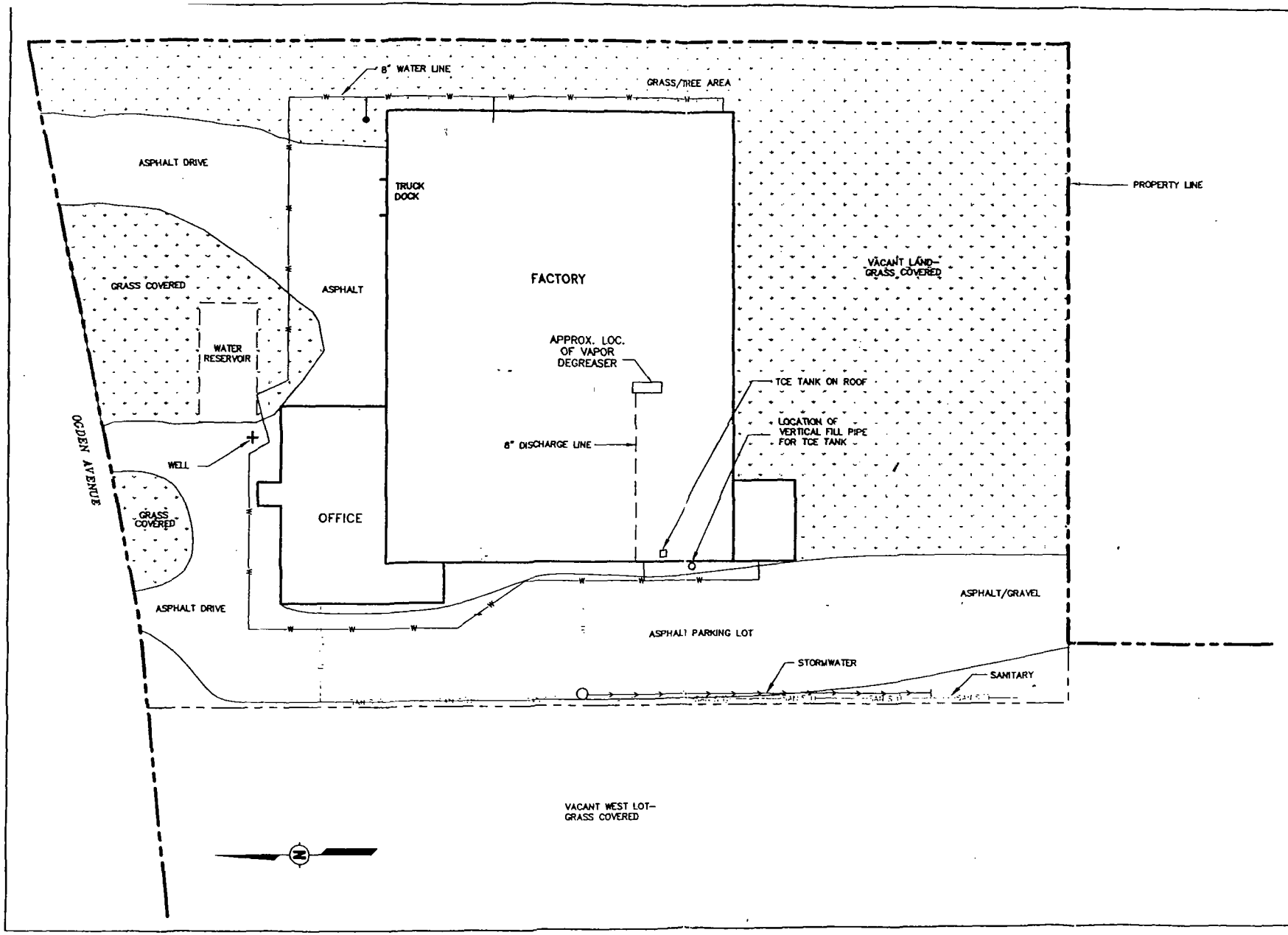
TCE impaired soil was encountered during repair work to a water line along the west side of the Lockformer facility building in the fall of 1991. In a 1992 site investigation, evidence of volatile organic compounds was noted during field screening and TCE was noted in laboratory analyses of a limited number of soil samples from the area of the site surrounding the fill pipe which extends to the TCE roof tank along the outside of the building. Subsequent investigations were conducted to further define the extent of contamination.

2.3 Sources

The information contained in this report is based upon exploration and sampling performed by STS Consultants and chemical analysis results provided to STS by VOC, QAL, IEA, Enviroscan and Quadrel laboratories. The TacoPro program developed by Andrews Environmental Engineering, Inc. was used to complete the remediation objectives section of this report.

Legal Description

(To Be Filled In By Client)



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SITE DIAGRAM
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

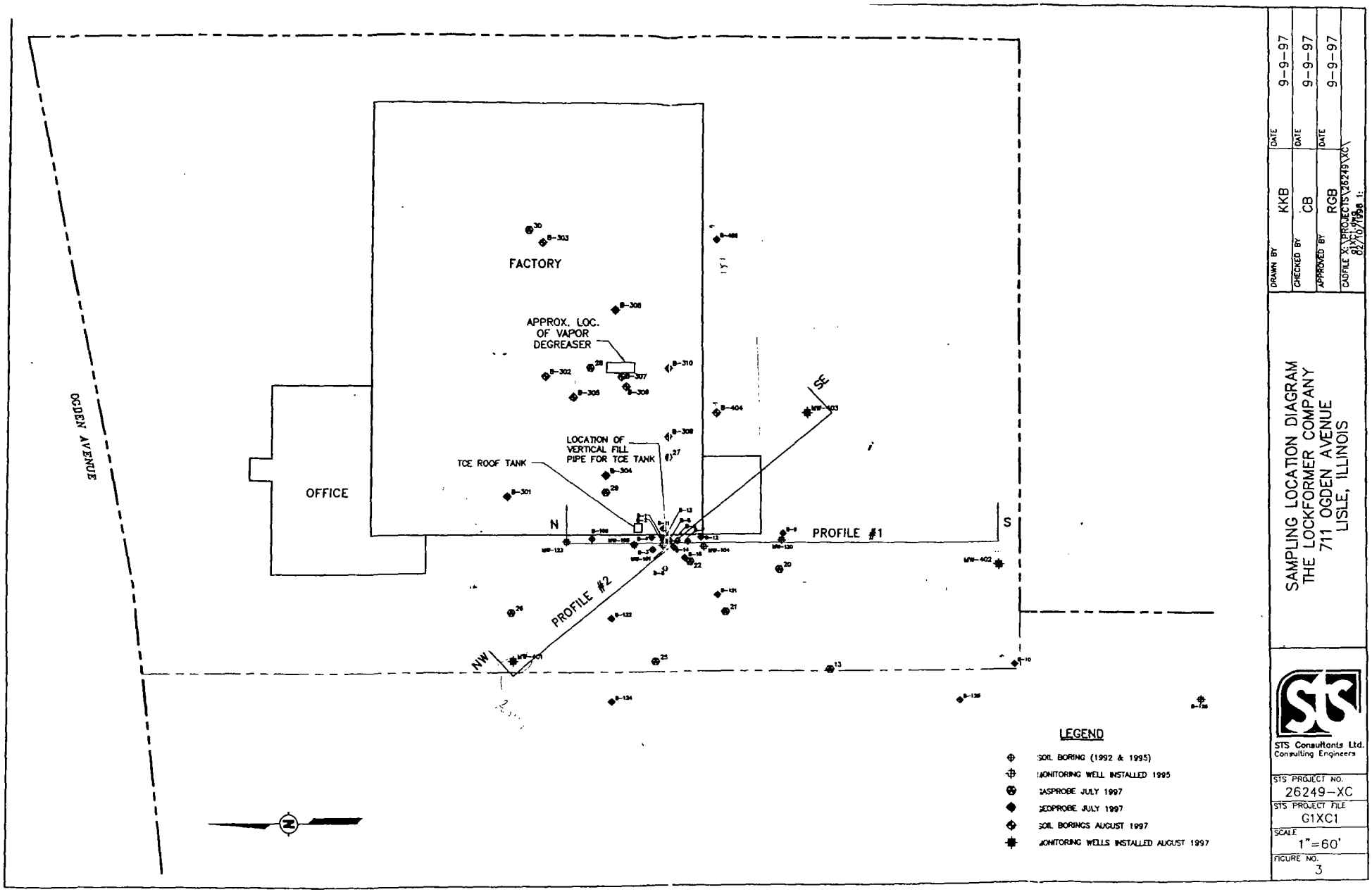
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.
26249-XC

STS PROJECT FILE
G1XC2

SCALE
1"=60'

