FINAL

Corrective Action Decision

The Boeing Wichita Site
Wichita, Kansas

February 2013

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
FINAL CORRECTIVE ACTION DECISION
THE BOEING WICHITA SITE
Wichita, Kansas

DECLARATION OF REMEDIAL ACTION SELECTION

SITE NAME AND LOCATION

The Boeing Wichita Site
Wichita, Sedgwick County, Kansas

STATEMENT OF BASIS AND PURPOSE

This Final Corrective Action Decision (CAD) document presents the remedy selected to address contamination at the Boeing Wichita Site (Site) in Wichita, Kansas. Since 1985, various investigations have identified numerous contaminants in soil, groundwater and surface water at concentrations well above the corresponding threshold levels. Primary contaminants of concern (COCs) for the site include: tetrachloroethene (PCE); trichloroethene (TCE); cis-1,2-dichloroethene (cis-1, 2-DCE); vinyl chloride (VC); benzene, toluene, ethylbenzene and xylene(s) (BTEX); and chromium.

The data collected through the investigations at the Site identify a large contaminant plume extending from the northeast edge of the Site to the west and southwest of the property boundary. In general, contaminant concentrations within the body of the plume have decreased over the period of record as a result of ongoing source abatement measures and natural processes.

The Feasibility Study (FS) focused on the evaluation of various remedial action alternatives to address groundwater contamination at the Site. The remedial action selected for the Site was based on documents and information contained in the Administrative Record File for the Site.

DESCRIPTION OF THE SELECTED REMEDY

KDHE has determined that the selected remedy, as described in the final CAD, satisfies or meets the criteria established for remedy selection and will be protective of human health and the environment. The selected remedy for groundwater includes groundwater extraction and treatment, *in situ* bioremediation, permeable reactive barrier walls (PRB), monitored natural attenuation (MNA), and Environmental Use Controls (EUCs). Contaminated soil will be managed in accord with a forthcoming soil-waste management plan (SWMP). The main components of the selected remedy are summarized below:

- **Groundwater Extraction and Treatment – The existing groundwater extraction and treatment system will continue to operate, providing hydraulic control and source treatment of groundwater contamination at the Site. The performance of**

the groundwater extraction and treatment system will be constantly evaluated to ensure containment and maximize mass removal.

- ***In Situ* Bioremediation – Amendments will be injected into the aquifer in targeted locations to enhance natural biological degradation processes.**

- **Permeable Reactive Barriers – PRBs, consisting of zero-valent iron, will be installed to preclude contaminant migration in groundwater in areas with relatively lower contaminant concentrations.**

- **Monitored Natural Attenuation – This component relies on natural attenuation processes to reduce contaminant concentrations to acceptable levels and will be employed in select locations.**

- **Groundwater Monitoring - Groundwater monitoring will be conducted to determine whether the proposed remedial strategy is effective at reducing contaminant concentrations to acceptable levels. Additional monitoring wells may be added to facilitate performance monitoring of individual components of the remedy. The groundwater monitoring program will continue until conditions at the Site meet the requirements of KDHE Bureau of Environmental Remediation's (BER) Reclassification Plan (Policy #BER-RS-024). Once KDHE determines the groundwater monitoring program is no longer needed, the monitoring wells will be properly plugged in accordance with Kansas Administrative Regulation (KAR) 28-30.**

- **Five Year Reviews - Five-year performance reviews will be conducted to evaluate the effectiveness of the proposed remediation activities and demonstrate that the remedial strategy continues to be protective of human health and the environment.**

- **Land Use Controls - Institutional controls, in the form of Environmental Use Controls and existing deed restrictions, will restrict future use of the Site and prevent human exposure to contaminated media. This will include a prohibition on the installation of new consumptive use water wells on the Site.**

- **Soil-Waste Management Plan – Residual soil contamination at the site will be addressed on an opportunistic basis as infrastructure and site access permit as described in the forthcoming SWMP. This may include excavation and offsite disposal of contaminated soil and/or *in situ* treatment. It is anticipated that contaminated soil will remain at the site for the foreseeable future.**

- **Contingency - In the event that Boeing is unable to implement the selected remedy in total or if the remedy proves ineffective, KDHE may require contingency implementation. Contingency actions may include expanded implementation of certain components of the preferred alternative or other**

alternatives evaluated in the FS Report to ensure protection of human health and the environment.

DECLARATION:

The selected remedy will be protective of human health and the environment and attain State, Federal and local requirements that are applicable or relevant and appropriate. The selected remedy also actively reduces the toxicity, mobility and volume of contamination identified at the Site. In selecting and declaring this remedy, KDHE believes implementation of this remedy will have a beneficial effect by reducing the toxicity, mobility and volume of contaminants.

2/26/2013

Date

Robert Moser, M.D.
Secretary of Kansas Department of Health and Environment

TABLE OF CONTENTS

1. PURPOSE OF THE FINAL CORRECTIVE ACTION DECISION FOR GROUNDWATER AND SOIL REMEDIATION 1
2. SITE BACKGROUND 2
2.1. SITE LOCATION 2
2.2. SITE HISTORY 2
3. REMEDIAL INVESTIGATION 3
3.1. HYDROGEOLOGICAL SETTING 4
3.2. SUMMARY OF SITE-WIDE SOIL AND GROUNDWATER INVESTIGATION RESULTS 4
4. INTERIM MEASURE IMPLEMENTATION 5
4.1. GROUNDWATER INTERIM MEASURES 5
4.2. SOIL INTERIM MEASURES 6
5. SITE RISKS 7
6. REMEDIAL ACTION OBJECTIVES 7
6.1. CLEANUP LEVELS 7
7. SUMMARY OF REMEDIAL ALTERNATIVE EVALUATED 8
7.1 ALTERNATIVE 1 – NO ACTION 9
7.2 ALTERNATIVE 2 – GROUNDWATER EXTRACTION AND TREATMENT 9
7.3 ALTERNATIVE 3 – GROUNDWATER EXTRACTION AND TREATMENT WITH NANO-SCALE ZERO VALENT IRON (NZVI) INJECTION 9
7.4 ALTERNATIVE 4 – GROUNDWATER EXTRACTION AND TREATMENT WITH IN SITU BIOREMEDIATION, ZVI PERMEABLE REACTIVE BARRIER WALLS, AND MONITORED NATURAL ATTENUATION 10
8. DESCRIPTION OF THE PREFERRED REMEDY 10
9. COMMUNITY INVOLVEMENT 13
10. DOCUMENTATION OF MINOR CHANGES 13
11. RESPONSIVENESS SUMMARY 13

TABLES 15
Table 1– Historical and Current Maximum Concentrations of Select Analytes from the Boeing Site 16
Table 2 – Cleanup Levels for Soil and Groundwater (Select Analytes) 17

FIGURES 18
Figure 1 – Site Boundaries 19
Figure 2 – Soil Excavation Areas 20
Figure 3 – Potentiometric Surface Map 21
Figure 4 – Contour Map of TCE Concentrations at Site 22
Figure 5 – Location of Remedial Wells and Air Strippers at Site 23

ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT

ARARs	Applicable or Relevant and Appropriate Requirements
AS	Air Sparge
AST	Above Ground Storage Tank
ATG	Alternate Treatment Goal
bgs	Below Ground Surface
CAD	Corrective Action Decision
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
EAB	Enhanced Anaerobic Bioremediation
EUC	Environmental Use Control
FS	Feasibility Study
IWTP	Industrial Waste Treatment Plant
KDHE	Kansas Department of Health and Environment
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NZVI	Nano-scale Zero Valent Iron
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
PCE	Tetrachloroethene
PRB	Permeable Reactive Barrier
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RSK	Risk-Based Standards for Kansas
SWMP	Soil-Waste Management Plan
SVE	Soil Vapor Extraction
TCE	Trichloroethene
UIC	Underground Injection Control
UST	Underground Storage Tank
VI	Vapor Intrusion
VOC	Volatile Organic Compound
µg/kg	micrograms per Kilogram
µg/L	micrograms per Liter
ZVI	Zero valent iron

GLOSSARY

Administrative Record – The body of documents that form the basis for selection of a particular response at a site. Parts of the AR are available in an information repository near the site to permit interested individuals to review the documents and to allow meaningful participation in the remedy selection process.

Air Sparge – Remediation method for removing volatile organic compound vapors from the groundwater by injection of air into the groundwater causing the chemicals to evaporate faster. The vapors are removed by vacuum.

Air Stripping – The process of forcing air through polluted water to remove harmful chemicals. The air causes the chemicals to change from a liquid to a gas. The gas is collected and treated if necessary.

Aquifer – An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking or other purposes. The water contained in the aquifer is called groundwater.

Applicable or Relevant and Appropriate Requirements (ARARs) – The federal and state environmental laws that a remedy will meet. These requirements may vary among sites and alternatives.

