Corrective Action Decision

Tri-County Public Airport Site
Herington, Kansas

FINAL: December 2020
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
FINAL CORRECTIVE ACTION DECISION
TRI-COUNTY PUBLIC AIRPORT SITE
HERINGTON, KANSAS

DECLARATION OF CORRECTIVE ACTION DECISION

SITE NAME AND LOCATION
Tri-County Public Airport Site
Herington, Morris County, Kansas

STATEMENT OF BASIS AND PURPOSE
The Final Corrective Action Decision document presents the corrective action selected by the Kansas Department of Health and Environment (KDHE) for the Tri-County Public Airport (TCPA) Site (Site) located at approximately eight miles east of Herington Kansas, more specifically in Sections 31 and 32, Township 15 South, and Section 5, 6 and 18, Township 16 South, all in Range 6 East of the Delavan Kansas Quadrangle, Morris County. Facility operations began in 1943. Historically, operations at the facility have included aircraft and vehicle maintenance, pilot training, marksmanship, and aircraft mechanical support and operations. The total area of the TCPA, including the former runways is approximately 3.5 square miles. During its prime, the facility had over 300 buildings, however the majority of the TCPA buildings were razed after World War II. Existing historical structures include two hangers (Hanger 1 and 4) and a water tower cover an area approximately ½ mile wide (east to west), and one mile long (north to south) along the west side of the TCPA facility. On the east side of the TCPA facility are three concrete runways currently used for cattle feedlot operations. The surrounding area consists of agricultural properties. Approximately nineteen residences are located within a one-mile radius of the TCPS.

The Site’s contaminants of concern (COC’s) are primarily chlorinated solvents, including but not limited to trichloroethene and its degradation products. Site media impacted by the COCs are soil, groundwater and surface water. In December 2000, Raytheon Aircraft company (RAC) entered into a Consent Order and Final Order with KDHE to conduct a site investigation and evaluate cleanup alternatives. In September 2015, KDHE and Beechcraft Corporation, (predecessor to Textron Aviation, Inc) entered into a Consent Agreement and Final Order which outlined the requirements for developing a Corrective Action Plan and implement the Corrective Action. Interim remedial measures included the source area excavation and offsite disposal, a Soil Vapor Extraction (SVE) system, and In-Situ Chemical Oxidation (ISCO). The United States Environmental Protection Agency and RAC provided drinking water alternatives to residential water supplies affected by Site related contamination.
DESCRIPTION OF THE SELECTED REMEDIAL ACTION
KDHE has determined that the selected corrective action, as described and evaluated in the Final Corrective Action Decision, meets the criteria established for selection and will be protective of human health and the environment. KDHE has selected ISCO and SVE for Hangar 1, ISCO and SVE for Hangar 4, ISCO for the Potential Burial Area, Institutional Controls for the facility as a whole, and Long-term Monitoring and Water Well Management for the Site as a whole.

DECLARATION
The selected remedial actions are protective of human health and the environment; attain state, federal and local requirements that are applicable or relevant and appropriate to this corrective action; and provide cost-effective performance. The remedial actions will reduce the mass, mobility, and volume of contaminated groundwater and prevent exposure to contamination that is above applicable levels. In selecting and declaring this corrective action, KDHE believes implementation of the remedial actions will have a beneficial effect on health and the environment.

Lee A. Norman, M.D.
Secretary

Attachment: Final Corrective Action Decision
Final Corrective Action Decision  
Tri-County Public Airport Site – Herington, Kansas  
December 2020
Final Corrective Action Decision
Tri-County Public Airport Site – Herington, Kansas
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<td>Applicable or Relevant and Appropriate Requirements</td>
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<td>HAAF</td>
<td>Herington Army Airfield</td>
<td>µg/m³</td>
<td>Volatile Organic Compound</td>
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<td>Human Health Risk Assessment</td>
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<td>Interim Remedial Measure</td>
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<td>ISCO</td>
<td>In Situ Chemical Oxidation</td>
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<td>KDHE</td>
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<td>MCL</td>
<td>Maximum Contaminant Level</td>
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GLOSSARY

**Administrative Record** – The body of documents that form the basis for selection of a particular response at a site. Parts of the administrative record 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.

**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.

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

**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.

**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 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.

**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.

**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.

**Tier 2 Level** – Calculated risk-based cleanup value for a specific contaminant. These values can be found in Appendix A of the

**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.
1. PURPOSE OF THE DRAFT CORRECTIVE ACTION DECISION

The primary purposes of the Final Corrective Action Decision (CAD) for the Former Tri-County Public Airport (TCPA) Site are to: 1) summarize information from the key site documents including the Remedial Investigation/Feasibility Study (RI/FS) report¹ and subsequent FS Addendum²; 2) briefly describe the alternatives for remediation detailed in the FS Addendum; 3) identify and describe the Kansas Department of Health and Environment’s (KDHE) selected remedy for addressing contamination at the Site; and, 4) document public comments on the selected remedy.

