BOEING

WICHITA

ZERO - LINE INVESTIGATION WORK PLAN

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Boeing Work Plan

Zero Line Investigation

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BOEING WORK PLAN
ZERO LINE INVESTIGATION

1.0 INTRODUCTION

Boeing-Wichita began site investigations in 1985. The Kansas Department of Health & Environment and Boeing Military Airplane Company entered into a Consent Order on April 16, 1987. Geological investigations at the Boeing-Wichita site indicated a complex geohydrological system and multiple source areas at the Boeing-Wichita site.

The 1987 Consent Order (Case No. 87-E-12) was amended per discussions between KDHE and Boeing during 1991 and 1992. KDHE approved the Amended Consent Order on January 22, 1993.

Installation of additional monitoring wells during the 1992 and 1993 drilling program at the Boeing-Wichita site has further defined the zero contamination line. Remediation of hot spots and containment of the contaminants beneath the Boeing-Wichita site is being accomplished by system of recovery wells. The remediation systems are continually monitored to ascertain its effectiveness.

Additional monitoring wells have been installed at the Boeing-Wichita site during 1993. The isopach maps and Wellington gray shale structure map contained in the "1992 Update" have been revised to include the data acquired during the 1993 drilling program to date.

Study of newly acquired data along the Kansas Turnpike substantiates that the contamination in the springs originates from a source other than Boeing-Wichita.

Also, additional monitoring wells are required near MW # 97 to define the zero contamination line and aid in the placement of recovery wells at this location. Six deep monitoring wells are planned to determine if any of the contamination has migrated downward into the Wellington Shale. These six monitoring wells have been completed. Please refer to the enclosed report of the installation of the deep monitoring wells.

2.0 HISTORICAL EVALUATION & SITE DESCRIPTION

2.1 SITE LOCATION

Boeing-Wichita is located in Sedgwick County, Kansas. The site is outside the Wichita, Kansas, city boundary and is located in parts of Sections 11, 12, 13, and 14, Township 28 South, Range 1 East. McConnell Air Force Base borders the Boeing-Wichita Site to the east, Highway 15 and the Kansas Turnpike to the West, 31st Street South to the North, and 47th Street South is the Southern boundary.

The Kansas Turnpike zero line investigation is located in the S/2 NW/4 and N/2 SW/4 Section 11, Township 28 South, Range 1 East. Monitoring well # 97 is located in the NW/4 NW/4 Section 12, Township 28 South, Range 1 East.

2.2 HISTORY OF SITE OPERATIONS

In November 1930, Stearman Company relocated to the current Plant 1 location.

Prior to this date, the site was used for agricultural purposes. In May 1938, Stearman became the Stearman Aircraft Division of the Boeing Company, and in September 1941, it became the Wichita Division of The Boeing Company. During the early years, the plant did not generate large quantities of hazardous waste. Lacquer and paint thinners were used in the production of the fabric covered aircraft. Other solvents, including carbon tetrachloride, acetone, and mineral spirits were later used at the facility as the chemicals became available.

When the contract to build the B-29 bomber was issued to Boeing in the early stages of WWII, Wichita was chosen as the primary site to produce the aircraft. The Plant II portion of the Wichita facility was built by the government between 1941 and 1943 for the singular purpose of assembling the B-29. Plant II has been modified extensively and added to periodically since 1943.

The production of the B-29, and later production of the B-47 and the B-52 aircraft that came later, involved using large amounts of chemicals. The initial use of Trichloroethylene (TCE) was in 1949, and the first degreaser was installed in Plant II in 1950. Several other degreasers have been installed, moved, or removed since that time. When the Manufacturing Process Facility (MPF) building came on line in 1992, most of the plating lines and some degreasers in Plant II have been decommissioned and or removed. The MPF process tanks and degreasers are on the second level suspended above secondary containments on the first level so that if a spill occurs it can be immediately addressed and will not cause any harm to the environment.

In 1957, the Industrial Waste Treatment Plant (IWTP) was completed. The IWTP was built to process waste water and chemical byproducts from the process lines in operation at Boeing-Wichita. Until that time, Boeing had discharged wastewater to the Wichita City Sewer and directly to the Arkansas River through what was called an "Industrial Main". Contamination has been found in the IWTP area but it probably is a combination of the Plant I and Plant II plumes rather than from a result of IWTP activities.

The groundwater contamination problem was discovered in late 1985, as the result of Boeing's environmental audit of property it purchased located to the north of MacArthur Road and east of K-15 Highway. The findings were reported to the KDHE and an Administrative Order was issued that put Boeing on track to remediate the problem. A remediation project was designed and implemented within months of the discovery and measurable improvements were documented initially. Changes were made inside the plant to curtail the sources of the TCE and continual upgrades have been made to the recovery well system to address new information as it developed.

The system has grown in size as new areas of contamination were found. The initial results that were developed in 1985-1987, by an outside environmental contractor showed the plume of contamination to be contained generally under the southwest portion of Plant II. The results fit the model of what was expected and both the KDHE and Boeing were confident that the actual problem had been identified and was being addressed. Subsequent to the initial evaluation, however, there were indications of additional contamination in the Plant I area, Fuel Farm, IWTP, and South Campus areas. These have been investigated. It is now apparent that there were several sources at the site. Some of which were from degreaser operations, chemical platting and milling operations and some of which were a result of Underground Storage Tanks (UST's).

2.3 HISTORY OF REGULATORY ACTIONS

As stated in the introduction, the KDHE and Boeing Military Airplane Company entered into a consent order on April 16, 1987. The 1987 Consent Order (Case No. 87-E-12) was amended by the KDHE and Boeing and approved on January 22, 1993.

2.4 REVIEW OF PREVIOUS INVESTIGATIONS

Boeing will review all available site investigation reports pertinent to the areas requiring further study. Deficiencies will be noted and included in the quarterly reports submitted to the KDHE. Appropriate action will be undertaken to correct any deficiencies in the continuing investigation and ongoing remediation at the Boeing-Wichita site.

KDHE will continuously be updated by phone, letter(s), quarterly reports, and site investigation reports on the effectiveness of the Boeing-Wichita site remediation.

The following outline will be utilized for the quarterly ground water report detailing progress of the remediation at the Boeing-Wichita site:

BOEING SITE

A. Overall area: Maps - static water level, TVOC, monitoring wells, recovery wells, etc.

B. Executive summary of site work
   1. Zero-line
   2. TVOC
   3. Static water level
   4. Work completed during quarter
   5. Bedrock map

C. Amount of ground water produced

D. Monitoring well installation procedure

E. Index monitoring wells

INDIVIDUAL SITES: 23 L, South Campus, Main Plume, Plant 1, Plant II, Fuel Farm, Activity Center, and Springs/Kansas Turnpike.

A. Site specific maps

   1. TVOC
   2. BTEX
   3. Static water level
   4. Bedrock
   5. New monitoring well summary

B. Executive summary

1. Work performed on site
   a. New monitoring wells: depths, screen, analytical
   b. New recovery wells: depths, screen, analytical
2. Discussion of TVOC (<> changes) and SWL (<> changes) and amount of ground water produced at each site
3. Problems (if any)
4. Future plans

3.0 SITE CHARACTERIZATION

3.1 SURFACE FEATURES

Surface features such as building locations and associated foundations, underground tanks and piping, possible surface disposal areas, property lines, utility lines, surface ponds, and drainage ditches will be analyzed to determine their possible affect on VOC migration. Historical surface features will be identified by the use of historical photographs, available topographic, and site maps.

3.2 GEOLOGY

The Boeing-Wichita site lies within the Arkansas River Lowlands section of the Central Lowland physiographic province (Lane and Miller, 1965). West of Highway 15, the exposed sediments are usually alluvium and terrace deposits (Wisconsinan to Recent) overlying the Wellington Shale (Permian) and east of Highway 15, the sediments exposed at the surface consist of loess (Illinoisan to Recent) overlying Permian or Pleistocene deposits (Ross and Kirshen, 1991).

Underlying the Pleistocene deposits is the Upper Wellington Member of the Wellington Formation. It consists mainly of gray shale with thin beds of limestone, gypsum, and anhydrite. Average thickness of the Upper Wellington is 250 feet, but the thickness at the Boeing-Wichita site is estimated to be 65'$\pm$ (Gogel, 1981).

Below the Upper Wellington Member is the Hutchinson Salt Member of the Wellington Formation. It is estimated to be 100 feet thick along the western edge of the Boeing-Wichita site (Gogel, 1981). The Hutchinson Salt is absent approximately 1 to 2 miles east of the Boeing-Wichita site (Gogel, 1981).

3.3 SURFACE WATER HYDROLOGY

All storm water runoff at the Boeing-Wichita site eventually flows to the Arkansas River (Lower Arkansas River Basin), which is approximately one half mile west of the western edge of Boeing property. There are four major drainage routes or tributaries which flow from Boeing-Wichita into the Arkansas River. Three of the tributaries are unnamed and flow predominately west to the Arkansas River. The fourth tributary flows north through a residential area, then to Gypsum Creek and then to the River. These drainage routes are designated on the Storm Water Map as A through D, commencing with the

tributary receiving storm water runoff from Boeing Outfall Numbers 1 (the discharge from Boeing's North Lake), 2, 2 A, 2 B, 8, 9, and 10 as A, then proceeding clockwise around the site to Tributary D which receives flow from Boeing Outfall Numbers 5, 6, and 7. Tributary B is the one which flows north to Gypsum Creek. It only receives runoff from Boeing Outfall No. 3. Tributary C receives runoff from Boeing Storm Water Outfall No. 4, which is the discharge from Boeing's South Lake. This flow goes south under 47th Street before turning southwest through a residential area, to State Highway K-15, thence to the Arkansas River.

3.4 HYDROGEOLOGY

The hydrogeology of the Boeing-Wichita site has been discussed in previous reports. Additional data obtained during this investigation will be used in conjunction with previous investigations to further characterize the hydrogeology of the Kansas Turnpike Authority (KTA) site, MW-97 area, and the vertical extent of the contamination.

Aquifer test data obtained during two earlier pump tests, IWTP and Glickman areas, discussed in earlier reports will be reviewed to determine if it represents the KTA site hydraulic properties. Isopach maps and Wellington gray shale structure map (See Appendixes) will be updated with the geologic data obtained from these three monitoring wells. Seven cross sections (A - A', B - B', C - C', D - D', E - E', F - F', & G - G') were prepared and discussed in the **"Geological Investigation Boeing Wichita"** report. Two additional cross sections, H-H' and I-I', (See Appendixes) were constructed following the installation of the KTA thirteen monitoring wells. Cross section H - H' and I - I' will be reviewed to determine if additional cross sections are needed to depict the hydrogeology of the Boeing-Wichita site.

3.4.1 INSTALLATION OF NEW MONITORING WELLS

Based upon the review of the data provided by the ten monitoring wells installed on the Kansas Turnpike Authority property during August, 1993, three additional monitoring wells have been installed as shown on the KTA site map (See Appendixes). The three additional monitoring wells helped determine the axis of the bedrock low which is present at the site. Also, the analytical data obtained from the monitoring wells will assist in further defining the plume.

Monitoring wells will be installed by Geotechnical Services, Inc. following the drilling, well construction, and sampling procedures presented in Appendixes. See Appendixes for Geotechnical Services, Inc. site safety plan.

3.4.2 AQUIFER HYDRAULIC PROPERTIES

Several pump tests have been conducted in the past and analyzed to determine the aquifer hydraulic properties at the site. Also, slug tests have been performed at the Boeing-Wichita site.

Hydraulic conductivity values are estimated to range from .005 gpd/ft^2 to 250 gpd/ft^2, because of the varying lithology of the sediments at the site. These hydraulic conductivity values will be reevaluated to determine if additional pump or slug test(s) are

necessary. In the event additional slug or pump test(s) are required to aid in groundwater modeling or remediation design, appropriate tests will be conducted.

3.4.3 STRATIGRAPHIC CROSS-SECTIONS

Previous reports submitted to the KDHE have consisted of cross sections, isopach maps, Wellington gray shale structure maps, and isoconcentration maps. Available cross sections and new data acquired during monitoring well installation will be reviewed. Additional cross section(s) will be prepared if deemed necessary.

3.4.4 GROUNDWATER MODELING

Boring logs available at the Boeing site are being reviewed at the present time. Stratigraphic data is being compiled into a spreadsheet. Once the stratigraphic data has been assembled and reviewed for accuracy, a ground water model will be prepared for the Boeing site.

3.5 CLIMATOLOGY

The Boeing site has a typical continental climate. This climate is characterized by large daily and annual variations in temperature. The average daily temperature in the winter is 33.3 degrees F, and the average daily temperature in the summer is 78.9 degrees F. Lowest temperature on record is minus 22 degrees F, which occurred on February 12, 1899. The highest recorded temperature in Wichita, Kansas, is 114 degrees F on August 12, 1936.

Precipitation is heaviest from May to September. The average annual precipitation is 28.93 inches. Average seasonal snowfall is 15.4 inches.

The above climatological data has been used in designing the five remedial systems presently operating at the Boeing site.

4.0 SOURCE CHARACTERIZATION

4.1 SUMMARY OF DATA AND IDENTIFICATION OF POTENTIAL VOC SOURCE AREAS

Please refer to individual site discussions.

4.2 POTENTIAL PATHWAYS OF CONTAMINANT MIGRATION

Potential pathways for VOC migration at the Boeing site are groundwater and surface water. The presence of elevated VOC levels in the ground water has been documented in earlier reports. Ground water at the site is being withdrawn and treated (i.e. air stripping). Effluent from the air strippers at the site is being discharged to the Boeing Industrial Waste Treatment Plant.

Surface water is a potential pathway for contaminant migration at the site. Creeks, springs, and ponds at the site have been monitored since 1986. Results of the past and

present monitoring is reported in each quarterly report.

4.3 PRELIMINARY IDENTIFICATION OF OPERABLE UNITS

The Boeing-Wichita site has been divided into eight general areas. These areas are 23L, South Campus, Main Plume, Plant 1, Plant II, Fuel Farm, Activities Center, and Springs/Kansas Turnpike.

4.4 NATURE AND EXTENT OF CONTAMINATION

Trichloroethylene, a solvent used in metal degreasing operations, is the main contaminant present in the ground water at the site. Other contaminants present in the ground water are hexavalent chromium, benzene, ethylbenzene, toluene, xylene, and carbon tetrachloride. Distribution of the contamination is depicted on maps submitted with each quarterly report to the KDHE.

The contamination is located predominantly on Boeing property. Groundwater flow, which is generally to the west or southwest at the site, has moved a small amount of the contamination off site, based upon present information. Recovery wells located on the downgradient edge of the plume are halting the off site migration. The remedial system (recovery wells and air strippers) is monitored by Boeing personnel on a daily basis to assure the system is operating at maximum efficiency.

5.0 CURRENT REMEDIAL ACTIVITIES

- 5.1 BOEING SITE GENERAL
- 5.2 23L SITE
- 5.3 SOUTH CAMPUS
- 5.4 MAIN PLUME
- 5.5 PLANT 1
- 5.6 FUEL FARM
- 5.7 PLANT II
- 5.8 ACTIVITY CENTER

6.0 SPRINGS/KANSAS TURNPIKE

Please refer to the discussion of the Springs/Kansas Turnpike area.

7.0 MAPS

All isopach maps and the Wellington gray shale structure map have been updated to include the data obtained during the installation of monitoring wells and recovery wells during the 1993 drilling program. Updated maps are enclosed in the appendixes of this report. Data obtained from the three proposed monitoring wells has been added to these maps. Data obtained from the proposed monitoring wells at the MW-97 site and the six deep monitoring wells will be used in updating all isopach maps, isoconcentration maps, and the Wellington gray shale structure map.

8.0 PROPOSED FURTHER INVESTIGATION

Proposed monitoring wells are discussed in the individual site discussions. Location of any additional monitoring wells will be based upon review of available quarterly monitoring well and recovery well data.

9.0 REFERENCES

Bevan, Hugh E., 1989, Water Resources of Sedgwick County, Kansas: U.S. Geological Survey, Water-Resources Investigation Report 88-4225, 119p.

Bittersweet Energy, Inc., 1992, Geological Investigation Boeing-Wichita, Project No. 393816, Sedgwick Co., Kansas, 178p.

Bittersweet Energy, Inc., 1992, Monitoring Well # 63 Plant 1: Boeing-Wichita Pumping Test, 16p.

Bittersweet Energy, Inc., 1992, Glickman Site- Pumping Test Summary, Project No. 178929, Sedgwick Co., Kansas, 46p.

Gogel, T., 1981, Discharge of Saltwater From Permian Rocks to Major Stream-Aquifer Systems in Central Kansas: Kansas Geological Survey, Chemical Quality Series 9, 60p.

Lane, C. W. and D. E. Miller, 1965, Geohydrology of Sedgwick, County, Kansas: Kansas Geological Survey, Bulletin 176, 100p.

Lane, C. W. and D. E. Miller, 1965, Logs of Wells and Test Holes in Sedgwick County, Kansas: Kansas Geological Survey, Special Distribution Publication 22, 175p.

Merriam, D. F., 1963, The Geological History of Kansas: Kansas Geological Survey, Bulletin 162, 317p.

Mid West Analytical Laboratories, 1986, Remedial Investigations, 51p.

Mid West Corporation, 1986, Site Environmental Audit of the Trachtman/Dekarsky Property, 33p.

Mid West Environmental Consultants, 1986, Site Environmental Audit of the Person Property, 28p.

Mid West Environmental Consultants, 1987, Site Environmental Audit of the Lekron Farm Property, 25p.

Mid West Environmental Consultants, 1987, Site Environmental Audit of the Farha Property, 40p.

Penner, Harold L. and William A. Wehmueller, 1979, Soil Survey of Sedgwick County, Kansas: United States Department of Agriculture, Soil Conservation Service, 126p.

Ross, Jorgina A. and Deborah S. Kirshen, 1991, Geological Map of Sedgwick County, Kansas: Kansas Geological Survey, Map M-25, 1p.

Terracon Environmental, Inc., 1990, Warehouse 2, Project No. 52905108, 32p.

Terracon Environmental, Inc., 1990, Phase 2 Groundwater Plant 1 Facility, Project No. 52905009, 131p.

Terracon Environmental, Inc., 1990, Preliminary Groundwater Study Plant 1 Facility, Project No. 52905009, 111p.

Terracon Environmental, Inc., 1991, Monitor Well Installation/Abandonment Flight Line Monitor Wells, Project No. 52915060, 22p.

Terracon Environmental, Inc., 1991, Recovery Well Installation Boeing IWTP, Boeing Military Airplanes Wichita, Kansas, Project No. 52915005, 93p.

Terracon Environmental, Inc., 1991, Groundwater Study K-15 Springs, Project No. 52905062, 175p.

Terracon Environmental, Inc., 1989, Scope of Services Recovery Wells: BAMD Fuel Farm, Tasks II and III, Boeing Project No. B8-9303, 32p.

REPLY TO KDHE QUESTIONS

1. The following information concerning the new monitoring wells should be summarized: drilling method(s), groundwater sampling procedure, well construction materials and procedure, well depths and screen intervals. This information could be provided in an Appendix to this workplan as suggested in # 12 below.

PLEASE REFER TO APPENDIX F OF ZERO-LINE INVESTIGATION WORKPLAN FOR DRILLING METHOD(S), GROUNDWATER SAMPLING PROCEDURE, WELL CONSTRUCTION MATERIALS AND PROCEDURE.

PLEASE REFER TO APPENDIX C AND D OF WORKPLAN FOR WELL DEPTHS AND SCREEN INTERVALS.

2. Page 1, Section A. Describe the rational behind the assertion that the contamination in monitoring wells in the northernmost area is not connected to the Boeing contamination. A cross section of this area would be helpful. Discuss the groundwater flow patterns in the future.

Source of contamination located at 3524 E. Craig does not appear to be a result of off-site migration of the Boeing plume. Since ground water flow is generally west to southwest in the area, the source would have to be to the northeast. You will note the zero line of the Boeing plume has been defined to the northeast of the Craig Street contamination. Based upon the direction of ground water flow, bedrock configuration, and zero line of the Boeing plume as presently defined, an unidentified source not related to the Boeing plume is present in the area. Please refer to the individual site discussions for further details.

3. Page 1, Section A. A request for coordination of additional investigation is not appropriate in this workplan. KDHE plans to investigate this area in the future.

ACKNOWLEDGED

4. The levels of and types of contaminants should be discussed for each area of the site. Site areas can be divided according to location, type of contaminant(s), or remediation activities.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

5. The specific problems in defining the zero-line for each site area should be discussed in greater detail. If the zero-line has been defined for the site area according to the monitoring well data, this should be substantiated in the workplan so that further investigative work is shown to be unnecessary.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

6. Page 1, Section B. Discuss and specify further plans to define the zero-line along K-15. Future monitoring wells should be located on a map and their proposed construction design should be discussed. The rationale for the locations of these wells should be summarized.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

7. Page 1, Sections B and C. The schedule should indicate when the new monitoring wells will be constructed and sampled for each site area.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

8. Page 2A. It is unclear whether the recovery and vapor extraction wells discussed are completed or not. Describe the operation of the vapor extraction system; how will this system be monitored? What are the depths of the vapor extraction wells and the recovery wells? A larger scale map should be provided for this area showing monitoring wells, recovery wells, vapor extraction wells, air stripper(s), and discharge lines.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

DEPTHS OF VAPOR EXTRACTION AND RECOVERY WELLS ARE LOCATED IN SECTION 3, 4, AND 5 OF GEOLOGICAL INVESTIGATION AND GROUNDWATER RECOVERY SYSTEM INSTALLATION, UPDATE 1992 SUBMITTED APRIL, 1993.
FOR DEPTHS OF MONITORING WELLS AND RECOVERY WELLS DRILLED DURING THE 1993 DRILLING PROGRAM, PLEASE REFER TO APPENDIX B AND C OF ZERO-LINE INVESTIGATION WORKPLAN.

9. Page 2.B. A larger scale map should be provided for this area showing monitoring wells, recovery wells, vapor extraction wells, air stripper(s), and discharge lines.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

10. Page 2.C. Copies of the well plugging reports should be sent for our files. A larger scale map should be provided for this area showing monitoring wells, recovery wells, plugged wells, vapor extraction wells, air stripper(s), and discharge lines.

Please refer to Appendix H for list of wells plugged at the Boeing-Wichita site and the a copy of the WWC-5 for each of the plugged wells.

11. Page 2.D. A larger scale map should be provided for this area showing monitoring wells, recovery wells, plugged wells, vapor extraction wells, air stripper(s), and discharge lines.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS.

12. Page 2.E. The "1992 Update" could be included as an Appendix to this workplan.

TRANSMITTED TO KDHE IN APRIL, 1993.

13. A title and key should be provided for all attached maps.

ACKNOWLEDGED

14. The Amended Consent Order specified that a proposal to address the discharge of contaminated water from the springs was to be submitted within 60 days following the signing of the Order (see paragraph I.B. of Order). This workplan does not address this issue.

SEE SECTION 6.O OF ZERO LINE INVESTIGATION

15. The schedule should include further detail such as the following: past events completed to satisfy the zero-line investigation as discussed, future well construction and future groundwater sampling at the individual site areas.

PLEASE REFER TO INDIVIDUAL SITE DISCUSSIONS

Boeing Site General

Key Well Map
TVOC Isoconcentration Map
Chromium Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

BOEING GENERAL SITE

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   Contaminants present at the Boeing-Wichita site include Trichlorethylene, Tetrachloroethylene, Benzene, Ehtylbenzene, Toluene, Xylene, Hexavalent Chromium, and Carbon Tetrachloride. Levels of TVOC'S range from 0 ug/L to 500,000 ug/L at the site. Hexavalent Chromium range from 0 ug/L to 4,280 ug/L. The sources for the contaminants have been UST'S, Degreasers, barrel storage, and platting lines.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line and possible future monitoring well locations will be identified in the discussion of the Seven SITE SPECIFIC AREAS at the Boeing-Wichita site.

3. SCHEDULE FOR MONITORING WELL INSTALLATION

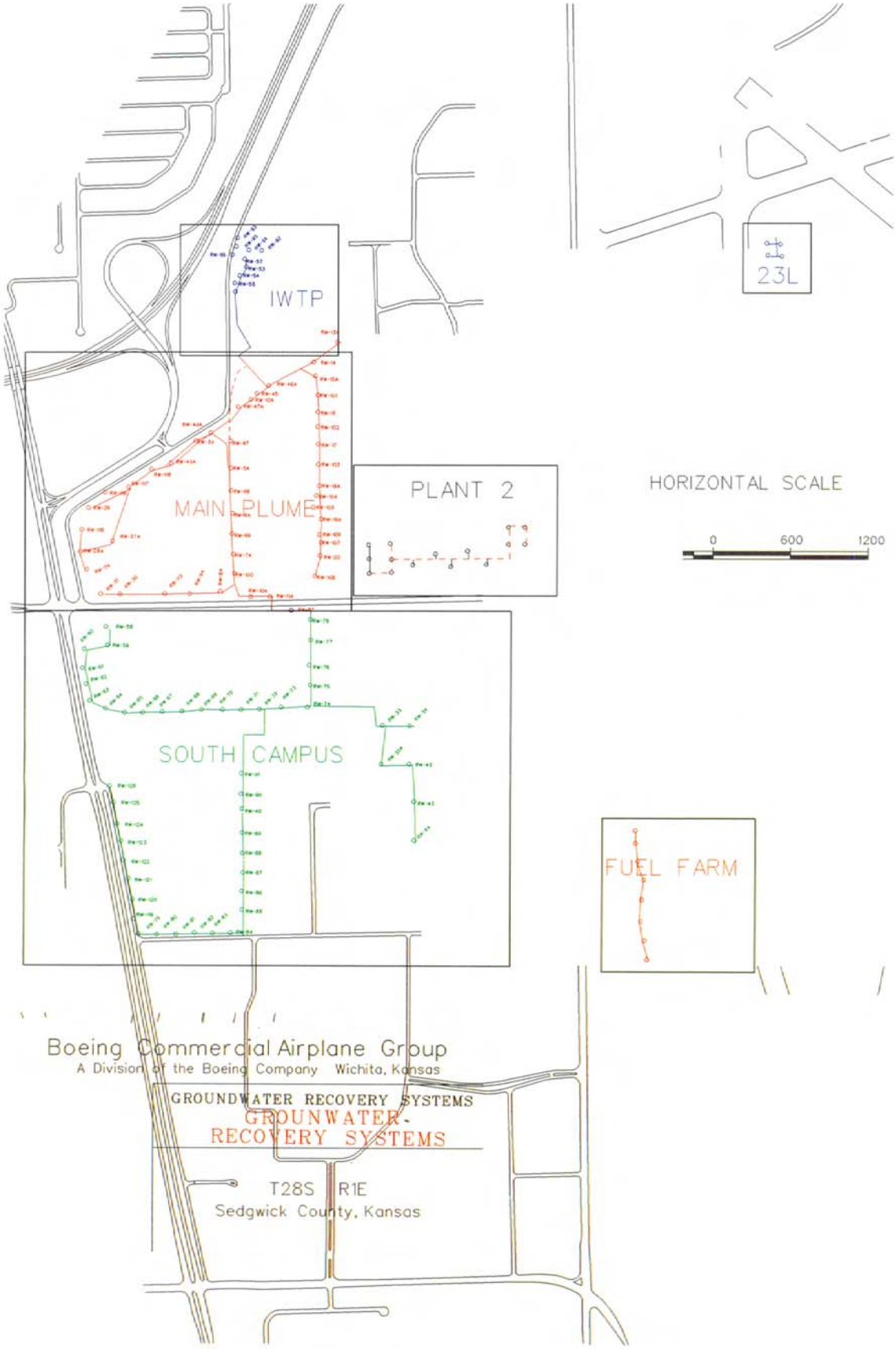
   The installation of six deep monitoring was completed on November 10, 1993. Locations and the information on six deep wells are shown on the monitoring well location map in the appendixes of this report. No additional monitoring wells are planned at this time.