Bioremediation – the process of allowing anaerobic microbes to clean up contaminants enhanced by adding nutrients or zero valent iron.

Corrective Action Decision – The decision document in which KDHE selects the remedy and explains the basis for selection for a site.

Enhanced Anaerobic Bioremediation (EAB) – the process of allowing anaerobic microbes to clean up contaminants by adding nutrients.

Exposure – Contact made between a chemical, physical, or biological agent and the outer boundary of an organism. Exposure is quantified as the amount of an agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut).

Feasibility Study (FS) – A study conducted to evaluate alternatives for cleanup of contamination.

Groundwater – Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

Hydraulic Containment – Use of groundwater extraction and treatment to hydraulically control the movement of contaminated groundwater in order to prevent continued expansion of the contamination zone.

Maximum Contaminant Levels (MCLs) – The maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

Monitoring – Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. For example, monitoring wells drilled to different depths at the Site would be used to detect any migration of the plume.

Monitored Natural Attenuation – Allowing natural processes to remediate pollution in soil and groundwater while site conditions are routinely monitored.

Nano-scale Zero Valent Iron – Use of very small iron particles with no charge to assist with bioremediation of chlorinated solvents

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – The federal regulations that guide the Superfund program. These regulations can be found at 40 Code of Federal Regulations, Part 300.

National Pollution Discharge Elimination System (NPDES) – As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches.

Plume – A body of contaminated groundwater flowing from a specific source.

Remedial Investigation (RI) – A study of the source, nature, and extent of contamination.

Risk – The probability of adverse health effects resulting from exposure to an environmental agent or mixture of agents.

Soil Vapor Extraction – Remedial method whereby volatile organic compound vapors in the soil vadose zone are removed by application of vacuum to pull the vapors out.

Tier 2 Level – Calculated risk-based cleanup value for a specific contaminant. These values can be found in Appendix A of the *Risk-Based Standards for Kansas (RSK) Manual.*

Threshold – The dose or exposure below which no harmful effect is expected to occur.

Toxicity – A measure of degree to which a substance is harmful to human and animal life.

Vapor Intrusion – The migration of contaminants from the subsurface into overlying and/or adjacent buildings.

Volatile Organic Compounds (VOCs) – Carbon compounds, such as solvents, which readily volatilize at room temperature and atmospheric pressure. Most are not readily dissolved in water, but their solubility is above health-based standards for potable use. Some VOCs can cause cancer.

Underground Injection Control (UIC) – Underground injection is the technology of placing fluids underground, in porous formations of rocks, through wells or other similar conveyance systems. While rocks such as sandstone, shale, and limestone appear to be solid, they can contain significant voids or pores that allow water and other fluids to fill and move through them. Man-made or produced fluids (liquids, gases, or slurries) can move into the pores of rocks by the use of pumps or by gravity. The fluids may be water, wastewater, or water mixed with chemicals.

1. Purpose of the Final Corrective Action Decision for Groundwater and Soil Remediation

The primary purposes of the final Corrective Action Decision (CAD) for The Boeing Wichita Site (Boeing) are to: 1) summarize information from the key site documents including the Remedial Investigation[1,2,3,4] (RI) and Revised Feasibility Study[5] (FS) reports; 2) briefly describe the alternatives for site-wide groundwater remediation detailed in the FS report; 3) identify and describe the Kansas Department of Health and Environment's (KDHE) selected remedy; and, 4) document comments and KDHE's responses to the public comments received regarding the draft CAD. The public was encouraged to review and comment on the preferred remedy presented in the draft CAD during the public comment period held from July 2 to August 2, 2012.

KDHE has selected a final remedy for the Site after reviewing and considering all information submitted during the 30-day public comment period. The RI was performed in phases by various consulting firms from 1986 to 1992[1,2,3,4]. The current FS for the Site, approved by KDHE in 2011, was prepared by Golder Associates, Inc. The public was encouraged to review and comment on the technical information presented in the RI and FS reports and other documents contained in the Administrative Record file. The Administrative Record file includes all pertinent documents and site information that form the basis and rationale for selecting the final remedy. The Administrative Record file was made available during the public comment period and continues to be available for public review during normal

Highlight 1: Public Information

Administrative Record File

Kansas Department of Health and Environment
Bureau of Environmental Remediation
1000 SW Jackson Street; Suite 410
Topeka, Kansas 66612-1367
Contact: Margaret Townsend
Phone: 785-296-1936
E-mail: mtownsend@kdheks.gov
Web: www.kdheks.gov/remedial/

Local Information Repository

City of Wichita Department of Public Works and Utilities
Environmental Health Division
1900 E. Ninth Street
Wichita, Kansas 67214
Contact: Shawn Maloney
Phone: 316-268-8351
E-mail: smaloney@wichita.gov

[1] MWAL/IT, 1986, *Volume I, Remedial Investigation*, prepared by Mid West Analytical Laboratories and International Technology Corporation, on behalf of the Boeing Military Airplane Company, Wichita, Kansas.
[2] MWAL/IT, 1986, *Volume II, Remedial Investigation*, Appendices, prepared by Mid West Analytical Laboratories and International Technology Corporation, on behalf of the Boeing Military Airplane Company, Wichita, Kansas.
[3] Terracon Environmental, Inc., 1990, *Phase 2 Groundwater Study, Plant 1,* on behalf of the Boeing Military Airplane Company, Wichita, Kansas,
[4] Bittersweet Energy Inc., 1992, *Geological Investigation Boeing-Wichita,* prepared by Bittersweet Energy, Inc. on behalf of the Boeing Commercial Airplane Group, Wichita, Kansas.
[5] Golder Associates Inc., 2010, *Revised Feasibility Study Report for the Former Boeing Wichita Facility*, Wichita, Kansas, approved February 2012.

business hours at the location shown in Highlight 1. Also, as shown, the City of Wichita maintains a local information repository for the Site. The City's repository is available for review and copying during normal business hours.

2. Site Background

The Site is an industrial area of southeast Wichita, Kansas. A long history of industrialization has left a legacy of volatile organic compounds (VOCs) in soil and groundwater throughout the area, including chlorinated solvents such as tetrachloroethene (PCE), trichloroethene (TCE), and associated degradation products, as well as petroleum hydrocarbon-related contaminants, chromium (total and hexavalent), and others.

2.1. Site Location

The original Boeing facility occupied approximately 1,127 acres. Much of the former Boeing facility has been sold to other parties; however Boeing continues to perform environmental remediation activities. The Site boundary and sub-unit boundaries are shown on Figure 1. Within each sub-unit, one or more individual source areas have been identified. Additional information regarding the status of various source area investigation and cleanup activities is available in the RI, FS, and summarized later in this document.

2.2. Site History

Since the 1930s Boeing, or its predecessors, have operated an airplane manufacturing facility at the Site. As part of its operations, Boeing used various solvents during the processing of aircraft parts and for aircraft assembly. Boeing also has used and presently uses chromium in processing machine and aircraft parts.

Contamination was identified at the Site in late 1985 during an environmental investigation of the nearby Cessna Plant II facility. In 1986, Boeing notified KDHE of the contamination. An Administrative Order (AO) was issued by KDHE in January 1986. Contamination was generally attributed to solvent degreasing, metal plating, and fuel spills or leaks at the Site.

Since 1985, multiple contaminants have been detected in various environmental media at the Site, including groundwater, at concentrations well above the corresponding U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL). Primary site-related contaminants of concern (COCs) include: PCE; TCE; cis-1, 2-dichloroethene (cis-1, 2-DCE); vinyl chloride (VC); benzene, toluene, ethylbenzene and xylene(s) (BTEX); and chromium.

Pursuant to the AO, Boeing completed a site investigation and installed a groundwater extraction and treatment system that has been expanded and continues to operate. In April 1987, KDHE issued a Consent Order (CO) to permit Boeing to address source area contamination and installation of additional remedial wells for containment of the contamination on-site. In 1992 KDHE issued an Amendment to the CO to: address the cleanup levels developed in the original CO; use interim measures (IM) to address other sources of contamination discovered at the Site; develop remedial measures to control contamination of springs and creeks in the vicinity of the

Site; further delineate the groundwater plume; and, establish a zero concentration line to define the extent of the contaminant plume.

During investigation activities at the Site, TCE contamination was identified in domestic wells in the 31st and Clifton area northwest of the Site as shown in Figure 1. In 2001, KDHE issued a second CO Amendment to address contamination in this area; however, at present contamination in this area is addressed separately from the Site.

Since 1987, Boeing has worked cooperatively with KDHE to address environmental impacts, including: current operation of approximately 179 recovery wells, 195 monitoring wells; 9 air stripper sites; installation of a 300-foot long by 30-foot deep groundwater interceptor trench to recover off-site groundwater contamination immediately upgradient of two springs (spring 4 and spring 5) at the northwest edge of the Site; and installation of more than a dozen air-strippers to remove TCE dissolved in recovered groundwater which is then discharged to the Arkansas River through a National Pollutant Discharge Elimination System (NPDES) permit or is treated at the Spirit industrial waste treatment plant (IWTP) and recycled for use in the Spirit plant. The combined remedial systems have proven to be effective at reducing the overall mass of VOCs in groundwater. In addition to groundwater extraction and treatment, Boeing is currently performing dual-phase recovery at select well locations.