KDHE has selected a final remedy for the Site after reviewing and considering all information submitted during the 30-day public comment period. The public was encouraged to review and comment on the preferred remedy presented in the draft CAD. The public was provided the opportunity to submit written comments to KDHE during the public comment period (October 29 to November 30, 2020).

Extensive investigation activities and interim remedial tasks have been performed on behalf of Beechcraft Corporation in accord with the Consent Order between Beechcraft Corporation and KDHE.³ The public was encouraged to review and comment on the technical information presented in the CAD Addendum and other documents contained in the Administrative Record file⁴. 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 is available for public review during normal business hours at the location shown in Highlight 1-1. For convenience, to interested members of the public, copies of the RI/FS report, FS Addendum

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² Essential Management Solutions, LLC. June 30, 2015. Feasibility Study Addendum, Tri-County Public Airport Site.
³ Consent Order #00-E-0197 as amended on March 3, 2009 (Case # 00-E-0197A) and on June 10, 2013 (Case # 00-E-0197A2).
⁴ Administrative Record File #C5-064-70163
and the draft CAD were also available for review and copying during normal business hours at
the local information repository located at the Herington Public Library in Herington, Kansas.

2. **FACILITY BACKGROUND**

2.1. **Facility Location**

The facility is located approximately eight miles east of Herington Kansas; more specifically in Sections 31 and 32, Township 15 South, and Sections 5, 6, and 18, Township 16 South, all in Range 6 East of the Delavan Kansas Quadrangle, Morris County, as depicted to the right. The facility is also depicted in Figure 1. The total area of the TCPA, including the former runways is approximately 3.5 square miles. The City of Latimer, Kansas is located approximately three miles north of the TCPA in the northwest 1/4 of Section 23, Township 15 South, Range 2 East.

2.2. **Facility History**

Between 1942 and 1944, the U.S. Government acquired the facility location as defined above, and in 1943, it was activated as the Herington Army Airfield ("HAAF"). The primary function of the HAAF was to serve as a heavy bomber airbase for the U.S. Army Air Force during World War II. Activities at the HAAF included aircraft and vehicle maintenance, pilot training, marksmanship, and aircraft mechanical support operations. The main facilities at HAAF included a maintenance sub-depot (Hangar 1 complex), runways, hangars, aircraft maintenance shops, fuel storage tanks,
motor pool, barracks, administration buildings, a sewage treatment plant, and a landfill. During its operation HAAF consisted of over 300 buildings, most of which were used as barracks to house approximately 2,000 personnel at the base, while the largest of which were used for aircraft maintenance.

The Hangar 1 sub-depot complex housed maintenance operations including complete aircraft overhauls and correction of major issues identified on test flights. A spark plug cleaning operation in a nearby building at the complex ran 24/7 utilizing a vapor degreaser to clean all spark plugs prior to deployment of aircraft and crews overseas. The motor pool, located just west of the sub-depot, included general maintenance buildings and a heavy maintenance building where approximately 200 vehicles were serviced. Other maintenance activities at HAAF consisted of general servicing of aircraft and vehicles. Wash racks were located adjacent to the sub-depot and other hangars.

In the summer of 1944, HAAF’s mission changed to a primary processing base for the new Boeing B-29 Super Fortress. Maintenance operations at HAAF operated 24 hours a day, 7 days a week. B-29s were stored on the tarmac where mechanics worked all over the aircraft, identifying and fixing any problems, with engine rebuild and repair, cylinder repair, engine replacements, and other aircraft teardown and rebuild activities completed at the Hangar 1 sub-depot complex. The B-29 had a total of 144 spark plugs and all were cleaned using TCE vapor degreasers before departing for the Pacific Theater of Operations.

The HAAF was deactivated in 1946. In 1948 title to the HAAF was conveyed to the City of Herington. Beech Aircraft Company (Beech) leased a portion of the former HAAF from the City of Herington from 1950 to 1960. This partial leasehold covered several airport buildings and the use of the airport, taxiways and apron, some existing machinery, equipment, and tools where Beech refurbished military Model 18 Beech airplanes under contract with the United States government. The aircraft refurbishment involved disassembling the airplane by removing wings, engines, and landing gear. The wings were rebuilt and wings, engines, and landing gear shipped to the Beech Wichita, Kansas Facility or other facilities. Old fuselages remaining at the TCPA were sold as scrap. All Beech operations wound down during the late 1950’s with completion of government contracts. All equipment was shipped to Wichita. Raytheon Company purchased
Beech Aircraft Corporation in 1980. At the time of the purchase, Beech became the aircraft division of the Raytheon Company, retaining the name Beech Aircraft Corporation.

In 1995, Raytheon Company changed the name of the aircraft division to Raytheon Aircraft Company (RAC). In 2006, Raytheon sold the company to a consortium of Goldman Sachs and Onex Corporation which subsequently became Hawker Beechcraft Corporation in 2007. In 2012, Hawker Beechcraft Corporation filed a voluntary petition for bankruptcy protection and in 2013 Beechcraft Corporation emerged from bankruptcy. The stock of Beechcraft Corporation was sold to Textron Inc. and the shares were subsequently transferred to Textron Aviation Incorporated. As a result, Beechcraft Corporation became a wholly owned subsidiary of Textron Aviation Inc. In January 2017, Beechcraft Corporation effectively merged into Textron Aviation Inc.