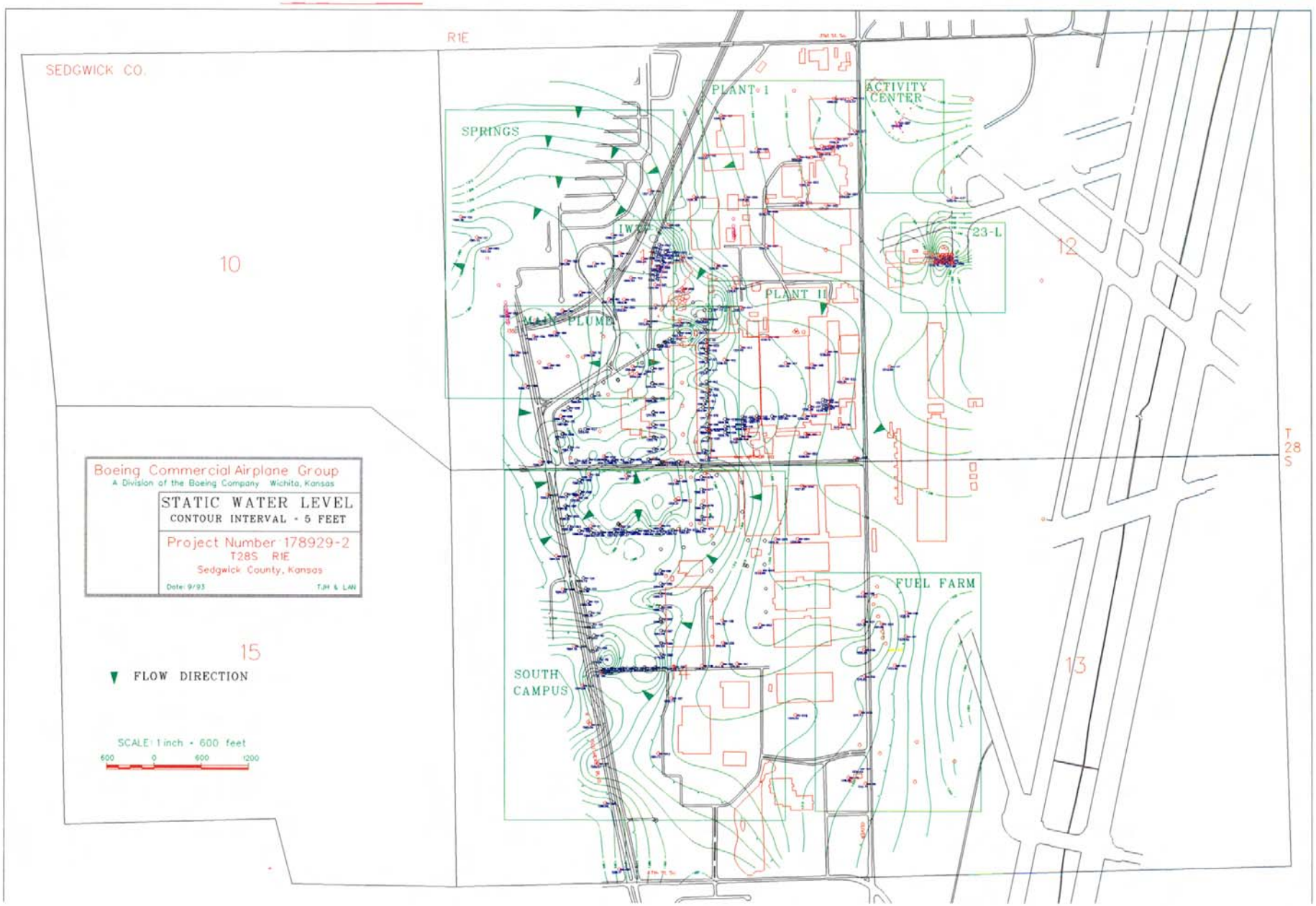
4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

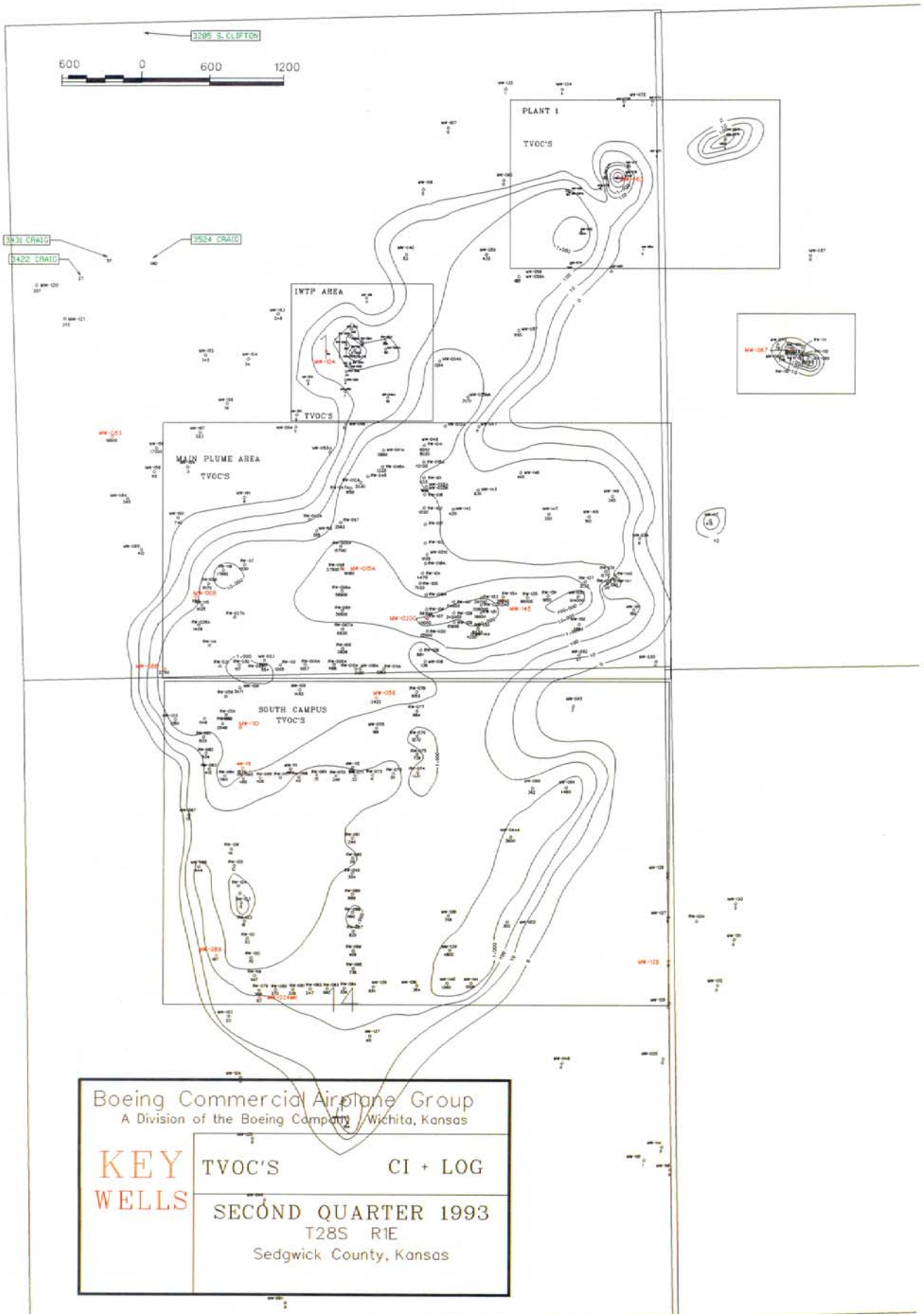
   Approximately 180 monitoring wells, 148 recovery wells, and 12 soil vent wells are located at the site. Fifteen monitoring wells (the KEY wells) are sampled monthly, and are used to measure the effectiveness of the recovery systems.

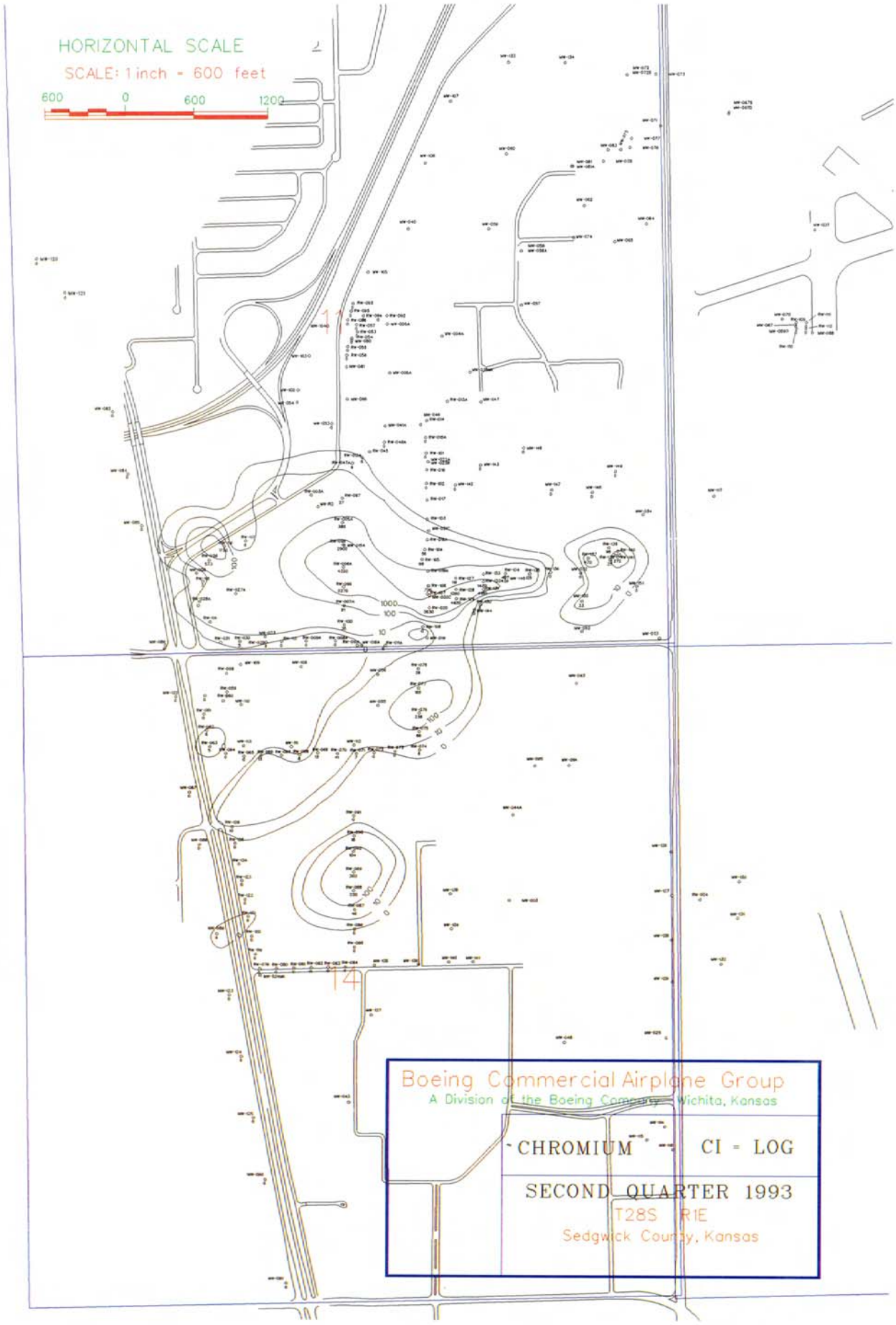
5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

   Thirty-nine new monitoring wells have been installed since the original discussions on the zero investigation work plan a year ago. Six deep monitoring wells have been installed. Thirteen monitoring wells were installed on the Kansas Turnpike Authority property to identify the zero line on the Northwest side of the Boeing property.

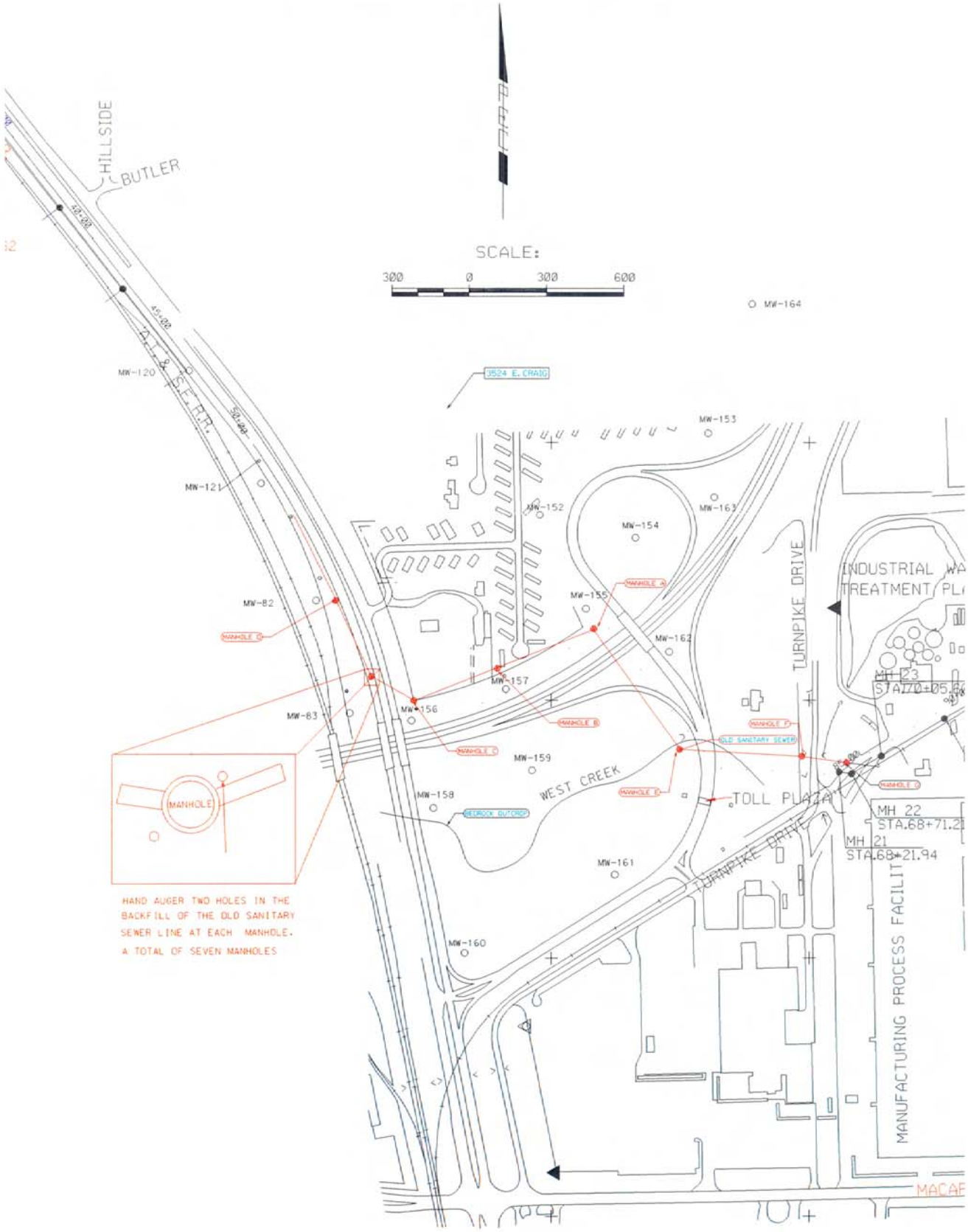

IWTP
MAIN PLUME
PLANT 2
SOUTH CAMPUS
FUEL FARM
23L
HORIZONTAL SCALE
0
600
1200
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
GROUNDWATER RECOVERY SYSTEMS
GROUNWATER-
RECOVERY SYSTEMS
T28S R1E
Sedgwick County, Kansas

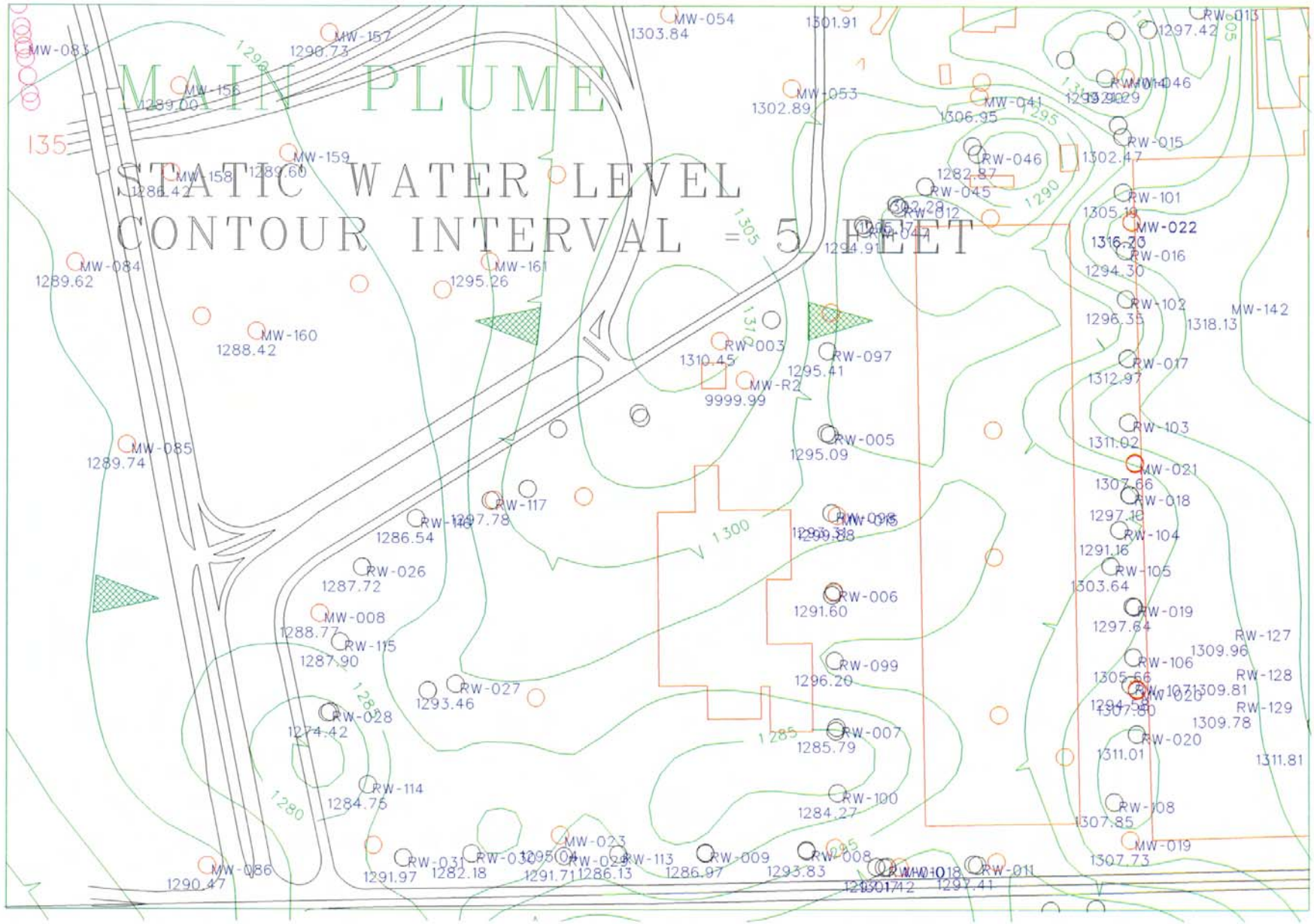

R1E
SEDGWICK CO.
PLANT I
ACTIVITY CENTER
SPRINGS
IW
23-L
12
10
PLANT II
MAIN PLUME
T 28 S
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
STATIC WATER LEVEL
CONTOUR INTERVAL - 5 FEET
Project Number 178929-2
T28S R1E
Sedgwick County, Kansas
Date: 9/93
TJH & LAN
FUEL FARM
15
FLOW DIRECTION
SOUTH CAMPUS
13
SCALE: 1 inch = 600 feet
600 0 600 1200


3205 S. CLIFTON
600 0 600 1200
PLANT 1
TVOC'S
3401 CRAIG
3422 CRAIG
3524 CRAIG
IWTP AREA
TVOC'S
MAIN PLUME AREA
TVOC'S
SOUTH CAMPUS
TVOC'S
Boeing Commercial Airplane Group
A Division of the Boeing Company / Wichita, Kansas
KEY WELLS
TVOC'S CI + LOG
SECOND QUARTER 1993
T28S R1E
Sedgwick County, Kansas


HORIZONTAL SCALE
SCALE: 1 inch = 600 feet
600
0
600
1200
11
14
100
1000
100
10
Boeing Commercial Airplane Group
A Division of the Boeing Company, Wichita, Kansas
CHROMIUM
CI = LOG
SECOND QUARTER 1993
T28S R1E
Sedgwick County, Kansas

SANITARY SEWER INVESTIGATION




MAIN PLUME
STATIC WATER LEVEL
CONTOUR INTERVAL = 5 FEET
MW-083
MW-157
1290.73
MW-156
1289.00
MW-159
1289.60
MW-158
1286.42
MW-084
1289.62
MW-161
1295.26
MW-160
1288.42
MW-085
1289.74
MW-086
1290.47
MW-054
1303.84
1301.91
MW-053
1302.89
MW-041
1306.95
RW-046
1282.87
RW-045
1302.28
RW-044
1294.91
RW-003
1310.45
RW-097
1295.41
MW-R2
9999.99
RW-005
1295.09
RW-117
RW-118
1297.78
1286.54
RW-026
1287.72
MW-008
1288.77
RW-115
1287.90
RW-027
1293.46
RW-028
1274.42
RW-114
1284.75
RW-006
1291.60
RW-099
1296.20
RW-007
1285.79
RW-100
1284.27
MW-023
RW-031
1291.97
RW-030
1282.18
RW-029
1291.71
RW-028
1286.13
RW-113
1286.97
RW-009
1293.83
RW-008
1297.41
RW-018
RW-011
RW-013
1297.42
RW-014
RW-015
1302.47
RW-101
1305.19
MW-022
1316.20
RW-016
1294.30
RW-102
1296.35
MW-142
1318.13
RW-017
1312.97
RW-103
1311.02
MW-021
1307.66
RW-018
1297.16
RW-104
1291.16
RW-105
1303.64
RW-019
1297.64
RW-127
1309.96
RW-106
1305.66
RW-128
1309.81
RW-020
1307.80
RW-129
1309.78
1311.01
1311.81
RW-108
1307.85
MW-019
1307.73
1300
1295
1290
1285
1280
1305
1310
1315

23 L - IWTP

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

The source of the contamination in the 23L area was a leaky UST. The UST was removed in 1986. The level of BTEX has historically been in the range of 120,000 ug/L total BTEX, but due to the remediation efforts they are now in the 30,000 ug/L range.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

The plume is confined to a small area due to the lithology of the area. 23L area is primarily a tight clay with very low transmissivity. Three small sandy stringers are present in some of the wells. The zero line is defined by MW-69 and MW-70 on the down gradient side of the plume. The four groundwater recovery wells have lowered the water table in the area as much as 30 feet in some wells.

3. SCHEDULE FOR MW INSTALLATION

No additional monitoring wells are planned for this area.

4. DESCRIPTION OF M-W, R-W, VE-W, DISCHARGES, SAMPLED AND RECOVERY SYSTEM MEASURING WELLS (KEY WELLS) CURRENT REMEDIAL ACTIVITIES

Boeing currently has four groundwater recovery wells, and 12 soil vent wells in the 23L remediation project. There are six monitoring wells in the immediate area. The water is first processed though an oil-water separator then the water is processed through a bubble tray airstripper. The airstripper effluent is discharged to Boeing's Industrial Waste Plant. The free product is captured and disposed of as waste fuel. Monitoring well 67 is the KEY well used to measure the effectiveness of the remediation project.

5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

The remediation work plan has been completed and in operation since March of this year. We have pumped and treated over 1.7 million gallons of water, and have captured over 180 gallons of gasoline.

IWTP AREA

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of the contaminants is probably from an old barrel storage/recycle area of reclamation. The contaminant is Trichloroehtylene and Tetrachloroehtylene with original levels in the 60,000 ug/L range, and are currently at the 35,000 ug/L level.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line is defined by Monitoring wells 54, 102, 106, 153, and 164 to the Southwest, West, and North by the monitoring wells with the east side of the plume being connected to Plant 1 and the Main plumes. One of the deep wells has been installed is immediately west of the recovery well 57. No other monitoring wells are planned at this time.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

   The deep monitoring wells were completed on November 10, 1993. Locations and information can be found in the appendixes of this report.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

   Boeing currently has 17 monitoring wells and 10 recovery wells in area. Water is pumped to the Main airstrippers and the effluent is discharged to the Sanitary sewer. The Key well for this system is MW-104.

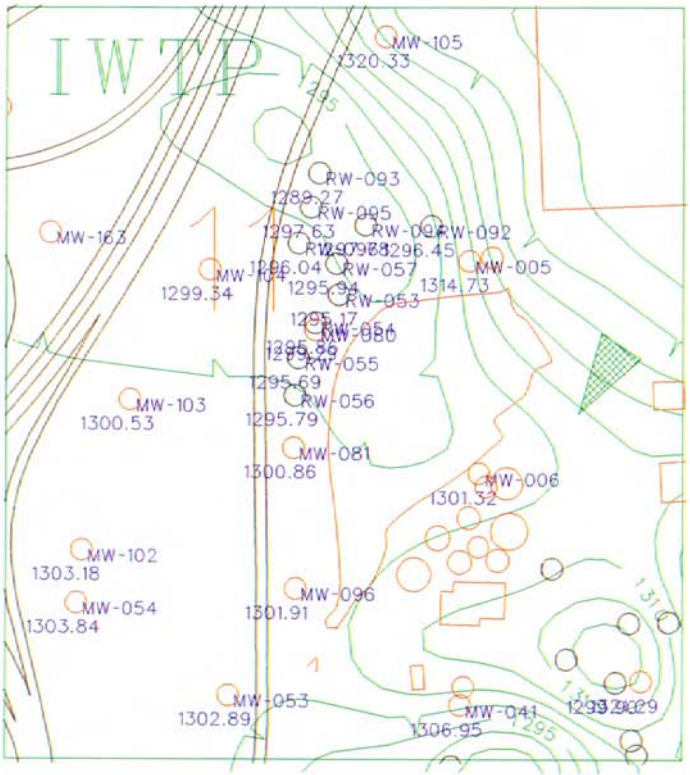
5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

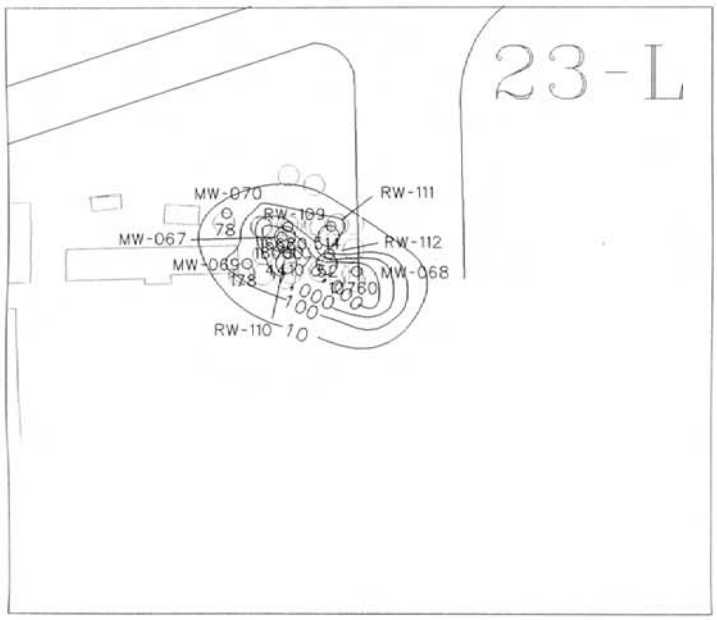
   Monitoring wells on the KTA property were installed as part of the zero work plan. In addition five of the ten recovery wells were installed as part of the work plan.

STATIC WATER LEVEL

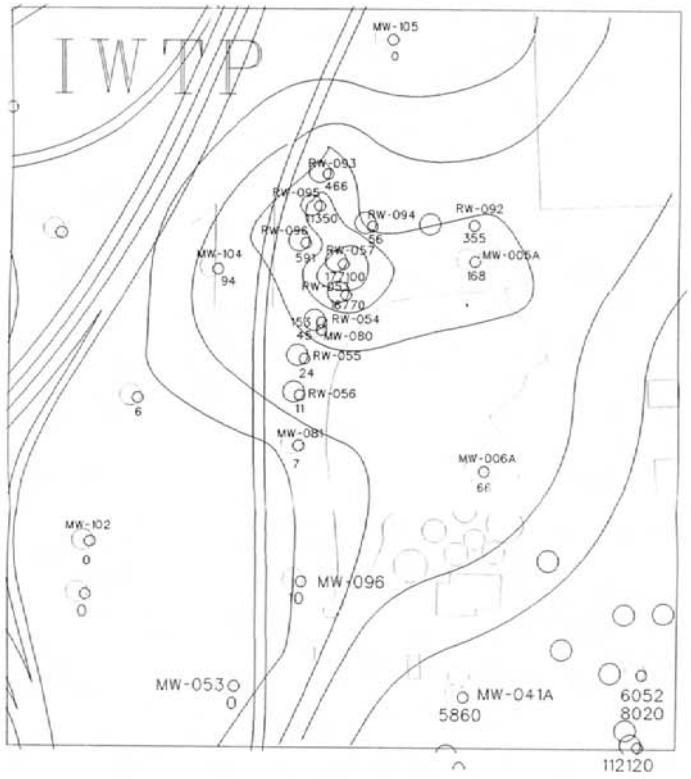
CONTOUR INTERVAL = 5 FEET

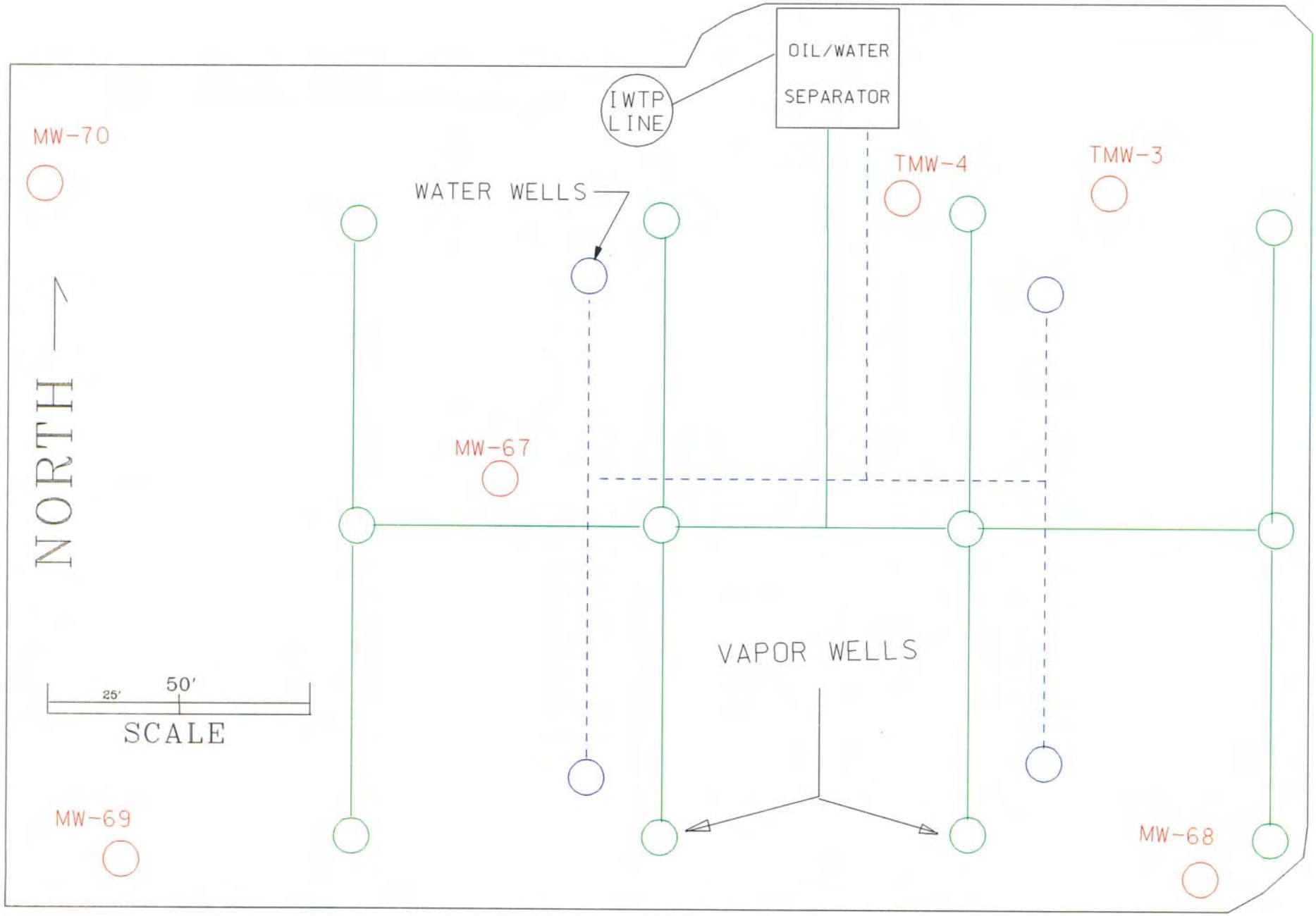
600 0 600 1200




23-L
MW-070
RW-111
RW-109
78
MW-067
RW-112
MW-069
178
MW-068
12760
1000
100
RW-110
10


600
0
600
1200


IWTP
MW-105
0
RW-093
466
RW-095
1350
RW-094
56
RW-092
355
RW-096
591
RW-057
MW-104
94
MW-006A
168
RW-053
RW-054
MW-080
RW-055
24
RW-056
11
6
MW-081
7
MW-006A
66
MW-102
0
MW-096
0
MW-053
0
MW-041A
5860
6052
8020
112120