Since 2003, Boeing has initiated numerous IMs throughout the Site, including enhanced anaerobic bioremediation (EAB) pilot projects with injection of ethanol, sodium lactate and/or zero valent iron (ZVI); excavation of identified soil sources; and use of soil-vapor extraction (SVE) and air sparge systems (AS) to mention a few. Details of these IMs can be found in the Administrative Record file referred to in Highlight 1. Despite the foregoing efforts, to date, contaminant concentrations still persist at levels in excess of the U.S. EPA corresponding MCL, in both on-site and off-site areas, requiring future remedial actions.

3. Remedial Investigation

The initial RI[1,2,3] work at the Site indicated the presence of various VOCs in groundwater. Additional RI work included updates[6,7,8,9] to geologic maps and cross-sections for the Site to determine heterogeneity that may impact the current or future remediation methods and definition of the plume area to the south and southwest of the Kansas Turnpike, in the vicinity of the industrial waste treatment plant in the Plant 1 area (Figure 1), to the west of the Plant 2 area (Englewood, Figure 1), and off-site to the west, southwest, and northwest. The zero-line delineation[6] study done in 1993 identified many potential source areas at the Site including

[6] Bittersweet Energy Inc, 1993a, *Boeing Zero-Line Investigation Work plan*, prepared by Bittersweet Energy, Inc. on behalf of Boeing Commercial Airplane Group, Wichita, Kansas.

[7] Bittersweet Energy Inc, 1993b, *Geological Investigation and Groundwater Recovery System Installation Update 1992*, prepared by Bittersweet Energy, Inc. on behalf of Boeing Commercial Airplane Group, Wichita, Kansas.

[8] Terracon Environmental, Inc., 1992, *Soil Gas/Groundwater Survey, Industrial Waste Treatment Plant*, Boeing Facility, Wichita, Kansas, on behalf of the Boeing Commercial Airplane Group.

[9] Allied Laboratories, 1992, *Phase 2 Environmental Site Assessment, AFL-CIO Soil & Groundwater Exploration, K-15 & MacArthur Road, Wichita, Kansas*, on behalf of the Boeing Commercial Airplane Group.

degreaser operations, chemical plating and milling operations, barrel storage areas, underground storage tanks (USTs), and an investigation of the sanitary sewer. Sampling of six deep monitoring wells across the Site to the Wellington Shale (bedrock) determined that the Wellington Shale does not appear to be impacted by contamination from the upper zones of the aquifer[7].

TCE has been detected in groundwater at concentrations up to 510,000 micrograms per liter (µg/L) in the Plant 2 area (Figure 1). Current TCE levels range from non-detect (ND) to approximately 117,000 µg/L in groundwater. Maximum concentrations, current concentrations, and Kansas Tier 2 Levels[10] for groundwater, are summarized in Table 1. Soil contamination has generally been removed, tested, and disposed of by Boeing, or its contractors, during the course of construction activities or other facility improvements. Chromium and numerous VOCs have been detected in soils at the Site. Areas where soils were removed are shown in Figure 2.

3.1. Hydrogeological Setting

Groundwater at the Site is generally encountered at a depth of 15 to 25 feet below ground surface (bgs). Groundwater flow occurs in the inter-bedded sand units in the aquifer, which are not continuous throughout the Site. The majority of aquifer materials encountered in the Site vicinity typically exhibit low hydraulic conductivities. Relatively thin layers of sandy, higher hydraulic conductivity, fluvial deposits are observed in borings just above the weathered bedrock surface of the Wellington Shale. High contrast in hydraulic conductivity exists between the sand layers, overlying silts/clays, and the underlying shale which may influence the movement of groundwater and contaminants.

The Site hydrogeologic conceptual model is controlled by silt, sand, and clay aquifer materials overlaying bedrock and weathered bedrock (gray clay) aquicludes. The aquifers are recharged primarily by precipitation recharge during late winter and early spring. The Site hydrogeologic model is also influenced by the Boeing remedial extraction system. Aquifers are predominantly fluvial sands and silts, loess silts/clays and weathered bedrock clays. Regional groundwater flow is generally from northeast to southwest with components of flow to the west and northwest in portions of the Site (Figure 3). Groundwater at the Site is hydraulically contained by the existing groundwater extraction and treatment system.

3.2. Summary of Site-Wide Soil and Groundwater Investigation Results

The data collected through the RI and other investigations at the Site identifies a large chlorinated solvent plume extending from the northeast edge to the west and southwest of the property boundary (Figure 4). Although there are a number of contaminants detected above the Kansas Tier 2 Levels, in the interest of brevity, only the figure depicting TCE concentrations, the most prevalent contaminant at the Site, is presented herein. Figure 4 presents the orientation of TCE plume.

[10] KDHE, 2010, *Risk-Based Standards for Kansas (RSK) Manual,* 5th Version, KDHE, October 2010; available online at: http://www.kdheks.gov/remedial/rsk_manual_page.html.

In general, contaminant concentrations within the body of the Boeing chlorinated solvent plume have decreased over the period of record as a result of ongoing source abatement measures and natural processes. The current levels of contaminants shown in Figure 4 principally occur within the center of the Site. Various portions of the Site show decreased concentrations in groundwater based on the results of the source control measures, interim remediation measures, and the groundwater extraction and treatment system at the Site. The location of the remedial well and air stripper installations are shown in Figure 5.

Soil remediation at the Site has principally involved excavation and removal of contaminated soil from the Site. Areas where major excavations have occurred are shown on Figure 2. These excavations were performed to the point of confirmation samples occurring below the Tier 2 Level for the soil-to-groundwater pathway where possible. In excavations where infrastructure precluded the complete removal of all contaminated soils, confirmation samples were collected in order to document the residual contaminant concentrations remaining in the soil.

4. Interim Measure Implementation

Interim measures are actions or activities taken to quickly prevent, mitigate, or remedy unacceptable risk(s) posed to human health and/or the environment by an actual or potential release of a hazardous substance, pollutant, or contaminant. Boeing has implemented interim measures for source area remediation across the Site. Additional information regarding source abatement efforts is available in FS and the Administrative Record files for subject source areas. The general areas where groundwater and soil remediation are occurring are shown in Figures 1 and 2.

4.1. Groundwater Interim Measures

Groundwater extraction and treatment is the principal interim measure at the Boeing Site. The existing groundwater extraction and treatment system provides hydraulic control of the contaminant plume and source treatment in some hot-spot areas. Index monitoring wells are identified in each sub-area of the Site to evaluate the effectiveness of groundwater extraction and treatment system as well as other interim measures and pilot test activities that are ongoing.

Groundwater recovered from several areas of the Boeing Site is treated by air stripping before discharge under National Pollutant Discharge Elimination System (NPDES) permit to the Arkansas River. Other areas of the Site have recovered groundwater treated by air stripper and then transferred to the Spirit IWTP for reuse in the Spirit plant. As of 2011, 1.927 billion gallons of contaminated groundwater was treated and either discharged to the Arkansas River or treated at the Spirit IWTP and recycled within the Spirit Plant.

An additional IM in the Plant-2 area (Figure 1) is enhanced anaerobic bioremediation (EAB) by injection of lactate and ethanol for microbial reduction of TCE and chromium which began in 2009 and continues to the present. TCE concentrations from monitoring wells in the Plant 2 area in 2009 ranged from 953 µg/L to 16,200 µg/L and chromium concentrations ranged from 40

micrograms per kilogram (µg/kg) to 84 µg/kg. In 2011, TCE concentrations ranged from 841 µg/L to 19,400 µg/L and chromium concentrations ranged from 40 µg/kg to 1,210 µg/kg.

At the Activity Center and 500 Ramp Areas (Figure 1) EAB with injection of lactate and ethanol began in 2003 and continues to present at the 500 Ramp Area. TCE concentrations at MW-03-01 (500 Ramp Area) were reduced from 162,400 µg/L in 2009 to 52,900 µg/L in 2011.

Zero-valent iron (ZVI) injection began in 2006 at the Englewood area (Figure 1). Additional pilot studies involving the injection of ZVI with palladium are in progress in the Englewood area. TCE concentrations from MW-198 in this area have reduced from 201 µg/L in 2006 to 29.8 µg/L in 2011.