In addition to the above, leases of the property have included farm equipment manufacturing, crop dusting, stone cutting, raising cattle and producing agricultural feed products.

The City of Herington held title until 1979 when it was conveyed to the Tri-County Public Airport Authority. In May 1998, the City of Herington dissolved the Tri-County Airport Authority and property ownership reverted back to the City. The City is the current owner of the Site.

2.3. Regulatory History

Chlorinated solvent - trichloroethylene (TCE) - contamination was first discovered in groundwater in connection with assessment work conducted between 1994 and 1997 by the United States Army Corps of Engineers to determine whether the Department of Defense activities at the HAAF resulted in contamination of soil or groundwater. A final report detailing the results of this investigation was completed on July 30, 1998. Concurrently, KDHE conducted several investigations during that time that included collection of soil and water samples.

In December 2000, KDHE and RAC entered into a Consent Order5 for a RI and FS. The Consent Order outlined the requirements for investigation and evaluating cleanup alternatives. In September 2015, KDHE and Beechcraft Corporation (predecessor to Textron Aviation, Inc) entered into a Consent Agreement and Final Order6 which outlined the requirements for developing a Corrective Action Plan and implementing the Corrective Action.

2.4. Facility Description

During its prime, the facility had over 300 buildings and housed around 2,000 personnel. The majority of the TCPA buildings were razed after World War II. A few remaining historical structures cover an area that is approximately ½ mile wide (east to west), and one mile long (north to south) along the west side of the TCPA facility as shown on the figure below. On the east side of the TCPA facility are three concrete runways that were used by the U.S. Army Air Force during its operations at the facility but are now used for cattle feedlot operations. The remaining structures include two hangars (Hangar 1 and 4) and a water tower. The TCPA main office and pilots lounge were constructed after the airfield was declared surplus by the Department of Defense. The

5 Consent Order, Case No. 00-E-0197 as amended on March 3, 2009 (Case No. 00-E-0197A), on June 10, 2013 (Case No. 00-E-0197-A2)
6 Consent Order, Case No. 15-E-20 BER as amended on May 26, 2017 (Case No. 15-E-20 BER)
southwest corner of the Site, which was the former location of barracks and recreational areas, is now leased by Hodgdon Pyrodex Corporation for manufacturing black powder. Hodgdon also currently leases Hangar 4 and US Stone currently leases Hangar 1 for splitting, cutting and profiling natural stone.

3. REMEDIAL INVESTIGATION (RI)

Various phases of investigation have been conducted at the Site from 1994 through 1998 with respect to TCE in groundwater. A RI was initiated in 2001 to investigate and characterize the extent and magnitude of TCE and its degradation products (e.g., cis-1,2 dichloroethylene (DCE), vinyl chloride) in soil and groundwater. The objectives of the RI included:

- identify and characterize areas of elevated critical Volatile Organic Compounds (VOCs) in unsaturated zone soils at potential source areas;
- characterize the extent of critical VOCs in the unsaturated zone soils at potential source areas;
- characterize the physical properties of the unsaturated zone soils;
- characterize the physical and chemical properties of the critical VOCs, mobility and persistence in the environment, and import fate and transport mechanisms;
- characterize the groundwater flow direction;
- characterize the extent of the critical VOC groundwater plume(s);
- identify any human and environmental targets that may be affected by the critical VOC impacts in the unsaturated zone soils and groundwater;
• assess the risk of critical VOC impact on identified groundwater or soil pathways or receptors; and
• gather sufficient data for the FS to evaluate and develop potential remedial alternative(s) or potential interim measure remedial alternatives to be implemented at the Site as required.

The results and findings of the RI are presented in the RI report, revised in 2006, and approved in February 2008.

A Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk (SLERA) Assessment were conducted and the results and findings of the HHRA and SLERA are documented in the HHRA\textsuperscript{7} and SLERA\textsuperscript{8} reports.

In 2008, an additional investigation was completed to support the FS. A FS report was completed and approved in 2010. However, a component of the remedy, Monitored Natural Attenuation (MNA), required additional evaluation prior to moving forward with a CAD. During the evaluation period, interim measures were implemented to accelerate the remediation process and further support a remedy selection. The findings were memorialized in a FS addendum, dated June 30, 2015, and approved by KDHE on August 9, 2015. Based on the environmental investigations conducted to date, the KDHE concluded that soil and groundwater beneath the Site were contaminated with TCE attributable to the Hangar 1 and 4 and Potential Burial Area (Figure 8).

3.1. Site Setting
The Site is located in a rural agricultural farming and ranching area. The surrounding area consists of both native grass range and cultivated areas used to grow feed for livestock, wheat, soybeans and other grain crops. Approximately nineteen residences are located within a one-mile radius of the TCPA. The nearest residence is approximately 200 feet west of the TCPA boundary.