FIGURE NO.
2



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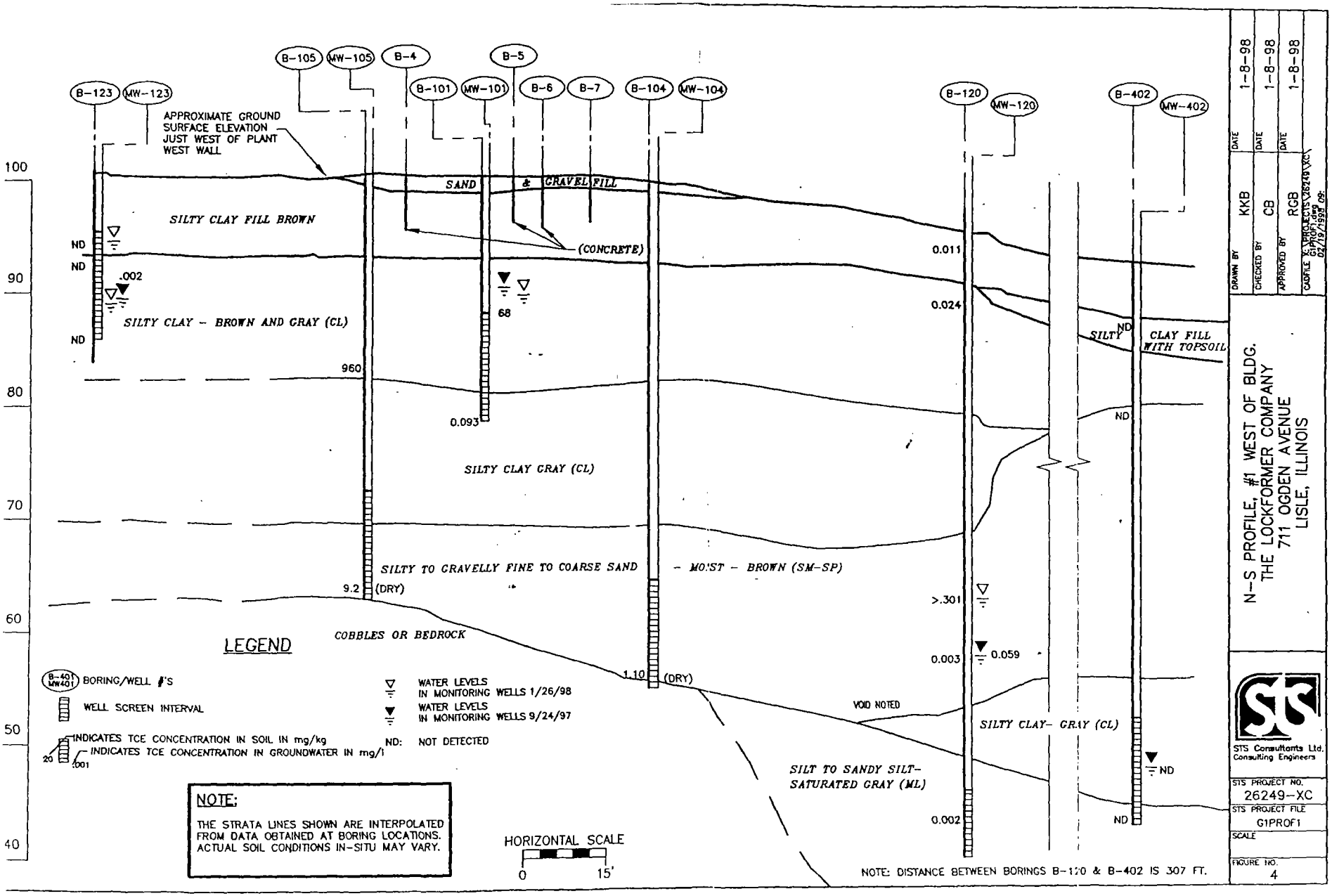
SAMPLING LOCATION DIAGRAM
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 26249-XC
STS PROJECT FILE G1XC1
SCALE 1"=60'
FIGURE NO. 3



N-S PROFILE, #1 WEST OF BLDG.
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

DRAWN BY	CHECKED BY	APPROVED BY
KKB	CB	RGB
DATE 1-8-98	DATE 1-8-98	DATE 1-8-98

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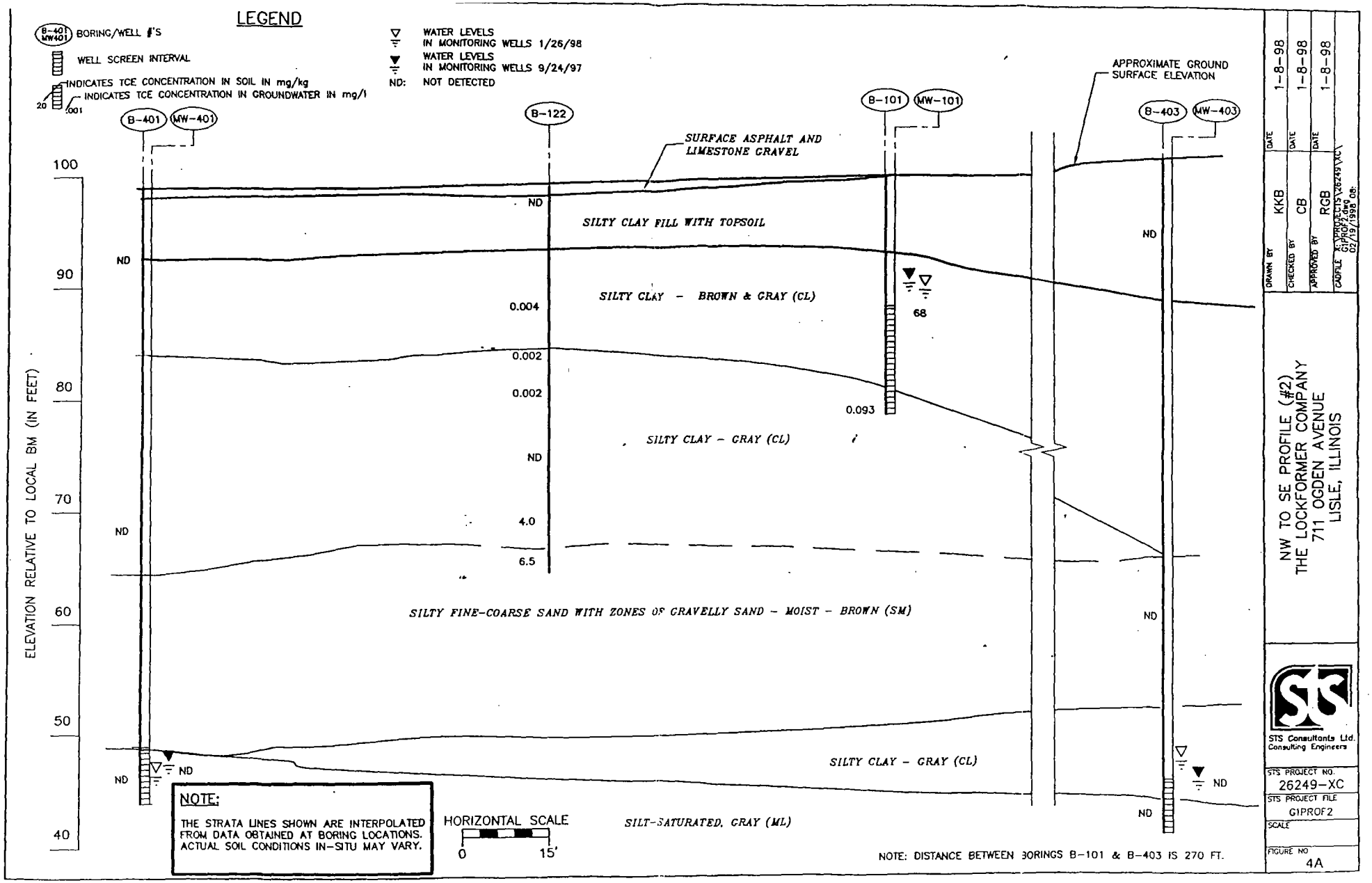
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 26249-XC
STS PROJECT FILE G1PROF1
SCALE
FIGURE NO. 4


LEGEND
B-401 MW401 BORING/WELL #'S
WELL SCREEN INTERVAL
20 INDICATES TCE CONCENTRATION IN SOIL IN mg/kg
.001 INDICATES TCE CONCENTRATION IN GROUNDWATER IN mg/l
WATER LEVELS IN MONITORING WELLS 1/26/98
WATER LEVELS IN MONITORING WELLS 9/24/97
ND: NOT DETECTED
B-401
MW-401
B-122
B-101
MW-101
B-403
MW-403
APPROXIMATE GROUND SURFACE ELEVATION
SURFACE ASPHALT AND LIMESTONE GRAVEL
SILTY CLAY FILL WITH TOPSOIL
SILTY CLAY - BROWN & GRAY (CL)
SILTY CLAY - GRAY (CL)
SILTY FINE-COARSE SAND WITH ZONES OF GRAVELLY SAND - MOIST - BROWN (SM)
SILTY CLAY - GRAY (CL)
SILT-SATURATED, GRAY (ML)
ELEVATION RELATIVE TO LOCAL BM (IN FEET)
100
90
80
70
60
50
40
ND
0.004
0.002
0.002
0.093
4.0
6.5
68
NOTE:
THE STRATA LINES SHOWN ARE INTERPOLATED FROM DATA OBTAINED AT BORING LOCATIONS. ACTUAL SOIL CONDITIONS IN-SITU MAY VARY.
HORIZONTAL SCALE
0
15'
NOTE: DISTANCE BETWEEN BORINGS B-101 & B-403 IS 270 FT.
DRAWN BY KKB DATE 1-8-98
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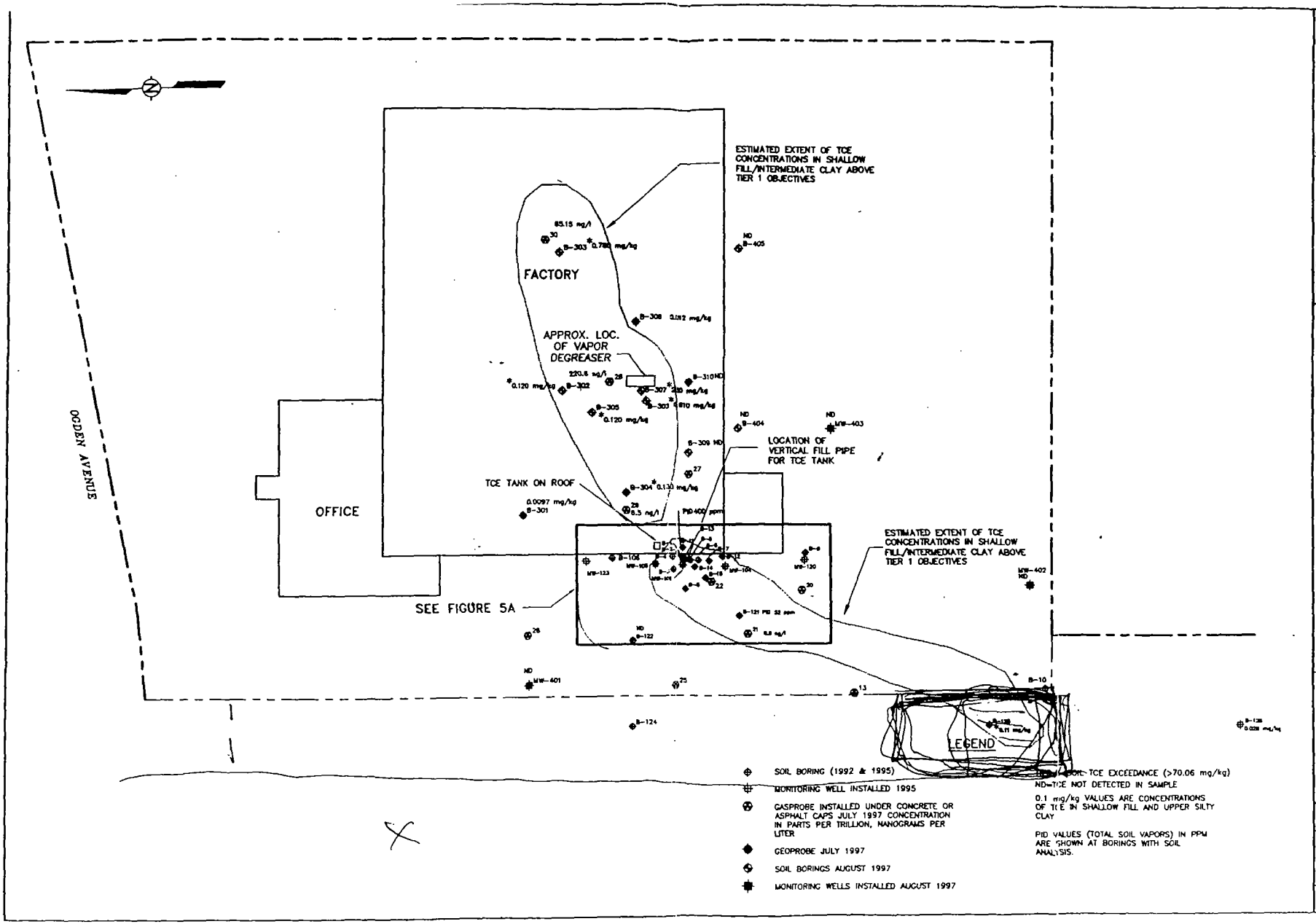
APPROVED BY RGB DATE 1-8-98
CADFILE X:\PROJECTS\26249\XC\G1PROF2.dwg 02/19/1998 08:
NW TO SE PROFILE (#2)
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS
STS Consultants Ltd.
Consulting Engineers
STS PROJECT NO. 26249-XC
STS PROJECT FILE G1PROF2
SCALE
FIGURE NO 4A