4.2. Soil Interim Measures

Interim measures for contaminated soils at the Site include opportunistic soil excavation in areas undergoing construction or other facility improvements. Excavated soils were characterized and disposed off-site without KDHE oversight but were performed according to the standards Boeing maintains for the Site. Major areas where soil excavation and removal of soil for off-site disposal occurred, as reported by Boeing, are shown in Figure 2. In addition, IWTP and industrial pipe lines that were sources for chromium, identified by stained and discolored soil, were replaced across the Site with double-lined stainless steel and/or fiberglass pipe.

Approximately 60 underground storage tanks (USTs) have been removed from the Site since the mid-1980s under the oversight of KDHE's South Central District Office (SCDO). As a part of UST removal, UST basins were over excavated and the removed soil was disposed of at a land farm south of the Fuel Farm area shown on Figures 1 and 2. Based on available information a minimum of 5,000 cubic yards of soil were removed during the UST removal process. Total petroleum hydrocarbon (TPH) concentrations remaining in the excavation walls or base ranged from ND to 980 milligrams per kilogram (mg/kg) in areas where infrastructure precluded complete excavation of soils at the UST site.

A soil excavation performed in 2010 at the 500 Ramp Area[11] utilized chitin for EAB at the vadose zone/groundwater table interface. The only VOCs detected in the excavation confirmation soil samples were acetone which ranged from ND to 164 µg/kg, below the Tier 2 Level for soil and the soil to groundwater pathways, and cis-1, 2-DCE which ranged from ND to 300 µg/kg, which is also below the Tier 2 Level for the soil and soil-to-groundwater pathways.

[11] Golder Associates, Inc., 2011, *Report on December 2010 500 Ramp Source Excavation Activities*, prepared on behalf of The Boeing Company, approved by KDHE 2012.

5. Site Risks

Site data were compared to KDHE's Tier 2 Levels[10] to evaluate risks. The Tier 2 Levels are based on a lifetime excess cancer risk of $1x10^{-5}$ and hazard index of 1. Site contaminants were detected in soils and groundwater across the site at concentrations above KDHE's Tier 2 Levels, indicating that additional remedial action and/or restrictions of some uses of the property may be warranted. Use of the Tier 2 Levels provides risk-based screening levels which reduce exposure and adequately address each significant pathway of human exposure. The Tier 2 Levels provide the standard to be achieved by reducing onsite contaminant concentrations and preventing the offsite migration of contaminants in groundwater above the Tier 2 Levels. Table 1 presents a summary of the historic maximum concentrations and current contaminant concentrations in groundwater at the Site, and the Kansas Tier 2 Levels or MCLs for the contaminants of concern (COCs).

Highlight 2: Remedial Action Objectives for Groundwater and Soil Remediation

The remedial action objectives for groundwater and soil remediation at the Boeing Site are to:

- Prevent human exposure to groundwater that is contaminated above acceptable levels and future degradation of groundwater resources;
- Prevent or minimize further migration of the contaminant plume;
- Restore groundwater to allow for its most beneficial uses (e.g., drinking water); and
- Prevent dermal and inhalation exposure of soil to workers and leaching of contaminants to groundwater.

6. Remedial Action Objectives

Remedial Action Objectives (RAOs) are media-specific goals for protecting human health and the environment. RAOs are developed through evaluation of applicable and relevant and appropriate requirements (ARARs) and To Be Considered standards with consideration of the findings of the RI and human health and ecological risk assessment. RAOs for the site-wide groundwater and soil contamination at the Site are summarized in Highlight 2. To ensure adequate remedial protections during future construction/excavation activities, a Soil Waste Management Plan (SWMP), being prepared by Boeing, will be finalized to help ensure that contaminated soil/wastes generated at the Site are properly managed and disposed.

6.1. Cleanup Levels

For groundwater cleanups being conducted at sites with drinking water aquifers, federally promulgated MCLs are the established remedial levels. Even though groundwater in the vicinity of the Site is not currently used for drinking purposes, it is a potential source of drinking water in the future. Therefore, MCLs, where available, and KDHE's Tier 2 Levels[10] for groundwater for those constituents for which EPA has not established MCLs, are the final remedial goals for groundwater. However, since the City of Wichita has restrictions in place precluding the use of groundwater for drinking purposes, an alternate treatment goal (ATG) has been established by KDHE for TCE of 21 µg/L within the boundaries of the Site. The ATG is intended to focus on

the areas of the Site where remediation is required; however, continued remedial system operations beyond these levels or cleanup activities in other areas may be necessary to control plume migration, mitigate impacts to other environmental media, and/or as otherwise needed to protect human health and the environment. Table 2 summarizes groundwater cleanup levels for groundwater target compounds for groundwater remediation. Groundwater leaving the boundaries of the Site must achieve MCLs.

For soil cleanup levels the KDHE Tier 2 Levels[10] for soil and the soil–to-groundwater pathway are used for interim measure and final remedial levels at the site. The major concerns with soil sources are the human exposure aspect and the potential for migration of contaminants from soil to groundwater.

7. Summary of Remedial Alternative Evaluated

Through the FS process, individual remedial action alternatives were first evaluated with respect to their ability to satisfy the following criteria as specified in the *National Oil and Hazardous Substances Contingency Plan*[12] (NCP): protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity mobility or volume through treatment; short-term effectiveness; implementability; and cost. The alternatives were then compared against one another to facilitate the identification of the preferred alternative for the Site. A detailed description of the various remedial action alternatives and the individual and comparative analyses is presented in the FS[5].

The common elements to the alternatives evaluated, which are included in the KDHE preferred remedy for the Site, include: various land-use controls (which complement remedial efforts by limiting future use of the property and preclude the installation or use of groundwater wells within the Boeing Site for drinking purposes and, as prescribed in the SWMP, may require notification of KDHE and Boeing concerning soil and/or groundwater remediation measures or soil excavation due to construction or other operational activities); long-term groundwater monitoring; 5-year performance reviews of the monitoring data by KDHE; implementation of individual source abatement measures; and implementation of the SWMP to address soil contamination at the Site. The timeframe for source treatment and overall groundwater remediation at the Site is dependent upon the locations of buildings or infrastructure with respect to known and future source areas and whether current business operations will allow access to those source areas.

The NCP requires the evaluation of a No Action alternative to serve as a baseline for comparison to other remedial action alternatives evaluated. Typically, the No Action alternative means the site is left unchanged, and no remedial actions are evaluated or taken at the site. In the FS for the Site No Action means that all current remedial actions will be discontinued and no future actions will be undertaken.

---

[12] *National Oil and Hazardous Substances Contingency Plan, 40 CFR 300 et seq*.; available online at: http://www.epa.gov/oem/content/lawsregs/ncpover.htm.

7.1 Alternative 1 – No Action

This alternative does not include continuation of existing interim remedial measures or long-term monitoring. This alternative has no cost associated with it.

7.2 Alternative 2 – Groundwater Extraction and Treatment

Under this alternative the existing groundwater extraction and treatment systems will be maintained and operated over a thirty-year time frame. Implementation of the KDHE approved optimization work plan[13,14] for the monitoring and remedial well network will maximize the effectiveness of the system as remediation is achieved. The current system provides capture of the contaminant plume throughout the Site. The current monitoring program and performance evaluation of the long-term monitoring network under KDHE oversight will ensure protection of groundwater.

Land-use controls in the form of Environmental Use Controls (EUCs) restricts land use and, as prescribed in the SWMP, may require notification of KDHE and Boeing for soil work, well installations, and other site remedial measures that are undertaken for the remediation of the Site until aquifer restoration is complete. Contingency measures may include installation of additional remedial wells and/or continued operation of the groundwater extraction and treatment systems if future monitoring indicates this is necessary. Finally, excavation of contaminated soil may be completed on an opportunistic basis if operational activities at the active facility allow future access to known, or future source areas. This work will be performed in accord with the SWMP. The net present value cost for this alternative is $17,000,000 over a thirty-year time frame.

7.3 Alternative 3 – Groundwater Extraction and Treatment with Nano-scale Zero Valent Iron (NZVI) Injection

This alternative includes continuation of the groundwater extraction and treatment systems, implementation of the optimization work plan[13,14] performance evaluation of the long-term monitoring network, implementation of EUCs, and application of the SWMP as described in Alternative 2. This alternative includes treatment of source areas through nano scale zero valent iron (NZVI) injections to minimize the remedy timeframe. This technology may require installation of additional wells and would require approval from the KDHE Bureau of Water Underground Injection Control Program (KDHE BOW UIC). Use of the NZVI injections would chemically destroy chlorinated solvents and reduce chromium with no byproducts requiring disposal. Additional long-term monitoring in these areas would be conducted to verify the continued performance of this groundwater treatment.