3.1.1. Topography
The Site is located in the Flint Hills Uplands physiographic province. The Flint Hills Uplands are characterized by rolling hills and rocky soil. Surface elevations range from approximately 1,505 feet National Geodetic Vertical Datum (NGVD) to 1,278 feet NGVD. The overall Site topography slopes from southeast to northwest, towards Clarks Creek.

3.1.2. Soils
Surficial soils consist of unconsolidated loess deposits of the Pleistocene-age Sanborn Formation. The loess deposits are characterized as aeolian sediments made up primarily of silts and clays. Site investigations have concluded that surficial soils and underlying unconsolidated deposits can range from 1 to 20 feet thick with low permeability.

\textsuperscript{7} Shaw Environmental, Inc., Human Health Risk Assessment, October 12, 2009, Tri-County Public Airport Site
\textsuperscript{8} Shaw Environmental, Inc., Screening-Level Ecological Risk Assessment, October 9, 2009, Tri-County Public Airport Site
3.1.3. Geology

The Site is underlain by Lower Permian Age bedrock units of the Chase Group, which are comprised of layers of limestone, cherty limestone, dolomitic limestone, dolomite, and shale as shown on the general geologic cross-section in Highlight 3-1 on the following page. Beneath the overburden soils, the following summarizes the shale and limestone members typically encountered at the Site.

- **Herington Limestone** - thickness from approximately 2 to 6.5 feet; typically dry;
- **Paddock Shale** - thickness from ~9.5 to 15 feet;
- **Krider Limestone** - thickness from ~0.5 to 4 feet; typically dry
- **Odell Shale** - thickness from ~12.5 to 20.5 feet;
- **Cresswell Limestone** - thickness from ~20.5 to 31.5 feet; first unit that continuously exhibits groundwater;
- **Grant Shale** - thickness from ~6 to 12 feet;
- **Stovall Limestone** ~2 to 4.5 feet thick;
- **Gage Shale** ~34 to 41.5 feet thick;
- **Towanda Limestone** ~10 to 15.5 feet thick; and
- **Fort Riley Limestone** - encountered at a depth of ~ 88 feet below ground surface (bgs)

During 1999 drilling activities vertical and horizontal fracturing was observed. Moving away from the facility to the north, these limestones are closer to the surface and appear in localized outcrops. At different locations at and near Clarks Creek, the Cresswell, Stovall, and Towanda are intersected by Clarks Creek and its tributaries, breaking continuity in the Cresswell and Stovall limestone members.
3.1.4. Surface Water, Springs, and Seeps

The Site lies in the middle of a major drainage basin divide. Surface water drainage from the west part of the Site drains towards Clarks Creek to the west. Runoff from Latimer also drains to the northwest towards Clarks Creek. Surface drainage on the east side of the Site drains to Level Creek and the West Fork Neosho River. Springs and intermittent seeps have been observed near Clarks Creek, particularly following precipitation events. The RI evaluated several locations identified as characteristic springs or seeps. The approximate locations are depicted on the figure above. Over the past 10 years, Seeps 7, 8 and 9 have exhibited dry conditions. The springs to the northwest of the TCPA and west of Latimer appear to originate at or just below the Stovall limestone formation. Spring locations to the north of Latimer appear to originate from the top of the Towanda limestone formation and have not historically exhibited impacts to groundwater.

3.1.5. Hydrology

Groundwater was investigated in an overburden (perched) zone and the four limestone members at the Site. These members include, in descending order, the Cresswell, Stovall, Towanda, and Fort Riley limestones. From a regional perspective, groundwater from the Cresswell, Stovall, and Towanda all generally flow to the northwest. Vertical gradients (both upward and downward) are observed and vary significantly with fluctuations in groundwater elevations in each of the limestones. At various locations, the Cresswell and Stovall units are not saturated as indicated by the presence of dry wells. Potentiometric maps (Figures 2A, 3A and 4A) were generated based on the results of the well gauging conducted in the first half of 2020.

**Overburden (perched):** In some locations across the Site, discontinuous perched water can be found in overburden soil at the top of the weathered bedrock. Perched water was typically found in borings that were installed into the top of the first weathered limestone or, as in the case of Hangar 1, in an area where the bedrock has been weathered away and in-filled with overburden.

**Cresswell Limestone:** Groundwater is encountered first in the Cresswell. Depth to water in the Cresswell varies ranging from approximately 25 feet bgs in MW-17 to 69 feet bgs in MW-30.
Stovall Limestone: The Stovall is a relatively thin unit, which depending on the area, is confined or unconfined, and ranges in thickness from 2 to 4.5 feet. The saturated thickness ranges from dry to total thickness of the limestone unit (approximately 2 to 4 feet).