OIL/WATER
SEPARATOR
IWTP
LINE
MW-70
WATER WELLS
TMW-4
TMW-3
NORTH
MW-67
VAPOR WELLS
25'
50'
SCALE
MW-69
MW-68

South Campus

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

SOUTH CAMPUS

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of contamination in the South Campus area is a combination of past barrel storage, past degreasing operations, and leaky UST's. The UST's have been removed. The contaminant mainly Trichloroethylene, is in the range of 0 ug/l to 4600 ug/l.
   Chromium is also present in the groundwater. Contaminant levels of chromium in the South Campus area are as high as 303 ug/l.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line of the South Campus plume is defined to the east by MW-93, MW-126, MW-127, MW-128, MW-129, and MW-48. Monitoring wells 90, 91, 124, and 125 define the zero line to the southwest. Two private residence wells define the South Campus plume to the west.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

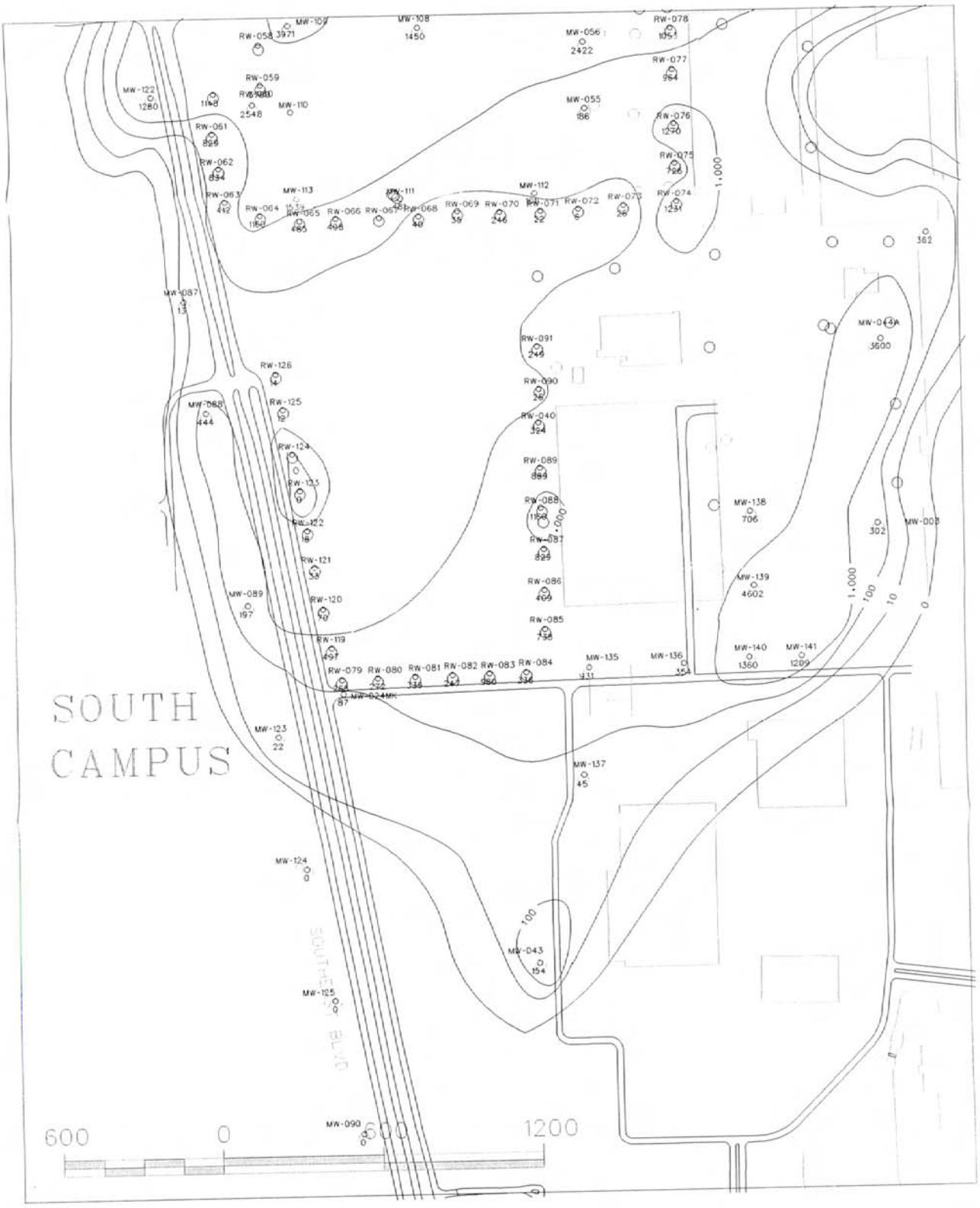
   Two deep monitoring wells have been installed in the South Campus area. One of the deep monitoring wells will be located near MW-108 and the other deep monitoring well will be installed near MW-44. No additional monitoring wells are planned at this time.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

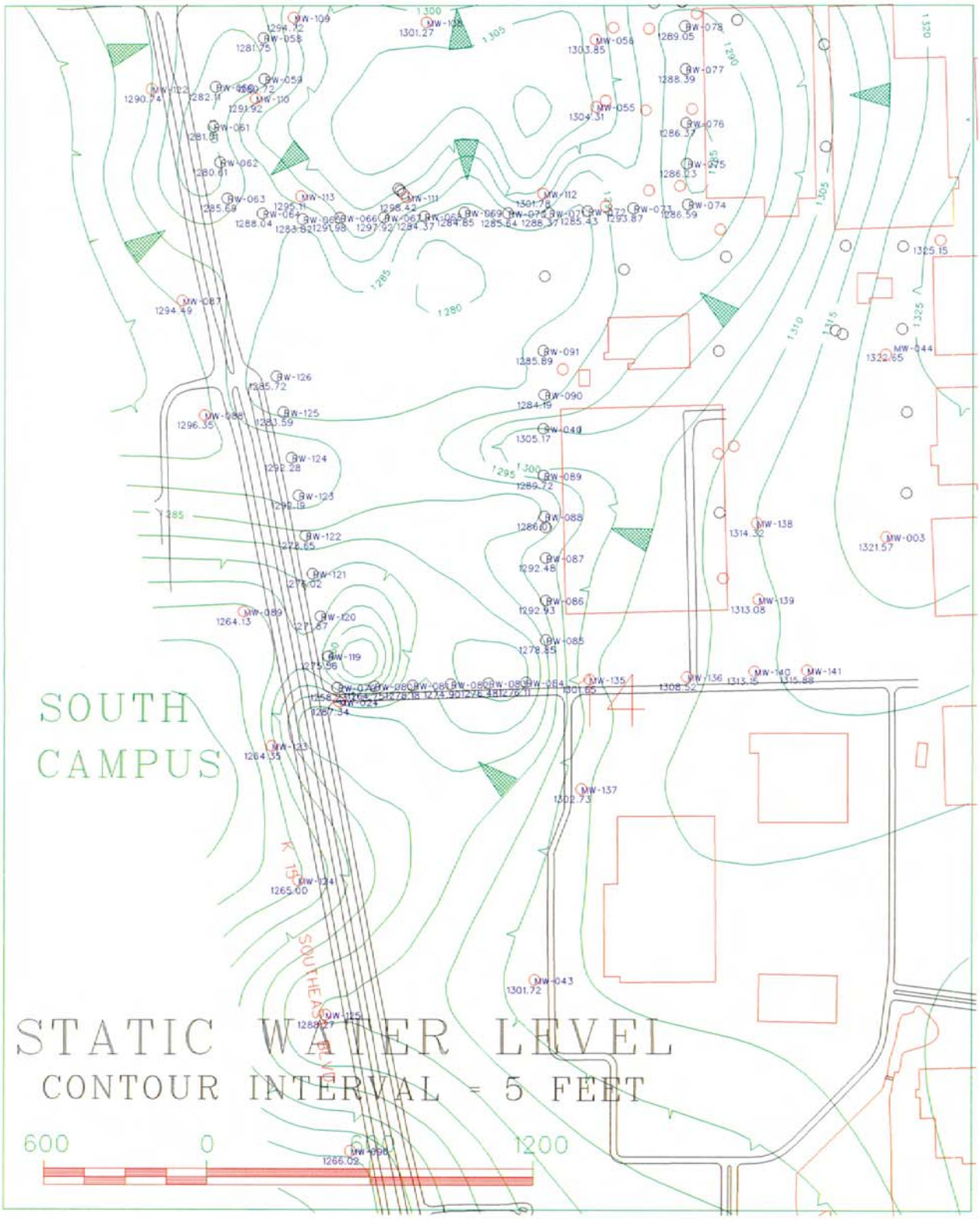
   Forty-two recovery wells are located along K-15 and within the South Campus to capture the plume, prevent it from migrating off site, and remediate the aquifer. Water is pumped to the South Campus airstrippers and the effluent is discharged into West Creek by NPDES permit. Key monitoring wells are MW-24, MW-56, MW-89, MW-110, and MW-113.

5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

   Monitoring wells 135, 136, 137, 138, 139, 140, and 141 were installed earlier this year.



TVOC'S CONTOURS
C. I. = LOGARITHMIC


SOUTH
CAMPUS
STATIC WATER LEVEL
CONTOUR INTERVAL = 5 FEET
600
0
600
1200
SOUTHEAST BLVD
K 15

Main Plume

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

Plant II

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

MAIN PLUME/PLANT 2 AREA

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of the plume is from past degreasing and platting operations in Plant 2. The contaminants include Trichloroethylene, Tetrachloroethlene, csi-1,2 dichloroethylene, and Hexavalent Chromium.
   The levels range from 0 to 500,000 ug/L of TVOC's and the levels of Chromium range from 0 to 4,920 ug/L.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line is defined by monitoring wells to the north and east, by bedrock outcrops to the northwest, and by a private water well to the west. The plume extends to the south of MacArthur road, and it is included with the South Campus Plume. The installation of deep monitoring wells has define the horizontal extent of the plume.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

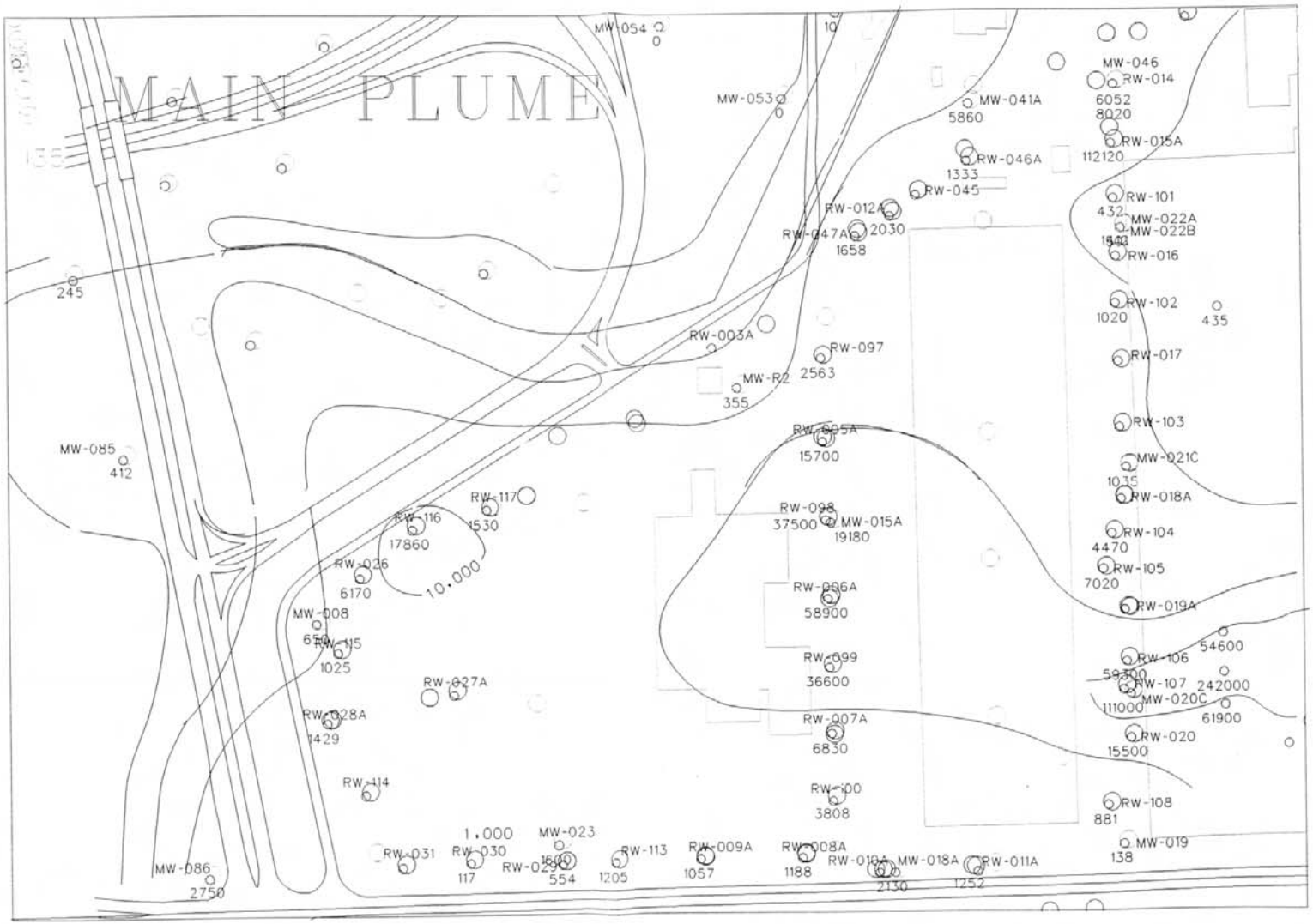
   The installation of two deep monitoring wells were completed November 10, 1993. No additional wells are planned at this time.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

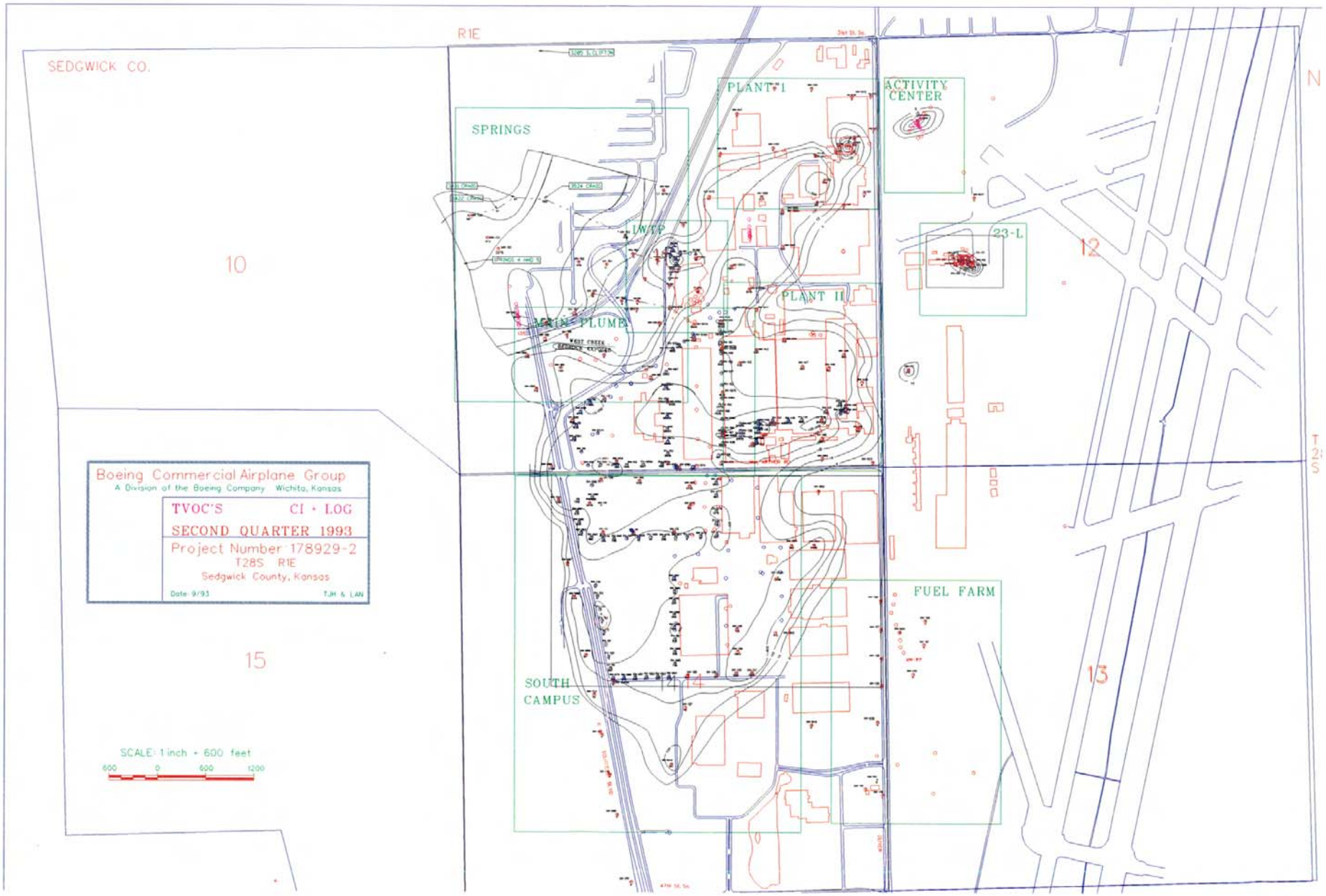
   There are 49 monitoring wells, 58 recovery wells, a soil vent system, and three airstripper locations with a total of seven airstrippers. The Main airstrippers consist of four packed column towers that discharge to the sanitary sewer. There are two packed column towers used as a backup system. The Plant 2 airstripper is a Carbonair Stat180 bubble tray unit that discharges to Boeing industrial waste plant. The soil vent system is shut down because the vapor samples cleaned up to nondetect levels. It will be put back in operation after a shut down cycle. Six Key wells, sampled monthly, are included in this area.

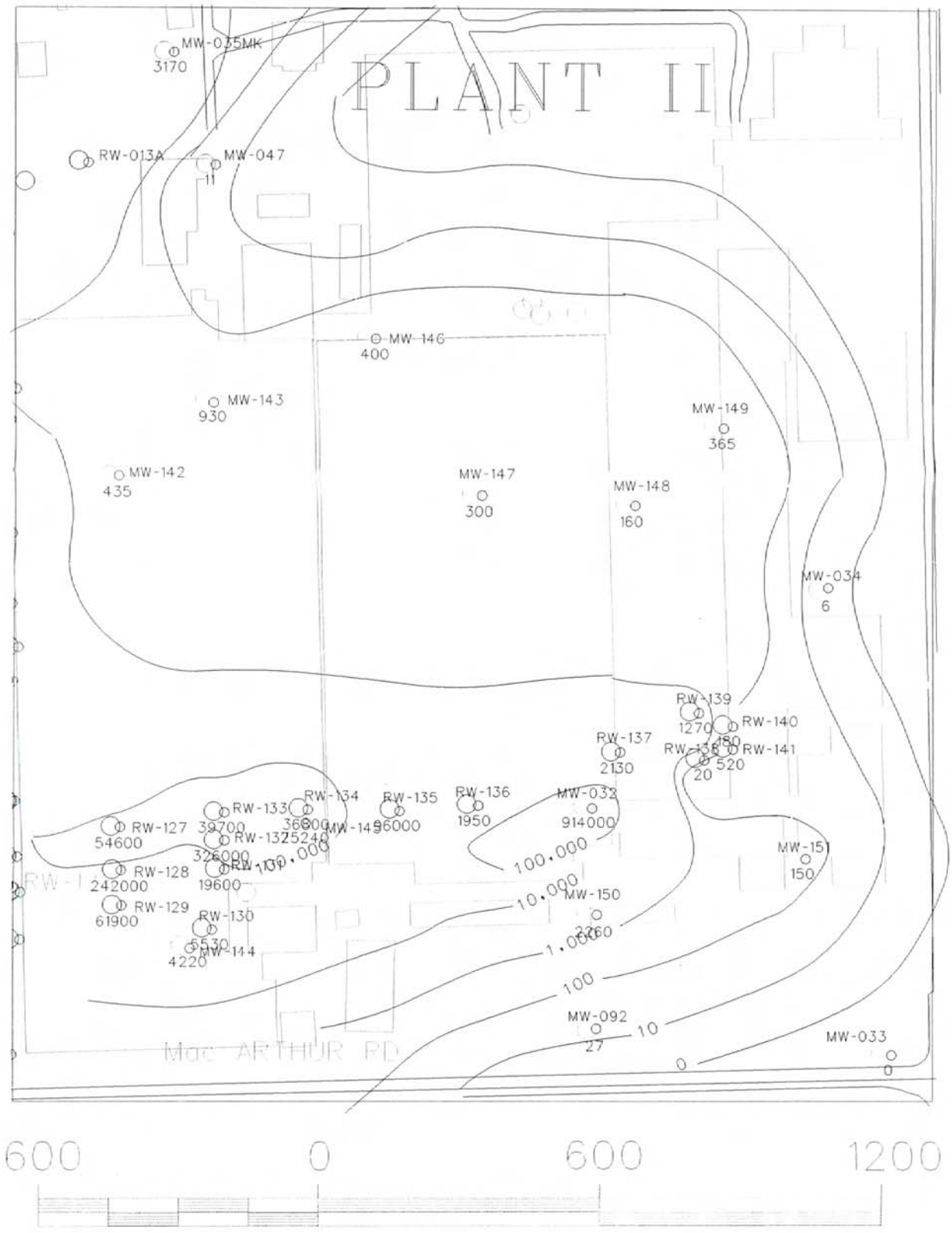
5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

The installation of monitoring wells on the KTA property, the installation of ten new monitoring wells in and around Plant 2, and the annual sampling of the private wells that penetrated the bedrock has been completed.

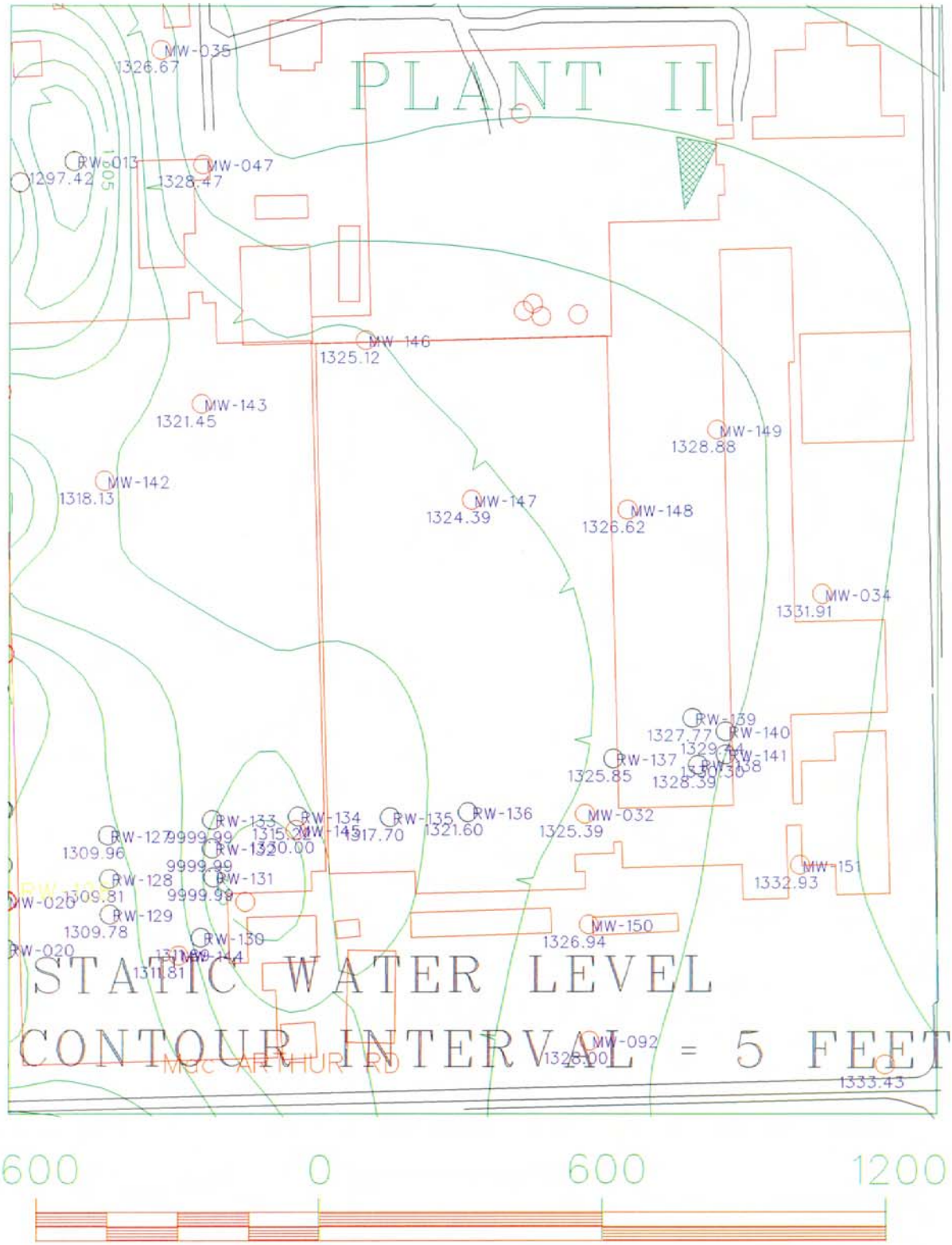


TVOC'S CONTOURS
C.I. = LOGARITHMIC


R1E
SEDGWICK CO.
SPRINGS
PLANT I
ACTIVITY CENTER
LWTP
23-L
PLANT II
MAIN PLUME
FUEL FARM
SOUTH CAMPUS
10
11
12
13
14
15
N
T 2 S
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
TVOC'S CI + LOG
SECOND QUARTER 1993
Project Number 178929-2
T28S R1E
Sedgwick County, Kansas
Date: 9/93
TJH & LAN
SCALE: 1 inch = 600 feet
600 0 600 1200



TVOC'S CONTOURS
C.I. - LOGARITHMIC


PLANT II
MW-035
1326.67
RW-013
1297.42
MW-047
1328.47
MW-146
1325.12
MW-143
1321.45
MW-142
1318.13
MW-147
1324.39
MW-148
1326.62
MW-149
1328.88
MW-034
1331.91
RW-139
1327.77
RW-140
RW-141
RW-137
1325.85
1328.39
RW-133
RW-134
RW-135
RW-136
MW-032
1325.39
RW-127
1309.96
9999.99
1315.20
MW-145
1317.70
1321.60
RW-132
1320.00
RW-128
1309.81
RW-131
RW-129
1309.78
RW-130
RW-020
MW-144
1311.81
MW-151
1332.93
MW-150
1326.94
MW-092
1328.00
1333.43
STATIC WATER LEVEL
CONTOUR INTERVAL = 5 FEET
600
0
600
1200

Activity Center

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

ACTIVITY CENTER AREA

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of the contaminants is from the Plant 1 site transported VIA a small stream then captured in a small sand body. The base of the sand body is 15 feet deep and is nine feet thick at the thickest section. The contaminants are Trichloroehtylene and cis-1,2 dichloroethylene that are in the 1,000 ug/L range.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line and the aquifer have been defined horizontally and vertically by monitoring wells and soil borings. No other monitoring wells are planned at this time.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

   No other monitoring wells are planned at this time.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

   There are eight monitoring wells, three recovery wells, and 12 soil borings installed at this time. The recovery wells have been drilled but they are not equipped at this time. The monitoring wells drilled to the Wellington are at the nondetect levels of VOC'S. There will be a bubble tray airstripper that will processes the water and discharge the effluent to the sanitary sewer. The KEY well in the area is MW-97s.

5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

   Monitoring wells and the soil borings were discussed to define the lateral extent of the plume.

Plant I

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

PLANT 1 AREA

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of the contaminants is from past degreasing operations. The contaminant is Trichloroethylene in the range of 100,000 ug/L.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   Seven new monitoring wells have been installed in the Plant 1 area. The zero line is defined to the north and west by MW-60, MW-106, and MW-105. Monitoring wells # 64 and 65 define the zero line to the east. To the southwest the plume merges into the main plume area.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

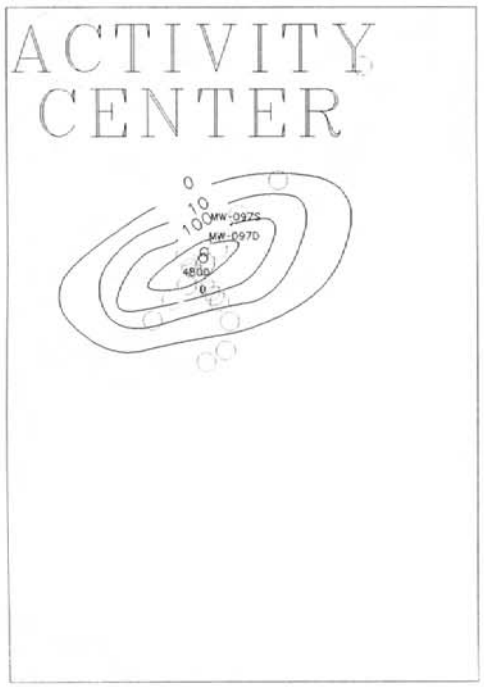
   One deep monitoring well was completed near MW-58 on November 10, 1993. No additional wells are planned at this time.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

   At the present time no recovery wells are located within the Plant 1 area. Recovery wells are planned in the near future. Key monitoring well for the Plant 1 area is MW-63.

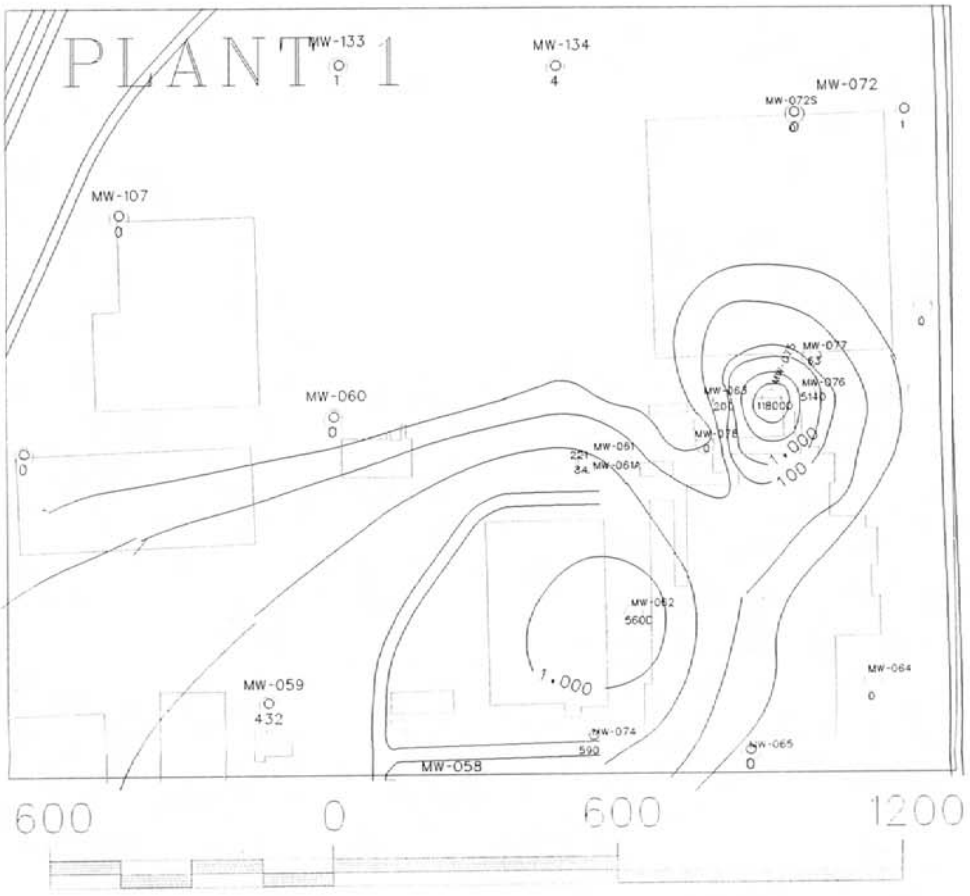
5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

   Monitoring well # 165 was recently installed to the east of MW-63 to aid in further defining the eastern edge of the plume.