Finally, excavation of contaminated soil may be completed on an opportunistic basis if operational activities at the active facility allow future access to known, or future, source areas

[13] Golder Associates, Inc., 2009, *Draft Optimization Work Proposal for the Monitoring Well and Recovery Well Networks, Former Boeing Facility, Wichita, Kansas,* prepared on behalf of the Boeing Company, September 2009.
[14] Golder Associates, Inc., 2010, *Optimization Work Proposal Summary for the Monitoring Well and Recovery Well Networks, Former Boeing Facility, Wichita, Kansas,* prepared on behalf of the Boeing Company, September 2010.

according to the SWMP previously described. Contingency measures may include installation of additional remedial wells and/or continued operation of the groundwater extraction and treatment systems if future monitoring indicates this is necessary. The net present value cost for this alternative is $15,000,000 over a thirty-year time frame. This cost estimate assumes that the full scale groundwater extraction and treatment system will operate for 5 years (during which focused in situ treatment activities will be implemented to reduce the aerial size of the groundwater plume), with resulting reduction in operation and monitoring costs in years 5 through 15, and further reduction in years 15 through 30.

7.4 Alternative 4 – Groundwater Extraction and Treatment with In Situ Bioremediation, ZVI Permeable Reactive Barrier Walls, and Monitored Natural Attenuation

This alternative includes continuation of the groundwater extraction and treatment systems, implementation of the optimization work plan[13,14] performance evaluation of the long-term monitoring network, implementation of EUCs, and application of the SWMP as described in Alternative 2. In addition this alternative would use *in situ* bioremediation injections of nutrients to address source areas. This technology may require installation of additional wells and would require approval from the KDHE Bureau of Water Underground Injection Control Program (KDHE BOW UIC). Installation of ZVI permeable reactive barriers (PRB) would be protective of groundwater in areas where lower concentrations of contaminants render the current groundwater extraction and treatment system less efficient. Use of the PRBs would permanently remove constituents in groundwater through chemical and biological destruction and augment the occurrence of natural attenuation. There would be a transition from PRBs to monitored natural attenuation (MNA) when source depletion has occurred to the extent that MNA is feasible. Performance groundwater monitoring would be used to collect additional data to determine that MNA is occurring and to verify the continued effectiveness of natural attenuation. Contingency measures may include installation of additional remedial wells and/or continued operation of the groundwater extraction and treatment systems if future monitoring indicates this is necessary. Finally, excavation of contaminated soil may be completed on an opportunistic basis if operational activities at the active facility allow future access to known, or future, source areas according to the SWMP described previously. The net present value cost for this alternative is $13,000,000 over a thirty-year time frame. This cost estimate assumes that the full scale groundwater extraction and treatment system will operate for 5 years (during which focused *in situ* treatment activities will be implemented to reduce the aerial size of the groundwater plume), with resulting reduction in operation and monitoring costs in years 5 through 15, and further reduction in years 15 through 30.

8. Description of the Preferred Remedy

On the basis of information available in the Administrative Record and summarized above, KDHE has determined that the preferred remedy for the Site, outlined below, satisfies or meets the criteria established by both State and Federal programs and will be protective of human health and the environment. KDHE has identified **Alternative 4 – Groundwater Extraction and Treatment Using the Current System with *In Situ* Bioremediation, Permeable Reactive**

Barrier Walls, and Monitored Natural Attenuation as the preferred remedy for addressing soil and groundwater contamination at the Site. This alternative will incorporate land use controls, in the form of EUCs, which will include consideration of restrictions such as no future use of the property for residential purposes, no installation of wells except for remedial purposes, providing access and notification as prescribed by the SWMP to KDHE or Boeing for any Site disturbance in impacted areas such as soil excavation, construction, well removals, or installation of wells; and additional restrictions. Consideration of EUCs will take into account maintenance and enforcement of existing deed restrictions affecting those portions of the Site owned and operated by Spirit Aerosystems, Inc., including restrictions (i) prohibiting residential use, childcare facilities, hospitals, or schools, or installation and operation of wells (other than remediation wells) or use of groundwater for potable water or irrigation, (ii) requiring future land use to be conducted in manner that would protect and preserve integrity of the environment and all existing and future waste containment and monitoring and treatment systems required by the chosen remedy, and (iii) requiring written approval for modification or relocation of any treatment, containment, or monitoring device or system required by the chosen remedy or any soil excavation or construction of permanent structures, drainage ditches or changes to surface contour or pavement that could adversely affect the chosen remedy. In addition, City of Wichita Municipal Code of Ordinances, Title 7, Chapter 7.30, Section 7.30.105 currently prohibits the installation of new wells, except for remedial purposes, and use of pre-existing water wells in contaminated areas. The feasibility of comprehensive soil remediation may be evaluated in the future based on changes in facility operations or site infrastructure as a contingency action. Use of existing and planned land use controls will be protective of human health by preventing residential use of property, human use and exposure to the groundwater until it is remediated, and prevention of exposure of workers at the Site to contaminated soil.

The existing groundwater extraction and treatment system will continue to operate under the preferred remedy for groundwater. The system provides hydraulic control of contamination at and emanating from the Boeing Site and, when combined with use of *in situ* bioremediation, ZVI PRBs in areas where the groundwater extraction and treatment system has reached its limit of effectiveness, and natural attenuation processes, may eventually reduce contaminant concentrations in groundwater to MCLs in the long term. A comprehensive groundwater monitoring program will be implemented under the preferred remedy to evaluate the performance of the groundwater remediation systems. In addition, five-year reviews will be conducted by KDHE as long as contamination remains at the Site (in soil or groundwater) at concentrations above levels which would permit unrestricted use. These reviews will provide an opportunity to review the overall protectiveness and effectiveness of the remedial strategy. Implementation of the optimization work plan[13,14] for the Site will (1) determine the effectiveness of the groundwater extraction and treatment system performance in conjunction with *in situ* remediation in order to determine the optimum locations for PRBs at the Site and (2) will also determine where the aerial extent of the plume is diminishing thus precluding the need for continued use of all of the remedial and monitoring wells. The groundwater extraction and treatment system, *in situ* bioremediation, and use of PRBs is protective of human health and the environment by decreasing the volume and reducing toxicity of COCs at the Site, and decreasing

the aerial extent of the plume, thus decreasing the possibility of human exposure to contaminated groundwater.

Most of the Site is covered with parking lots or buildings which serve as a cap for limiting infiltration and preventing direct contact with contaminated soils. Maintenance of surface cover in impacted areas may be a component of future Environmental Use Controls. However, Boeing does not currently own some areas of the Site and therefore has limited control over surface cover maintenance. In instances where surface cover (e.g. parking lots or buildings) is removed and access is available, Boeing will address contaminated soils to the extent practicable. Residual soil contamination will be excavated and properly managed in accord with the SWMP where access permits on an opportunistic basis; however, some contamination will remain in place for the foreseeable future.

The net present value for this alternative is $13,000,000 over a thirty-year time frame. This cost estimate assumes that the full scale groundwater extraction and treatment system will operate for 5 years (during which focused *in situ* treatment activities will be implemented to reduce the aerial size of the groundwater plume and PRBs will be used where most effective), with resulting reduction in operation and monitoring costs in years 5 through 15, and further reduction in years 15 through 30. The remedial systems will continue to operate as necessary until RAOs are attained. In addition, Boeing may propose implementation of new or innovative remedial technologies in the future to address residual contamination as pilot tests, as approved by KDHE. In the event that Boeing is unable to implement the preferred remedy as described herein in total or the remedy proves ineffective, KDHE may require contingency implementation. Contingency actions may include expanded implementation of certain components of the preferred alternative or other alternatives evaluated in the FS Report to ensure protection of human health and the environment. Costs associated with contingency implementation are not included in the costs presented in the draft CAD. Boeing will be required to provide Financial Assurance to cover the present and future costs for the remedial effort.

The preferred alternative is protective of human health and the environment by providing alternatives for remediation (*in situ* bioremediation and PRBs) to supplement the potential for decreasing effectiveness of the groundwater extraction and treatment as the aerial footprint of the plume decreases. Complying with groundwater ARARs will be dependent on access to source areas at the operational facility; however the installation of PRBs will assist in groundwater treatment even in areas where source treatment is not achievable due to infrastructure limitations. The preferred remedy provides long term effectiveness and permanence by supplementing the groundwater extraction and treatment system with source treatment, plume treatment, and use of MNA with the expectation of higher mass removal and achievement of restoration within the shortest time-frame. The preferred remedy provides a means to destroy chlorinated solvents and reduce chromium in groundwater through the use of *in situ* bioremediation. In the short-term, the remedy will cause some impact on the community and the ecology of the Site due to well installation and PRB wall construction; however, once the construction stage is done the overall impacts will be minimal. The preferred remedy is implementable and involves the coordination of several technologies to address contamination at the Site. These are proven technologies and

difficulties coordinating the various methods should be minimal. The cost for the preferred alternative is the least expensive of the considered alternatives due to the likelihood of decreasing use of the groundwater extraction and treatment system as the supplemental remedial methods are applied across the Site.

These criteria are further discussed and presented in section 4.1 Criteria for Detailed Evaluation and in Table 4 in the FS[5].