Towanda limestone: The Towanda is the first continuous aquifer at the Site and ranges in thickness from 10 to 15.5 feet. The Towanda is confined or semi-confined as indicative by the potentiometric surfaces, which range from near the top of the Towanda limestone three miles north of Latimer on the east side of Clarks Creek, to as much as 45 feet above the top of the Towanda limestone on the west side of Clarks Creek approximately one mile west of Latimer.

Fort Riley Limestone: The Fort Riley is believed to be continuous and confined across the entire Site. Monitoring well MW-40C is the only Site monitoring well installed into the Fort Riley. Monitoring well MW-40C is located hydraulically down gradient of the TCPA and is located on the west side of Clarks Creek approximately one mile west of Latimer. Monitoring well MW-40C is installed to a total depth of 105 feet bgs. At this location, the top of the Fort Riley limestone is approximately 88 feet bgs and the potentiometric surface of the water is approximately 18 feet bgs.

Deeper bedrock aquifers exist below the Fort Riley Limestone in the Barneston Limestone Formation of the Chase Group Formations. However, based on the extensive geologic and hydrogeologic evaluations conducted to date, the Cresswell, Stovall and Towanda are the primary water bearing aquifers of concern evaluated throughout this CAD. These limestone units have saturated zones that serve as potential usable water supply for area residences downgradient of the facility.

3.2. Summary of Remedial Investigation Results

The RI identified contaminants of concern (COCs) in soils, groundwater, and surface water at the Site. COCs are primarily chlorinated solvents: specifically, TCE and its degradation products in soil, groundwater and surface water. For a more comprehensive data summary, refer to the RI/FS Report and other investigation reports in the Administrative Record File. A summary of the media specific investigation results is presented below.

3.2.1. Soil Investigation Summary

Due to the large size of the TCPA Site, multiple areas were identified and targeted for investigation for TCE and related compounds. Based on the environmental investigations conducted to date as presented in Section 3, soil impacts were identified in the following primary areas.

Hangar 1: Prior to the excavation (discussed below in Section 4.2), chlorinated solvents were identified at concentrations exceeding KDHE Tier 2 Risk-Based Standards for Kansas (RSK) screening levels\(^9\). The primary source area for impacted soil at Hangar 1 was located under the northern apron and to the north/northwest near the former spark plug building. VOCs were detected immediately beneath the concrete down to the bedrock surface at Hangar 1. TCE was

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detected at a maximum concentration of 2,300 milligrams per kilogram (mg/kg) (1-2 feet bgs) and vinyl chloride of 38 mg/kg (11 feet bgs). In 2005, 45,431 tons of soils that was contaminated above the KDHE Tier 2 RSK levels were excavated and removed under the direction of the USEPA.

**Hangar 4:** The Hangar 4 source area soils were predominately isolated to the southern half of the hangar and outside the hangar to the west and south. Shallow subsurface impacts were limited to an area in the central/western portion beneath the building. TCE was detected at a concentration of 0.77 mg/kg from 1-2 feet bgs. Hangar 4 was historically equipped with a degreaser pit, which has since been backfilled with sand and capped with concrete. The highest concentration of TCE detected at Hangar 4 was at depth (25-30 feet bgs) and attributable to the groundwater impacts discussed below.

**Potential Burial Area:** The Potential Burial Area and other isolated source area(s) (e.g., bulk storage building, spark plug building, etc.) only contained sporadic detections of VOCs. The VOCs were limited to the degradation products of TCE, primarily cis-1,2 DCE. The limited detections that exceeded the RSK levels were at depths ranging from 9-13 feet bgs.

Table 2 summarizes the maximum historical and post excavation concentrations of select COCs in soil with comparison to applicable RSK levels across the Site.

### 3.2.2. Groundwater Investigation Summary

Various investigation activities have been conducted to identify and characterize impacts to groundwater. The primary COC associated with the Site, TCE, was detected in the Cresswell, Stovall, and Towanda aquifers, defined by the monitoring well networks at the Site. The groundwater impacts correspond to the soil source areas discussed above. TCE in the groundwater extends off Site to the northwest, past the town of Latimer. Benzene and ethylbenzene were also detected above the MCLs in the area of the former World War II HAAF fuel storage area at the north end of the Site. TCE was not detected in the groundwater sample collected from the Fort Riley aquifer.

The Cresswell and Stovall zones are impacted on-site with significant variation in VOC concentrations between the identified former source mass areas. In 2008, TCE concentrations were the highest at the Hangar 4 area with a maximum concentration of 51,000 micrograms per Liter (µg/L) in the Cresswell and 1900 µg/L in the Stovall. In the Hangar 1 and Potential Burial Area, concentrations were orders of magnitude lower, generally ranging from 30 µg/L to 100 µg/L for the Cresswell and Stovall aquifers. Some isolated higher concentrations were detected downgradient of the Potential Burial Area, such as a shallow perched aquifer sample with a concentration of TCE detected at 5,300 µg/L. The highest concentrations of TCE identified on-Site within the Towanda are near MCLs.