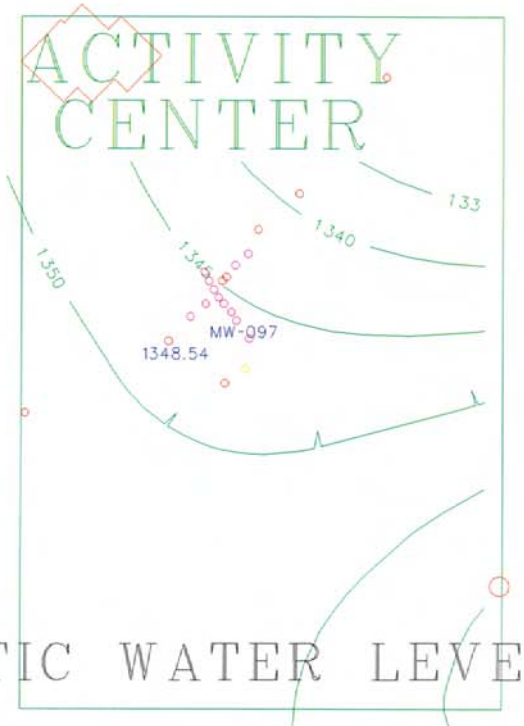


600 0 600 1200

TVOC'S CONTOURS
C. I. = LOGARITHMIC



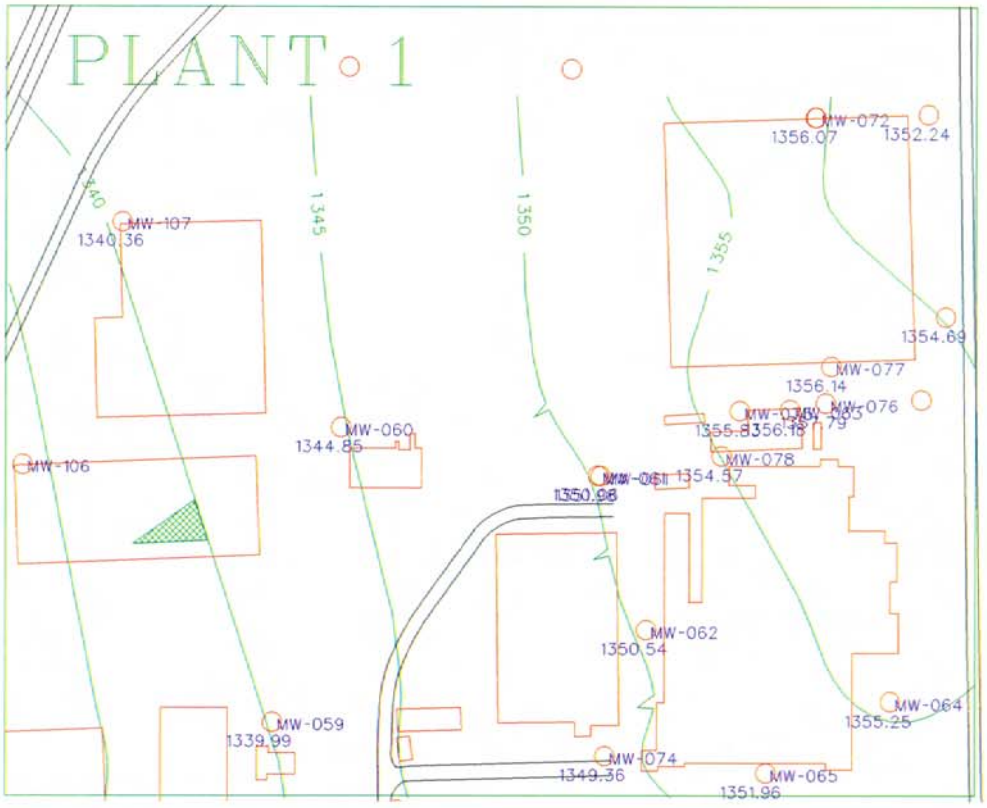
600 0 600 1200



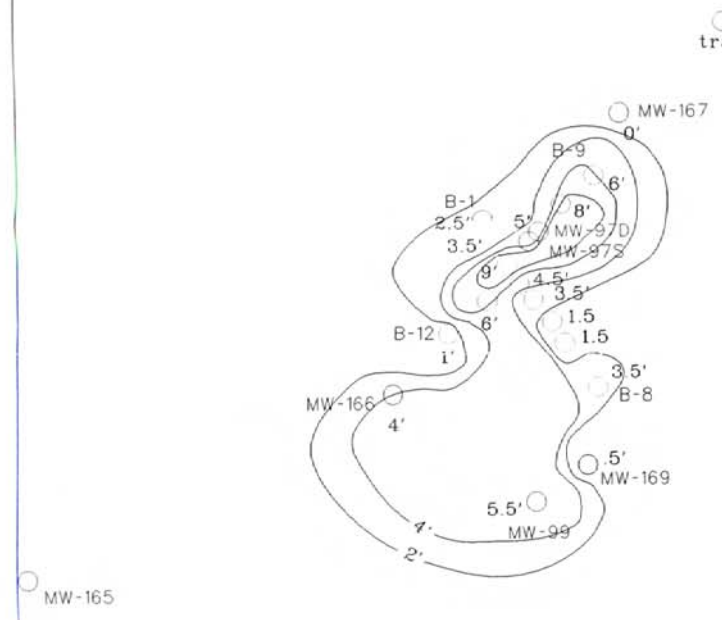
STATIC WATER LEVEL

CONTOUR INTERVAL = 5 FEET

600 0 600 1200

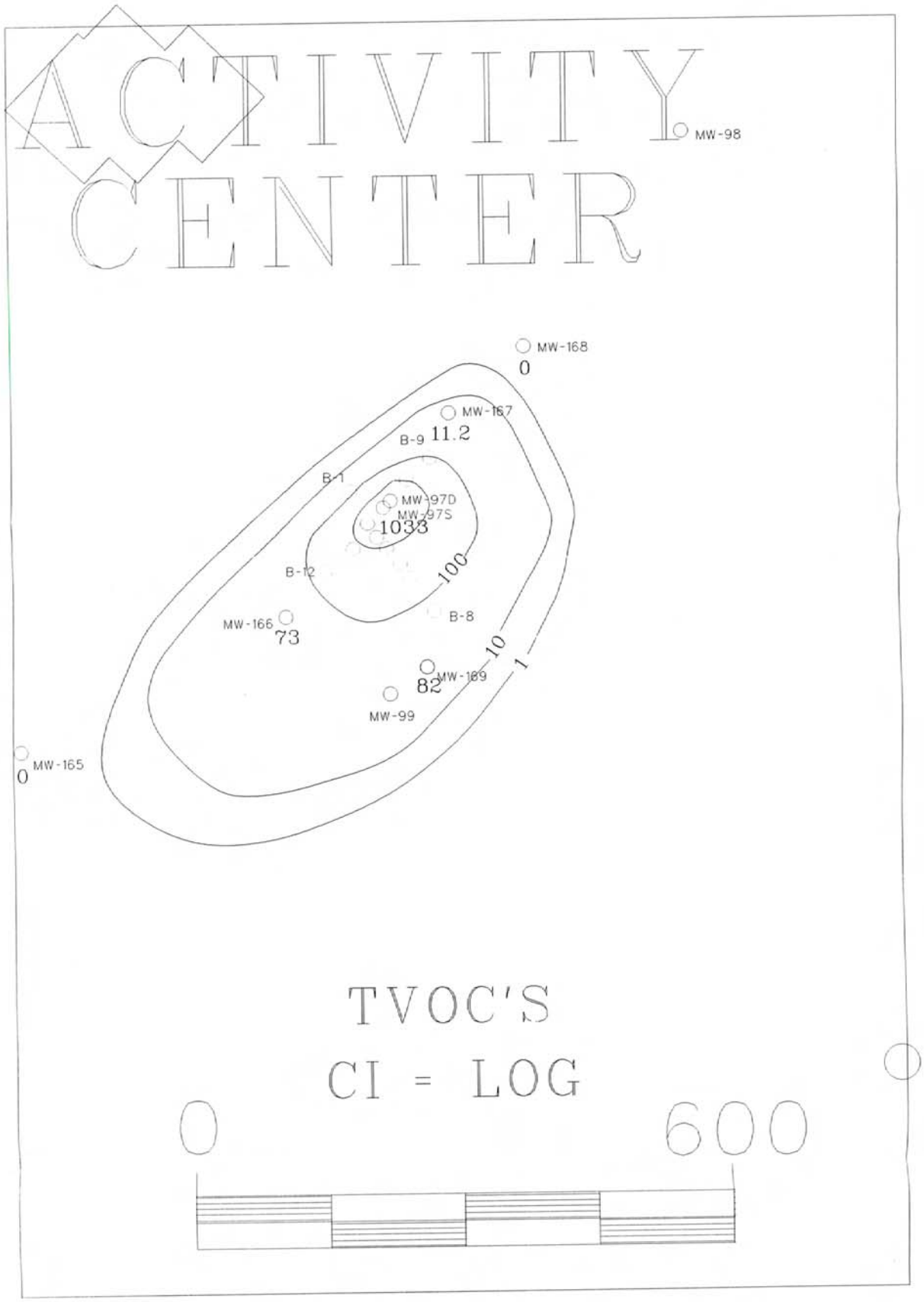


ACTIVITY CENTER



SAND ISOPACH

CI = 2 FEET


ACTIVITY CENTER
MW-98
MW-168
0
MW-167
B-9
11.2
B-1
MW-97D
MW-97S
1033
B-12
100
B-8
MW-166
73
10
1
MW-169
82
MW-99
MW-165
0
TVOC'S
CI = LOG
0
600

Fuel Farm

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

FUEL FARM AREA

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of the contamination is from fueling, defueling, and fuel storage operations. The contaminant is BTEX in the range from 0 to 5,000 ug/l. The second quarter sampling event was used for this work plan.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line has been defined with the installation of new monitoring wells around the site. The TVOC map indicates all wells that were sampled are nondetect. No additional wells are planned at this time, but the investigation and excavation of three septic systems with lateral lines are scheduled for December 1993.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

   No additional wells are planned at this time.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

   There are eleven monitoring wells, eight recovery wells, and an airstripper site with two packed column towers. The airstripper effluent is discharged to an NPDES permitted outfall. The Key well is MW-128 used to measure the effectiveness of the recovery system.

5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

   Seven new monitoring wells were installed to define the zero line. In addition, 36 hand auger holes were installed to identify the lateral extent of the NAPL layer in MW-1-2A.

Continental Analytical
SERVICES, INC.

November 6, 1992

Mr. Mike Spain
The Boeing Company
Environmental Engineer
Mail Stop K11-65
P.O. Box 7730
Wichita, Kansas 67277-7730

Re: Results and Conclusions from Additional Work Performed.
The Boeing Company, Wichita, Kansas
CAS File No.: 92-5802

Dear Mike:

This letter details the methodology, results and conclusion from the additional work performed for the referenced project.

In August 1992, fourteen hand-augered borings were installed that extended into the water table. A non-aqueous phase liquid (NAPL) layer was identified in two of the soil borings and in one existing monitoring well. Additional work was requested by Boeing to determine the extent and thickness of the NAPL layer. The locations of the borings and wells that had a NAPL layer present are shown on the attached map.

In October 1992, twelve additional soil borings were installed to aid in determining the extent and source of the NAPL layer at the site. The soil borings were advanced to groundwater using a 4-inch diameter hand-operated bucket auger. The two-inch diameter PVC screen and casing were placed in the boring. No gravel pack or seal was placed in the annulus. The screen was placed so that the water surface intersected the screen. The elevation of the top of the casing and the ground surface adjacent to the soil borings were surveyed. The benchmark used for the survey was the top of the well casing at Monitor Well 1-2A. This elevation had been previously surveyed by Butler Consultants using Boeing Benchmark #103. The depth to water was measured in each boring using an interface detector probe. This instrument also measured the thickness of the NAPL layer, if one was present in the boring.

The survey data, groundwater elevations and NAPL layer thickness are given in the attached tables. Measurements were collected on separate days to ensure equilibrium had been reached.

1804 Glendale Road • Salina, Kansas 67401
913-827-1273 • 800-535-3076 • FAX 913-823-7830

Only one of the soil borings installed in October had a NAPL layer present. A NAPL layer with a thickness of approximately one-half inch was present in Soil Boring #32. This soil boring is located to the east of Monitoring Well MW1-2A. The source of this NAPL layer appears to be the underground storage tank area immediately north of Monitoring Well MW1-2A. A soil boring placed in the backfill of the storm sewer piping north of the underground storage tank area did not have a NAPL layer present and no odor was noted in the water or soil.

None of the additional soil borings installed in the vicinity of the oil/water separator had a NAPL layer present. A saturated zone was encountered in several of the soil borings in this area above the water table underlying the area. These saturated zones do not appear to be continuous. Small roots were noted in the soil from the soil boring at the approximate elevation of the saturated soil. It is possible that the area to the north of the oil/water separator is fill to a depth of eight to ten feet below grade. At the time this fill was placed, vegetation may have been left that resulted in poor compaction and led to the creation of these saturated pockets.

After collecting the measurements from the borings, the screen and casing were removed and the borings were filled with medium bentonite chips.

In conclusion, both areas where a NAPL layer was identified appear to be of limited areal extent.

If you have any questions, or if we can be of further assistance, please call.

Jack C. Eslick
Butler Environmental Consultants, Inc.
Project Engineer

Kathleen A. Mitchell
Kathleen A. Mitchell
Continental Analytical Services, Inc.
Vice-President, Operations

Boeing

Probe ID #	Surface Elevation MSL (ft)	TOC[1] Elevation MSL[2] (ft)	Total Depth (ft)	Measurement Data						
				Date	Time	Depth to Water (ft)	Depth to NAPL[3] (ft)	NAPL Thickness (ft)	Measured GW[4] Elevation (ft)	Corrected GW Elevation (ft)
1	1335.01	1335.53	4 3/4	8/4/92	0735	3.58	-----	-----	1331.95	1332.00
				8/4/92	1613	3.55	-----	-----	1331.98	1332.03
				8/6/92	0925	3.41	-----	-----	1332.12	
2	1335.44		11	No Liquid Encountered						
2R	1335.44	1337.89	17 1/2	8/4/92	1620	16.58	-----	-----	1321.31	1321.31
				8/6/92	0935	16.64	-----	-----	1321.25	1321.25
3	1334.30		4 1/2	Refusal at 4 1/2 feet						
				No Liquid Encountered						
4	1334.43		4 1/2	Refusal at 4 1/2 feet						
				No Liquid Encountered						
5	1334.30		8 1/2	Refusal at 8 1/2 feet						
				No Liquid Encountered						
6	1334.46	1336.63	17	8/4/92	0733	16.74	-----	-----	1319.89	1319.89
				8/4/92	1604	16.76	-----	-----	1319.87	1319.87
				8/6/92	0920	16.78	-----	-----	1319.85	1319.85
7	1334.49	1336.86	7 3/4	8/4/92	0730	8.96	-----	-----	1327.90	1329.90
				8/4/92	1609	9.34	-----	-----	1327.52	1329.52
8	1332.83		4	Refusal at 4 feet						
				No Liquid Encountered						
9	1332.60		6 1/2	Refusal at 6 1/2 feet						
				No Liquid Encountered						
10	1333.72		7 1/2	Refusal at 7 1/2 feet						
				No Liquid Encountered						
11	1333.31		4	Refusal at 4 feet						
				No Liquid Encountered						

Probe ID #	Surface Elevation MSL (ft)	TOC[1] Elevation MSL[2] (ft)	Total Depth (ft)	Measurement Data						
				Date	Time	Depth to Water (ft)	Depth to NAPL[3] (ft)	NAPL Thickness (ft)	Measured GW[4] Elevation (ft)	Corrected GW Elevation (ft)
12	1332.58		6 1/2	Refusal at 6 1/2 feet						
				No Liquid Encountered						
13	1333.32		4	Refusal at 4 feet						
				No Liquid Encountered						
14	1335.09	1337.32	17 1/2	8/4/92	1615	16.13	-----	-----	1321.19	1321.19
				8/6/92	0930	16.18	-----	-----	1321.14	1321.14
15	1334.66	1336.34	18	8/4/92	1611	15.71	-----	-----	1320.63	1320.63
				8/6/92	0922	15.71	-----	-----	1320.63	1320.63
16	1334.92	1336.39	18 1/2	8/4/92	1606	16.95	-----	-----	1319.44	1319.44
				8/6/92	0917	16.93	-----	-----	1319.46	1319.46
17	1333.86	1336.21	17 1/2	8/4/92	1600	16.73	-----	-----	1319.48	1319.48
				8/6/92	0915	16.72	-----	-----	1319.49	1319.49
18	1333.26	1335.89	17	8/5/92	1507	15.79	-----	-----	1320.10	1320.10
				8/6/92	0905	15.66	15.33	0.33	1320.23	1320.49
				8/7/92	0730	14.72	14.22	0.50	1321.17	1321.57
19	1334.77	1334.74	17	8/5/92	1510	12.98	-----	-----	1321.76	1321.76
				8/6/92	0924	12.98	-----	-----	1321.76	1321.76
20	1334.88	1335.61	17	8/5/92	1515	13.23	-----	-----	1322.38	1322.38
				8/6/92	0938	13.22	-----	-----	1322.39	1322.39
21	1333.63	1334.97	18	8/5/92	1520	15.61	15.38	0.23	1319.36	1319.54
				8/6/92	0910	16.31	15.17	1.14	1318.66	1319.57
22	1333.13	1334.05	8	8/7/92	0715	7.13	-----	-----	1326.92	1326.92
22R	1333.13	1335.10	15	8/7/92	1000		-----	-----		
				8/7/92	1320	9.53	-----	-----	1325.57	1325.57

Probe ID #	Surface Elevation MSL (ft)	TOC[1] Elevation MSL[2] (ft)	Total Depth (ft)	Measurement Data						
				Date	Time	Depth to Water (ft)	Depth to NAPL[3] (ft)	NAPL Thickness (ft)	Measured GW[4] Elevation (ft)	Corrected GW Elevation (ft)
23	1333.07	1334.11	9 3/4	8/7/92	0720	7.95	-----	-----	1326.16	1326.16
23R	1333.07	1333.92	10	Refusal at 10 feet						
				8/7/92	1330	7.67	-----	-----	1326.25	1326.25
24	1332.77		8	Refusal at 8 feet						
				Moist Sand Encountered Prior to Refusal						
25	1328.49	1329.69	9.39	10/10/92	1408	8.80	----	----	1320.89	1320.89
				10/11/92	0900	8.82	----	----	1320.87	1320.87
26	1322.91	1324.60	14.60	10/10/92	1345	10.17	----	----	1314.43	1314.43
				10/11/92	0815	10.25	----	----	1314.35	1314.35
27	1324.89	1328.40	19.06	10/10/92	1356	18.43	----	----	1309.97	1309.97
				10/22/92	0852	18.40	----	----	1310.00	1310.00
28	1323.23	1324.36	10.65	10/10/92	1348	8.79	----	----	1315.57	1315.57
				10/11/92	0847	8.76	----	----	1315.60	1315.60
29	1328.52	1330.06	14.12	10/10/92	1416	12.66	----	----	1317.40	1317.40
				10/11/92	0906	12.72	----	----	1317.34	1317.34
30	1328.52	1328.85	12.55	10/10/92	1412	11.07	----	----	1317.78	1317.78
				10/11/92	0903	11.14	----	----	1317.71	1317.71
31	1323.99	1325.39	19.58	10/10/92	1352	14.91	----	----	1310.48	1310.48
				10/11/92	0850	15.15	----	----	1310.24	1310.24
32	1324.70	1325.91	18.96	10/10/92	1300	15.47	15.43	0.04	1310.44	1310.47
				10/11/92	0915	15.48	15.44	0.04	1310.43	1310.46
33	1325.30	1326.59	19.00	10/10/92	1342	16.25	----	----	1310.34	1310.34
				10/11/92	0910	16.27	----	----	1309.64	1309.64

Boeing

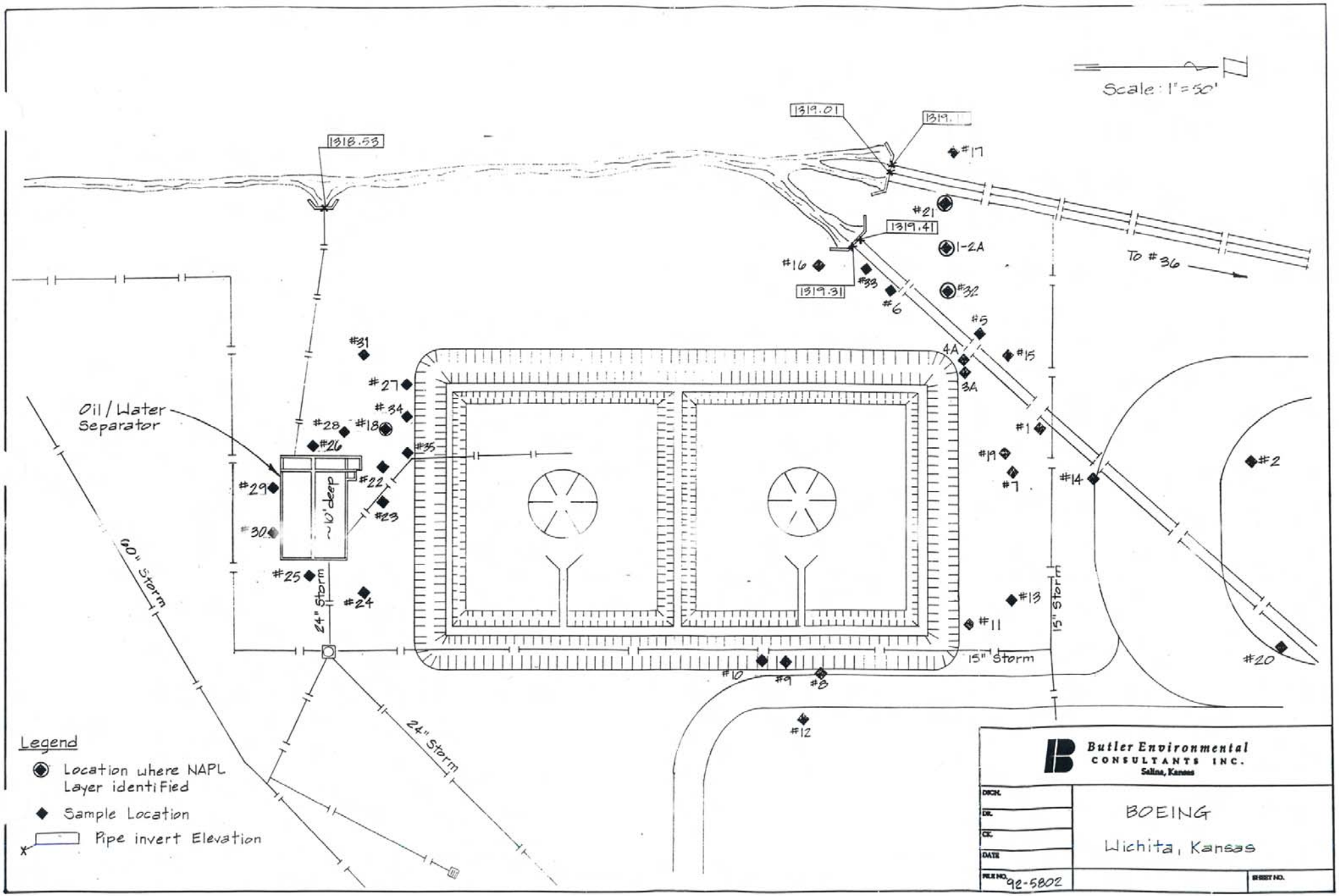
Probe ID #	Surface Elevation MSL (ft)	TOC[1] Elevation MSL[2] (ft)	Total Depth (ft)	Measurement Data						
				Date	Time	Depth to Water (ft)	Depth to NAPL[3] (ft)	NAPL Thickness (ft)	Measured GW[4] Elevation (ft)	Corrected GW Elevation (ft)
34	1330.34	1332.62	19.85	10/10/92	1400	16.79	-----	-----	1315.83	1315.83
				10/11/92	0855	16.75	----	----	1315.87	1315.87
35	1324.50	1326.81	12.18	10/10/92	1404	10.14			1316.67	1316.67
				10/11/92	0858	10.08	-----	-----	1316.73	1316.73
36	1326.79	1329.31	18.94	10/10/92	1310	18.27	----	----	1311.04	1311.04
				10/11/92	1230	18.27	----	----	1311.04	1311.04

(1) TOC = Top of Casing

(2) MSL = Mean Sea Level

(3) NAPL = Non-aqueous Phase Liquid

(4) GW = Groundwater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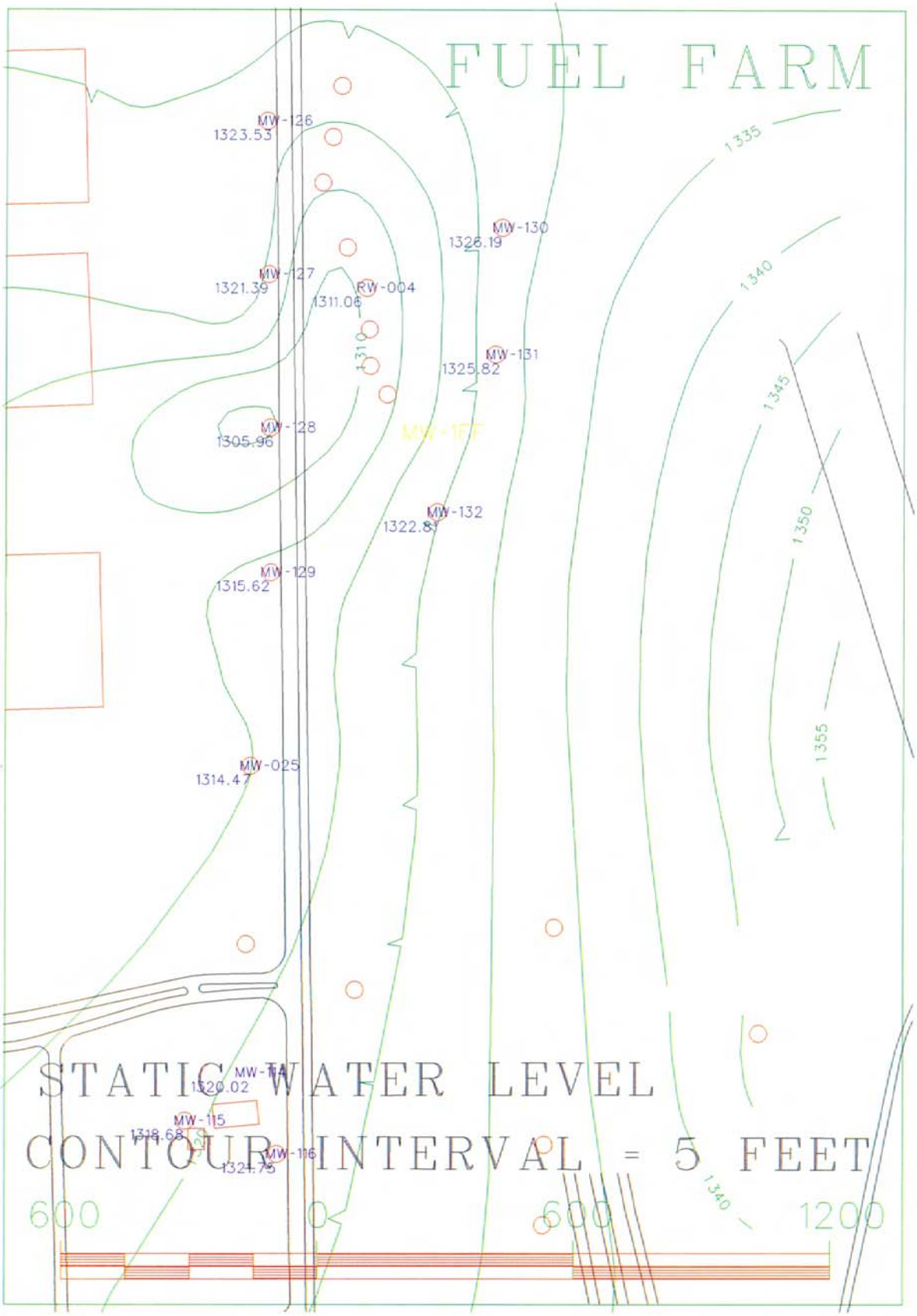
1319.01
1319.
1318.53
#17
#21
1319.41
1-2A
#16
#33
#32
1319.31
#6
To #36
#5
4A
#15
3A
#31
#27
#34
#28
#18
#26
#35
#1
#19
#7
#2
#14
Oil / Water Separator
#29
#22
#23
#30
~10' deep
#25
24" Storm
#24
60" Storm
#13
#11
15" Storm
15" Storm
#20
#10
#9
#8
#12
24" Storm
Legend
Location where NAPL Layer identified
Sample Location
Pipe invert Elevation
Butler Environmental CONSULTANTS INC.
Salina, Kansas
DSGN.
DR.
CK.
DATE
FILE NO. 92-5802
SHEET NO.
BOEING
Wichita, Kansas

TVOC'S CONTOURS
C. I. - LOGARITHMIC


FUEL FARM
MW-126
1323.53
MW-130
1326.19
MW-127
1321.39
RW-004
1311.06
MW-131
1325.82
MW-128
1305.96
MW-132
1322.83
MW-129
1315.62
MW-025
1314.47
MW-115
1318.68
MW-116
1321.75
1335
1340
1345
1350
1355
1310
STATIC WATER LEVEL
CONTOUR INTERVAL = 5 FEET
600
0
600
1200

Springs / Kansas Turnpike

TVOC Isoconcentration Map
Static Water Level Map
Groundwater Recovery System

K-15/SPRINGS AREA

1. LEVELS, TYPES, AND SOURCE OF CONTAMINATION

   The source of the contaminants is from an unknown source that does not originate from the Boeing-Wichita site. The details of the Kansas Turnpike Authority monitoring wells are in this section of the zero investigation work plan. The contaminants are Trichloroethylene and cis-1,2 dichloroethylene. Historically the range of TVOC'S has been 30,000 ug/L, but the most recent samples are 7,740 ug/L TVOC'S.