SHALLOW FILL/INTERMEDIATE CLAY TCE CONCENTRATION
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

DRAWN BY	KKB	DATE 9-9-97
CHECKED BY	CB	DATE 9-9-97
APPROVED BY	RGB	DATE 9-9-97

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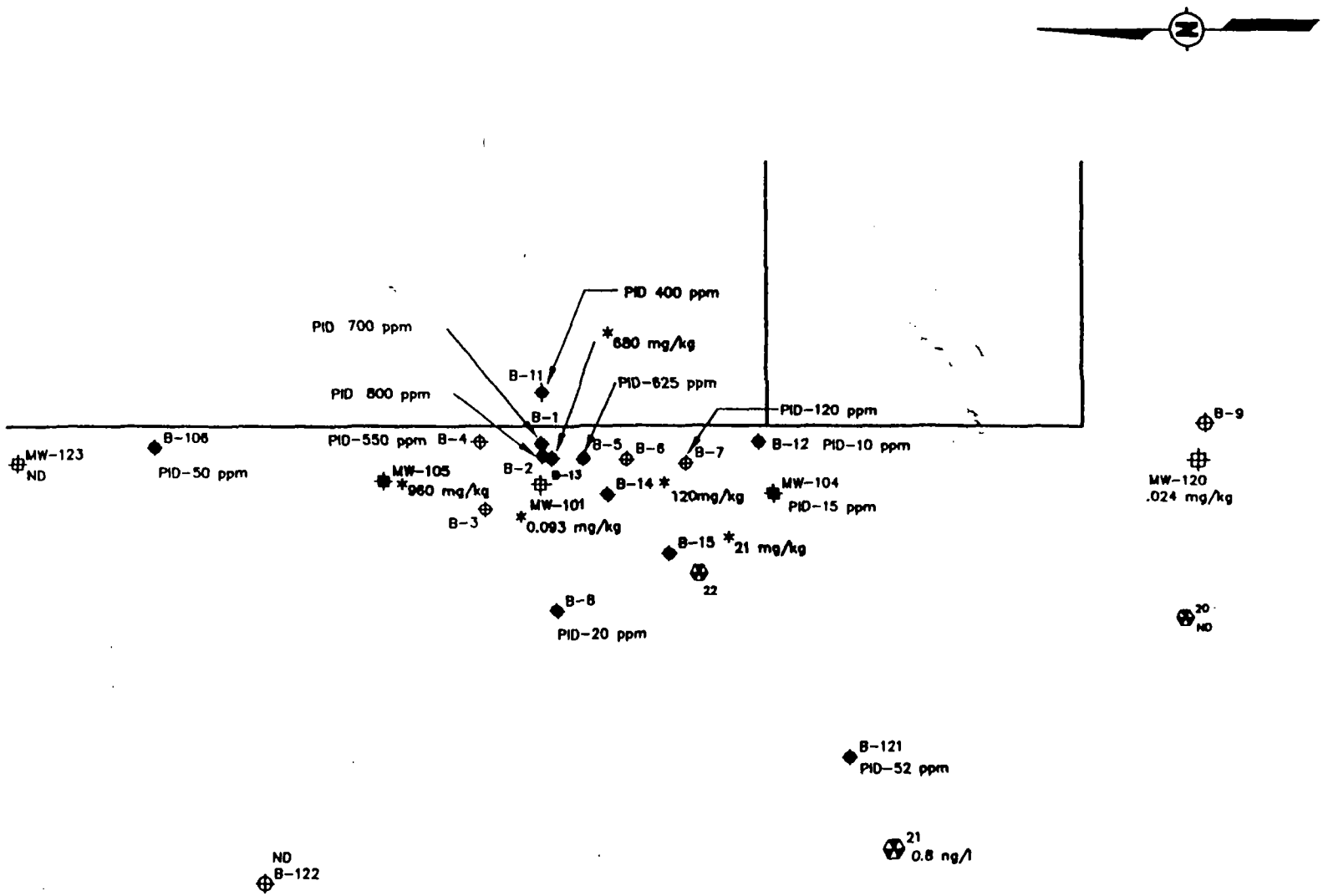
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.
26249-XC

STS PROJECT FILE
G1XC5

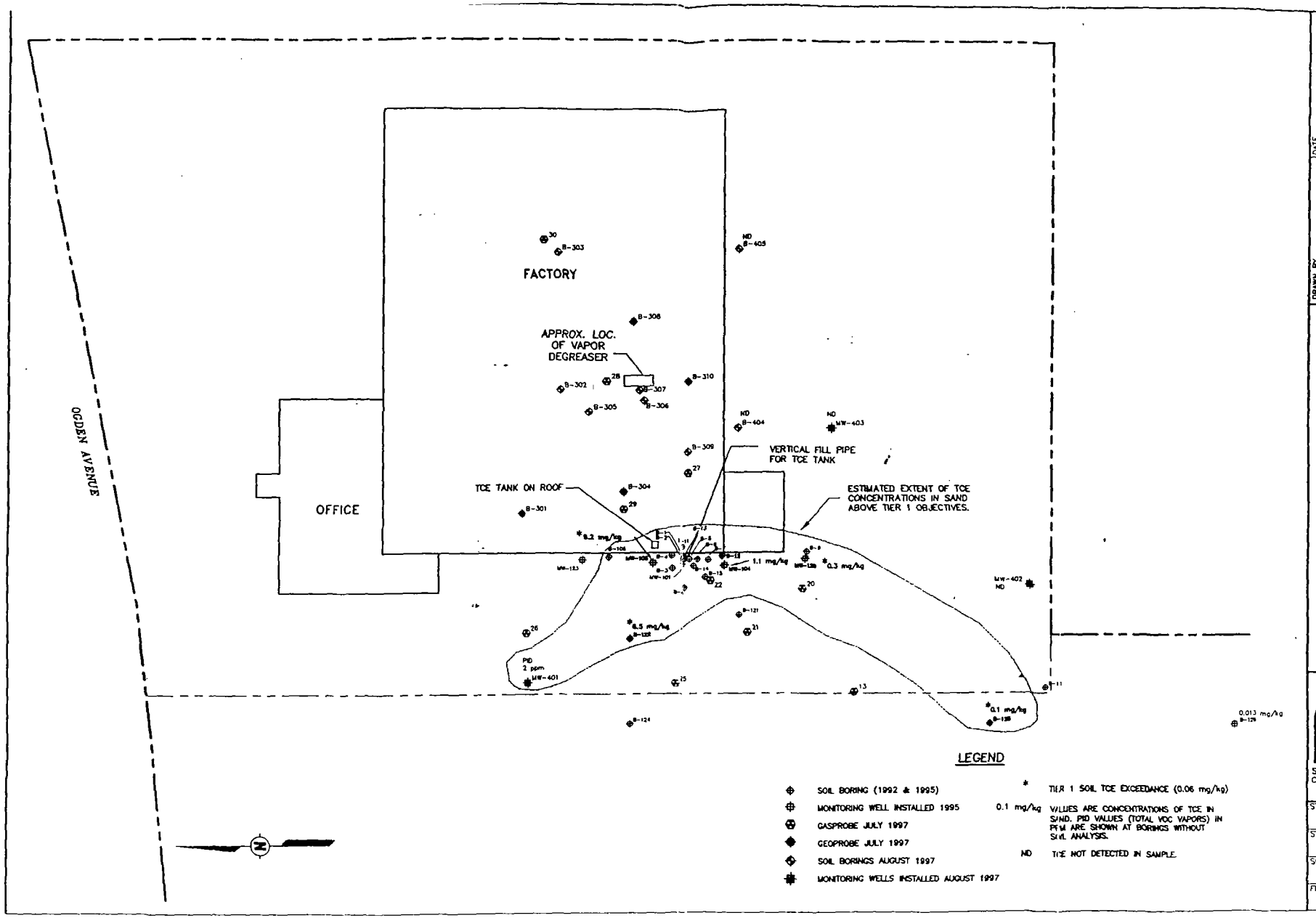
SCALE
1"=60'