Impacted groundwater within the Cresswell, Stovall, and Towanda aquifers exhibit minimal to no naturally enhanced biological degradation of TCE. However, TCE concentrations and variability have significantly decreased with time following implementation of the approved interim remedial measures (IRMs). TCE concentrations have decreased to generally less than 40 µg/L. Figures 2B,
3B and 4B present the TCE concentrations for the Cresswell, Stovall and Towanda aquifers based on first half 2020 data.

Expanded results and discussion of groundwater samples obtained during investigation activities are included in the previously mentioned RI/FS Report, dated July 29, 2010.

### 3.2.3. Surface Water Investigation Summary

Select spring and seep locations have been sampled periodically between 1998 and 2015. As part of the approved MNA and Groundwater Monitoring Plan and subsequent modifications, the sampling locations have continued to be monitored on a semi-annual basis, and TCE concentrations continue to range from less than 1 µg/L to 15 µg/L. Surface water samples continue to be collected from locations along Clarks Creek to the west and northwest of Latimer, and from the intermittent tributary located to the north/northwest of Latimer. Recently, TCE concentrations have not been detected above 1.0 µg/L. These recent sampling events confirm the absence of TCE concentrations above the Domestic Well Supply Use of the Kansas Surface Water Quality Standards in the surface water located downgradient of the spring and seep areas. Expanded results and discussion of surface samples obtained during investigation activities are included in the previously mentioned RI/FS Report, dated July 29, 2010.

### 3.2.4. Vapor Investigation Summary

The groundwater to indoor air pathway was extensively evaluated in a human health risk assessment (discussed below in Section 5.2). Actual indoor air testing was conducted in Hangar 1 in 2003, which was prior to the soil removal discussed below in section 4.2, and therefore represents a worst-case scenario. The concentrations prior to removal of the impacted soil were below the Tier 2 RSK indoor air screening criteria of 2.09 micrograms per cubic meter (µg/m³). In 2009, twelve residential indoor air and five background samples were collected. TCE or degradation products were not detected above the KDHE screening criteria. Based on the data at the time, KDHE concluded that further testing was not warranted. Since that time, chlorinated solvent concentrations in groundwater have significantly diminished following implementation of interim remedial measures (IRMs) discussed in Section 4. A vapor intrusion pathway review evaluation was completed in 2015 as part of the Feasibility Study Addendum, and it was concluded with multiple lines of evidence that the vapor intrusion to indoor air pathway is not an applicable pathway based on the current Site conceptual model.

### 4. INTERIM MEASURE/REMEDIATION IMPLEMENTATION

IRMs 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. IRMs have been implemented at the Site to address soil and groundwater contamination. The IRMs include domestic well water remediation, the excavation and offsite disposal of soils containing VOCs, a Soil Vapor Extraction (SVE) system, and In-Situ Chemical Oxidation (ISCO) to address TCE and its degradation products in the groundwater.
4.1. Domestic Well Remediation

In November 1997, an EPA time-critical removal action was initiated to provide bottled water to 13 residences and a carbon filtration system for one residence. In 2000, whole-house carbon filtration systems were installed in 15 residences that had been provided bottled water. In addition to the 15 homes in which systems were installed, approximately seven residences that already had carbon filtration systems were provided maintenance and monitoring. Extension of the Herington water system was completed which included adding approximately 50 new residences to the water line in early 2006. The water supply line provides potable water for the airport and other industrial operations at the TCPA. It also connected the residences previously mentioned that had filtration systems to the water line. The exceptions are one residence (812 S. 2700 Road) that has VOC detections less than the MCLs but continues to use carbon treatment, and the other is a business that is no longer in operation.

4.2. Soil Removal Action

As discussed in Section 3.2.1, a Removal Action was implemented in September 2005 at the direction of USEPA for the excavation and off-site disposal of VOC-impacted soil from the Hangar 1 area. The excavation was backfilled, compacted with clean soils from a designated borrow area, and landscaped and reseeded. Impacted soils above the established remedial goals were removed to a maximum depth of 16 feet bgs or bedrock, whichever was encountered first. Prior to backfilling the excavation, post excavation sampling and analysis activities were performed to ensure remedial goals had been achieved. Soil removal was continued until results indicated remedial goals were met. A total of 45,431 tons of soil was excavated and transported off-site for disposal.

4.3. In-Situ Chemical Oxidation Injections

An In-Situ Chemical Oxidation (ISCO) IRM was implemented in the spring of 2009 to address TCE and its degradation products within the Cresswell and Stovall aquifers in the Hangar 4 area. ISCO involves the introduction of a chemical oxidant into the subsurface for the purpose of transforming the groundwater contaminants into less harmful chemical compounds. ISCO remediates contaminants in the subsurface without having to pump the contaminated groundwater out of the ground for treatment. When the process is complete, only water and other harmless chemicals are left behind. Sodium permanganate (NaMnO₄) was chosen for the IRM injections based on pilot tests. Injection wells were installed to facilitate injections utilizing the gravity feed method, as well as offering an easy option for potential follow-up injections as necessary. The purpose of the IRM was to expedite remediation and prevent potential further degradation of groundwater migrating downgradient. Performance monitoring has been conducted since initiation of the IRM to assess the effectiveness of the ISCO system, which has been continued for over ten years.