2. ZERO LINE DEFINED, FUTURE PLANS TO DEFINE, AND RATIONALE OF LOCATION OF FUTURE MONITORING WELLS

   The zero line was defined by monitoring wells between the Springs area and the Boeing-Wichita site. All of the information such as bedrock structure, bedrock outcrops along Northwest Creek, potentiometric surface, groundwater flow, the sanitary sewer investigation, and zero line separation indicates the Springs area is a separate plume not related to Boeing-Wichita site. No additional work is planned at this time.

3. SCHEDULE FOR MONITORING WELLS INSTALLATION

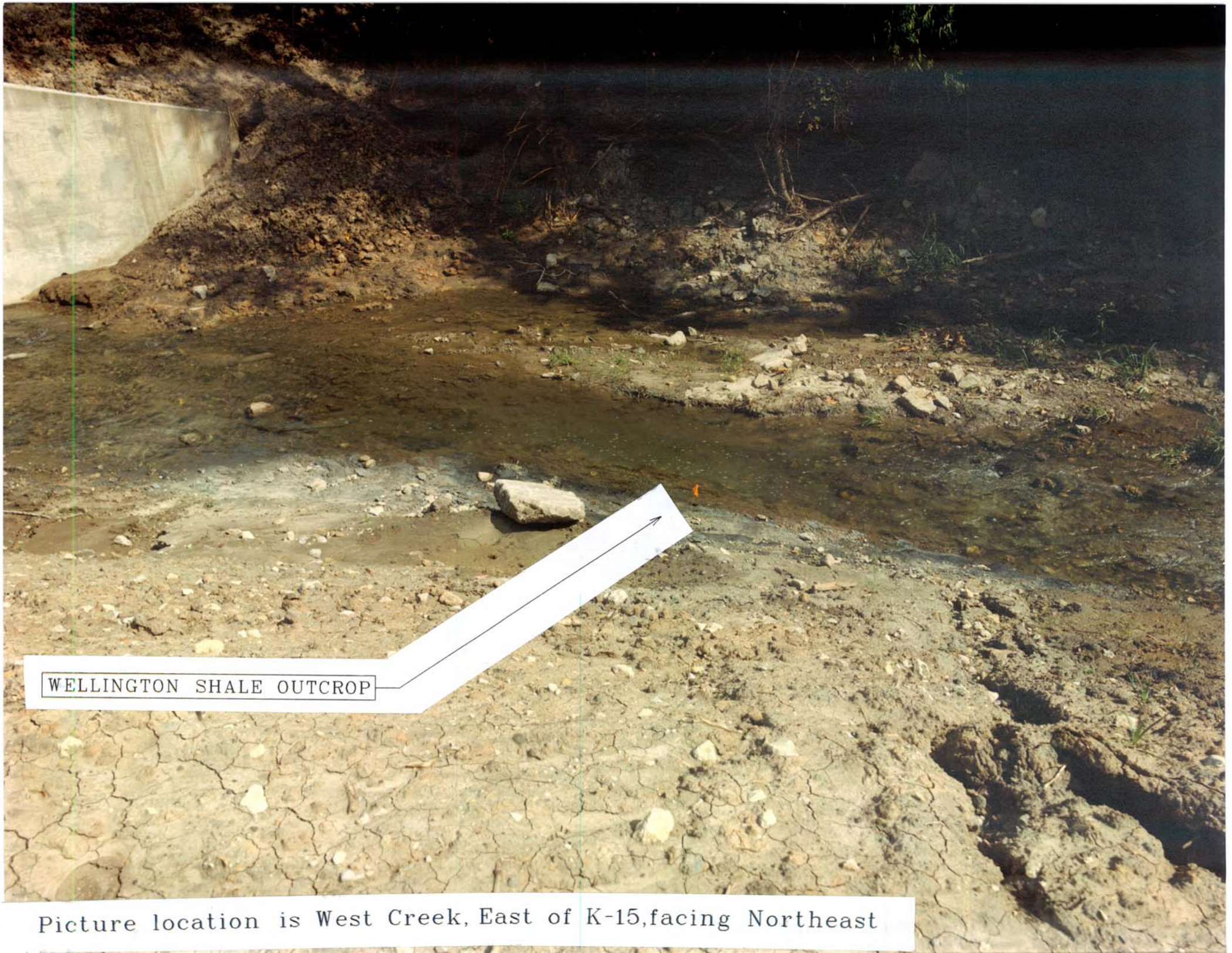
   Further amendment of the Consent Order is necessary to remove the Springs and K-15 area north of the Turnpike from the order.

4. DESCRIPTION OF MONITORING WELLS, RECOVERY WELLS, VAPOR EXTRACTION WELLS, DISCHARGES, SAMPLES, RECOVERY SYSTEM, MEASURING WELLS (KEY WELLS), AND CURRENT REMEDIAL ACTIVITIES

   Fifteen new wells were installed in this area. Thirteen of which were on the Kansas Turnpike Authority property; two were north of MW-82 along K-15.

5. WHAT HAS BEEN COMPLETED IN THE PREVIOUSLY DISCUSSED ZERO WORK PLAN.

   The fifteen monitoring wells, and the sanitary sewer investigation have been completed. This was discussed in the original zero investigation plan.



Picture location is West Creek, East of K-15, facing Northeast


WELLINGTON SHALE OUTCROP

SANITARY SEWER INVESTIGATION

The purpose of the investigation was to identify if the sanitary sewer had leaked or the backfill was a conduit for groundwater to migrate to the west.

Hand augered holes were drilled on both sides of the manholes, where possible, from the Boeing site to MW-82 along K-15. Samples of the water in the backfill sand were taken and analyzed when encountered. The only boring that had any significant VOC's was manhole D. TVOC'S of 296 ug/L were in the water in the D-2 boring. That level is representative of the TVOC concentration in the groundwater in the area.

The investigation also disproved the conduit theory. The sanitary sewer crosses Northwest Creek by the Turnpike exit. At that point it is encased in cement thereby cutting off any possible path along the sewer backfill.

Picture location is West Creek, West of KTA bridge, facing North

Sanitary Sewer Investigation

Boring Logs

BORING LOG / MONITOR WELL SCHEMATIC

BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
A-1/A-2	N of Turnpike next to Interchange	NA	K. Johnson	B. Petersen

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Grass	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
NE	NE	NA	NA	Hand Auger	15'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS	DEP. FT.	WELL CONSTRUCTION: SCHEMATIC
					Fill, brown, clayey, moist, no odor.		
5					Clay, brown, silty, slightly sandy.	5	
					Clay, red, sandy, slightly moist.		
					Clay, red, very plastic, moist.		
10						10	
					Sand, white, clean, well sorted, subangular to subrounded, medium to coarse grains with scattered clay balls, slightly arkosic, no odor.		
15						15	
					BOH @ 15'		
20					Soil samples collected.	20	
25						25	
30						30	
35						35	

WELL CONSTRUCTION: DETAILS

- ELEVATION
  - Casing: NA
  - Pad:
- PROTECTIVE COVER
  - Type: NA
  - Size:
  - Pad Size:
- WELL SEAL
  - Type: Bentonite
  - Amount: 50 lbs.
  - Water: 3 gal.
- WELL PACK
  - Type: NA
  - Amount:
- RISER
  - Type: NA
  - Schedule:
  - Inside Dia.:
  - Length:
- SCREEN
  - Type: NA
  - Schedule:
  - Slot:
  - Inside Dia.:
  - Length:
- END CAP
  - Type: NA
  - Length:

DATE DRILLED: 8-11-93
DATE COMP.: 8-11-93

Geotechnical Services Inc.

Project	Boeing Turnpike	
Location	Wichita, KS	
Job No.	2111041	Date 8-11-93

Form 301-K 8/92

BORING LOG / MONITOR WELL SCHEMATIC

BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
B-1/B-2	N of Turnpike, between interchange and K-15	NA	K. Johnson	K. Matson

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Grass	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
NE	NE	NA	NA	Hand Auger	14.5'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS	DEP. FT.	WELL CONSTRUCTION: SCHEMATIC	DETAILS
5					Clay, brown fill. Clay, red, silty, caliche, moist.	5		ELEVATION Casing: NA Pad:
10					Silty, brown, moist. Sand, white, fine to medium grains, moist.	10		PROTECTIVE COVER Type: NA Size: Pad Size: WELL SEAL Type: Bentonite Amount: 50 lbs. Water: 3 gal.
15					BOH @ 14.5'	15		WELL PACK Type: NA Amount:
20						20		RISER Type: NA Schedule: Inside Dia.: Length:
25						25		SCREEN Type: NA Schedule: Slot: Inside Dia.: Length:
30						30		END CAP Type: NA Length:
35						35		DATE DRILLED: 8-13-93 DATE COMP.: 8-13-93

Geotechnical Services Inc.

Project	Boeing Turnpike
Location	Wichita, KS
Job No.	2111041
Date	8-13-93

Form 301-K 8/92

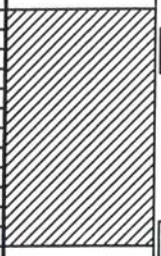
BORING LOG / MONITOR WELL SCHEMATIC

BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
C-1/C-2	N of Turnpike, E of K-15	NA	K. Johnson	B. Petersen

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Grass	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
9'	9'	9'	Groundlevel	Hand Auger	9'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS
0					Clay, light brown, caliche nodules, moist.
					Clay, red, slightly sandy, caliche nodules, moist, no odor.
5					
					Clay, red, sandy, very plastic, moist, no odor.
10					BOH @ 9'
					Water samples collected.
15					
20					
25					
30					
35					

WELL CONSTRUCTION



- ELEVATION
  - Casing: NA
  - Pad:
- PROTECTIVE COVER
  - Type: NA
  - Size:
  - Pad Size:
- WELL SEAL
  - Type: Bentonite
  - Amount: 50 lbs.
  - Water: 3 gal.
- WELL PACK
  - Type: NA
  - Amount:
- RISER
  - Type: NA
  - Schedule:
  - Inside Dia.:
  - Length:
- SCREEN
  - Type: NA
  - Schedule:
  - Slot:
  - Inside Dia.:
  - Length:
- END CAP
  - Type: NA
  - Length:

DATE DRILLED: 8-11-93
DATE COMP.: 8-11-93

Geotechnical Services Inc.

Project	Boeing Turnpike
Location	Wichita, KS
Job No.	2111041
Date	8-11-93

Form 301-K 8/92

BORING LOG / MONITOR WELL SCHEMATIC

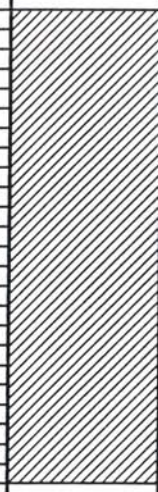
BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
D-1/D-2	W of K-15, N of Turnpike	NA	K. Johnson	T. Hansen

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Grass	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
15'	15'	15'	Groundlevel	Hand Auger	15'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS
5					Clay, brown, moist.
					Clay, red, silty, caliche nodules.
					Sand, tan, fine to medium grains.
10					
15					BOH @ 15'
					Water samples collected.
20					
25					
30					
35					

WELL CONSTRUCTION

SCHEMATIC



DETAILS

ELEVATION
Casing: NA
Pad:

PROTECTIVE COVER
Type: NA
Size:
Pad Size:

WELL SEAL
Type: Bentonite
Amount: 50 lbs.
Water: 3 gal.

WELL PACK
Type: NA
Amount:

RISER
Type: NA
Schedule:
Inside Dia.:
Length:

SCREEN
Type: NA
Schedule:
Slot:
Inside Dia.:
Length:

END CAP
Type: NA
Length:

DATE DRILLED: 8-12-93
DATE COMP.: 8-12-93

Geotechnical Services Inc.

Project	Boeing Turnpike
Location	Wichita, KS
Job No.	2111041
Date	8-12-93

Form 301-K 8/92

BORING LOG / MONITOR WELL SCHEMATIC

BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
E-1/E-2	NW of Toll booth by creek	NA	K. Johnson	K. Matson

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Grass	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
13'	13'	13'	Groundlevel	Hand Auger	13'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS	DEP. FT.	WELL CONSTRUCTION: SCHEMATIC	DETAILS
5					Fill, brown, clayey, sandy.	5		ELEVATION Casing: NA Pad:
10					Sand, gray, fine to medium grains.	10		PROTECTIVE COVER Type: NA Size: Pad Size: WELL SEAL Type: Bentonite Amount: 50 lbs. Water: 3 gal.
15					BOH @ 13' Water samples collected.	15		WELL PACK Type: NA Amount:
20						20		RISER Type: NA Schedule: Inside Dia.: Length:
25						25		SCREEN Type: NA Schedule: Slot: Inside Dia.: Length:
30						30		END CAP Type: NA Length:
35						35		DATE DRILLED: 8-13-93 DATE COMP.: 8-13-93

Geotechnical Services Inc.

Project	Boeing Turnpike
Location	Wichita, KS
Job No.	2111041
Date	8-13-93

Form 301-K 8/92

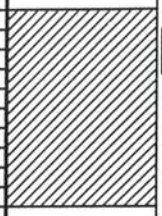
BORING LOG / MONITOR WELL SCHEMATIC

BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
F-1/F-2	W of Turnpike Drive, S of creek	NA	K. Matson	B. Petersen

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Grass	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
8'	8'	8'	Groundlevel	Hand Auger	8'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS
0					Fill, dark gray, clayey, sandy, very moist.
5					Sand, brown, medium to coarse grains, wet.
8					BOH @ 8'
10					Water samples collected.
15					
20					
25					
30					
35					

WELL CONSTRUCTION



- ELEVATION
  - Casing: NA
  - Pad:
- PROTECTIVE COVER
  - Type: NA
  - Size:
  - Pad Size:
- WELL SEAL
  - Type: Bentonite
  - Amount: 50 lbs.
  - Water: 3 gal.
- WELL PACK
  - Type: NA
  - Amount:
- RISER
  - Type: NA
  - Schedule:
  - Inside Dia.:
  - Length:
- SCREEN
  - Type: NA
  - Schedule:
  - Slot:
  - Inside Dia.:
  - Length:
- END CAP
  - Type: NA
  - Length:

DATE DRILLED: 8-11-93
DATE COMP.: 8-11-93

Geotechnical Services Inc.

Project	Boeing Turnpike
Location	Wichita, KS
Job No.	2111041
Date	8-11-93

Form 301-K 8/92

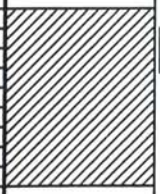
BORING LOG / MONITOR WELL SCHEMATIC

BH/MW	LOCATION OF DRILL HOLE	MW TAG I.D.	DRILLER	GEOLOGIST
G-1/G-2	SW of Waste Treatment Plant	NA	K. Johnson	T. Hansen

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	STATIC LEVEL	DATUM	Gravel	Hand Auger
				DRILLING METHOD/SAMPLE METHOD	TOTAL DEPTH
7'	7'	7'	Groundlevel	Hand Auger	7.5'

DEP. Ft.	SAMPLE DATA: SAMPLE NO.& TYPE	"N" BLOWS /FT	% REC.	HEAD SPACE (PID)	SOIL DESCRIPTION: GEOLOGIC DESCRIPTION & OTHER REMARKS
					Clay, brown, caliche nodules.
5					Sand, tan, fine to medium grains.
					Clay, reddish tan.
					BOH @ 7.5'
10					Water samples collected.
15					
20					
25					
30					
35					

WELL CONSTRUCTION



- ELEVATION
  - Casing: NA
  - Pad:
- PROTECTIVE COVER
  - Type: NA
  - Size:
  - Pad Size:
- WELL SEAL
  - Type: Bentonite
  - Amount: 40 gal.
  - Water: 3 gal.
- WELL PACK
  - Type: NA
  - Amount:
- RISER
  - Type: NA
  - Schedule:
  - Inside Dia.:
  - Length:
- SCREEN
  - Type: NA
  - Schedule:
  - Slot:
  - Inside Dia.:
  - Length:
- END CAP
  - Type: NA
  - Length:

DATE DRILLED: 8-12-93
DATE COMP.: 8-12-93

Geotechnical Services Inc.

Project	Boeing Turnpike
Location	Wichita, KS
Job No.	2111041
Date	8-12-93

Form 301-K 8/92

Continental Analytical
SERVICES, INC.

08/27/93

Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Received: 08/18/93
CAS File No.: 93-5009
CAS Order No.: 18221
Your P.O./Project No.: M.S.

Dear Mr. Smith MSK11-65:

Enclosed are the laboratory reports for the following samples:

CAS LAB ID #	SAMPLE DESCRIPTION	DATE SAMPLED
93080900	G-1 7.5'	08/12/93
93080901	G-2 7.5'	08/12/93
93080902	G-1	08/12/93
93080903	D-2	08/12/93
93080904	D-1	08/12/93

Thank you for choosing CAS for this project. If you have any questions, please contact me at 800-535-3076.

CONTINENTAL ANALYTICAL SERVICES, INC.

Kathleen A. Mitchell
Project Manager

1804 Glendale Road • Salina, Kansas 67401-6675
913-827-1273 • 800-535-3076 • FAX 913-823-7830

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18221
Client P.O.: M.S.

Lab Number: 93080901
Sample Description: G-2 7.5'

Date Sampled: 08/12/93
Time Sampled: 1730

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(1.0)	µg/kg	1671/11
1,1,2,2-Tetrachloroethane	ND(1.0)	µg/kg	1671/11
1,1,2-Trichloroethane	ND(1.0)	µg/kg	1671/11
1,1-Dichloroethane	ND(1.0)	µg/kg	1671/11
1,1-Dichloroethylene	ND(1.0)	µg/kg	1671/11
1,2-Dichlorobenzene	ND(1.0)	µg/kg	1671/11
1,2-Dichloroethane	ND(1.0)	µg/kg	1671/11
1,2-Dichloropropane	ND(1.0)	µg/kg	1671/11
1,3-Dichlorobenzene	ND(1.0)	µg/kg	1671/11
1,4-Dichlorobenzene	ND(1.0)	µg/kg	1671/11
2-Chloroethylvinyl Ether	ND(1.0)	µg/kg	1671/11
Benzene	ND(1.0)	µg/kg	1671/11
Bromodichloromethane	ND(1.0)	µg/kg	1671/11
Bromoform	ND(1.0)	µg/kg	1671/11
Bromomethane	ND(1.0)	µg/kg	1671/11
Carbon Tetrachloride	ND(1.0)	µg/kg	1671/11
Chlorobenzene	ND(1.0)	µg/kg	1671/11
Chloroethane	ND(1.0)	µg/kg	1671/11
Chloroform	ND(1.0)	µg/kg	1671/11
Chloromethane	ND(1.0)	µg/kg	1671/11
cis-1,2-Dichloroethylene	ND(1.0)	µg/kg	1671/11
cis-1,3-Dichloropropene	ND(1.0)	µg/kg	1671/11
Dibromochloromethane	ND(1.0)	µg/kg	1671/11
Dichlorodifluoromethane	ND(1.0)	µg/kg	1671/11
Ethylbenzene	ND(1.0)	µg/kg	1671/11
Methylene Chloride	ND(1.0)	µg/kg	1671/11
Tetrachloroethylene	ND(1.0)	µg/kg	1671/11
Toluene	ND(1.0)	µg/kg	1671/11
trans-1,2-Dichloroethylene	ND(1.0)	µg/kg	1671/11
trans-1,3-Dichloropropylene	ND(1.0)	µg/kg	1671/11
Trichloroethylene	ND(1.0)	µg/kg	1671/11
Trichlorofluoromethane	ND(1.0)	µg/kg	1671/11
Vinyl Chloride	ND(1.0)	µg/kg	1671/11
Xylene	ND(1.0)	µg/kg	1671/11

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18221
Client P.O.: M.S.

Lab Number: 93080902
Sample Description: G-1

Date Sampled: 08/12/93
Time Sampled: 1645

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1517/34
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1517/34
1,1,2-Trichloroethane	ND(0.2)	µg/L	1517/34
1,1-Dichloroethane	ND(0.2)	µg/L	1517/34
1,1-Dichloroethylene	ND(0.2)	µg/L	1517/34
1,2-Dichlorobenzene	ND(0.2)	µg/L	1517/34
1,2-Dichloroethane	ND(0.2)	µg/L	1517/34
1,2-Dichloropropane	ND(0.2)	µg/L	1517/34
1,3-Dichlorobenzene	ND(0.2)	µg/L	1517/34
1,4-Dichlorobenzene	ND(0.2)	µg/L	1517/34
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1517/34
Benzene	ND(0.2)	µg/L	1517/34
Bromodichloromethane	ND(0.2)	µg/L	1517/34
Bromoform	ND(0.2)	µg/L	1517/34
Bromomethane	ND(0.2)	µg/L	1517/34
Carbon Tetrachloride	ND(0.2)	µg/L	1517/34
Chlorobenzene	ND(0.2)	µg/L	1517/34
Chloroethane	ND(0.2)	µg/L	1517/34
Chloroform	ND(0.2)	µg/L	1517/34
Chloromethane	ND(0.2)	µg/L	1517/34
cis-1,2-Dichloroethylene	13.	µg/L	1517/34
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1517/34
Dibromochloromethane	ND(0.2)	µg/L	1517/34
Dichlorodifluoromethane	ND(0.2)	µg/L	1517/34
Ethylbenzene	ND(0.2)	µg/L	1517/34
Methylene Chloride	ND(0.2)	µg/L	1517/34
Tetrachloroethylene	ND(0.2)	µg/L	1517/34
Toluene	0.6	µg/L	1517/34
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1517/34
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1517/34
Trichloroethylene	2.3	µg/L	1517/34
Trichlorofluoromethane	ND(0.2)	µg/L	1517/34
Vinyl Chloride	1.3	µg/L	1517/34
Xylene	ND(0.2)	µg/L	1517/34

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker

Clifford J. Baker
Laboratory Director

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18221
Client P.O.: M.S.

Lab Number: 93080903
Sample Description: D-2

Date Sampled: 08/12/93
Time Sampled: 1830

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(2.0)	µg/L	1517/38
1,1,2,2-Tetrachloroethane	ND(2.0)	µg/L	1517/38
1,1,2-Trichloroethane	ND(2.0)	µg/L	1517/38
1,1-Dichloroethane	ND(2.0)	µg/L	1517/38
1,1-Dichloroethylene	ND(2.0)	µg/L	1517/38
1,2-Dichlorobenzene	ND(2.0)	µg/L	1517/38
1,2-Dichloroethane	ND(2.0)	µg/L	1517/38
1,2-Dichloropropane	ND(2.0)	µg/L	1517/38
1,3-Dichlorobenzene	ND(2.0)	µg/L	1517/38
1,4-Dichlorobenzene	ND(2.0)	µg/L	1517/38
2-Chloroethylvinyl Ether	ND(2.0)	µg/L	1517/38
Benzene	ND(2.0)	µg/L	1517/38
Bromodichloromethane	ND(2.0)	µg/L	1517/38
Bromoform	ND(2.0)	µg/L	1517/38
Bromomethane	ND(2.0)	µg/L	1517/38
Carbon Tetrachloride	ND(2.0)	µg/L	1517/38
Chlorobenzene	ND(2.0)	µg/L	1517/38
Chloroethane	ND(2.0)	µg/L	1517/38
Chloroform	ND(2.0)	µg/L	1517/38
Chloromethane	ND(2.0)	µg/L	1517/38
cis-1,2-Dichloroethylene	16.	µg/L	1517/38
cis-1,3-Dichloropropene	ND(2.0)	µg/L	1517/38
Dibromochloromethane	ND(2.0)	µg/L	1517/38
Dichlorodifluoromethane	ND(2.0)	µg/L	1517/38
Ethylbenzene	ND(2.0)	µg/L	1517/38
Methylene Chloride	ND(2.0)	µg/L	1517/38
Tetrachloroethylene	ND(2.0)	µg/L	1517/38
Toluene	ND(2.0)	µg/L	1517/38
trans-1,2-Dichloroethylene	ND(2.0)	µg/L	1517/38
trans-1,3-Dichloropropylene	ND(2.0)	µg/L	1517/38
Trichloroethylene	280.	µg/L	1517/38
Trichlorofluoromethane	ND(2.0)	µg/L	1517/38
Vinyl Chloride	ND(2.0)	µg/L	1517/38
Xylene	ND(2.0)	µg/L	1517/38

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18221
Client P.O.: M.S.

Lab Number: 93080904
Sample Description: D-1

Date Sampled: 08/12/93
Time Sampled: 1815

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1517/35
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1517/35
1,1,2-Trichloroethane	ND(0.2)	µg/L	1517/35
1,1-Dichloroethane	ND(0.2)	µg/L	1517/35
1,1-Dichloroethylene	ND(0.2)	µg/L	1517/35
1,2-Dichlorobenzene	ND(0.2)	µg/L	1517/35
1,2-Dichloroethane	ND(0.2)	µg/L	1517/35
1,2-Dichloropropane	ND(0.2)	µg/L	1517/35
1,3-Dichlorobenzene	ND(0.2)	µg/L	1517/35
1,4-Dichlorobenzene	ND(0.2)	µg/L	1517/35
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1517/35
Benzene	ND(0.2)	µg/L	1517/35
Bromodichloromethane	1.0	µg/L	1517/35
Bromoform	ND(0.2)	µg/L	1517/35
Bromomethane	ND(0.2)	µg/L	1517/35
Carbon Tetrachloride	ND(0.2)	µg/L	1517/35
Chlorobenzene	ND(0.2)	µg/L	1517/35
Chloroethane	ND(0.2)	µg/L	1517/35
Chloroform	4.7	µg/L	1517/35
Chloromethane	ND(0.2)	µg/L	1517/35
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1517/35
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1517/35
Dibromochloromethane	ND(0.2)	µg/L	1517/35
Dichlorodifluoromethane	ND(0.2)	µg/L	1517/35
Ethylbenzene	ND(0.2)	µg/L	1517/35
Methylene Chloride	ND(0.2)	µg/L	1517/35
Tetrachloroethylene	0.4	µg/L	1517/35
Toluene	0.7	µg/L	1517/35
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1517/35
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1517/35
Trichloroethylene	2.7	µg/L	1517/35
Trichlorofluoromethane	ND(0.2)	µg/L	1517/35
Vinyl Chloride	ND(0.2)	µg/L	1517/35
Xylene	ND(0.2)	µg/L	1517/35

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

CAS
CONTINENTAL ANALYTICAL SERVICES, INC.
1804 Glendale
Salina, Kansas 67401 • 913/827-1273

FIELD CHAIN-OF-CUSTODY RECORD

Site Name: Boeing (Geotechinal Service) Sample Date: 8-12-93

COOLER CONTENTS

SAMPLE DESCRIPTION	SAMPLE TIME	FIELD COMMENTS	TEST ASSIGNMENTS
G-1 7.5'	1523		601/602, Xylene
G-2 7.5'	1730		↓
G-1	1645		
D-2	1830		↓
D-1	1815		
			Standard

CHAIN-OF-CUSTODY CHRONICLE

Cooler Opened By: (print) Dave Poague Date: 8-18-93 Time: AT

Signature: [signature] Seal No.: NS Intact: U

I have received these materials in good condition from the above person.

Name: _____ Signature: _____

Date: _____ Remarks: _____

Cooler Sealed By: (print) Dave Poague Date: 8-18-93

Signature: [signature] Seal No.: 93188

FOR LAB USE ONLY

Opened By: [illegible] Date: 8 19 93 Time: [illegible]

Cooler No.: _____ Temp. °C: _____ Seal No.: _____ Intact: _____

Continental Analytical
SERVICES, INC.

08/27/93

Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Received: 08/18/93
CAS File No.: 93-5009
CAS Order No.: 18220
Your P.O./Project No.: M.S.

Dear Mr. Smith MSK11-65:

Enclosed are the laboratory reports for the following samples:

CAS LAB ID #	SAMPLE DESCRIPTION	DATE SAMPLED
93080896	B-1 15'	08/13/93
93080897	B-2 15'	08/13/93
93080898	E-1	08/13/93
93080899	E-2	08/13/93

Thank you for choosing CAS for this project. If you have any questions, please contact me at 800-535-3076.

CONTINENTAL ANALYTICAL SERVICES, INC.

Kathleen A. Mitchell

Kathleen A. Mitchell
Project Manager

1804 Glendale Road • Salina, Kansas 67401-6675
913-827-1273 • 800-535-3076 • FAX 913-823-7830

Continental Analytical
SERVICES, INC.

Client: Boeing Commercial Airplane Group
ATTN:Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18220
Client P.O.: M.S.

Lab Number: 93080896
Sample Description: B-1 15'

Date Sampled: 08/13/93
Time Sampled: 1200

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			
1,1,1-Trichloroethane	ND(1.0)	µg/kg	1671/10
1,1,2,2-Tetrachloroethane	ND(1.0)	µg/kg	1671/10
1,1,2-Trichloroethane	ND(1.0)	µg/kg	1671/10
1,1-Dichloroethane	ND(1.0)	µg/kg	1671/10
1,1-Dichloroethylene	ND(1.0)	µg/kg	1671/10
1,2-Dichlorobenzene	ND(1.0)	µg/kg	1671/10
1,2-Dichloroethane	ND(1.0)	µg/kg	1671/10
1,2-Dichloropropane	ND(1.0)	µg/kg	1671/10
1,3-Dichlorobenzene	ND(1.0)	µg/kg	1671/10
1,4-Dichlorobenzene	ND(1.0)	µg/kg	1671/10
2-Chloroethylvinyl Ether	ND(1.0)	µg/kg	1671/10
Benzene	ND(1.0)	µg/kg	1671/10
Bromodichloromethane	ND(1.0)	µg/kg	1671/10
Bromoform	ND(1.0)	µg/kg	1671/10
Bromomethane	ND(1.0)	µg/kg	1671/10
Carbon Tetrachloride	ND(1.0)	µg/kg	1671/10
Chlorobenzene	ND(1.0)	µg/kg	1671/10
Chloroethane	ND(1.0)	µg/kg	1671/10
Chloroform	ND(1.0)	µg/kg	1671/10
Chloromethane	ND(1.0)	µg/kg	1671/10
cis-1,2-Dichloroethylene	ND(1.0)	µg/kg	1671/10
cis-1,3-Dichloropropene	ND(1.0)	µg/kg	1671/10
Dibromochloromethane	ND(1.0)	µg/kg	1671/10
Dichlorodifluoromethane	ND(1.0)	µg/kg	1671/10
Ethylbenzene	ND(1.0)	µg/kg	1671/10
Methylene Chloride	ND(1.0)	µg/kg	1671/10
Tetrachloroethylene	ND(1.0)	µg/kg	1671/10
Toluene	ND(1.0)	µg/kg	1671/10
trans-1,2-Dichloroethylene	ND(1.0)	µg/kg	1671/10
trans-1,3-Dichloropropylene	ND(1.0)	µg/kg	1671/10
Trichloroethylene	ND(1.0)	µg/kg	1671/10
Trichlorofluoromethane	ND(1.0)	µg/kg	1671/10
Vinyl Chloride	ND(1.0)	µg/kg	1671/10
Xylene	ND(1.0)	µg/kg	1671/10

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

1804 Glendale Road • Salina, Kansas 67401-6675
913-827-1273 • 800-535-3076 • FAX 913-823-7830

Client: Boeing Commercial Airplane Group
ATTN:Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18220
Client P.O.: M.S.