FIGURE NO.
5



STS PROJECT NO. 26249-XC	STS Consultants Ltd. Consulting Engineers	DETAIL AREA THE LOCKFORMER COMPANY 711 OGDEN AVENUE LISLE, ILLINOIS	DRAWN BY KKB — DATE 2-23-98 CHECKED BY CB — DATE 2-23-98 APPROVED BY RGB — DATE 2-23-98 CADFILE X:\PROJECTS\26249\XC\g1XC5B.dwg
STS PROJECT FILE g1XC5B.dwg			
SCALE 1"=40'±			
FIGURE NO. 5A			

02/23/1998 17:



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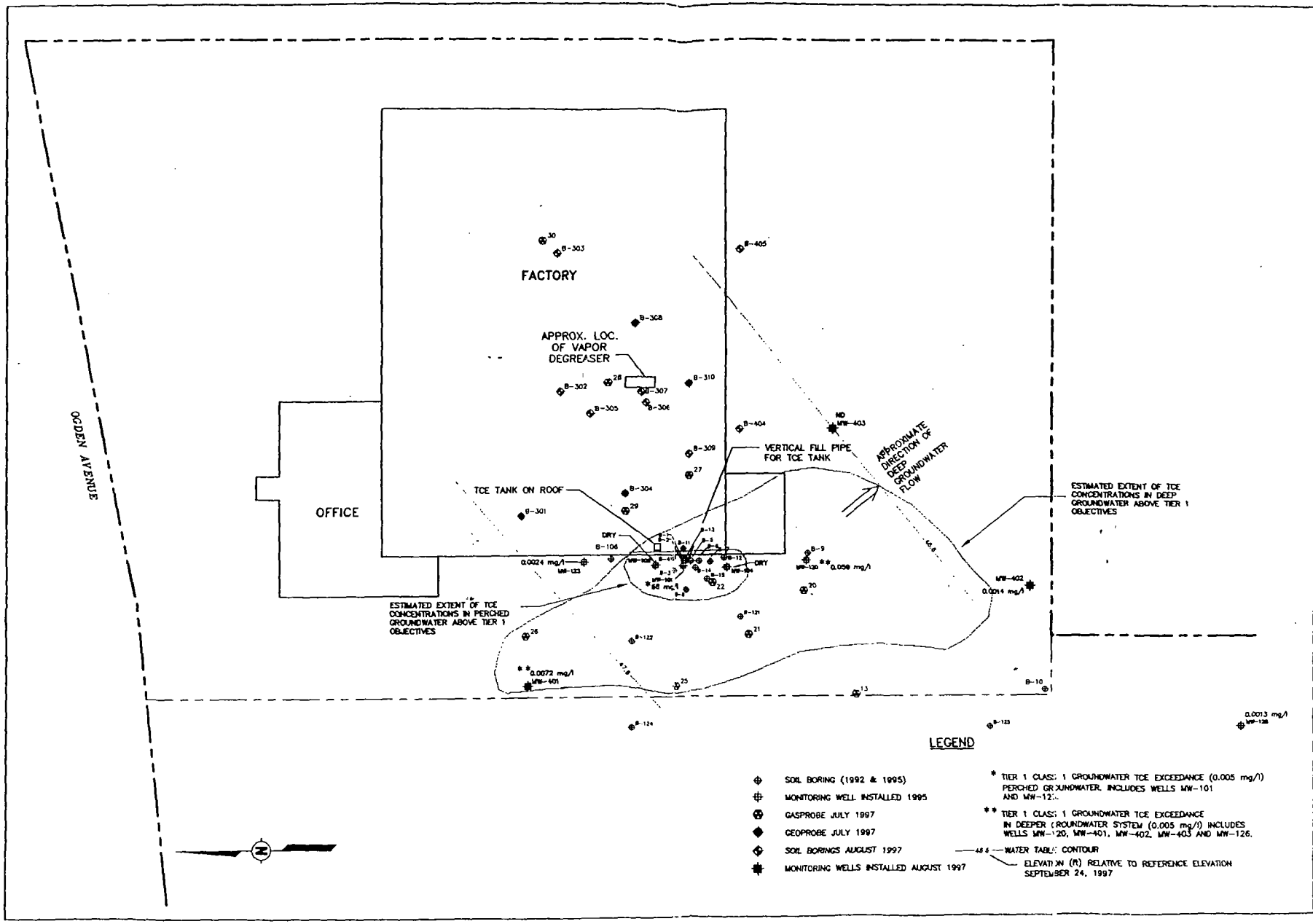
APPROVED BY RGB DATE 9-9-97
CADFILE X:\PROJECTS\26249\XC\ 01/23/1998 1:

INTERMEDIATE SAND TCE CONCENTRATIONS
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 26249-XC
STS PROJECT FILE G1XC4
SCALE 1"=60'
FIGURE NO. 6



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APPROVED BY RGB DATE 9-9-97
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GROUNDWATER TCE CONCENTRATIONS THE LOCKFORMER COMPANY 711 OGDEN AVENUE LISLE, ILLINOIS

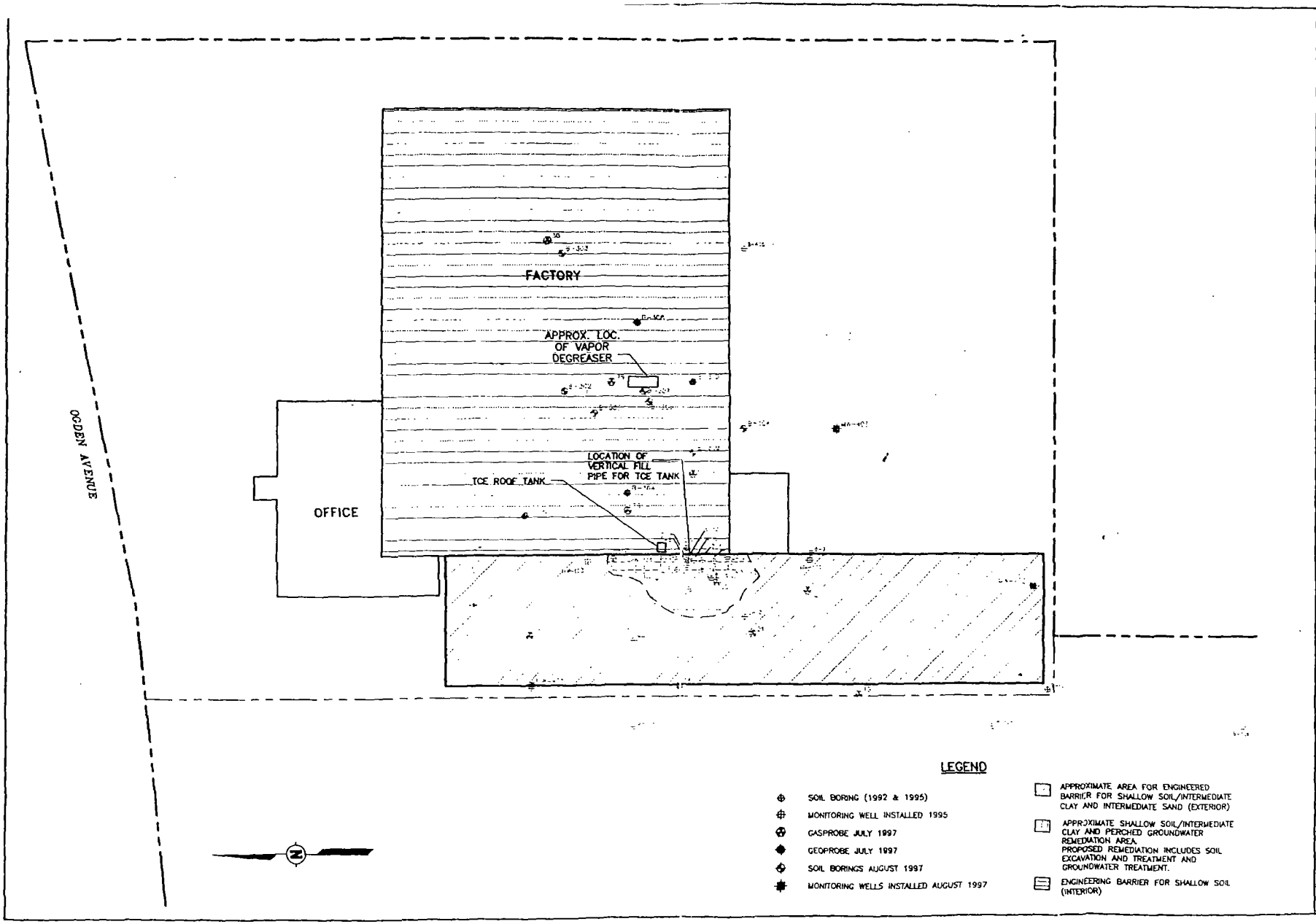
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.
26249-XC

STS PROJECT FILE
G1XC7

SCALE
1"=60'

FIGURE NO.
7



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TIER 2 EVALUATION/RECOMENDATIONS
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 26249-XC
STS PROJECT FILE G1XC8
SCALE 1"=60'
FIGURE NO. 8

3.0 RESPONSE ACTIONS

Based upon the findings of the 1992 site investigation, The Lockformer Company site at 711 Ogden Avenue, Lisle, IL entered into the Illinois Voluntary Pre-Notice Program in November 1994. A site investigation was initiated in 1995 with a series of borings, groundwater monitoring wells and on-site laboratory analysis in the vicinity of the TCE fill pipe. A representative from the IEPA observed part of this investigation. Follow up sampling was conducted in November 1996. Additional site investigation in other areas of the property was performed in the summer of 1997.