Due to the success of the injections at Hangar 4, ISCO was expanded to include Hangar 1. In the Hangar 1 and the Potential Burial Area, a tracer study was conducted to better refine the hydrological characteristics of groundwater transport time, direction, velocity, advection and dispersion within VOC-impacted groundwater. Results indicated a hydraulic communication
between the Cresswell and Stovall aquifers near Hangar 1. Observable groundwater flow patterns suggested an adequate spatial distribution to support initiation of a follow-up in-situ remediation in the Hangar 1 and Potential Burial areas. These findings along with geochemical data provided the basis for the design of the expanded ISCO remediation program. ISCO began in the Hangar 1 and Potential Burial Areas in 2014, with results indicating VOC concentrations generally decreasing in response to injections.

**4.4. Soil Vapor Extraction (SVE)**

Pilot testing of SVE was conducted in the Hangar 4 area to determine an estimated radius of influence, airflow, and effluent VOC concentrations. SVE systems remove volatile chemicals from the soil by applying a vacuum through a network of underground wells. Pilot testing indicated that SVE was an effective technology for addressing VOCs in soil and shallow bedrock. It was implemented in the Hangar 4 area in June 2011 and has run continuously since October 2013 with the exception of periodic operation and maintenance activities. Operation of the SVE system has resulted in greater subsurface response in the shallow bedrock and Cresswell unit at Hangar 4. A limited SVE pilot test in the Hangar 1 area was conducted in select existing monitoring wells due to the success at Hangar 4 from June to July 2014. Pilot testing indicated that SVE was not as conducive for operations in Hangar 1 area’s shallow overburden soils; however, it was effective in the extraction of VOCs from the lower unsaturated Cresswell formation. Based on the results, SVE was recommended as an IRM with construction and operation activities initiated during May 2015 for Hangar 1.

**5. SITE RISKS AND RECEPTORS**

The COCs for the Site found posing a risk are TCE and its degradation products, which have been identified in groundwater, soil, and surface water. Other COCs historically detected include acetone, benzene, ethylbenzene, methylene chloride, toluene, metals (arsenic, chromium, and mercury), and perchlorate. COCs detected during the investigation phases were compared to their respective concentrations in the Tier 2 Risk-based summary Table in Appendix A of the KDHE RSK Manual to determine if the chemical- and media-specific concentrations are protective of human health and the environment. Additionally, a series of site-specific risk assessments (Ecological and Human Health) characterized the risk(s) posed to human health and the environment.

**5.1. Screening Level Ecological Risk Assessment (SLERA)**

The SLERA\(^\text{10}\), which was completed in 2009, evaluated ecological risk factors such as risk to burrowing mammals from soil contamination and risk to terrestrial or aquatic receptors from surface water or sediment contamination. The assessment identified no risk to ecological receptors in soil, surface water or sediment. Soil and groundwater IRMs have addressed any potential risk to ecological receptors.

\(^{10}\) Shaw Environmental, Inc., Screening-Level Ecological Risk Assessment, October 9, 2009, Tri-County Public Airport Site
5.2. Human Health Risk Assessment (HHRA)

As part of the RI/FS Consent Order, an HHRA was conducted. COCs associated with the Site have both slope factors and reference doses that indicate the COCs are carcinogens and present other potential adverse health effects with exposure. The slope factor evaluates the lifetime risk for cancer; the unit risk factors in the lifetime cancer risk due to continuous exposure in indoor air. COCs that are carcinogens are often the driver for risk. In the event that a site-specific risk assessment is performed, the acceptable range lies within $1 \times 10^{-4}$ (1 in 10,000) to $1 \times 10^{-6}$ (1 in 1,000,000). The risk-based screening levels adopted as the Remedial Action Objectives are identified in Section 6 below.

The HHRA evaluated potential exposure pathways that could present a risk to human health. For an exposure pathway to be complete, it must include four basic elements: a source, release mechanism from the source to media, transport through media to a receptor, and a point of exposure with a receptor. The contaminants identified in the investigation provided the basis for evaluating the exposure pathways. Potential exposure pathways for human receptors were evaluated under current or future scenarios including exposure to groundwater and vapor. Exposure pathways addressed incidental ingestion, dermal contact, and inhalation from irrigation activities and indoor air migrating from groundwater. On the Site, soil pathways addressed incidental ingestion, dermal contact, inhalation of dust and vapors of COCs in the soil, and inhalation of vapors during trenching from COCs in groundwater to commercial/industrial workers. Residential exposures include incidental ingestion, dermal contact, and inhalation of COCs in groundwater from irrigation activities and inhalation in indoor air from groundwater. A summary of media-specific risks and exposure pathways is identified as follows:

**Soil:** The soil pathway level addresses the impact to human health via ingestion of contaminated soil, inhalation of fugitive emissions or dusts, and dermal contact with contaminated soil. In the HHRA, this pathway was evaluated with respect to the current commercial/industrial workers, future commercial/industrial workers and future construction workers that may come in contact with impacted soil during construction activities. Risk associated with soil was determined to be within an acceptable range indicating that there is no unacceptable human health or environmental exposure from contact with soil.