9. Community Involvement

A Public Relations Strategy for the Site was developed by KDHE. Public input and comment was encouraged by KDHE throughout the process. Public notice of the availability of the draft CAD was published in *The Wichita Eagle* on July 2, 2012, and the public comment period was offered from July 2 to August 2, 2012. As per the Public Relations Strategy, the notice included information for the public availability session and hearing held on July 31, 2012, where the public was given additional opportunity to ask questions and provide comments on the draft CAD. In addition, KDHE established a webpage dedicated to the Boeing Site, which has been made available online, and continues to be available online at www.kdheks.gov/remedial/site_restoration/boeing.html. Notice of the public availability session and hearing was posted on KDHE's Boeing webpage. Many site documents, including this final CAD, are available on the webpage.

10. Documentation of Minor Changes

One attendee provided verbal comments that were heard and recorded at the Public Hearing for the Draft Corrective Action Decision for The Boeing Wichita Site held on July 31, 2012, in Wichita, Kansas. No written comments were received. In response to the comments received, KDHE amended the draft CAD as specified in Section 11. In addition, several minor changes were made to the draft CAD document based on further internal review.

11. Responsiveness Summary

The purpose of this section is to review and provide responses to comments received during the Public Hearing and the public comment period for the draft CAD. One attendee provided comments during the Public Hearing and no comment letters or emails were received from the public at large. The comments (*italics*) and KDHE's responses (**bold**) are shown below.

Comment #1: The commenter questioned whether the selected remedial methods represent the best and acceptable practices for this environment and situation (at the Boeing Wichita Site).

Response #1: The components of the overall remedial strategy for the Boeing Wichita Site were screened against other potential alternatives in the FS as required by

the NCP. KDHE considers the selected remedy to be protective of human health and the environment. No revision required.

Comment #2: The commenter was concerned about the impact of the National Pollutant Discharge Elimination System (NPDES) discharge of water to the river and asked if there was testing at the discharge point.

Response #2: The Boeing Company has an NPDES permit to discharge treated wastewater from the existing groundwater extraction and treatment system. The water is tested on a monthly basis with results reported to KDHE. No contaminants of concern have been detected in treated wastewater samples at the Site. No revision required.

Comment #3: The commenter was concerned about the radiological content of the soil and groundwater at the Site.

Response #3: KDHE performed a site assessment at the Century Instrument Corporation (CIC) located southwest of the Boeing Site at 4440 Southeast Boulevard, Wichita, Kansas. The purpose of the assessment was to identify potential leakage of radiological materials into soil and/or groundwater at that site. As part of the evaluation, two of The Boeing Company's monitoring wells were sampled: MW-123 and MW-124, both located on the west side of Kansas Highway 15 to the west of the CIC site. The wells had radium-226 levels well below the USEPA MCL for combined radium-226 and radium-228 of 5 picocuries per liter (pCi/L). The results from the site assessment indicate that radium is not present in the water at levels considered harmful to human health or the environment. KDHE will work with The Boeing Company in the future to determine if further radiological assessments are warranted. No revision required.

TABLES

Table 1– Historical and Current Maximum Concentrations of Select Analytes from the Boeing Site

Compound	Maximum Historical Concentration (µg/L)†	Current Maximum Concentration 2011 (µg/L)	MCL or KDHE Tier 2 Level‡ (µg/L)
PCE	545	140	5
TCE	510,000	117,000	5
cis-1,2-Dichloroethene	2,260	40,200	70
Vinyl chloride	1,496	8,700	2
1,1,1-Trichloroethane	500	ND	200
1,1-Dichloroethane	1,075	2.2	25
1,1-Dichloroethene	610	139	7
Carbon tetrachloride	2,600	1,150	5
Chloroform	1,000	260	80
Chromium	3,700	274	100

‡KDHE Tier 2 Levels default to MCLs where available. Tier 2 Level for groundwater provided from KDHE's Risk Based Standards for Kansas (RSK) Manual, October, 2010.
µg/L - micrograms per liter

Table 2 – Cleanup Levels for Soil and Groundwater (Select Analytes)

Compound	MCL or KDHE Tier 2 Level‡ Groundwater µg/L	Alternate Treatment Goal for Groundwater µg/L	Tier 2 Level Soil Pathway mg/kg	Tier 2 Level Soil-to-Groundwater Protection Pathway mg/kg
Benzene	**5**	Not Established	15.9	168
Carbon tetrachloride	**5**	Not Established	8.44	0.0734
Chloroform	**80**	Not Established	4.22	0.85
Chromium	**100**	Not Established	33.6	Not Established
1,1-Dichloroethane	**25**	Not Established	46.8	0.269
1,1-Dichloroethene	**7**	Not Established	313	85.9
cis-1,2-Dichloroethene	**70**	Not Established	115	0.855
PCE	**5**	Not Established	7.54	0.121
Toluene	**1000**	Not Established	4,320	51.2
TCE	**5**	**21**	41	0.0842
1,1,1-Trichloroethane	**200**	Not Established	11,800	2.8
TPH	**500**	Not Established	220	79.3
Vinyl chloride	**2**	Not Established	4.47	0.0205

‡KDHE Tier 2 Levels for groundwater default to MCLs where available. Tier 2 Level for groundwater provided from KDHE's Risk Based Standards for Kansas (RSK) Manual, October, 2010.
µg/L micrograms per liter; mg/kg milligrams per kilogram.

FIGURES

Figure 1 – Site Boundaries

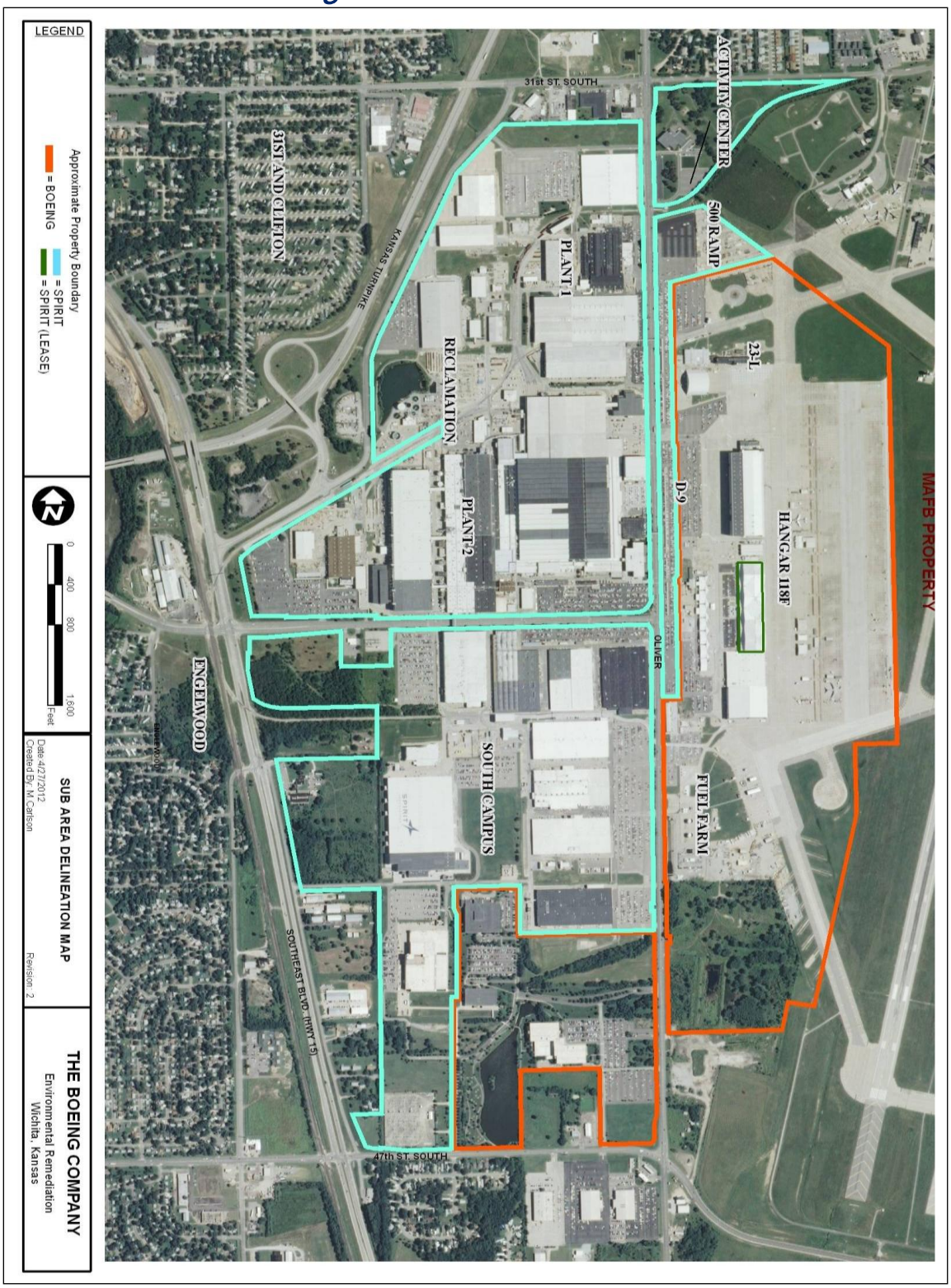

Figure prepared by The Boeing Company (2012) and modified by KDHE (2012).