In August 1997 the degreaser pit inside the facility was emptied, observed and cleaned. The old degreaser was replaced by new degreasing equipment at that time. Photographs of the degreaser pit prior to equipment replacement are included in Appendix A. Removal of the TCE tank on the building roof is planned. The Lockformer Company plans to replace the roof tank with an above ground tank near the existing fill pipe location after the proposed remedial action is completed.

4.0 SITE SPECIFIC SAMPLING PLAN

4.1 Sampling Methods and Locations

Sampling was conducted by STS in three phases starting with a soil screening investigation in 1992. The 1992 borings were performed using hand auger techniques and extended to a maximum depth of nine feet. The sampling locations are shown on Figure 3, labeled B-1 through B-15. Soil samples were retrieved in the stainless steel bucket at the end of the hand auger equipment at one to two and half foot intervals and screened for evidence of contamination using a photo-ionization detector (PID) capable of measuring total organic vapor concentrations for compounds with ionization potentials less than 10.2 electron volts (EV).

In March 1995, STS submitted a work plan to the IEPA for the Lockformer Company. This was implemented in June 1995, along with additional borings and the installation of groundwater monitoring wells based on the field findings. The eleven boring locations from the 1995 investigation are shown on Figure 3, labeled B-101, B-104 through B-106, and B-120 through B-126. The 1995 borings were performed using conventional hollow stem auger techniques using 4¼ inch diameter augers. Soil samples were obtained at 2.5 to 5.0 ft intervals using a split spoon sampler and screened in the field with the PID for evidence of volatile organic vapors as noted above. Selected samples were placed in glass containers and delivered directly to an on-site laboratory for chemical analysis. Additional samples were sent to an offsite laboratory for analysis.

Two inch diameter groundwater monitoring wells, MW-101, MW-104, MW-105, MW-120, MW-123 were installed in five of the 1995 borings. Monitoring well MW-126 was installed in weathered limestone. Well installation diagrams are included in Appendix B. Each well consisted of a 5 or 10 foot stainless steel well screen, 10 ft of stainless steel riser pipe and then PVC pipe extending up to ground surface. The annular space was backfilled with sand around the well screen and bentonite chips or cement-bentonite grout above the sand. Each well is protected by a cement-mounted metal cover either flush-mounted or with 3 ft stickup.

The monitoring wells installed during the 1995 investigation were developed and sampled in 1996.

Areas of the site beneath the building and on the south and west sides of the building were sampled in 1997 by soil gas probes, Geoprobe borings (interior borings) and conventional drilling equipment (exterior borings and wells). Five borings were drilled and sampled in 1997 as in 1995 except that an all-terrain mounted drill rig was needed for some of the borings due to soft ground conditions south of the Lockformer building. The samples selected for chemical analysis in 1997 were delivered to a subcontract laboratory in Naperville, IL under chain of custody control. The 1997 sampling locations are also shown on Figure 3. The interior borings are labeled B-301 through B-310. The exterior borings are labeled B-401 and B-405. Three additional two inch diameter groundwater monitoring wells, MW-401, MW-402, and MW-403, were installed in three of the 1997 borings. The gas probe locations from the 1997 investigation are shown by a symbol and a probe number.

The soil conditions encountered are described in boring logs prepared from field logs recorded during the field exploration. The boring logs are included in Appendix C. Soil types and groundwater levels noted during drilling are included on the logs. In addition, the results of the PID screening of the soil samples are noted on the logs. The samples taken for chemical analysis from the soil borings are listed in Table 1.

Groundwater samples were collected from monitoring wells MW-101, MW-120, MW-123 and MW-126 in November 1996 and from monitoring wells MW-401, MW-402 and MW-403 in August 1997. Monitoring wells MW-104 and MW-105 were dry and not sampled. Groundwater samples were transported to an offsite laboratory for analysis.

In June-July, 1997, STS performed a soil-gas survey of the subject site in order to better assess the horizontal extent of contamination. STS installed 31 and 24 EMFLUX® soil-gas cartridges during initial and supplemental surveys, respectively. EMFLUX® soil-gas cartridges were installed at various locations underneath the factory floor and outside the factory. The soil-gas sampling points installed for the initial survey are shown on Figure 3. After the recommended 72-hour waiting period, the sample cartridges were collected and sent to Quadrel Services, Inc., (Clarksburg, MD) for analysis. Analyses included TCE, PCE, and the

following chlorinated compounds thought to be degradation products: 1,1-DCE, trans-1,2-DCE, and cis-1,2-DCE. Other compounds tested included 1,1,1-TCA chloroform and carbon tetrachloride. The measured soil-gas concentrations are not directly correlated to actual soil contaminant concentrations, and measured levels in soil gas analyses above clean-up objectives do not necessarily indicate an exceedance of these objectives in the soil. Results from the supplemental survey could not be used as an indicator of soil contamination because follow-up intrusive soil sampling at borings B-402, B-403, B-404 and B-405 showed that contaminant concentrations in the soil were below minimum detection levels.

4.2 Sampling Analyses and Results

The results of the chemical analyses are summarized in Tables 1, 2, and 3 for the exterior soil borings, interior soil borings, and the site groundwater, respectively. Only chemical parameters detected above standard detection levels are listed on these tables.

The selected soil samples listed in Table 1 were analyzed either in a temporary on-site laboratory or a subcontract lab. Soil samples from borings B-13 through B-15 were analyzed by Quality Analytical Labs. Soil samples collected at borings B-121 through B-126 and at borings B-101 through B-120 were analyzed on-site by Trace and Enviroscan Laboratory, respectively, with limited additional laboratory analysis by Industrial Environmental Analysis (IEA). Samples from the exterior and interior borings (300 series and 400 series borings) performed in 1997 were analyzed by V.O.C. Analytical Laboratories. Individual laboratory reports of soil analysis results are included in Appendix D. The methods utilized are listed on the data sheets.

The groundwater samples (collected in 1996 and 1997) were analyzed by V.O.C. Analytical Laboratories. Individual laboratory results are included in Appendix E.

4.3 Physical Analyses

Five soil samples were submitted for physical analyses in preparation for performance of Tier 2 calculations for the subject site. Four soil samples were collected at boring B-401 located to the west of the impacted area. Soil samples were collected just below the fill zone (8.5-10 ft), in

the zone where perched water occurs (13-15 ft) and at two deeper dry soil zones (23-25 ft and 43.5-45 ft). One soil sample for physical analysis was collected at a depth of 23-25 feet below ground surface at boring B-403 located to the south of the impacted area.

The soil samples were submitted to STS' soil testing laboratory in Techny, Illinois for one or more of the following analyses: water content (ASTM D5084), hydraulic conductivity (ASTM D5084), dry density (ASTM D1556), specific gravity (ASTM D854), and organic content (ASTM D2974). Table 4 summarizes the results of the physical soil analyses.

Quality Assurance Plan

Field activities were conducted in general accordance with STS procedures included as Appendix F. STS soil sampling, well installation, groundwater sampling, decontamination and waste handling procedures are provided. The analysis methods and method detection limits used by the subcontract laboratories are included on the individual laboratory sample data sheets. Laboratory CQA protocol documentation can be provided upon request.

5.0 DOCUMENTATION OF FIELD ACTIVITIES

5.1 Site Conditions

Soil Conditions

Soil boring logs from the 1992, 1995, 1996 and 1997 explorations are attached as Appendix C. The soils generally consist of 3 to 8 feet of silty clay fill and/or topsoil, underlain by silty clay soils to a depth of 18 to 32 feet below ground surface. Seams and pockets of silt and sand were prevalent in the natural silty clay strata. Beneath the silty clay is a thick sequence of gravelly sand which generally extends to the top of bedrock, although some silt and clay may be present at the top of rock.

Bedrock was encountered at approximately 37.5 feet and at 44.5 feet below ground surface at wells MW-105 and MW-104, respectively, located just west of the building. Water well logs for the residential development northwest of the Lockformer facility indicated that depth to bedrock was approximately 40 feet. Shallow bedrock in the site vicinity consists of the Silurian age Niagaran dolomite. The bedrock surface slopes down to the south and west of well MW-105 as bedrock was not encountered at depths of 55 feet, 57.5 feet, and 60 feet at wells MW-401, MW-120, and MW-403, respectively. On the adjacent lot to the west, bedrock was encountered at a deeper depth, approximately 80 feet at a well located approximately 75 feet from the southwest property boundary.

The 1992 soil screening results indicated that shallow soil to a depth of seven feet was impacted by VOCs at borings B-1, B-2, B-5, B-7, B-8, and B-11 where PID readings were as high as 800 ppm.

Cross-sections of the subsurface extrapolated from soil borings are presented in Figures 4a and 4b. Analytical results of soil analyses are shown on the cross-sections and in plan view on Figures 5 and 6 for the shallow/intermediate clay soils and the intermediate sand strata, respectively. As shown in Table 1, the analytical results indicated maximum shallow soil

TCE concentrations of 680 mg/kg, 120 mg/kg and 21 mg/kg in samples collected from borings B-13, B-14, and B-15, respectively. Additionally, maximum PCE concentrations of 20 mg/kg, 1.7 mg/kg and 0.88 mg/kg were reported for soil samples collected in borings B-13, B-14 and B-15, respectively. Borings B-13, B-14 and B-15 were located near the fill pipe on the west side of the Lockformer main building.

In the underlying intermediate clay, the analytical results indicated maximum TCE concentrations of 960 mg/kg and 0.093 mg/kg in borings B-105 and B-101, respectively. Boring B-105 was located south and boring B-101 was located west of the fill pipe area. Additionally 1,1,1-TCA and 1,1,2-TCA contamination was noted in boring B-13. Contamination is defined as soil concentrations exceeding the IEPA threshold of 0.060 mg/kg TCE, 2 mg/kg 1,1,1-TCA, and 0.020 mg/kg 1,1,2-TCA (IEPA Tier 1 Remediation objectives for the migration to groundwater pathway).