Lab Number: 93080897
Sample Description: B-2 15'

Date Sampled: 08/13/93
Time Sampled: 1200

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			
1,1,1-Trichloroethane	ND(1.0)	µg/kg	1671/10
1,1,2,2-Tetrachloroethane	ND(1.0)	µg/kg	1671/10
1,1,2-Trichloroethane	ND(1.0)	µg/kg	1671/10
1,1-Dichloroethane	ND(1.0)	µg/kg	1671/10
1,1-Dichloroethylene	ND(1.0)	µg/kg	1671/10
1,2-Dichlorobenzene	ND(1.0)	µg/kg	1671/10
1,2-Dichloroethane	ND(1.0)	µg/kg	1671/10
1,2-Dichloropropane	ND(1.0)	µg/kg	1671/10
1,3-Dichlorobenzene	ND(1.0)	µg/kg	1671/10
1,4-Dichlorobenzene	ND(1.0)	µg/kg	1671/10
2-Chloroethylvinyl Ether	ND(1.0)	µg/kg	1671/10
Benzene	ND(1.0)	µg/kg	1671/10
Bromodichloromethane	ND(1.0)	µg/kg	1671/10
Bromoform	ND(1.0)	µg/kg	1671/10
Bromomethane	ND(1.0)	µg/kg	1671/10
Carbon Tetrachloride	ND(1.0)	µg/kg	1671/10
Chlorobenzene	ND(1.0)	µg/kg	1671/10
Chloroethane	ND(1.0)	µg/kg	1671/10
Chloroform	ND(1.0)	µg/kg	1671/10
Chloromethane	ND(1.0)	µg/kg	1671/10
cis-1,2-Dichloroethylene	ND(1.0)	µg/kg	1671/10
cis-1,3-Dichloropropene	ND(1.0)	µg/kg	1671/10
Dibromochloromethane	ND(1.0)	µg/kg	1671/10
Dichlorodifluoromethane	ND(1.0)	µg/kg	1671/10
Ethylbenzene	ND(1.0)	µg/kg	1671/10
Methylene Chloride	ND(1.0)	µg/kg	1671/10
Tetrachloroethylene	ND(1.0)	µg/kg	1671/10
Toluene	ND(1.0)	µg/kg	1671/10
trans-1,2-Dichloroethylene	ND(1.0)	µg/kg	1671/10
trans-1,3-Dichloropropylene	ND(1.0)	µg/kg	1671/10
Trichloroethylene	ND(1.0)	µg/kg	1671/10
Trichlorofluoromethane	ND(1.0)	µg/kg	1671/10
Vinyl Chloride	ND(1.0)	µg/kg	1671/10
Xylene	ND(1.0)	µg/kg	1671/10

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18220
Client P.O.: M.S.

Lab Number: 93080898
Sample Description: E-1

Date Sampled: 08/13/93
Time Sampled:

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1517/38
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1517/38
1,1,2-Trichloroethane	ND(0.2)	µg/L	1517/38
1,1-Dichloroethane	ND(0.2)	µg/L	1517/38
1,1-Dichloroethylene	ND(0.2)	µg/L	1517/38
1,2-Dichlorobenzene	ND(0.2)	µg/L	1517/38
1,2-Dichloroethane	ND(0.2)	µg/L	1517/38
1,2-Dichloropropane	ND(0.2)	µg/L	1517/38
1,3-Dichlorobenzene	ND(0.2)	µg/L	1517/38
1,4-Dichlorobenzene	ND(0.2)	µg/L	1517/38
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1517/38
Benzene	ND(0.2)	µg/L	1517/38
Bromodichloromethane	ND(0.2)	µg/L	1517/38
Bromoform	ND(0.2)	µg/L	1517/38
Bromomethane	ND(0.2)	µg/L	1517/38
Carbon Tetrachloride	ND(0.2)	µg/L	1517/38
Chlorobenzene	ND(0.2)	µg/L	1517/38
Chloroethane	ND(0.2)	µg/L	1517/38
Chloroform	ND(0.2)	µg/L	1517/38
Chloromethane	ND(0.2)	µg/L	1517/38
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1517/38
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1517/38
Dibromochloromethane	ND(0.2)	µg/L	1517/38
Dichlorodifluoromethane	ND(0.2)	µg/L	1517/38
Ethylbenzene	ND(0.2)	µg/L	1517/38
Methylene Chloride	ND(0.2)	µg/L	1517/38
Tetrachloroethylene	ND(0.2)	µg/L	1517/38
Toluene	0.9	µg/L	1517/38
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1517/38
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1517/38
Trichloroethylene	0.8	µg/L	1517/38
Trichlorofluoromethane	ND(0.2)	µg/L	1517/38
Vinyl Chloride	ND(0.2)	µg/L	1517/38
Xylene	ND(0.2)	µg/L	1517/38

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Continental Analytical
SERVICES, INC.

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 08/27/93
Date Sample Recd: 08/18/93
CAS File No: 93-5009
CAS Order No: 18220
Client P.O.: M.S.

Lab Number: 93080899
Sample Description: E-2

Date Sampled: 08/13/93
Time Sampled:

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1749/29
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1749/29
1,1,2-Trichloroethane	ND(0.2)	µg/L	1749/29
1,1-Dichloroethane	ND(0.2)	µg/L	1749/29
1,1-Dichloroethylene	ND(0.2)	µg/L	1749/29
1,2-Dichlorobenzene	ND(0.2)	µg/L	1749/29
1,2-Dichloroethane	ND(0.2)	µg/L	1749/29
1,2-Dichloropropane	ND(0.2)	µg/L	1749/29
1,3-Dichlorobenzene	ND(0.2)	µg/L	1749/29
1,4-Dichlorobenzene	ND(0.2)	µg/L	1749/29
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1749/29
Benzene	ND(0.2)	µg/L	1749/29
Bromodichloromethane	ND(0.2)	µg/L	1749/29
Bromoform	ND(0.2)	µg/L	1749/29
Bromomethane	ND(0.2)	µg/L	1749/29
Carbon Tetrachloride	ND(0.2)	µg/L	1749/29
Chlorobenzene	ND(0.2)	µg/L	1749/29
Chloroethane	ND(0.2)	µg/L	1749/29
Chloroform	ND(0.2)	µg/L	1749/29
Chloromethane	ND(0.2)	µg/L	1749/29
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1749/29
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1749/29
Dibromochloromethane	ND(0.2)	µg/L	1749/29
Dichlorodifluoromethane	ND(0.2)	µg/L	1749/29
Ethylbenzene	0.3	µg/L	1749/29
Methylene Chloride	ND(0.2)	µg/L	1749/29
Tetrachloroethylene	ND(0.2)	µg/L	1749/29
Toluene	0.3	µg/L	1749/29
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1749/29
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1749/29
Trichloroethylene	0.6	µg/L	1749/29
Trichlorofluoromethane	ND(0.2)	µg/L	1749/29
Vinyl Chloride	ND(0.2)	µg/L	1749/29
Xylene	ND(0.2)	µg/L	1749/29

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

1804 Glendale Road • Salina, Kansas 67401-6675
913-827-1273 • 800-535-3076 • FAX 913-823-7830

CAS

CONTINENTAL ANALYTICAL SERVICES, INC.
1804 Glendale
Salina, Kansas 67401 • 913/827-1273

FIELD CHAIN-OF-CUSTODY RECORD

Site Name: Boeing (Geotechnical Services) Sample Date: 8-17-93

COOLER CONTENTS

SAMPLE DESCRIPTION	SAMPLE TIME	FIELD COMMENTS	TEST ASSIGNMENTS
B-1 15'	1200		601/602, Xylene
B-2 15'	1200		↓
E-1	-		
E-2	-		
			Standard

CHAIN-OF-CUSTODY CHRONICLE

Cooler Opened By: (print) Dave Poague Date: 8-18-93 Time: NT

Signature: Dave Poague Seal No.: NS Intact: ✓

I have received these materials in good condition from the above person.

Name: _____ Signature: _____

Date: _____ Remarks: _____

Cooler Sealed By: (print) Dave Poague Date: 8-18-93

Signature: Dave Poague Seal No.: 43188

FOR LAB USE ONLY
Opened By: [illegible] Date: 8-19-93 Time: [illegible]

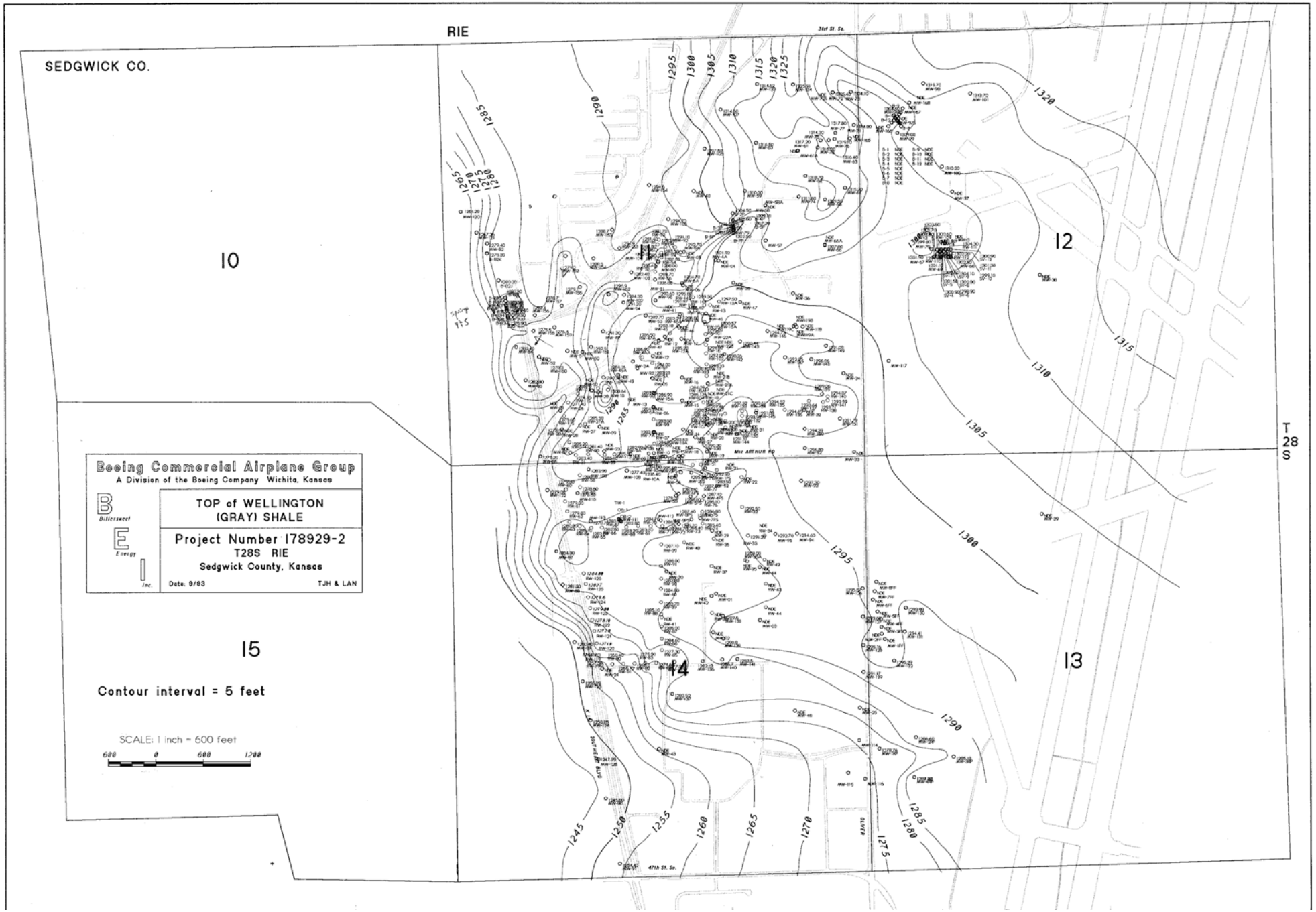
Cooler No.: _____ Temp. °C: _____ Seal No.: [illegible] Intact: _____

CAS 01-90-03-1.5K

Appendix A

MAPS

Top of Wellington (Gray) Shale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SEDGWICK CO.
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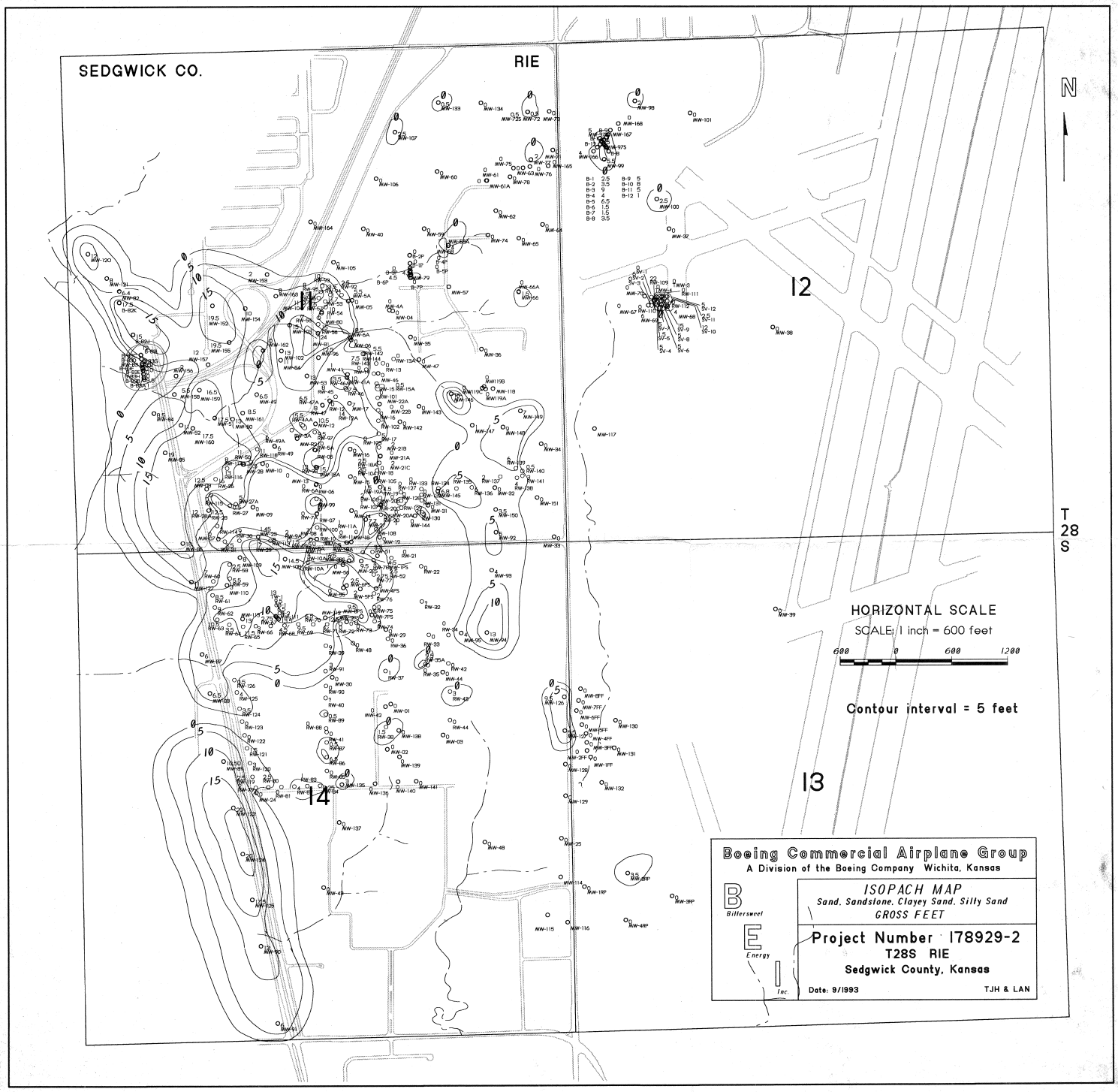
T 28 S
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
Billersweet Energy Inc.
TOP of WELLINGTON (GRAY) SHALE
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas
Date: 9/93
TJH & LAN
Contour interval = 5 feet
SCALE: 1 inch = 600 feet
600 0 600 1200
31st St. So.
47th St. So.
Mac ARTHUR RD
SOUTH BLVD
1245
1250
1255
1260
1265
1270
1275
1280
1285
1290
1295
1300
1305
1310
1315
1320
1325

Isopach Map

Sand, Sandstone, Clayey Sand, Silty Sand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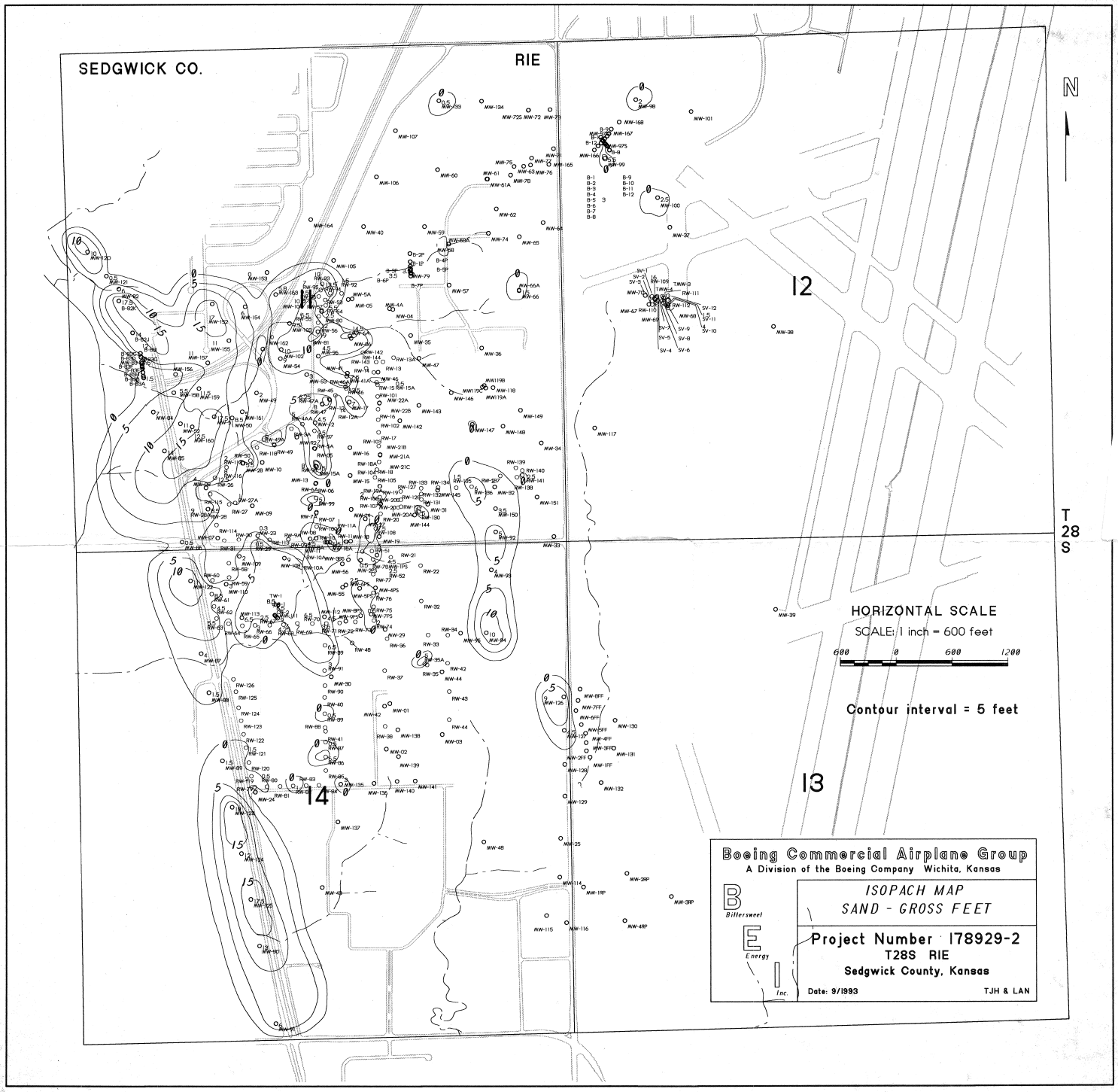
HORIZONTAL SCALE
SCALE: 1 inch = 600 feet
600 0 600 1200
Contour interval = 5 feet
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
B Billerswel
E Energy
I Inc.
ISOPACH MAP
Sand, Sandstone, Clayey Sand, Silty Sand
GROSS FEET
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas
Date: 9/1993
TJH & LAN

Isopach Map

Sand - Gross Feet


SEDGWICK CO.
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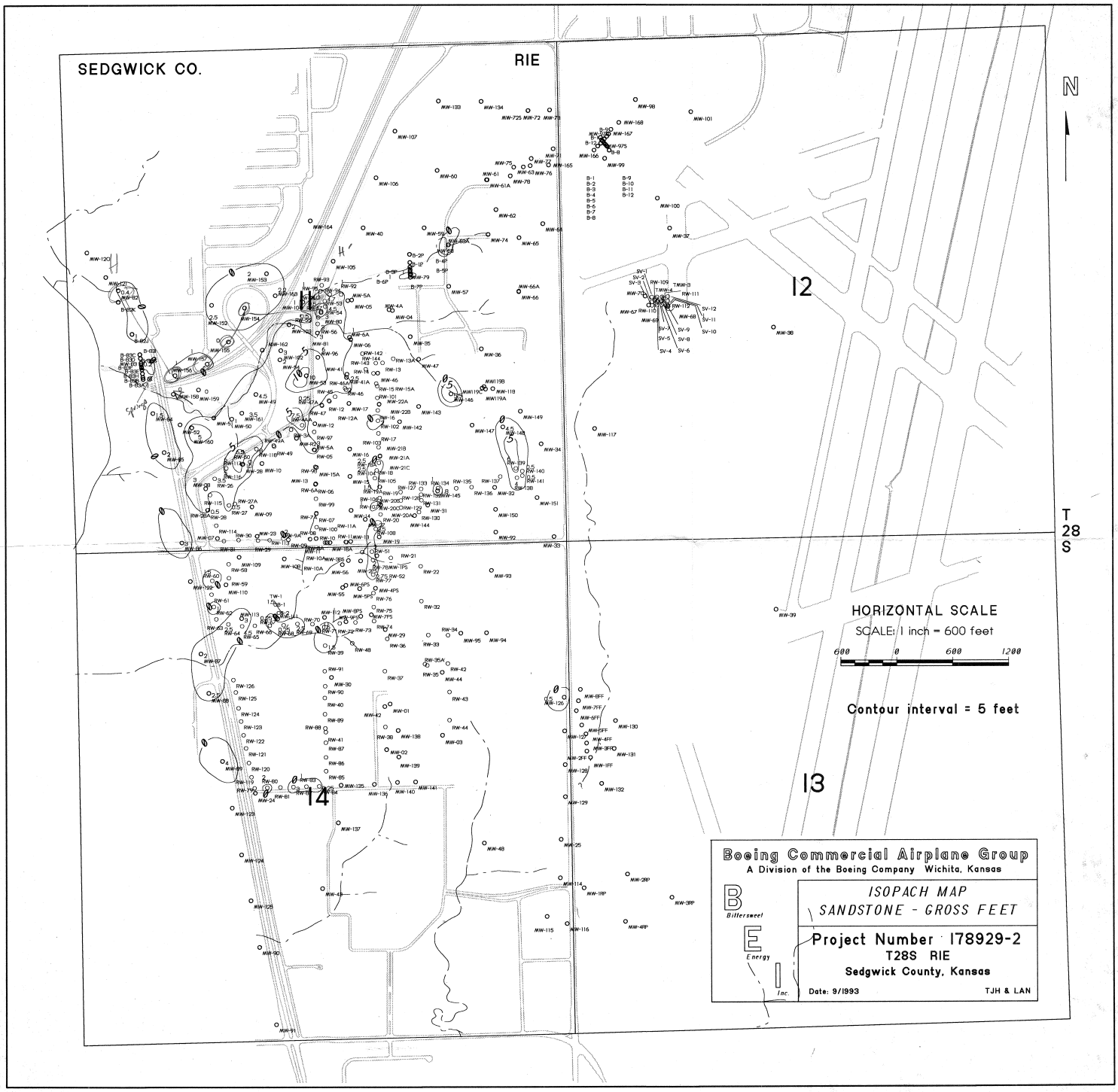
HORIZONTAL SCALE
SCALE: 1 inch = 600 feet
600 0 600 1200
Contour interval = 5 feet
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
Billersweet Energy Inc.
ISOPACH MAP
SAND - GROSS FEET
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas
Date: 9/1993
TJH & LAN

Isopach Map

Sandstone - Gross Feet


SEDGWICK CO.
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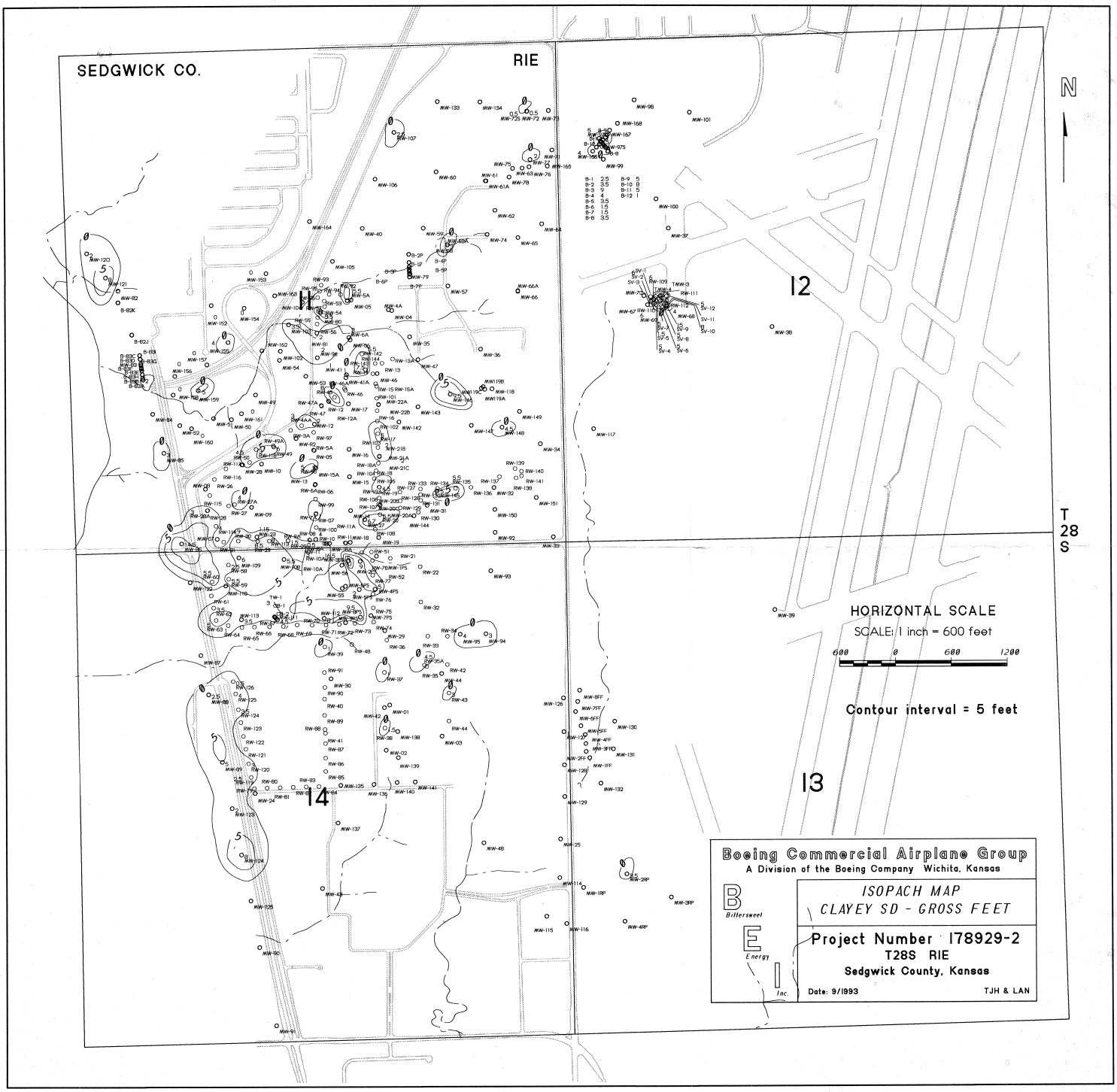
HORIZONTAL SCALE
SCALE: 1 inch = 600 feet
600 0 600 1200
Contour interval = 5 feet
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
Billerswel
Energy
Inc.
ISOPACH MAP
SANDSTONE - GROSS FEET
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas
Date: 9/1993
TJH & LAN

Isopach Map

Clayey Sand - Gross Feet


SEDGWICK CO.
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14
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28
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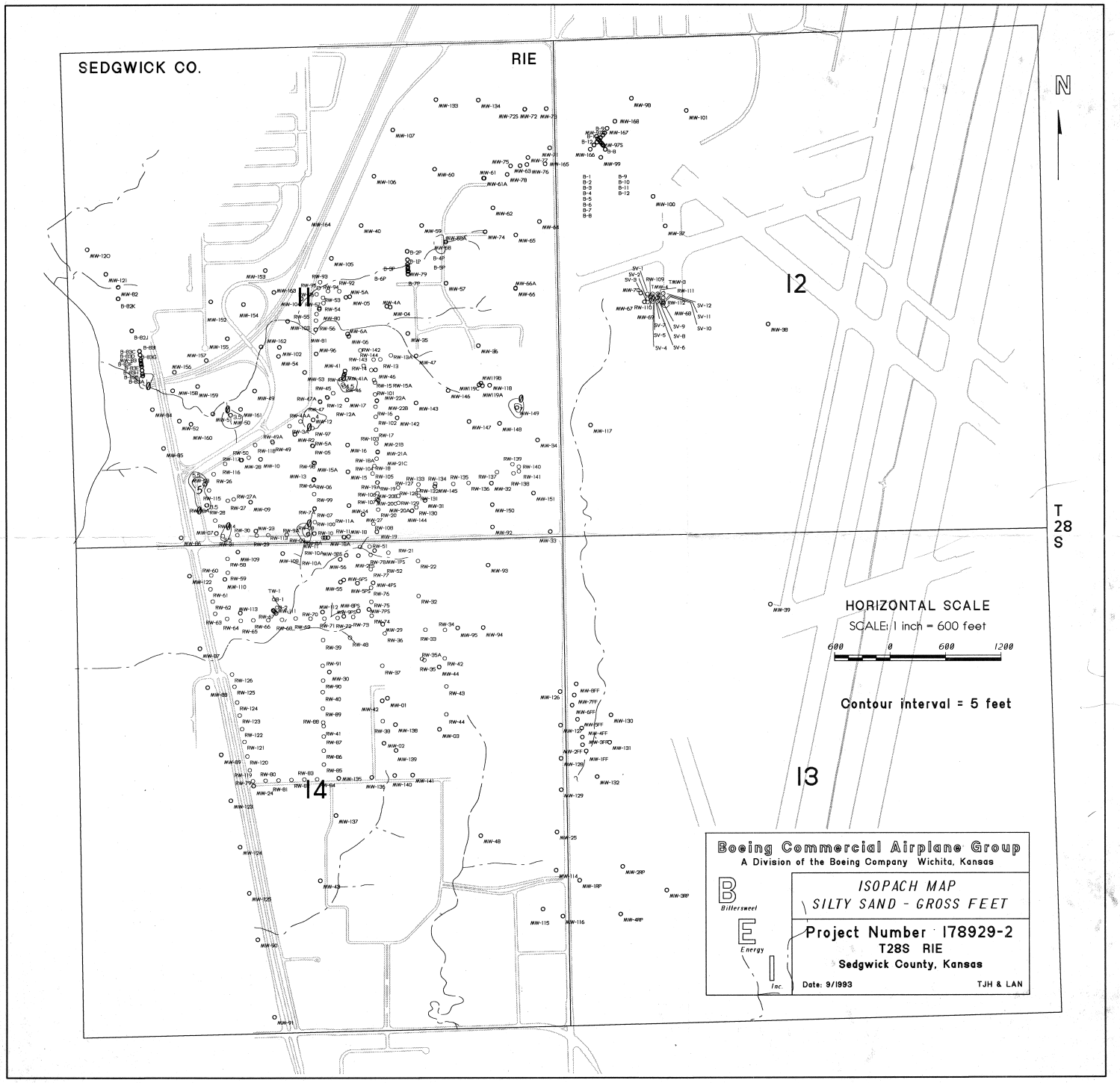
HORIZONTAL SCALE
SCALE: 1 inch = 600 feet
600 0 600 1200
Contour interval = 5 feet
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
B Billersweet E Energy I Inc.
ISOPACH MAP
CLAYEY SD - GROSS FEET
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas
Date: 9/1993
TJH & LAN

Isopach Map

Silty Sand - Gross Feet


SEDGWICK CO.
RIE
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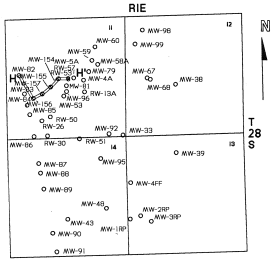
HORIZONTAL SCALE
SCALE: 1 inch = 600 feet
600 0 600 1200
Contour interval = 5 feet
Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas
B Bitersweet E Energy I Inc.
ISOPACH MAP
SILTY SAND - GROSS FEET
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas
Date: 9/1993
TJH & LAN

Appendix B

CROSS SECTIONS

Cross Section H - H'

STRUCTURAL CROSS SECTION H - H'



INDEX MAP

Boeing Commercial Airplane Group
Well Construction and Lithologic Log

Well No. MW-62 | Elevation Ground 1299.40 | Top of Csg. El 1302.59 | TOC Above GL 3.19 | Date Drilled 10/10/90
Water Level 11.79 | Screened Interval 4 - 22 ft. | Borehole Diameter 9.3 inch. | Csg. Diameter 2 inch. | Type Of Csg. PVC

Depth	Elev.	Description
0.00	1299.40	SILTY LEAN TO FAT CLAY, Dark brown
3.00	1296.40	MEDIUM SAND, Light brown
5.00	1294.40	SILTY FAT CLAY, Gray brown Trace of sand
8.60	1290.80	MEDIUM TO COARSE SAND, Light brown
18.90	1280.50	SANDSTONE, Light brown
20.00	1279.40	FAT CLAY (HIGHLY WEATHERED SHALE) Olive gray
22.50	1276.90	SHALE, Dark gray

BOC 22.00
BOH 22.50 ft.