Figure 2 – Soil Excavation Areas

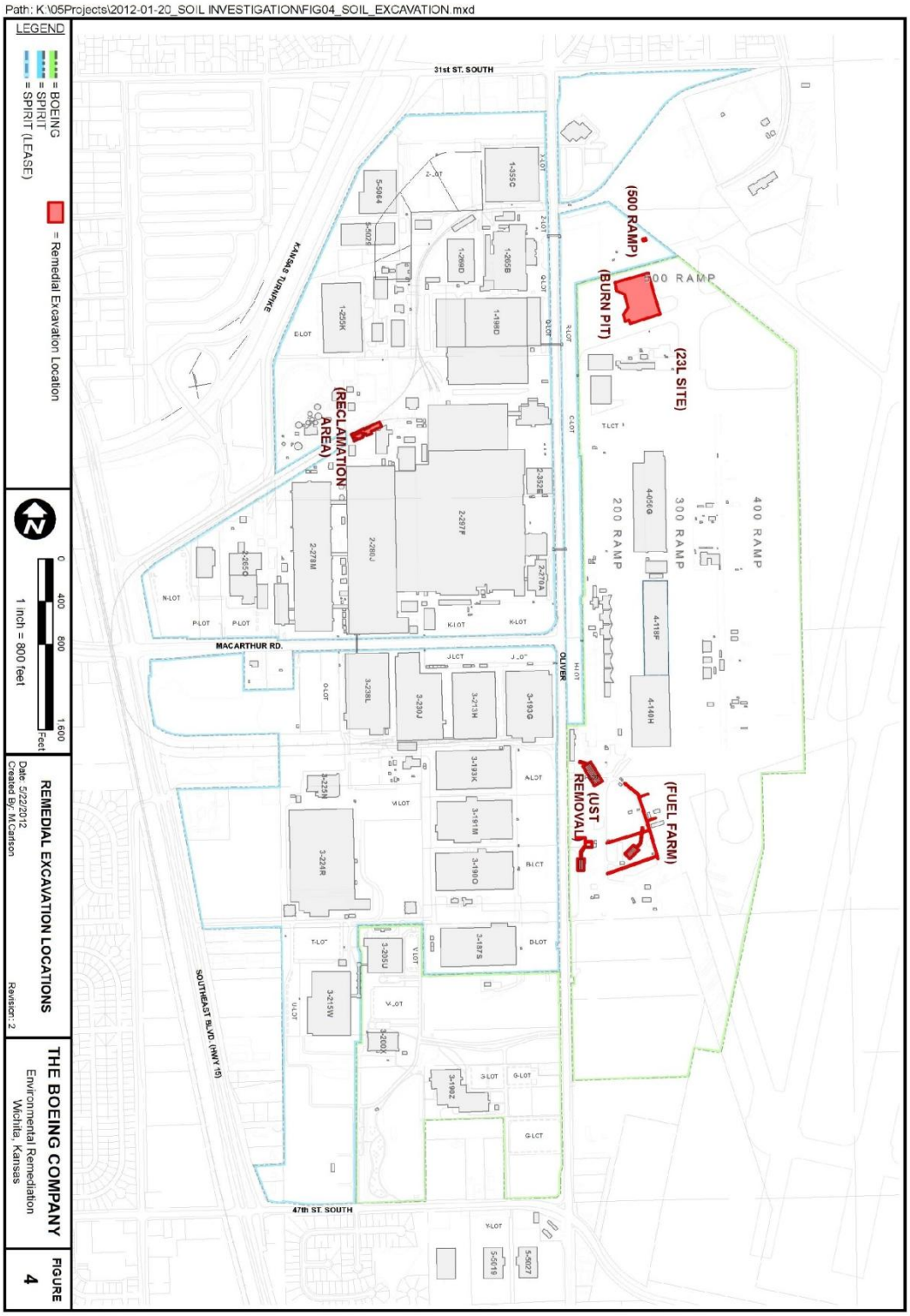

Figure prepared by Golder Associates, Inc. on behalf of the Boeing Company from Soil Waste Management Plan (2012)

Figure 3 – Potentiometric Surface Map

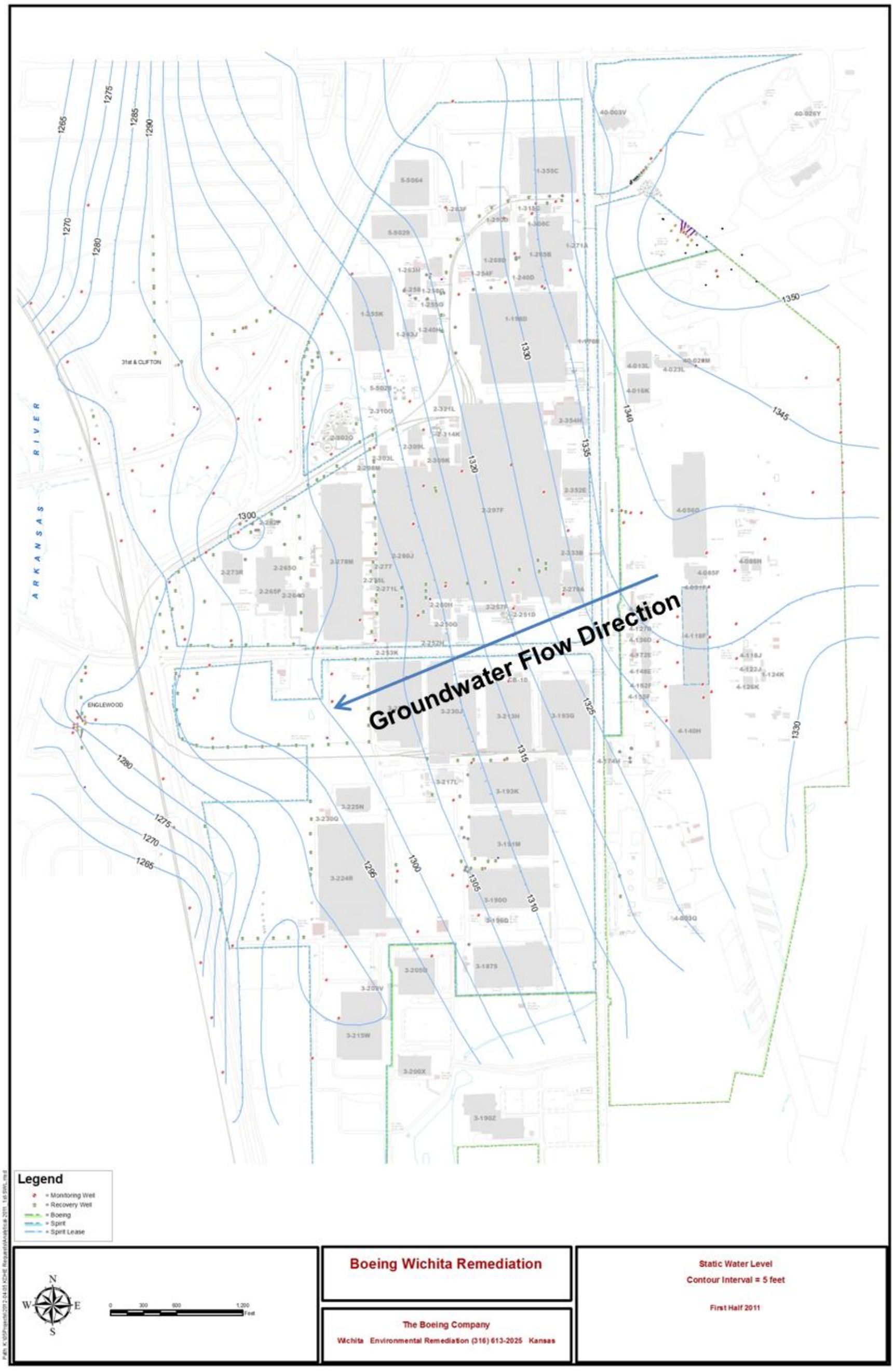

Figure from the Groundwater Monitoring Report First Semi-Annual, May 2011.Modified by KDHE May 2012.