In the intermediate sand strata, maximum TCE concentrations were reported to be 9.2 mg/kg at boring B-105, 6.5 mg/kg at boring B-122, 1.1 mg/kg at boring B-104 and >0.301 mg/kg at boring B-120. Other VOCs were noted in some of the soil samples analyzed, however the concentrations of these parameters were found to be below IEPA Tier 1 clean up objectives for the migration to groundwater pathway for soils.

The Quadrel Services soil-gas report and laboratory results of the initial survey are provided in Appendix G and are included on Figures 4 through 6. Of the analytes, TCE was the compound detected most frequently and along with PCE was found in the highest concentration. The highest TCE levels were found in Gasprobe-28 and 30 located beneath the factory floor and Gasprobe-22 located near and west of boring B-15. Concentrations of TCE were 26,000 nanograms per liter (parts per trillion), 63,500 ng/l and 24,000 ng/l, respectively.

The results of the physical soil testing are presented in Table 4. The organic carbon content of the soils collected on-site ranged from 1.1 percent for the deeper sand to 1.5 percent for the intermediate clay. On the west lot, the organic carbon content was reported to be 2.3 percent for the deeper sand.

Groundwater Conditions

Monitoring wells MW-101 and MW-123 are situated to collect shallow perched groundwater from the silty clay strata. Wells MW-104 and MW-105 are screened in the deeper sand and gravelly sand layers and wells MW-120, MW-401, MW-402 and MW-403 are screened in the silt strata below the sand layers, but above the top of bedrock. Monitoring well MW-126 is screened in weathered limestone.

The deep groundwater table at the Lockformer site is generally within the clayey silt/silty clay layer below the granular soils. Based on water level readings taken in September 1997 and January 1998, the deep water table is approximately 40 to 54 feet the below ground surface.

A perched groundwater table is present near the west wall of the Lockformer building. Wells MW-123 and MW-101 both had groundwater at approximately 11 feet below the surface. Wells MW-104 and MW-105 set at depths of 44 feet and 37 feet, respectively, have remained dry throughout the monitoring period.

The analytical results from the 1996 and 1997 testing of groundwater samples are summarized in Table 2 and included in Appendix F. The groundwater results are also shown on Figure 7. Allowable levels of selected parameters, as defined by the IEPA are also included in Table 2. The results indicate that elevated concentrations of several solvents were found in the shallow (20 feet) and deep (50 feet) groundwater, west and south of the Lockformer building. The maximum TCE concentrations in the perched groundwater at well MW-101 was 68 mg/l. In addition to the TCE concentrations, the shallow groundwater vinyl chloride, 1,1,1-DCE, cis 1,2-DCE, methyl chloride, chloroform, 1,1,1-TCA, 1,1,2-TCA and PCE concentrations were above allowable levels for IEPA Class I or Class II groundwater at monitoring well MW-101 located in close proximity to the fill pipe.

Deeper groundwater TCE concentrations at monitoring wells MW-120 and MW-401 were reported to be 0.059 mg/l and 0.0072 mg/l, respectively, and exceeded allowable IEPA Class I or Class II levels.

6.0 ENDANGERMENT ASSESSMENT

This section characterizes the extent of contamination for contaminants of concern related to the recognized environmental conditions. Tables 5 and 6 present summaries of the contaminants of concern, contaminant concentrations and the exceedances of the Tier 1 remediation objectives for soil and groundwater, respectively. A summary of the contaminants above Tier 1 levels is described below.

6.1 Contaminants in Site Soils

External Shallow Fill Soil and Intermediate Clay

The contaminant concentrations in the shallow fill soil are above Tier 1 objectives for TCE, PCE, 1,1,1-TCA and 1,1,2-TCA in the area of the fill pipe at borings B-13, B-14, and B-15. Based on elevated PID readings, the soil contamination is expected to extend north-south along the building between MW-123 and boring B-12 and underneath the building.

Tier 1 TCE and PCE soil cleanup objectives were exceeded in fill soils at borings B-13, B-14 and B-15 for the migration to groundwater pathway. The TCE ingestion and inhalation objectives for industrial-commercial land use and the inhalation objective for the construction workers also were exceeded for one or more soil samples. The Tier 1 soil objectives for 1,1,1-TCA and 1,1,2-TCA were exceeded for the migration to groundwater pathway at boring B-13. It is likely that TCE contaminants migrated via vapor or aqueous phases from the shallow fill soil downward into the underlying fractured brown and gray silty clay having sand and silt seams (intermediate clay), stiff gray silty clay and sand (intermediate sand) layers.

Tier 1 TCE soil cleanup objectives were exceeded in intermediate clay samples at borings B-105, B-101, and B-125 for the migration to groundwater pathway and at B-105 for the industrial-commercial ingestion and inhalation pathways and the construction worker inhalation pathway.

Two Tier 1 exceedances were noted in the gray silty clay soils (below the intermediate clay). The Tier 1 objective for TCE was exceeded at boring B-122. The Tier 1 objective for PCE was exceeded in boring B-401.

Interior Shallow Fill Soil

The probable source of the shallow fill soil contamination underneath the facility is the degreaser pit. Tier 1 TCE soil cleanup objectives were exceeded at borings B-301, B-302, B-303, B-304, B-305, B-306, and B-307 for the migration to groundwater pathway and at boring B-307 for the industrial-commercial and construction worker inhalation pathways.

Intermediate Sand

The intermediate sand layer exhibits TCE above Tier 1 soil objectives for the migration to groundwater pathway at borings B-104, B-105, B-120, B-122, and B-125.

The maximum concentrations that were reported (9.2 mg/kg) for soil samples collected in the intermediate sand layer are more than two orders of magnitude less than those (960 mg/kg) collected in the above lying intermediate clay layer. This indicates that the TCE was being attenuated as it migrated downward and laterally through the sand.

6.2 Contaminants in Site Groundwater

Perched Groundwater

The perched groundwater contained in the intermediate clay layer underlain by the stiff gray silty clay is contaminated above the Tier 1 Class I objectives with the following compounds: TCE, PCE, 1,1,1-TCA, 1,1,2-TCA, cis1,2-DCE, trans1,2-DCE, 1,1-DCE, vinyl chloride, methylene chloride, and chloroform. The contaminated perched groundwater (MW-101) is expected to be limited in extent as evidenced by groundwater concentrations below Tier 1 objectives collected at monitoring well MW-123 located approximately 70 ft north of well MW-101 and by the lack of perched water at boring B-120, located approximately 85 ft south of well MW-101.

Biodegradation via reductive dechlorination of the contaminated perched groundwater has likely occurred resulting in the presence degradation products including 1,1-DCE, cis-1,2-DCE, trans1,2-DCE and vinyl chloride-in the shallow groundwater samples analyzed in 1996. 1,1,1 TCA was also noted in some of the shallow groundwater samples.

Deeper Groundwater System

The deeper groundwater within the silt layer underlying the intermediate sand layer is contaminated with TCE above the Tier 1 Class I objective at monitoring wells MW-120 and MW-401. Groundwater samples collected at the downgradient well, MW-403, and at wells MW-402 and MW-126 were not contaminated above Tier 1 Class I objectives.

The Village of Lisle, including the Lockformer facility, receives drinking water from Lake Michigan supplied by the DuPage County Water Commission. An on-site well is used to supply water for industrial purposes. It was tested for VOCs in 1989 and contaminant concentrations were non-detect.

The Village of Downers Grove also receives drinking water from Lake Michigan supplied by the DuPage County Water Commission. Inquiry at the public works department indicated that a back-up municipal well located approximately 4000 feet from the Lockformer site has not been used since 1992. In Downers Grove, homes that are still supplied drinking water by private wells are scattered throughout the village.

The nearest surface water body to the site is the St. Joseph Creek located approximately 1,300 feet, south of the Lockformer property. The creek is considered downgradient of this site.

7.0 TIER 2 EVALUATION

Since, as shown in Tables 5 and 6, Tier 1 objectives have been exceeded at the Lockformer site, Tier 2 calculations were performed to determine alternative soil remediation objectives. Site specific physical data were used in Tier 2 calculations for PCE, TCE, 1,1,1-TCA and 1,1,2-TCA. The Tier 2 calculations were performed using TACO-Pro, a computer program designed by Andrews Environmental Engineering (Springfield, IL) specifically for performing the calculations. The Soil Screening Limit (SSL) equations were used in the calculations. Based on these findings, remedial objectives were developed, and remedial actions have been proposed.

7.1 Contaminated Soils

Table 7 summarizes the results of the Tier 2 calculations for site soils. To develop the Tier 2 objectives for the external shallow fill/intermediate soil, default values were used in the Tier 2 SSL equations for all variables except for organic carbon content. The percentage of organic carbon as determined by laboratory testing was 1.3 percent for clay soils underlying the fill soils (Table 4). The values used for each parameter are provided in the TACO-Pro Tier 2 report in Appendix I. The calculated Tier 2 corrective action objectives (maximum allowable values) provided on Table 7 are: 1.37 mg/kg for TCE, 0.28 mg/kg for PCE, 7.3 mg/kg for 1,1,1-TCA and 0.96 mg/kg for 1,1,2-TCA. Soil concentrations of 1,1,1-TCA and 1,1,2-TCA do not exceed the Tier 2 SSL corrective action objectives. Since the Tier 2 objectives for TCE and PCE are exceeded in some locations, remedial action as outlined in Table 8 and described below is proposed.

External Shallow Fill/Intermediate Soils

The shallow fill soils in the source area will be excavated to a maximum depth of approximately nineteen feet and remediated to the proposed Tier 2 alternative soil remediation objectives (Table 7). The area to be remediated, shown on Figure 8, covers approximately 3,000 square feet and extends up to 19 ft in depth based on a soil concentration

3110 yd^3

of 960 mg/kg at boring B-105. It is proposed that the soil be thermally treated on-site and be replaced in the source area.