Boeing Commercial Airplane Group
Well Construction and Lithologic Log

Well No. MW-156 | Elevation Ground 1289.40 | Top of Csg. El 1292.44 | TOC Above GL 3.04 | Date Drilled 8/16/93
Water Level 3.44 | Screened Interval 3 - 8 ft. | Borehole Diameter 4.25" ID. | Csg. Diameter 2 inch. | Type Of Csg. PVC

Depth	Elev.	Description
0.00	1289.40	Topsoil, Brown, Clayey, Sandy, Silty
1.00	1288.40	SAND, Tan, M-C, Mod. Sorted, Clayey
3.00	1286.40	SANDSTONE, White, M-VC, Carb. Cem.
7.00	1282.40	SHALE, Olive Green w/Gray, Yellow Iron Staining, Soft, Wet
8.50	1280.90	SHALE, Bluish Gray, Maroon, Soft, Wet

BOC 6.50
BOH 8.50 ft.

Boeing Commercial Airplane Group
Well Construction and Lithologic Log

Well No. MW-157 | Elevation Ground 1295.70 | Top of Csg. El 1298.39 | TOC Above GL 2.69 | Date Drilled 8/12/93
Water Level 7.66 | Screened Interval 8 - 18 ft. | Borehole Diameter 4.25" ID. | Csg. Diameter 2 inch. | Type Of Csg. PVC

Depth	Elev.	Description
0.00	1295.70	Topsoil, Brown, Clayey, Silty, Sandy
1.00	1294.70	SAND, Tan, M-VC Grained, Rounded to Well Rounded, Moderately Sorted
4.97	1290.73	
7.50	1288.20	SAND, Tan, M-VC Grained, Rd.To Well Rd., Mod. Sorted, Drilled Hard At Base, Sandstone
18.00	1282.70	SHALE, Olive Green, Tan, Rust, and Gray Areas, Firm, Moist
17.00	1278.70	SHALE, Weathered, Olive Green, Maroon, Gray & Yellow Areas, Firm, Wet
18.00	1277.70	SHALE, Dk. Bluish Gray, Soft, Wet

BOC 18.00
BOH 18.00 ft.

Boeing Commercial Airplane Group
Well Construction and Lithologic Log

Well No. MW-155 | Elevation Ground 1322.60 | Top of Csg. El 1325.33 | TOC Above GL 2.73 | Date Drilled 8/10/93
Water Level 33.50 | Screened Interval 25 - 45 ft. | Borehole Diameter 4.25" ID. | Csg. Diameter 2 inch. | Type Of Csg. PVC

Depth	Elev.	Description
0.00	1322.60	Topsoil, Dk. Brn., Silty & Sandy, Moist
1.00	1321.60	CLAY, Brown, Roots, Caliche Nodules, Firm, Moist
8.00	1314.60	SILT, Rust, Clayey & Sandy, Loose, Moist
16.00	1306.60	CLAY, Rust, Silty, Sandy, Caliche Nodules, Firm, Moist
29.00	1299.60	SAND, Tan, Quartz, M-C Grained, Rounded to Well Rounded, Well Sorted, Very Moist
30.77	1291.83	
34.00	1288.60	SAND,Clayey, Lt.Brown, M-VC Grained, Rounded to Well Rounded, Mod. Sorted, Wet
38.00	1284.60	SHALE, Olive Green, Tan, Rust, and Gray Areas, Firm, Moist
43.50	1279.10	
45.00	1277.60	SHALE, Dark Bluish Gray, Soft, Wet

BOC 45.00
BOH 45.00 ft.

BOEING COMMERCIAL AIRPLANE GROUP
Well Construction and Lithologic Log

Well No. MW-154 | Elevation Ground 1312.00 | Top of Csg. El 1315.01 | TOC Above GL 3.01 | Date Drilled 8/16/93
Water Level 16.00 | Screened Interval 9 - 24 ft. | Borehole Diameter 4.25" ID. | Csg. Diameter 2" ID. | Type Of Csg. PVC

Depth	Elev.	Description
0.00	1312.00	Topsoil, Brown, Silty, Sandy, Moist
7.00	1305.00	SILT, Lt. Brown, Clayey, Soft, Moist
10.00	1302.00	SAND, Tan, F-M Grained, Subrounded to Well Rounded, Moderately Sorted, Moist
12.99	1299.01	SAND, Tan, M-VC Grained, Subrounded to Well Rounded, Moderately Sorted
13.00	1299.00	SANDSTONE, Hard
17.00	1295.00	SHALE, Olive Green, Gray Areas, Yellow Iron Staining, Soft, Wet
23.50	1288.50	SHALE, Dk. Bluish Gray, Soft, Wet

BOC 24.00
BOH 24.00 ft.

Boeing Commercial Airplane Group
Well Construction and Lithologic Log

Well No. RW-57 | Elevation Ground 1322.00 | Top of Csg. El 1323.84 | TOC Above GL 1.84 | Date Drilled 3/13/91
Water Level 23.54 | Screened Interval 18 - 38 ft. | Borehole Diameter | Csg. Diameter 5 inch. | Type Of Csg. PVC

Depth	Elev.	Description
0.00	1322.00	FILL, Lean to fat clay w/silt Dark brown
2.00	1320.00	SANDY FAT CLAY, Tan-brown Carbonaceous with gypsum nodules
13.00	1309.00	FAT CLAY WITH COARSE SAND Tan-brown
19.00	1303.00	FAT CLAY, Red to Tan-brown, blocky
21.70	1300.30	
28.50	1293.50	MEDIUM SAND, Green-gray
32.50	1289.50	SANDSTONE, Light brown
33.00	1289.00	HIGHLY WEATHERED SHALE, Tan & Olive gray
36.50	1285.50	SHALE, Dark gray
40.50	1281.50	BOH 40.50 ft.

BOC 38.00

DATUM 1300 ft.

VERTICAL SCALE 1 inch = 7 feet
HORIZONTAL SCALE none

Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas

Bitterzweet Energy Inc.

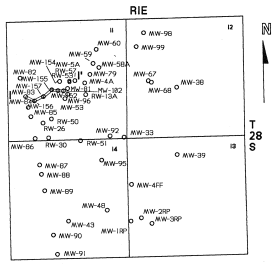
CROSS SECTION H - H'

Project Number 178929-2
T28S RIE
Sedgwick County, Kansas

Date: 9/1993 TJH & LAN

Cross Section I - I'

STRUCTURAL CROSS SECTION I - I'



INDEX MAP

DATUM 1300 ft.

Boeing Commercial Airplane Group — Well Construction and Lithologic Log

Well No. MW-83		Water Level	20.29
Elevation Ground	1306.50	Screened Interval	8 - 27 ft.
Top of Csg. El	1309.39	Borehole Diameter	9.2 inch
TOC Above GL	2.89	Csg. Diameter	2 inch
Date Drilled	9/28/90	Type Of Csg.	PVC

Depth		
0.00	1306.50	FILL: SANDY LEAN CLAY, Light brown
7.00	1299.50	SILTY LEAN CLAY, Red and black
13.00	1293.50	LEAN TO FAT CLAY, Dark brown
17.40	1289.10	FAT CLAY, Gray, blocky, trace sand at 22.0'
24.00	1282.50	
25.00	1281.50	FAT CLAY (HIGHLY WEATHERED SHALE)
27.00	1279.50	FAT CLAY, Light gray
28.00	1278.50	SHALE, Dark gray
BOC 27.50		BOH 28.00 ft.

TVOC 19,600 ppb

Boeing Commercial Airplane Group — Well Construction and Lithologic Log

Well No. MW-156		Water Level	3.44
Elevation Ground	1289.40	Screened Interval	3 - 8 ft.
Top of Csg. El	1292.44	Borehole Diameter	4.25" ID
TOC Above GL	3.04	Csg. Diameter	2 inch
Date Drilled	8/16/93	Type Of Csg.	PVC

Depth		
0.00	1289.40	
1.00	1288.40	Topsoil, Brown, Clayey, Sandy, Silty
2.00	1287.40	SAND, Tan, M-C, Mod. Sorted, Clayey
3.00	1286.40	SANDSTONE, White, M-VC, Carb. Cem.
7.00	1282.40	SHALE, Olive Green w/Gray, Yellow Iron Staining, Soft, Wet
8.50	1280.90	SHALE, Bluish Gray, Maroon, Soft, Wet
BOC 6.50		BOH 8.50 ft.

TVOC 17,200 ppb

Boeing Commercial Airplane Group — Well Construction and Lithologic Log

Well No. MW-157		Water Level	7.66
Elevation Ground	1295.70	Screened Interval	8 - 18 ft.
Top of Csg. El	1298.39	Borehole Diameter	4.25" ID
TOC Above GL	2.69	Csg. Diameter	2 inch
Date Drilled	8/12/93	Type Of Csg.	PVC

Depth		
0.00	1295.70	
1.00	1294.70	Topsoil, Brown, Clayey, Silty, Sandy
4.97	1290.73	SAND, Tan, M-VC Grained, Rounded to Well Rounded, Moderately Sorted
7.50	1288.20	SAND, Tan, M-VC Grained, Rd.To Well Rd., Mod. Sorted, Drilled Hard At Base, Sandstone
13.00	1282.70	SHALE, Weathered, Olive Green, Maroon, Gray & Yellow Areas, Firm, Wet
17.00	1278.70	
18.00	1277.70	SHALE, Dk. Bluish Gray, Soft, Wet
BOC 18.00		BOH 18.00 ft.

TVOC 223 ppb

Boeing Commercial Airplane Group — Well Construction and Lithologic Log

Well No. MW-155		Water Level	33.50
Elevation Ground	1322.60	Screened Interval	25 - 45 ft.
Top of Csg. El	1325.33	Borehole Diameter	4.25" ID
TOC Above GL	2.73	Csg. Diameter	2 inch
Date Drilled	8/10/93	Type Of Csg.	PVC

Depth		
0.00	1322.60	
1.00	1321.60	Topsoil, Dk. Brn., Silty & Sandy, Moist
8.00	1314.60	CLAY, Brown, Roots, Caliche Nodules, Firm, Moist
16.00	1306.60	SILT, Rust, Clayey & Sandy, Loose, Moist
29.00	1293.60	CLAY, Rust, Silty, Sandy, Caliche Nodules, Firm, Moist
30.27	1291.83	
34.00	1288.60	SAND, Tan, Quartz, M-C Grained, Rounded to Well Rounded, Wet Sorted, Very Moist
38.00	1284.60	SAND,Clayey, Lt.Brown, M-VC Grained, Rounded to Well Rounded, Mod. Sorted, Wet
43.50	1279.10	SHALE, Olive Green, Tan, Rust, and Gray Areas, Firm, Moist
45.00	1277.60	SHALE, Dark Bluish Gray, Soft, Wet
BOC 45.00		BOH 45.00 ft.

TVOC 19 ppb

BOEING COMMERCIAL AIRPLANE GROUP — Well Construction and Lithologic Log

Well No. MW-162		Water Level	14.20
Elevation Ground	1312.40	Screened Interval	10 - 16 ft.
Top of Csg. El	1315.92	Borehole Diameter	4.25" ID
TOC Above GL	3.52	Csg. Diameter	2" ID
Date Drilled	9/13/93	Type Of Csg.	PVC

Depth		
0.00	1312.40	
5.50	1306.90	CLAY, Brown, Slightly Sandy, Roots, Moist
9.00	1303.40	CLAY, Dark Greenish-Black, Silty, Roots, Moist
WLM 1301.72		
13.50	1298.90	CLAY, Greenish-Gray, Yellow Iron Staining Olive Green Areas, Slightly Sandy, Roots, Moist
15.50	1296.90	SHALE, Olive Green, Iron Staining, Firm Moist
16.50	1295.90	SHALE, Dark Gray, Firm, Moist
BOC 16.50		BOH 16.50 ft.

TVOC 0 ppb

BOEING COMMERCIAL AIRPLANE GROUP — Well Construction and Lithologic Log

Well No. MW-122		Water Level	9.70
Elevation Ground	1310.80	Screened Interval	8 - 18 ft.
Top of Csg. El	1313.74	Borehole Diameter	8.2"
TOC Above GL	2.94	Csg. Diameter	2" ID
Date Drilled	11/1/91	Type Of Csg.	PVC

Depth		
0.00	1310.80	
1.50	1309.30	FILL, Lt. Brn., F-M Grained, W/Silt & Rubble
2.50	1308.30	CLAY,Brown, Fat
6.76	1304.04	SAND, Brown to Lt. Brown, F-M Grained, Well Rounded, With Silt
9.00	1301.80	
12.00	1298.80	SANDSTONE, Light Brown
15.50	1295.30	SAND, Light Brown, F-C Grained, Wet
16.50	1294.30	HIGHLY WEATHERED SHALE, Brown to Olive-Gray, F-C Grained, With F-C Sand
18.00	1292.80	SHALE, Dark Gray, Laminated
BOC 18.00		BOH 18.00 ft.

TVOC 0 ppb

VERTICAL SCALE 1 inch = 7 feet

HORIZONTAL SCALE none

Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas

Billersweet Energy Inc.

CROSS SECTION I - I'

Project Number 178929-2
T28S R1E
Sedgwick County, Kansas

Date: 9/1993 TJH & LAN

Appendix E

DEEP MONITORING WELL SUMMARY

WELLINGTON SHALE MONITORING WELL INSTALLATION

RECOMMENDATIONS

1. Submit report and supporting data within 30 days to the Kansas Department of Health and Environment for review.

2. Request permission from the KDHE to plug the six deep monitoring wells, because of the potential liability to Boeing-Wichita of the upper Wellington member of the Wellington Formation being contaminated by these monitoring wells if the VolClay and bentonite seal would fail.

CONCLUSIONS

1. A zone (datum approximately +1260') within the upper Wellington member of the Wellington Formation will yield low volumes of water. Three out of the six monitoring wells were pumped dry during development by Layne-Western Company indicating the zone is discontinuous and its potential as a usable aquifer is questionable over a portion of the Boeing-Wichita site. Yields up to 3.5 gallons per minute were obtained during development of the other three monitoring wells. Determination of maximum yields was not within the scope of this study.

2. Water samples, collected and analyzed from the monitoring wells, indicate TVOC's above 5 ppb existing in only one of the six monitoring wells. Although, every effort was taken during monitoring well installation to prevent cross contamination between the upper aquifer and the upper Wellington member of the Wellington Formation it is possible the very low concentrations of TVOC's detected in the upper Wellington member are the result of cross contamination.

3. If the monitoring wells are not plugged, the potential exists for the Upper Wellington Formation to be contaminated by the upper aquifer at the Boeing-Wichita site if the bentonite seal in the deep monitoring wells would fail in the future.

INTRODUCTION

All monitoring wells and recovery wells installed at the Boeing-Wichita site before November 1, 1993, had only penetrated the upper portion of the Wellington Formation. Negotiations between Boeing and the Kansas Department of Health and Environment concluded the vertical extent of the contamination should be further defined. Installation of six deep monitoring wells across the Boeing-Wichita site is in response to the request by the Kansas Department of Health and Environment that deep monitoring wells be installed.

INITIATION

Deep monitoring wells were installed at the Boeing-Wichita Site per consent order with the Kansas Department of Health and Environment. Installation of monitoring wells was initiated by Mr. Jack Thornquist per purchase order with Layne-Western Company. Field operations were coordinated with and approved by Mr. Mike Spain, Environmental Engineering Department.

PURPOSE OF STUDY

As previously stated, the purpose of the deep monitoring wells was to ascertain the vertical extent of the contamination at the Boeing-Wichita Site.

SCOPE AND CONDITIONS OF STUDY

Drilling and installation of the six deep monitoring wells by Layne-Western Company began on November 1, 1993, and was completed on November 8, 1993. Temperatures during the field operations ranged from the upper 20's at night to upper 50's to low 60's during the daytime. No rainfall occurred during the drilling operations, thus no time was lost. Layne-Western developed the monitoring wells on November 8, 9, and 10, 1993.

PREVIOUS WORK

Before the installation of these six monitoring wells, no deep Wellington Formation monitoring wells had been installed at the Boeing-Wichita Site. All of the previously installed monitoring wells and recovery wells have only penetrated the upper portion of the Wellington Formation. Two deep water wells had been previously sampled by Boeing. The two deep water wells sampled were located at Williams Salvage (formerly located west of IWTP) and Mike's Heating and Air conditioning (4505 South Oliver).

PROCEDURES

Commencement of the deep monitoring wells began by the installation of six inch ID steel casing by using a Gardener Denver 1000 rotary rig or an Acker Soil Max ATV with hollowstem augers. The steel casing was set approximately two feet into competent Wellington Shale to seal off the upper aquifer. Annular space between the casing and formation was sealed using a neat cement grout with 2% bentonite. Sodium chloride was added to the grout as an accelerator to shorten the setting time of the grout in monitoring wells # 170, # 172, # 173, and # 175. A tremie pipe was used during grouting operations to assure proper placement of the grout.

Two inch Schedule 80, 20 slot, PVC screen and casing was then installed using an air rig. Each monitoring well was completed upon penetration of the first water zone or after penetrating fifty feet of Wellington Formation. Refer to well construction and lithologic logs for screened interval and geological descriptions of drilling samples. Drill cuttings were hauled to the Boeing Landfill for disposal.

Upon reaching total depth in each monitoring well, screen and casing was placed in the bore hole. Coarse Ritchie sand was used as a gravel pack. Gravel packing ceased when the gravel pack extended two feet above the screened interval. Pel Plug was then used to seal above the gravel pack before sealing the remainder (to ground level) of the annulus with VolClay grout. Thickness of the bentonite plugs ranged from 2.71 to 8 feet. Bentonite plug thickness was increased (2 feet required per KDHE) to assure the screened interval was sealed from the upper formations before placing the VolClay grout in the

annulus upon completion of all monitoring wells.

Layne-Western Company developed each monitoring well using a Grunfos pump. Development was stopped when 100 gallons of water had been removed from each monitoring well or the monitoring well was pumped dry. Development water was disposed at the Boeing Industrial Waste Treatment Plant. The Grunfos pump and hose were decontaminated before developing each monitoring well by pumping water through the pump and hose. Laboratory grade soap and water was then pumped through the equipment, and finally the pump and equipment was rinsed with deionized water. Continental Analytical Services, Inc. collected a water sample from each monitoring well by purging with a bailer. Water samples were analyzed by Continental Analytical Services, Inc.

RESULTS

Results of the lab analysis are presented in Appendix B of this report. A cross section J-J' (Appendix A of this report) utilizing the deep monitoring wells was prepared. Table 1 summarizes selected data for each of the deep monitoring wells.

DISCLOSURE AND DISCLAIMER

This report and the opinions, interpretations and analysis contained therein, are based upon the authors examination and interpretation of numerous technical matters including cross sections, boring logs, maps, and publications, the accuracy and reliability of which is not guaranteed by this report. This report is only to be utilized by the party to whom it is addressed and may not be relied upon by any other party. This report must be utilized in its entirety and portions of it may not be extracted.

The undersigned author of this report is not responsible for any extractions, extrapolations, or other use of the report not specifically authorized by the author, and in no event shall the author be liable for any loss or damage resulting from the use or reliance upon this report.

DISCUSSION

Six deep monitoring wells were installed at the Boeing-Wichita site. Locations of the six monitoring wells were selected by Mr. Mike Spain. Selection of the locations was based upon known areas of contamination in the upper aquifer at the site, direction of ground water flow, etc. Monitoring wells were primarily installed downgradient of the identified areas of contamination in the upper aquifer at the site.

The upper Wellington Member of the Wellington Formation is the bedrock unit underlying the site. Chemical Quality Series 9 (Plate 3) indicates the Hutchinson Salt Member of the Wellington formation underlies the site. Thickness of the Hutchinson Salt Member varies from 50 to 100 feet at the site. The Hutchinson Salt Member is absent approximately 1 to 2 miles east of Oliver Street. Top of the Hutchinson Salt Member is estimated to be at a datum of +1200 feet. Total depth of MW-174 is +1224.5'. This is the lowest datum encountered by the six monitoring wells. No salt was observed in the drilling samples.

Gray shale with minor amounts of gypsum, anhydrite, dolomite, and siltstone comprise the upper Wellington member (Leonard and Kleinschmidt, 1976). Lithology of the upper Wellington is mainly gray shale and gypsum beds (dry) at the Boeing site based upon description of samples collected during installation of the six monitoring wells.

Two deep water wells were previously sampled at the Boeing-Wichita site. One of the water wells, estimated depth 150 feet (personal communication with Kyle Parker-KDHE), is located at Mike's Heating and Air Conditioning. KDHE sampled this water well and Mr. Parker indicated it was high (20,000 to 25,000 ppm) in chlorides and TVOC's were nondect. The other deep water well, unknown depth, was located at Williams Salvage. Continental Analytical Services, Inc. sampled the water well and it was plugged by Terracon. The chemical analysis (Appendix B of this report) indicated the presence of cis-1,2-Dichloroethylene (3.1 ppb) and Trichloroethylene (3.1 ppb). A search of the KDHE computer water well records does not reveal any additional information on these two water wells.

Structural cross section J-J' (Appendix A of this report) was constructed using the six monitoring wells. Monitoring well # 170 is the northerly most monitoring well in the

cross section (refer to index map) and monitoring well # 175 is the most southerly well comprising the cross section. A datum of +1300' was used as a reference datum in preparing the cross section. At the time of this report only estimated elevations are available for the monitoring wells. A double arrow indicates the depth water was encountered while drilling. Surface casing depths are shown on the right hand edge of the well construction diagrams. Results of the chemical analysis for each monitoring well are shown at the bottom of each lithologic log. Three of the monitoring wells did not indicate any chromium or TVOC's to be present. Two out of the other monitoring wells showed concentrations of TVOC below 5 ppb. Only monitoring well # 174 indicated TVOC's above 5 ppb.

When an aquifer was penetrated, water reached the surface without delay. Monitoring wells # 174 and 175 did not encounter water while drilling. Slight dampness was encountered in the Wellington Shale, but these zones were thin and did not produce water while air drilling. Drilling was ceased and air was circulated to allow the zones to produce water during the drilling operations. Samples were dry except for the depths of slight dampness as noted in the description column on each lithologic log comprising the cross section.

Development pumping indicated the upper Wellington member to be a very low to low yield aquifer. Three of the monitoring wells (MW # 172, 174, & 175) were pumped dry during development. Only thirty gallons of water was removed from monitoring well # 175. Monitoring well # 175 was allowed to recover four times to obtain the 30 gallons of water during development. One hundred gallons was recovered from the three remaining monitoring wells. Pumping rates during development ranged from 2.25 to 3.5 gallons per minute. Table 1 shows the total depth, surface casing depth, screened interval, estimated ground level elevation, static water level, top casing above ground level, gallons removed during development, and pumping rate in gallons per minute during development pumping for the six monitoring wells.

The water levels in monitoring wells # 170, 172, and 175 (three most easterly) are above the top of the Wellington Formation. Water levels in the remaining three monitoring (three most westerly) wells are below the top of the Wellington Formation. Aquifers screened in all of the monitoring wells are confined aquifers.

Continental Analytical Services, Inc. sampled the six deep monitoring wells. Each water sample was analyzed using EPA method 601/602 plus xylene and chromium. Laboratory reports are contained in Appendix B of this report. Monitoring well # 174 water sample contained cis-1,2-Dichloroethylene (3.6 ppb) and Trichloroethylene (7.6 ppb). The water sample from monitoring well # 170 contained cis-1,2-Dichloroethylene (1.4 ppb) and Trichloroethylene (0.5 ppb). Only Trichloroethylene (0.3 ppb) was detected in monitoring well # 172. Laboratory analysis of the three remaining monitoring wells were non detect. None of the monitoring wells indicated the presence of hexavalent chromium.

SELECTED REFERENCES

Gogel, Tony, 1981, Discharge of Saltwater From Permian Rocks to Major Stream-Aquifer Systems in Central Kansas, Kansas Geological Survey, Chemical Quality Series 9, 60 p.

Leonard, R.B., and Kleinschmidt, M.K., 1976, Saline Water in the Little Arkansas River Basin Area, South-Central Kansas, Kansas Geological Survey, Chemical Quality Series No. 3, 24 p.

Moore, R.C., Frye, J.C., and Jewett, J.M., 1944, Tabular Description of Outcropping Rocks in Kansas: Kansas Geological Survey, Bull. 52 (1944 Reports Study), Pt. 4, p. 137-212.

Moore, R.C., Frye, J.C., Jewett, J.M., Lee, Wallace, and O'Connor, H.G., 1951, The Kansas Rock Column: Kansas Geological Survey, Bull. 89, 132 p.