Figure 4 – Contour Map of TCE Concentrations at Site

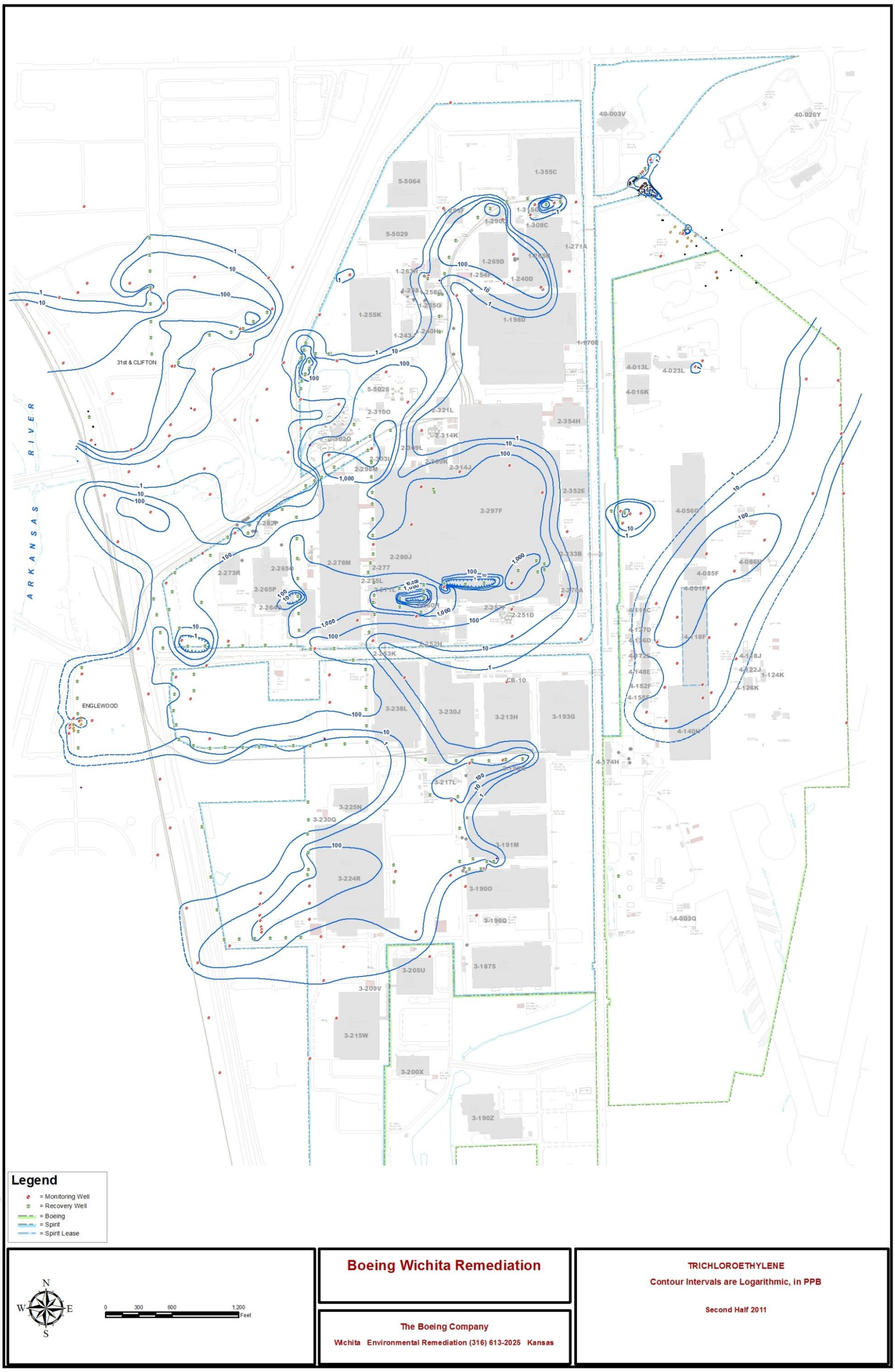

Figure from the Groundwater Monitoring Report, Second Semi-Annual, November 2011.

Figure 5 – Location of Remedial Wells and Air Strippers at Site

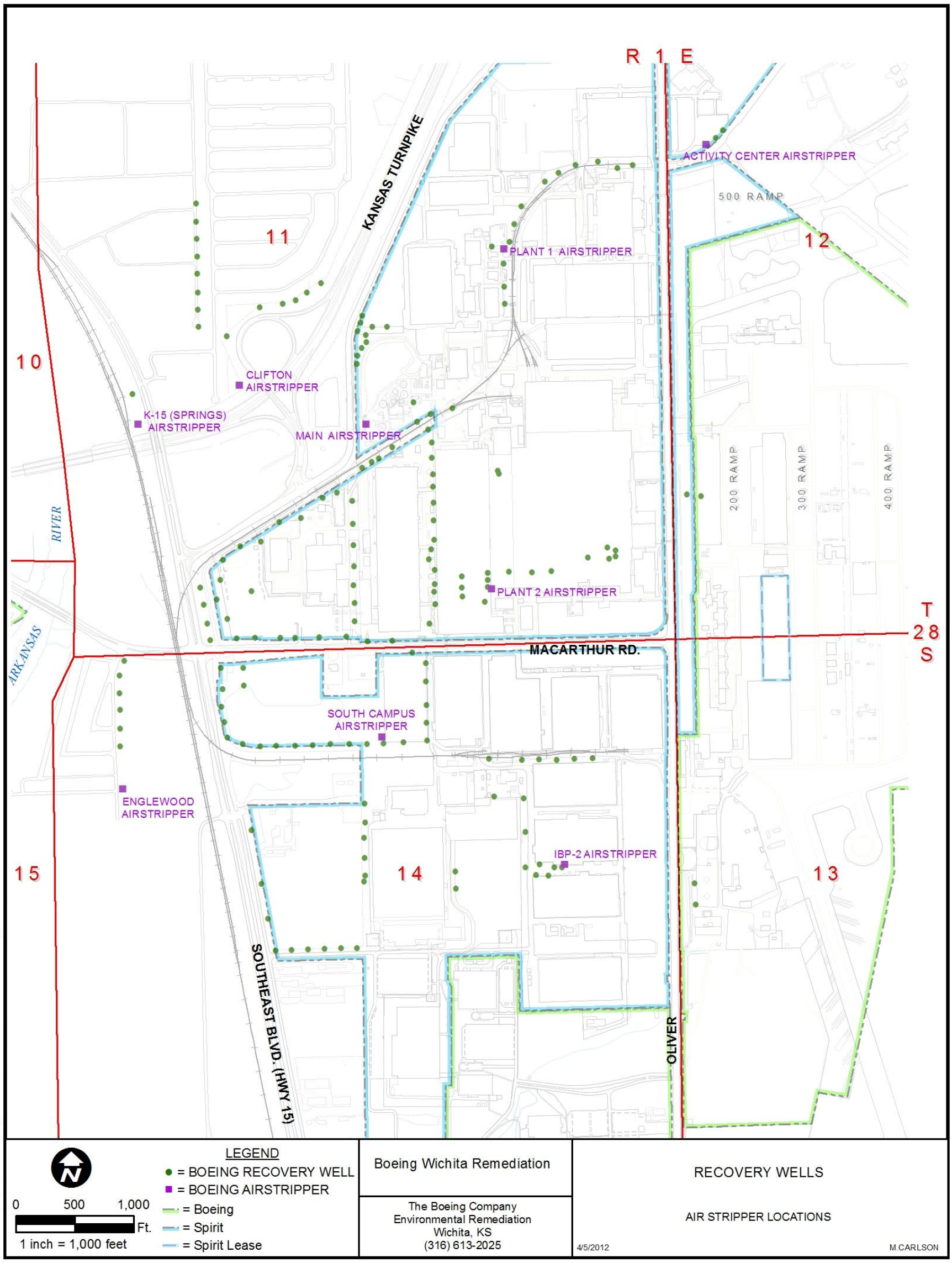

Figure from the Groundwater Monitoring Report, Second Semi-Annual, November 2011.

CONCURRENCE SHEET

BUREAU OF ENVIRONMENTAL REMEDIATION

RECEIVED
FEB 26 2013
OFFICE OF THE SECRETARY

DATE: February 5, 2013

This concurrence form is for your review and comments on the attached document; Please be advised that this is the ORIGINAL INSTRUMENT.

IN THE MATTER OF: Final Corrective Action Decision for the Boeing Wichita Site, Wichita Kansas **CASE NUMBER: 87-E-12**

C2-087-00015

	Name	Date	Comments
Project Manager	Margaret Townsend	2/5/2013	
Unit Chief		2/5/13	
Section Chief		2/6/13	
Bureau Manager	Gary Bloedy	2/8/13	
Legal Office (Ulrich)		2/11/13	
Director of Environment		2/18/13	
Deputy Chief Counsel		2/26/13	
Secretary		2/26/13	

PLEASE RETURN TO
BUREAU OF ENVIRONMENTAL REMEDIATION
Attention: Margaret Townsend

Received

FEB 18 2013

DIRECTOR OF ENVIRONMENT
DEPT. OF HEALTH & ENVIRONMENT