The excavation of all the soil above the Tier 2 remediation objective in this area may not be practical because of the presence of the building foundation and underground lines, maintenance of the structural integrity of the building and the presence of groundwater. Therefore, to ensure that the inhalation, ingestion and migration to groundwater exposure routes are cut off, it is proposed that an engineered barrier be installed and maintained. The points of exposure would be relocated to areas where Tier 2 soil objectives are met. The engineered barrier will be installed adjacent to the building extending west to a few feet from the property boundary and north and south to encompass B-123 and B-120, respectively, as shown on Figure 8.

Internal Shallow Soils

The proposed Tier 2 objectives for the soils beneath the factory floor are also presented in Table 7. The Tier 1 Soil Remediation Objectives were exceeded for TCE at borings B-307, B-302, B-303, B-304, B-305, and B-306 completed underneath the facility concrete floor.

To address the inhalation and migration to groundwater exposure pathways, it is proposed that the facility maintain the concrete floor as an engineered barrier to eliminate the pathway.

groundwater has already been impacted

Intermediate Sand Layer

The proposed Tier 2 cleanup objective for the intermediate sand on the site are exceeded; however, no action is planned to remediate the sand at this time because of the proposed installation of an engineered barrier over the impacted sand. With the addition of a barrier, the migration pathway will be eliminated. To prevent future contaminant migration from the source area to the intermediate sand layer, the shallow fill and clay soils and perched groundwater in the source area will be remediated to proposed Tier 2 remediation objectives and an engineered barrier will be constructed and maintained.

Intermediate Sand Layer - West Lot

STS performed preliminary Tier 2 calculations evaluating the status of the property directly west of the Lockformer west parking lot in relation to IEPA cleanup requirements. Using test results summarized in Table 4, IEPA cleanup objectives were calculated for TCE, the only parameter known to be in exceedance of Tier 1 levels on the west lot. Additionally, recent laboratory testing showed no detections of TCE at three other locations on the west lot. The Soil Screening Limit (SSL) equations were used in the calculations. Default values were used in the SSL equations for all variables except for organic carbon content. The percentage of organic carbon as determined by laboratory testing was 2.3 percent for the intermediate sand. The resulting Tier 2 TCE remediation objective proposed is 2.07 mg/kg. The values used for each parameter are provided in the TACO-Pro Tier 2 report in Appendix I. TCE concentrations reported at borings B-104 and B-125 do not exceed the proposed Tier 2 cleanup objectives.

7.2 Contaminated Groundwater

As shown on Table 6, the groundwater at the Lockformer Company exceeded the Class 1 objectives for some parameters. The proposed remedial actions are summarized on Table 9 and discussed below.

Perched Groundwater

The Tier 1 Class I Groundwater Remediation Objectives were exceeded for ten analytes at monitoring well MW-101 located in the shallow groundwater in the source area. To reduce the contaminant concentrations, the perched groundwater that drains into the excavation during soil remediation will be pumped to a tank and either disposed of off site or treated on-site. A sump will be installed in the excavation to collect contaminated perched water that may still remain after the replacement of clean soil. This groundwater will be discharged off-site if a sufficiently small volume of water is collected or, if cost-effective, the water will be treated via air stripping/carbon adsorption on-site and discharged to the storm sewer through a NPDES discharge permit. Installation of potable wells on-site will be prohibited.

Deeper Groundwater System

The Tier 1 Class 1 Groundwater Remediation Objective were exceeded at two monitoring wells set in the deeper groundwater. At monitoring well MW-401, TCE objectives were exceeded, and at monitoring well MW-120, TCE and cis 1,2-DCE objectives were exceeded. It is proposed that an institutional control prohibiting the installation of on-site potable wells be implemented. No other remedial action for the site groundwater is proposed at this time.

STS used equation R26 to calculate the downgradient TCE concentration at the property boundary. Water level data for monitoring wells MW-401, MW-402 and MW-403 were used to determine the relative groundwater elevation, direction of groundwater flow, and horizontal hydraulic gradient. The hydraulic conductivity of the groundwater system was determined by the performance of slug tests at monitoring wells MW-401 and MW-120. The TCE groundwater concentration of 59 µg/l at the source area was used in the equation. This was the concentration reported for the groundwater sampled at monitoring well MW-120 located just downgradient of the source area. The results of the R26 calculations indicate that concentrations of TCE will not exceed the Tier 1 Class 1 groundwater remediation objective at downgradient the property line. Therefore, no remedial action is planned regarding offsite impairment. The Tier 2 R26 calculations are presented in Appendix I.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The extent of TCE and other volatile organic compound contamination has been estimated based on investigations conducted since 1992. Concentrations of TCE, PCE, 1,1,2-TCA, and 1,1,1-TCA were found in the shallow fill soils in the fill pipe area above Tier 1 objectives. The conclusions from the investigation include the following:

- Contamination of TCE occurred in the shallow fill soils in the fill pipe area resulting in the downward migration of TCE through fractured brown and gray silty clay into stiff gray silty clay;

- TCE contaminants migrated downward and laterally to the northwest, south and southwest in the intermediate sand layer. Impacting groundwater at a depth of approximately 56 feet below ground level;

- Perched groundwater at a depth of approximately 12 feet below ground level appeared to be of limited extent in the vicinity of the fill pipe. The perched groundwater had concentrations of ten VOCs above Tier 1 Class 1 standards. Degradation products were present in the groundwater suggesting that PCE and TCE are undergoing reductive dechlorination.

Recommended corrective actions include:

- Source removal and treatment of shallow contaminated soil located in the fill pipe area to a depth of up to 19 feet.

- Removal and treatment of contaminated perched groundwater.

- Installation and maintenance of an engineered barrier which covers the fill pipe source area.

- Maintenance of the building concrete floor as an engineered barrier.
- Periodic air monitoring in the building if drain is drain is present in the vicinity of boring B-307.
- Restriction of land use to industrial/commercial uses.
- Prohibition of on-site potable wells.

ble 1
Analysis - Exterior Borings
o 1997

Concentration in ppb										
2-A	1,1,2,2-PCA	1,2,3-Trichloropropane	Tetrachloromethane	2-Chloroethyl vinyl ether	Bromodichloromethane	Total Xylene	Toluene	Benzene	Ethyl Benzene	1,2 Dichloroethane
			56			20		13		
					18	9	41	13		18
[illegible]	200	540		270			150			
							43			
			880			0.5	17		4	

1,1,2,2-PCA	1,2,3-Trichloropropane	Tetrachloromethane	2-Chloroethyl vinyl ether	Bromodichloromethane	Total Xylene	Toluene	Benzene	Ethyl Benzene	1,2 Dichloroethane
				600ppb	150000ppb	12000ppb	30ppb	13000ppb	20ppb

Table 2
Results of Soil Sample Analysis - Interior Borings
July 1997

Boring No.	Depth (ft)	Soil Type	Concentration in ppb							
			1,1 DCE	cis DCE	trans DCE	TCE	PCE	2 Butanone	Toluene	Total Xylenes
B-301	1-3.5	fill	ND	ND	ND	9.7	ND	26	ND	ND
B-302	1-3	fill	*	*	*	**120**	*	*	*	ND
B-303	1-3	fill	*	*	*	**780**	*	*	*	ND
B-304	1-3	fill	ND	ND	ND	**130**	ND	ND	ND	ND
	7-9	fill	ND	ND	ND	ND	ND	ND	ND	ND
B-305	1-3	fill	ND	ND	ND	**120**	ND	ND	ND	ND
	8-10	CL	ND	ND	ND	ND	ND	19	ND	ND
B-306	1-3	fill	*	*	*	**610**	*	*	*	ND
	8-10	Top Soil	ND	ND	ND	ND	ND	ND	ND	ND
B-307	4-6	fill	*	*	*	**22000**	*	11000	*	ND
	12.5-15	CL	*	*	*	**230**	*	*	*	ND
B-308	1-5	fill	ND	ND	ND	12	ND	ND	7.3	8.3
	8-10	CL	ND	ND	ND	6.8	ND	29	ND	ND
B-309	5.5-8	CL	ND	ND	ND	ND	ND	ND	ND	ND
B-310	1-3	fill	ND	ND	ND	ND	ND	ND	ND	ND
TACO Tier 1 Soil Cleanup Objectives, Migration to Groundwater (Industrial)										
			60ppb	400ppb	700ppb	60ppb	60ppb	--	12,000ppb	150,000ppb

* Elevated detection levels due to sample dilution; no detection

Indicates exceedance of Tier 1 Cleanup Objective

Table 4
Results of Physical Soil Testing
(for IEPA Tier 2 Calculations)

Boring No.	Depth (ft.)	Soil Type	Organic Content (%)	Specific Gravity	Dry Density ($lb/ft.^3$)	Natural Water Content (%)	Hydraulic Conductivity (cm/sec)
B-120	50-55	ML	--	--	--	--	2.2×10^{-4}**
B-401	50-55	ML	--	--	--	--	4.2×10^{-4}**
B-401	8.5-10	CL	1.3	--	--	19.5	4.2×10^{-8}*
	13-15	CL	1.5	--	112.7	17.8	--
	23-25	CL	--	--	108.2	21.0	--
	43.5-45	SM	1.1	2.81	--	11.5	--
B-403	23.-25	CL	1.1	2.72	109.2	21.8	3.0×10^{-8}*
West Lot	25-27	SP	2.3	2.78	--	3.9	--

-- Indicates not tested.
* Hydraulic conductivity from laboratory testing 1997.
** Hydraulic conductivity from field baildown tests, 1998.