TABLE 1: BOEING DEEP MONITORING WELL DATA

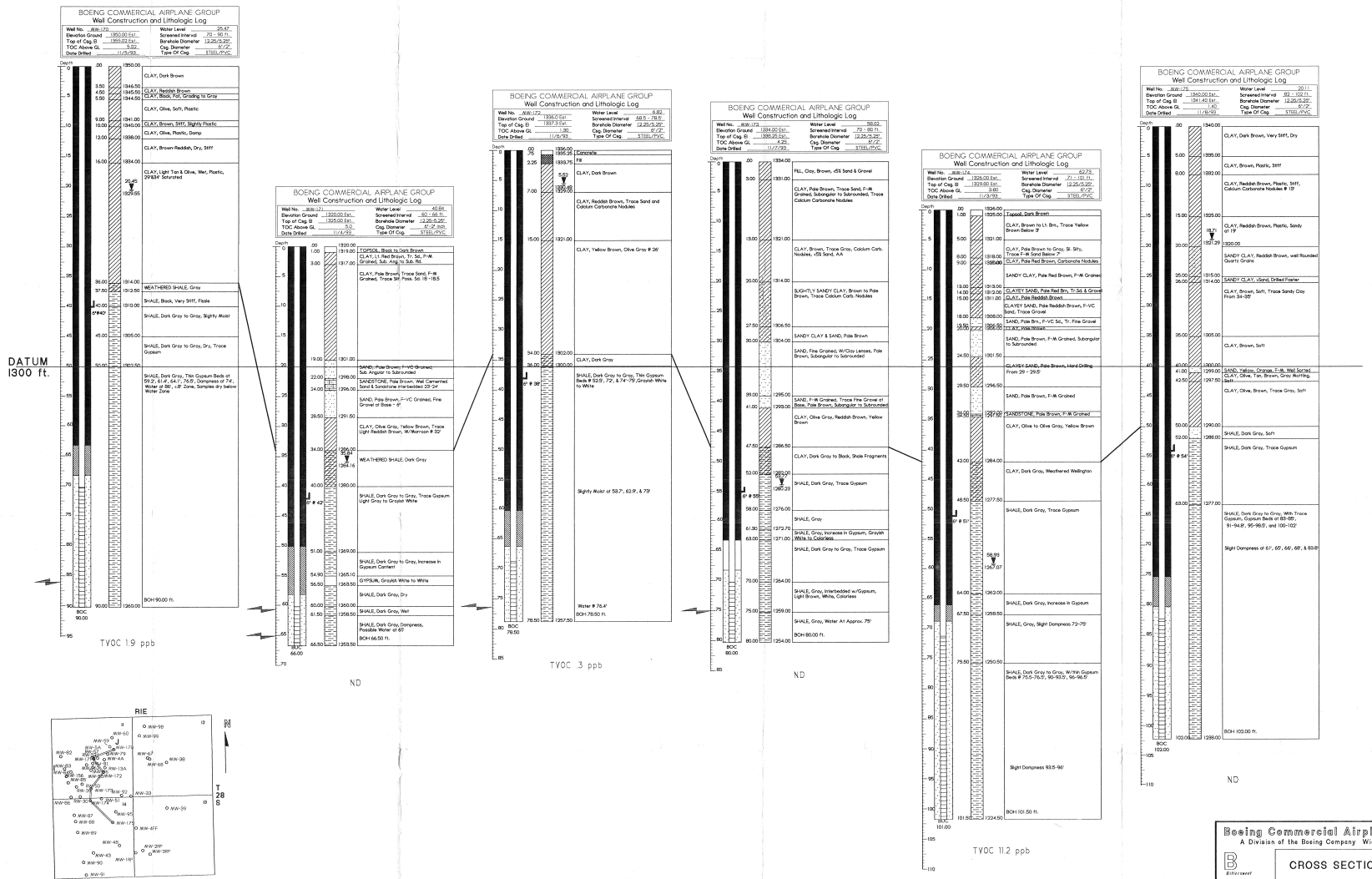
MW#	TOTAL DEPTH	SURFACE CASING	SCREENED INTERVAL	EST. G.L. ELEV.	SWL	TOC> G.L.	# GALLONS REMOVED	GPM
MW-170	90.0	40	70-90	1350.0	25.47	5.02	100	3.00
MW-171	66.5	42	60-66	1320.0	40.84	5.00	100	2.25
MW-172	78.5	38	68.5-78.5	1336.0	6.82	1.30	60-DRY	3.50
MW-173	80.0	55	70-80	1334.0	58.02	4.25	100	3.00
MW-174	101.5	51	71-101	1326.0	62.73	3.80	70-DRY	3.00
MW-175	102.0	54	82-102	1340.0	20.11	1.40	30-DRY*	2.50

* PUMPED DRY 4 TIMES

APPENDIX A

CROSS SECTION J-J'

STRUCTURAL CROSS SECTION J - J'



VERTICAL SCALE 1 inch = 7 feet

HORIZONTAL SCALE none

Boeing Commercial Airplane Group
A Division of the Boeing Company Wichita, Kansas

CROSS SECTION J - J'

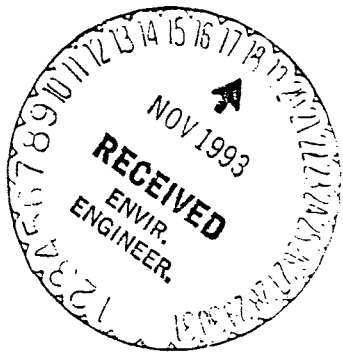
Project Number 178929-2
T28S RIE
Sedgwick County, Kansas

Date: 11/1993 TJH & LAN

APPENDIX B

CONTINENTAL ANALYTICAL SERVICES, INC.
LABORATORY REPORTS

Continental Analytical
SERVICES, INC.



11/16/93

Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Received: 11/10/93
CAS File No.: 93-5223
CAS Order No.: 19706
Your P.O./Project No.: M.S.

Dear Mr. Smith MSK11-65:

Enclosed are the laboratory reports for the following samples:

CAS LAB ID #	SAMPLE DESCRIPTION	DATE SAMPLED
93110840	MW-170	11/10/93
93110841	MW-171	11/10/93
93110842	MW-172	11/10/93
93110843	MW-173	11/10/93
93110844	MW-174	11/10/93
93110845	MW-175	11/10/93

The footnotes contained in the attached laboratory reports are summarized below for your reference.

CAS LAB ID #	TEST NAME	SAMPLE CONC.	LAB REPORT FOOTNOTE
93110845	Chromium, Hexavalent	ND(0.04) M	M - Reporting limit higher than normal due to matrix interferences.

Thank you for choosing CAS for this project. If you have any questions, please contact me at 800-535-3076.

CONTINENTAL ANALYTICAL SERVICES, INC.

Kathleen A. Mitchell
Project Manager

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 11/16/93
Date Sample Recd: 11/10/93
CAS File No: 93-5223
CAS Order No: 19706
Client P.O.: M.S.

Lab Number: 93110840
Sample Description: MW-170

Date Sampled: 11/10/93
Time Sampled: 1215

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1893/43
1,1,2-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethylene	ND(0.2)	µg/L	1893/43
1,2-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,2-Dichloroethane	ND(0.2)	µg/L	1893/43
1,2-Dichloropropane	ND(0.2)	µg/L	1893/43
1,3-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,4-Dichlorobenzene	ND(0.2)	µg/L	1893/43
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1893/43
Benzene	ND(0.2)	µg/L	1893/43
Bromodichloromethane	ND(0.2)	µg/L	1893/43
Bromoform	ND(0.2)	µg/L	1893/43
Bromomethane	ND(0.2)	µg/L	1893/43
Carbon Tetrachloride	ND(0.2)	µg/L	1893/43
Chlorobenzene	ND(0.2)	µg/L	1893/43
Chloroethane	ND(0.2)	µg/L	1893/43
Chloroform	ND(0.2)	µg/L	1893/43
Chloromethane	ND(0.2)	µg/L	1893/43
cis-1,2-Dichloroethylene	1.4	µg/L	1893/43
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1893/43
Dibromochloromethane	ND(0.2)	µg/L	1893/43
Dichlorodifluoromethane	ND(0.2)	µg/L	1893/43
Ethylbenzene	ND(0.2)	µg/L	1893/43
Methylene Chloride	ND(0.2)	µg/L	1893/43
Tetrachloroethylene	ND(0.2)	µg/L	1893/43
Toluene	ND(0.2)	µg/L	1893/43
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1893/43
Trichloroethylene	0.5	µg/L	1893/43
Trichlorofluoromethane	ND(0.2)	µg/L	1893/43
Vinyl Chloride	ND(0.2)	µg/L	1893/43
Xylene	ND(0.2)	µg/L	1893/43
Chromium, Hexavalent	ND(0.02)	mg/L	1733/46
Water Level Measurements	25.47	Feet	1924/34

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Boeing Commercial Airplane Group
Lab Number: 93110840

Analysis	Concentration	Units	Book/Page

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

CAS

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 11/16/93
Date Sample Recd: 11/10/93
CAS File No: 93-5223
CAS Order No: 19706
Client P.O.: M.S.

Lab Number: 93110841
Sample Description: MW-171

Date Sampled: 11/10/93
Time Sampled: 1250

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1893/43
1,1,2-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethylene	ND(0.2)	µg/L	1893/43
1,2-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,2-Dichloroethane	ND(0.2)	µg/L	1893/43
1,2-Dichloropropane	ND(0.2)	µg/L	1893/43
1,3-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,4-Dichlorobenzene	ND(0.2)	µg/L	1893/43
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1893/43
Benzene	ND(0.2)	µg/L	1893/43
Bromodichloromethane	ND(0.2)	µg/L	1893/43
Bromoform	ND(0.2)	µg/L	1893/43
Bromomethane	ND(0.2)	µg/L	1893/43
Carbon Tetrachloride	ND(0.2)	µg/L	1893/43
Chlorobenzene	ND(0.2)	µg/L	1893/43
Chloroethane	ND(0.2)	µg/L	1893/43
Chloroform	ND(0.2)	µg/L	1893/43
Chloromethane	ND(0.2)	µg/L	1893/43
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1893/43
Dibromochloromethane	ND(0.2)	µg/L	1893/43
Dichlorodifluoromethane	ND(0.2)	µg/L	1893/43
Ethylbenzene	ND(0.2)	µg/L	1893/43
Methylene Chloride	ND(0.2)	µg/L	1893/43
Tetrachloroethylene	ND(0.2)	µg/L	1893/43
Toluene	ND(0.2)	µg/L	1893/43
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1893/43
Trichloroethylene	ND(0.2)	µg/L	1893/43
Trichlorofluoromethane	ND(0.2)	µg/L	1893/43
Vinyl Chloride	ND(0.2)	µg/L	1893/43
Xylene	ND(0.2)	µg/L	1893/43
Chromium, Hexavalent	ND(0.02)	mg/L	1733/47
Water Level Measurements	40.84	Feet	1924/34

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Boeing Commercial Airplane Group
Lab Number: 93110841

Analysis	Concentration	Units	Book/Page

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

CAS

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 11/16/93
Date Sample Recd: 11/10/93
CAS File No: 93-5223
CAS Order No: 19706
Client P.O.: M.S.

Lab Number: 93110842
Sample Description: MW-172

Date Sampled: 11/10/93
Time Sampled: 1335

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1893/43
1,1,2-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethylene	ND(0.2)	µg/L	1893/43
1,2-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,2-Dichloroethane	ND(0.2)	µg/L	1893/43
1,2-Dichloropropane	ND(0.2)	µg/L	1893/43
1,3-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,4-Dichlorobenzene	ND(0.2)	µg/L	1893/43
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1893/43
Benzene	ND(0.2)	µg/L	1893/43
Bromodichloromethane	ND(0.2)	µg/L	1893/43
Bromoform	ND(0.2)	µg/L	1893/43
Bromomethane	ND(0.2)	µg/L	1893/43
Carbon Tetrachloride	ND(0.2)	µg/L	1893/43
Chlorobenzene	ND(0.2)	µg/L	1893/43
Chloroethane	ND(0.2)	µg/L	1893/43
Chloroform	ND(0.2)	µg/L	1893/43
Chloromethane	ND(0.2)	µg/L	1893/43
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1893/43
Dibromochloromethane	ND(0.2)	µg/L	1893/43
Dichlorodifluoromethane	ND(0.2)	µg/L	1893/43
Ethylbenzene	ND(0.2)	µg/L	1893/43
Methylene Chloride	ND(0.2)	µg/L	1893/43
Tetrachloroethylene	ND(0.2)	µg/L	1893/43
Toluene	ND(0.2)	µg/L	1893/43
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1893/43
Trichloroethylene	0.3	µg/L	1893/43
Trichlorofluoromethane	ND(0.2)	µg/L	1893/43
Vinyl Chloride	ND(0.2)	µg/L	1893/43
Xylene	ND(0.2)	µg/L	1893/43
Chromium, Hexavalent	ND(0.02)	mg/L	1733/47
Water Level Measurements	6.82	Feet	1924/35

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Boeing Commercial Airplane Group
Lab Number: 93110842

Analysis	Concentration	Units	Book/Page

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

CAS

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 11/16/93
Date Sample Recd: 11/10/93
CAS File No: 93-5223
CAS Order No: 19706
Client P.O.: M.S.

Lab Number: 93110843
Sample Description: MW-173

Date Sampled: 11/10/93
Time Sampled: 1410

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1893/43
1,1,2-Trichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethane	ND(0.2)	µg/L	1893/43
1,1-Dichloroethylene	ND(0.2)	µg/L	1893/43
1,2-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,2-Dichloroethane	ND(0.2)	µg/L	1893/43
1,2-Dichloropropane	ND(0.2)	µg/L	1893/43
1,3-Dichlorobenzene	ND(0.2)	µg/L	1893/43
1,4-Dichlorobenzene	ND(0.2)	µg/L	1893/43
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1893/43
Benzene	ND(0.2)	µg/L	1893/43
Bromodichloromethane	ND(0.2)	µg/L	1893/43
Bromoform	ND(0.2)	µg/L	1893/43
Bromomethane	ND(0.2)	µg/L	1893/43
Carbon Tetrachloride	ND(0.2)	µg/L	1893/43
Chlorobenzene	ND(0.2)	µg/L	1893/43
Chloroethane	ND(0.2)	µg/L	1893/43
Chloroform	ND(0.2)	µg/L	1893/43
Chloromethane	ND(0.2)	µg/L	1893/43
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1893/43
Dibromochloromethane	ND(0.2)	µg/L	1893/43
Dichlorodifluoromethane	ND(0.2)	µg/L	1893/43
Ethylbenzene	ND(0.2)	µg/L	1893/43
Methylene Chloride	ND(0.2)	µg/L	1893/43
Tetrachloroethylene	ND(0.2)	µg/L	1893/43
Toluene	ND(0.2)	µg/L	1893/43
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/43
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1893/43
Trichloroethylene	ND(0.2)	µg/L	1893/43
Trichlorofluoromethane	ND(0.2)	µg/L	1893/43
Vinyl Chloride	ND(0.2)	µg/L	1893/43
Xylene	ND(0.2)	µg/L	1893/43
Chromium, Hexavalent	ND(0.02)	mg/L	1733/47
Water Level Measurements	58.02	Feet	1924/35

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Boeing Commercial Airplane Group
Lab Number: 93110843

Analysis	Concentration	Units	Book/Page

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

CAS

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 11/16/93
Date Sample Recd: 11/10/93
CAS File No: 93-5223
CAS Order No: 19706
Client P.O.: M.S.

Lab Number: 93110844
Sample Description: MW-174

Date Sampled: 11/10/93
Time Sampled: 1445

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1893/44
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1893/44
1,1,2-Trichloroethane	ND(0.2)	µg/L	1893/44
1,1-Dichloroethane	ND(0.2)	µg/L	1893/44
1,1-Dichloroethylene	ND(0.2)	µg/L	1893/44
1,2-Dichlorobenzene	ND(0.2)	µg/L	1893/44
1,2-Dichloroethane	ND(0.2)	µg/L	1893/44
1,2-Dichloropropane	ND(0.2)	µg/L	1893/44
1,3-Dichlorobenzene	ND(0.2)	µg/L	1893/44
1,4-Dichlorobenzene	ND(0.2)	µg/L	1893/44
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1893/44
Benzene	ND(0.2)	µg/L	1893/44
Bromodichloromethane	ND(0.2)	µg/L	1893/44
Bromoform	ND(0.2)	µg/L	1893/44
Bromomethane	ND(0.2)	µg/L	1893/44
Carbon Tetrachloride	ND(0.2)	µg/L	1893/44
Chlorobenzene	ND(0.2)	µg/L	1893/44
Chloroethane	ND(0.2)	µg/L	1893/44
Chloroform	ND(0.2)	µg/L	1893/44
Chloromethane	ND(0.2)	µg/L	1893/44
cis-1,2-Dichloroethylene	3.6	µg/L	1893/44
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1893/44
Dibromochloromethane	ND(0.2)	µg/L	1893/44
Dichlorodifluoromethane	ND(0.2)	µg/L	1893/44
Ethylbenzene	ND(0.2)	µg/L	1893/44
Methylene Chloride	ND(0.2)	µg/L	1893/44
Tetrachloroethylene	ND(0.2)	µg/L	1893/44
Toluene	ND(0.2)	µg/L	1893/44
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/44
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1893/44
Trichloroethylene	7.6	µg/L	1893/44
Trichlorofluoromethane	ND(0.2)	µg/L	1893/44
Vinyl Chloride	ND(0.2)	µg/L	1893/44
Xylene	ND(0.2)	µg/L	1893/44
Chromium, Hexavalent	ND(0.02)	mg/L	1733/47
Water Level Measurements	62.73	Feet	1924/36

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LABORATORY REPORT

Client: Boeing Commercial Airplane Group
Lab Number: 93110844

Analysis	Concentration	Units	Book/Page

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Client: Boeing Commercial Airplane Group
Attn: Bill Smith MSK11-65
P.O. Box 7730
Wichita, KS 67277-7730

Date Sample Rptd: 11/16/93
Date Sample Recd: 11/10/93
CAS File No: 93-5223
CAS Order No: 19706
Client P.O.: M.S.

Lab Number: 93110845
Sample Description: MW-175

Date Sampled: 11/10/93
Time Sampled: 1545

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	1893/44
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	1893/44
1,1,2-Trichloroethane	ND(0.2)	µg/L	1893/44
1,1-Dichloroethane	ND(0.2)	µg/L	1893/44
1,1-Dichloroethylene	ND(0.2)	µg/L	1893/44
1,2-Dichlorobenzene	ND(0.2)	µg/L	1893/44
1,2-Dichloroethane	ND(0.2)	µg/L	1893/44
1,2-Dichloropropane	ND(0.2)	µg/L	1893/44
1,3-Dichlorobenzene	ND(0.2)	µg/L	1893/44
1,4-Dichlorobenzene	ND(0.2)	µg/L	1893/44
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	1893/44
Benzene	ND(0.2)	µg/L	1893/44
Bromodichloromethane	ND(0.2)	µg/L	1893/44
Bromoform	ND(0.2)	µg/L	1893/44
Bromomethane	ND(0.2)	µg/L	1893/44
Carbon Tetrachloride	ND(0.2)	µg/L	1893/44
Chlorobenzene	ND(0.2)	µg/L	1893/44
Chloroethane	ND(0.2)	µg/L	1893/44
Chloroform	ND(0.2)	µg/L	1893/44
Chloromethane	ND(0.2)	µg/L	1893/44
cis-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/44
cis-1,3-Dichloropropene	ND(0.2)	µg/L	1893/44
Dibromochloromethane	ND(0.2)	µg/L	1893/44
Dichlorodifluoromethane	ND(0.2)	µg/L	1893/44
Ethylbenzene	ND(0.2)	µg/L	1893/44
Methylene Chloride	ND(0.2)	µg/L	1893/44
Tetrachloroethylene	ND(0.2)	µg/L	1893/44
Toluene	ND(0.2)	µg/L	1893/44
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	1893/44
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	1893/44
Trichloroethylene	ND(0.2)	µg/L	1893/44
Trichlorofluoromethane	ND(0.2)	µg/L	1893/44
Vinyl Chloride	ND(0.2)	µg/L	1893/44
Xylene	ND(0.2)	µg/L	1893/44
Chromium, Hexavalent	ND(0.04) M	mg/L	1733/47
Water Level Measurements	20.11	Feet	1924/36

M - Reporting limit higher than normal due to matrix interferences.

-Continued-

CONTINENTAL ANALYTICAL SERVICES, INC.

LABORATORY REPORT

Client: Boeing Commercial Airplane Group
Lab Number: 93110845

Analysis	Concentration	Units	Book/Page

Laboratory analyses were performed on samples utilizing procedures published in Title 40 of the Code of Federal Regulations, Parts 136 or 141, or in EPA Publication, SW-846, 3rd edition, September, 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

CONTINENTAL ANALYTICAL SERVICES, INC.

1804 Glendale Road · Salina, Kansas 67401 · 913-827-1273 · 800-535-3076 · FAX 913-823-7830

Client: BOEING COMMERCIAL AIRPLANE GROUP
Attn: BILL SMITH MSK11-65
P.O. BOX 7730
WICHITA, KS 67277-7730

Date Sample Rptd: 03/24/92
Date Sample Recd: 03/12/92
CAS File No: 91-5223
CAS Order No: 10445
Client P.O.:

Lab Number: 92030961
Sample Description: WILLIAMS SALVAGE WELL

Date Sampled: 03/12/92
Time Sampled: 1030

Analysis	Concentration	Units	Book/Page
EPA Method 601/602/Xylene			/
1,1,1-Trichloroethane	ND(0.2)	µg/L	895 /12
1,1,2,2-Tetrachloroethane	ND(0.2)	µg/L	895 /12
1,1,2-Trichloroethane	ND(0.2)	µg/L	895 /12
1,1-Dichloroethane	ND(0.2)	µg/L	895 /12
1,1-Dichloroethylene	ND(0.2)	µg/L	895 /12
1,2-Dichlorobenzene (ortho)	ND(0.2)	µg/L	895 /12
1,2-Dichloroethane	ND(0.2)	µg/L	895 /12
1,2-Dichloropropane	ND(0.2)	µg/L	895 /12
1,3-Dichlorobenzene	ND(0.2)	µg/L	895 /12
1,4-Dichlorobenzene	ND(0.2)	µg/L	895 /12
2-Chloroethylvinyl Ether	ND(0.2)	µg/L	895 /12
Benzene	ND(0.2)	µg/L	895 /12
Bromodichloromethane	ND(0.2)	µg/L	895 /12
Bromoform	ND(0.2)	µg/L	895 /12
Bromomethane	ND(0.2)	µg/L	895 /12
Carbon Tetrachloride	ND(0.2)	µg/L	895 /12
Chlorobenzene	ND(0.2)	µg/L	895 /12
Chloroethane	ND(0.2)	µg/L	895 /12
Chloroform	ND(0.2)	µg/L	895 /12
Chloromethane	ND(0.2)	µg/L	895 /12
cis-1,2-Dichloroethylene	3.1	µg/L	895 /12
cis-1,3-Dichloropropene	ND(0.2)	µg/L	895 /12
Dibromochloromethane	ND(0.2)	µg/L	895 /12
Dichlorodifluoromethane	ND(0.2)	µg/L	895 /12
Ethylbenzene	ND(0.2)	µg/L	895 /12
Methylene Chloride	ND(0.2)	µg/L	895 /12
Tetrachloroethylene	ND(0.2)	µg/L	895 /12
Toluene	ND(0.2)	µg/L	895 /12
trans-1,2-Dichloroethylene	ND(0.2)	µg/L	895 /12
trans-1,3-Dichloropropylene	ND(0.2)	µg/L	895 /12
Trichloroethylene	3.1	µg/L	895 /12
Trichlorofluoromethane	ND(0.2)	µg/L	895 /12
Vinyl Chloride/Chloroethene	ND(0.2)	µg/L	895 /12
Xylene	ND(0.2)	µg/L	895 /12
Static Water Level	19.72	Feet	896 /24

Quality control analyses were performed on samples at time of analysis in accordance with procedures published in Title 40 of the Code of Federal Regulations part 136, July 1, 1986 or in EPA Publication, SW-846, 3rd edition, Nov. 1986. ND(), where noted, indicates none detected with the detection limit in parentheses.

Samples will be retained for thirty days unless otherwise notified.

CONTINENTAL ANALYTICAL SERVICES, INC.

Clifford J. Baker
Laboratory Director

Appendix F

DRILLING

WELL CONSTRUCTION

SAMPLING

MONITORING WELL INSTALLATION

Monitoring wells at the Boeing-Wichita site will be installed as follows:

* 4.25" ID or greater Hollow-stem auger will be the drilling method used to install the monitoring wells. Solid-stem continuous-flight auger may be used to penetrate the sandstone at the site. If flight auger is used, the borehole will be enlarged with hollow-stem auger before installing the casing and screen.

* One or two split spoon samples will be obtained from each 5 foot interval during the drilling of each monitoring well. A geologist will describe the split spoon samples. A boring log will be prepared for each monitoring well.

* Two (2) inch ID Schedule 80 flush-threaded PVC .020 slot screen and Schedule 80 flush-threaded PVC casing will be installed.

* Each monitoring well will be screened from approximately static water level to one foot into the Wellington gray shale.

* Filter pack, # 8-20 silica sand, will be placed in the annulus as the hollow-stem auger is being removed from the borehole to approximately two feet above the top of the screen.

* Sodium bentonite pellets will be placed on top of the filter pack. Remainder of the annulus will be filled with a volclay grout, sodium bentonite pellets, or 3% bentonite cement.

* A locking cap will be located on top of the casing.

* A protective housing with lock will be installed.

* A 46" X 46" cement pad (size of pad may vary depending upon local site conditions) with 4 barrier posts will be placed to safeguard the protective housing and portion of casing exposed above ground level.

* Licensed water well driller will install the monitoring wells.

* Field headspace analyses will be conducted on cuttings using OVM or PID equipment.

* Cuttings, if not hazardous, will be disposed of at the Boeing Landfill. If hazardous, the cuttings will be properly manifested and disposed of off-site at a secure RCRA facility.

* All drilling equipment will be decontaminated prior to use at each location using high pressure water. Equipment will be placed in a portable decon pit to assure containment of all wash water and cuttings. Drilling equipment will be washed until all visible evidence of dirt and contamination has been removed. The portable pit is located near the Industrial Waste Treatment Plant. All cuttings from the portable pit will be hauled to the Boeing Landfill. Decon water will be disposed of at IWTP.

MONITORING WELL DEVELOPMENT

* Water level will be measured ($\pm$ .01 feet) with an electrical water level indicator before developing each monitoring well.

* Wash water level indicator will be washed with deionized or distilled water and laboratory grade detergent before and after each use. Followed by a rinse with deionized or distilled water.

* Monitoring well development will be accomplished using a disposable bailer or Grundfos pump.

* Disposable gloves will be worn while sampling each monitoring well and disposed of properly after each monitoring well is sampled.

* Grundfos pump and flow lines will be decontaminated before development begins at each location.

* If using a disposable bailer, new cord will be used when developing each monitoring well.

* Three to ten well volumes of water will be removed to assure proper development. More than 10 well volumes will be removed if the groundwater has not become fairly clear.

* Development water will be containerized and disposed at the Boeing Industrial Waste Treatment Plant.

MONITORING WELL SAMPLING

* Disposable bailer will be used to collect the water sample after purging the monitoring well.

* Each sample container will be filled from the bailer. The 40 ml (VOC) vials will be filled until the water forms a convex surface at the mouth of the vial. Vial will then be capped and the vial inverted to inspect for trapped air bubbles. If bubbles exist, the vial will be refilled until no bubbles are present.

* Water samples will be labeled properly and placed on ice in secure sample coolers for transportation to the laboratory.

* Water samples collected for hexavalent chromium will be collected and placed in, non-preserved, 250 ml plastic containers. The 250 ml plastic container will be placed on ice in a cooler for transportation to the laboratory. Sample will be filtered at the laboratory.

FIELD LOGBOOK

The following information should be recorded in the field logbook when sampling each monitoring well:

* Identification of monitoring well
* Well Depth
* Static water level depth and measurement technique
* Presence of immiscible layer and detection method
* Well yield-high or low
* Purge volume and pumping rate
* Time well purged
* Collection method for immiscible layer and sample identification numbers.
* Well evacuation procedure/equipment
* Sample withdrawal procedure/equipment
* Date and time of collection
* Well Sampling sequence

* Types of containers used and sample identification numbers
* Preservative(s) used
* Parameters requested for analysis
* Field analysis data and method(s)
* Sample distribution and transporter
* Field observations on sampling event
* Name of collector
* Climatic conditions including air temperature
* Internal temperature of field and shipping (refrigerated) containers

CHAIN-OF-CUSTODY

Chain-of-custody will be completed for each sample to document possession from time of collection until it is analyzed. Noted on the chain-of-custody will be the sample number, signature of collector, date and time of collection, sample type (ie. ground water, surface water, etc.), well identification, number of containers, parameters requested for analysis, dates of possession, and signature of person(s) involved in the chain of possession.

REFERENCES

National Water Well Association, 1986, RCRA Ground Water Monitoring Technical Enforcement Guidance Document (TEGD), 323 p.

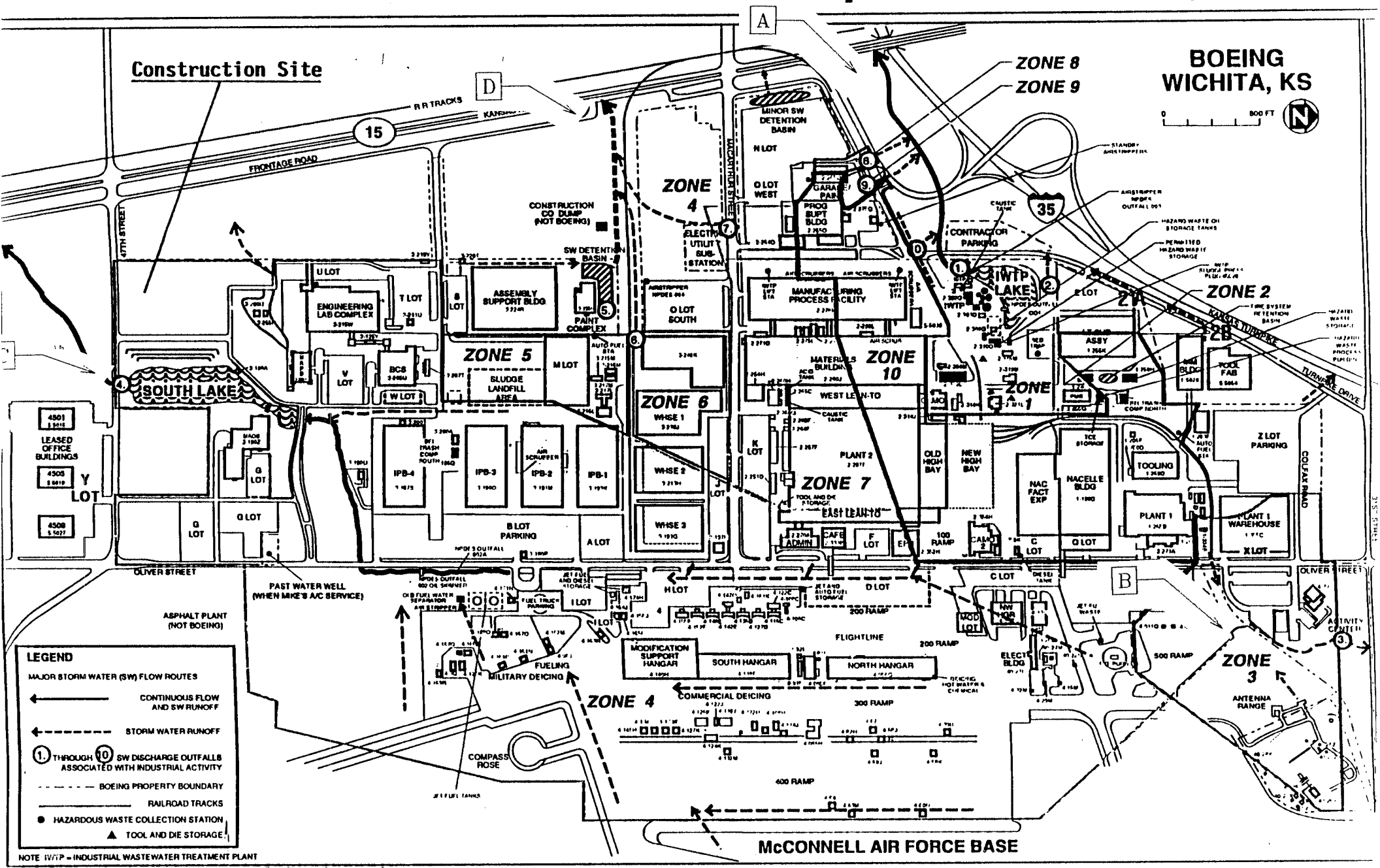
Continental Analytical Services, Inc., 1992, Boeing Quarterly Groundwater Monitoring Report, Fourth Quarter 1992, 240 p.

Appendix G

STORM WATER MAP

Storm Water Map

FOR CONSTRUCTION ACTIVITY
Stearman Substation (Boeing/Western Resourc



DATE: 9/1/92

Environmental Engineering
NPDES Administration