Table 5
Summary of Tier 1 Objective Exceedances - Soils
Lockformer Site
Lisle, Illinois

			TCE TIER 1 Objectives (mg/kg)				
			Industrial - Commercial		Construction Worker		Groundwater Ingestion Class I 0.06
			Ingestion 520	Inhalation 8.9	Ingestion 1,200	Inhalation 12	
Soil Strata	Sample Location, depth	Concentration (mg/kg)	**TIER 1 EXCEEDANCES**				
SHALLOW FILL	B-13, 1-2'	680	X	X		X	X
Exterior	B-13, 2-3'	310		X		X	X
	B-13, 3-4'	110		X		X	X
	B-14, 1-2'	120		X		X	X
	B-15, 3-4'	21		X		X	X
Interior	B-302, 1-3'	0.120					X
	B-303, 1-3'	0.780					X
	B-304, 1-3'	0.130					X
	B-305, 1-3'	0.120					X
	B-306, 1-3'	0.610					X
	B-307, 4-6'	22.0		X		X	X
	B-307, 12.5-15'	0.230					X
INTERMEDIATE CLAY	B-105, 15-17'	960	X	X		X	X
	B-101, 20-21.5'	0.093					X
	B-125, 10-12.0'	0.110					X
INTERMEDIATE SAND	B-104, 42-44'	1.1					X
	B-105, 35-36.5'	9.2		X			X
	B-120, 35-37'	>0.301					X
	B-122, 30-32'	4.0					X
	B-122, 32.5-34.5'	6.5					X
	B-125, 17.5-19.5'	0.1					X

Table 5 (Continued)
Summary of Tier 1 Objective Exceedances - Soils
Lockformer Site
Lisle, Illinois

			PCE TIER 1 Objectives (mg/kg)				
			Industrial - Commercial		Construction Worker		Groundwater Ingestion Class I 0.06
			Ingestion 110	Inhalation 20	Ingestion 2,400	Inhalation 28	
Soil Strata	Sample Location, depth	Concentration (mg/kg)	**TIER 1 EXCEEDANCES**				
SHALLOW FILL *Exterior*	B-13, 1-2'	20		X			X
	B-13, 2-3'	9					X
	B-13, 3-4'	2.5					X
	B-14, 1-2'	1.7					X
	B-15, 3-4'	0.88					X
INTERMEDIATE CLAY	B-401, 28-30'	0.140					X

			1,1,1-TCA TIER 1 Objectives (mg/kg)				
			Industrial - Commercial		Construction Worker		Groundwater Ingestion Class I 2.0
			Ingestion --	Inhalation 1,200	Ingestion --	Inhalation 1,200	
Soil Strata	Sample Location, depth	Concentration (mg/kg)	**TIER 1 EXCEEDANCES**				
SHALLOW FILL *Exterior*	B-13, 1-2'	2.2					X

Table 5 (Continued)
Summary of Tier 1 Objective Exceedances - Soils
Lockformer Site
Lisle, Illinois

			1,1,2-TCA TIER 1 Objectives (mg/kg)				
			Industrial - Commercial		Construction Worker		Groundwater
			Ingestion 8,200	Inhalation 1,800	Ingestion 8,200	Inhalation 1,800	Ingestion Class I 0.02
Soil Strata	Sample Location, depth	Concentration (mg/kg)	**TIER 1 EXCEEDANCES**				
SHALLOW FILL *Exterior*	B-13, 3-4'	0.120					X

Table 6
Summary of Tier 1 Objective Exceedances - Groundwater
Lockformer Facility
Lisle, Illinois

	Well Number	Contaminants Exceeding Tier 1 Objectives	Concentration in Site Groundwater (µg/l)	Tier 1 Objective: IEPA Class I Groundwater (µg/l)
Localized Perched Groundwater System	MW-101	Vinyl Chloride	73	2
		1,1 Dichloroethene	530	7
		Methylene Chloride	63	5
		Trans 1,2-DCE	490	100
		Chloroform	7	0.02
		1,1,1 TCA	4,800	200
		Trichloroethene	68,000	5
		1,1,2 TCA	57	5
		cis 1,2 DCE	38,000	70
		Tetrachloroethene	9.5	5
Deeper Groundwater System	MW-120	TCE	59	5
		cis 1,2-DCE	79	70
	MW-401	TCE	7.2	5

Table 7
Proposed Tier 2 Soil Cleanup Objectives
Lockformer Site
Lisle, Illinois

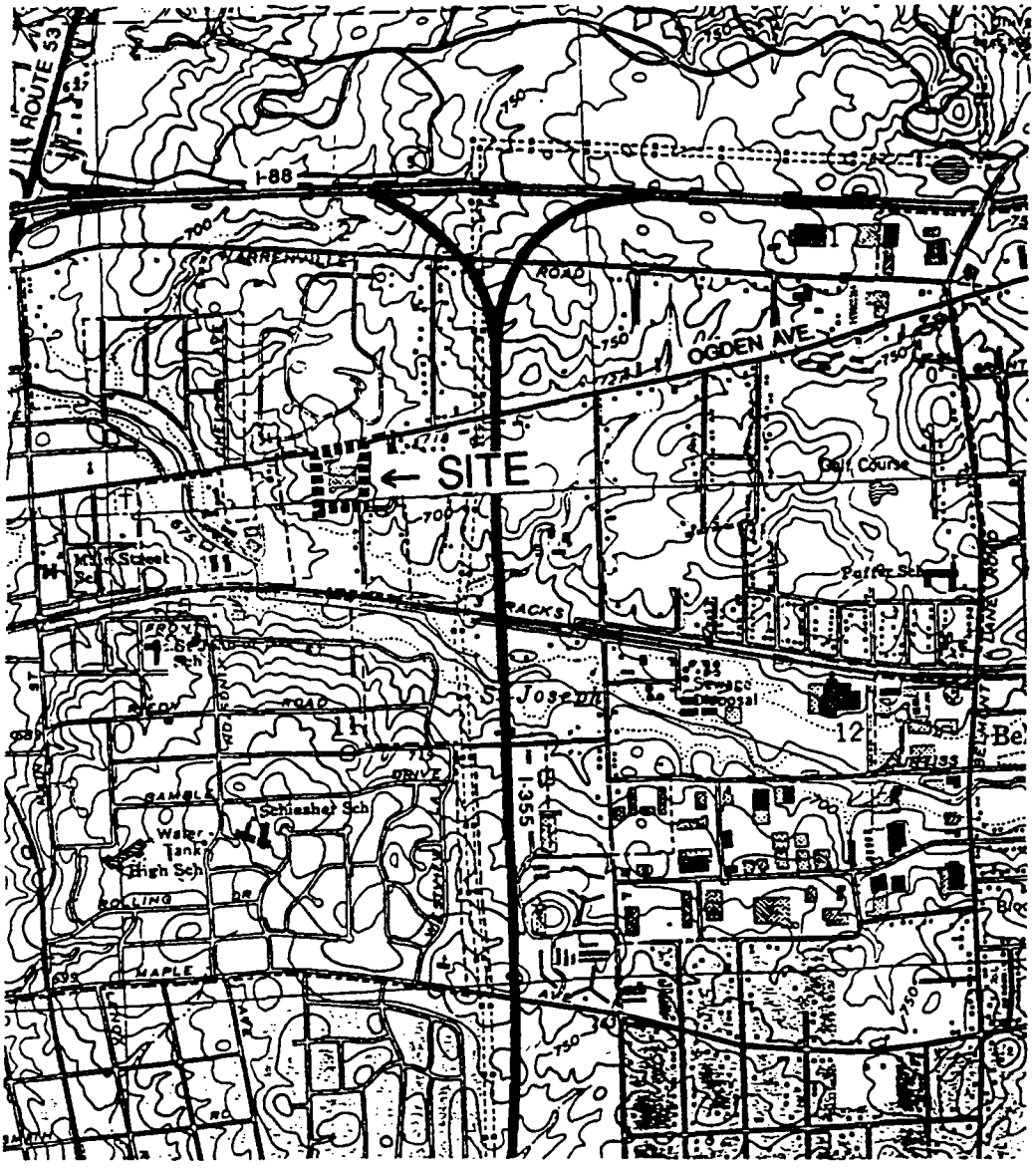
Soil Strata	Contaminants Exceeding Tier 1 Obj.	Maximum Concentration in Site Soils (mg/kg)	Site Specific Tier 2 Cleanup Objectives (mg/kg)				
			Industrial - Commercial		Construction Worker		Migration to Groundwater Class I
			Ingestion	Inhalation	Ingestion	Inhalation	
I. SHALLOW FILL / INTERMEDIATE CLAY	TCE	960	520*	9.8	1,200*	13.8	1.37
	PCE	20	110*	22	2,400*	31	0.28
	1,1,1-TCA	2.2	--	2,173	--	2,173	7.31
	1,1,2-TCA	0.120	8,200*	3,296	8,200*	3,296	0.96
II. INTERMEDIATE SAND	TCE	9.2	520*	8.9*	1,200*	12*	2.07

* Tier 1 Remediation Objective.
Tier 2 Remediation Objectives calculated using SSL equations.

Table 9
Proposed Remedial Action for Site Groundwater
Lockformer Facility
Lisle, Illinois

	Proposed Remedial Action
I. Localized Perched Groundwater System	1) Pump, treat and dispose of less than 100,000 gallons - Groundwater encountered during soil excavation will be pumped to an on-site frac tank. - Installation of sump to collect remaining impacted groundwater - Impacted groundwater will be disposed of off-site or treated (air-stripping) on-site and discharged 2) Institutional Control prohibiting installation of potable wells on-site
II. Deeper Groundwater System	1) Institutional Control Prohibiting installation of potable wells on-site (R26 calculation indicates compliance at site boundary)

FIGURES



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REFERENCE: U.S. GEOLOGICAL SURVEY; WHEATON, IL QUADRANGLE 1980.

STS Consultants Ltd.
Consulting Engineers

SITE VICINITY DIAGRAM
THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

DRAWN BY	KKB	1-22-98
CHECKED BY	WTE	1-22-98
APPROVED BY	CB	1-22-98
CADFILE	SCALE	1"=2000'±
STS PROJECT NO. 26249-XC	FIGURE NO.	1