**Groundwater:** Groundwater contaminated with COCs poses the primary route for potential exposure. Groundwater impacted with COCs at concentrations exceeding their respective Tier 2 RSK levels or Maximum Contaminant Levels (MCLs) could present an unacceptable risk through inhalation, ingestion, or dermal contact with groundwater used for drinking or other household uses such as bathing. Water well surveys have historically been conducted, and are periodically updated, to identify potential receptors that may be in contact with contaminated groundwater. For residents located where VOCs are present in groundwater above MCLs, water is provided by a water supply line. With the exception of one residence (812 S. 2700th Rd), which has a whole house carbon filtration system and is below the MCL for TCE, all residences are served by the Herington water system which was extended to approximately 50 area residences in 2006.

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11 Shaw Environmental, Inc., Human Health Risk Assessment, October 12, 2009, Tri-County Public Airport Site
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Herington obtains its water from a City constructed water supply reservoir that was built in 1981. Therefore, current exposure does not include ingestion of groundwater. Future exposure may exist if a new water supply well was installed in an area with VOCs in groundwater. Several area water wells, which were used for domestic uses, are now used for lawn and garden purposes. The HHRA evaluated the groundwater with respect to the most sensitive receptor pathways including irrigation or filling a child’s portable pool. The risks associated with ingestion, dermal contact, or inhalation of vapors was determined to be within an acceptable range indicating that there is no unacceptable human health or environmental exposure from contact with off-site groundwater.

Total risk to future commercial/industrial workers could exceed a cumulative risk if workers were subjected to dermal contact and ingestion with on-site groundwater. To ensure effective management and protection of the groundwater pathway, on-site Environmental Use Control (EUC) restrictions are included as a component to the remedy.

**Vapor:** For COCs that are both volatile and mobile, vapor migration through the subsurface may be a concern. Potential routes of exposure to COCs through vapor intrusion were evaluated within the site-specific conceptual model. Unsaturated utility trench backfill material and vadose zone soils are typical vapor migration paths. Underground utilities present potential conduit routes for vapors to migrate (e.g. storm sewer, electric and water lines). Vapor intrusion exposure also can occur via the movement of COC vapors from soil gas within the unsaturated pore space of the vadose zone through the foundation into the interior air space of a structure. As discussed in Section 3.2.4, indoor air from Hangar 1 was used to assess inhalation exposures for current/future commercial workers under a worst-case scenario prior to remediation. All estimates of cancer risk and non-cancer hazards were below KDHE’s screening criteria. The potential risk was exceeded for construction workers exposed to vapors in a trench; however, the EUC restrictions that are included as a component to the remedy address the vapor pathway. The groundwater to indoor air pathway was thoroughly evaluated in 2009 for residential homes and, as memorialized in reports was determined to be within an acceptable range indicating that there is no unacceptable human health or environmental exposure from contact with soil vapor. Further, based on KDHE recently released new guidance on Vapor Intrusion in August 2016, the soil vapor pathway remains incomplete due to various criteria including depth of contaminants, location of nearest potential receptor to contaminants and concentrations of contaminants.

**Surface Water:** For surface water, ingestion and dermal contact are not complete exposure pathways since surface water impacted with site-related COCs is not used for domestic purposes (e.g. drinking water source) within the extent of site boundary.

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 investigation reports. RAOs for the Site are summarized below:
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- Prevent exposure to site-related contaminated media that poses unacceptable risk.  
- Restore groundwater to its most beneficial use.  
- Prevent migration of COCs from soil to groundwater that would result in groundwater impacts in excess of levels for beneficial use.

6.1. Cleanup Levels

Groundwater cleanup levels at sites with drinking water aquifers are set to the federally promulgated MCLs. For those constituents which federal MCLs have not been established for groundwater, KDHE’s RSK Tier 2 levels as specified in the KDHE RSK Manual are the final remedial cleanup levels. This CAD establishes active treatment goals for groundwater that when achieved, may no longer warrant active remediation (i.e. continual injections). However, those levels are only applicable when adequate receptor management is conducted. For on-site soils, KDHE will use RSK Tier 2 levels for soil for the protection of human health and protection of the groundwater. Additional data may be gathered after the finalized CAD to revise the soil to groundwater pathway values in accord with the calculations provided in the KDHE RSK Manual. Surface water cleanup levels will be based on the domestic use category of the Kansas Surface Water Quality Standards if the surface water body is shown to be used for domestic purposes. If the surface water body is not used for domestic purposes, the next applicable and most stringent standard would be applied. Table 3 summarizes the MCLs and/or KDHE RSK Tier 2 Levels, active treatment goals and Kansas Surface Water Quality Standards.

7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

Throughout 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\textsuperscript{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. Each alternative was then compared against one another to facilitate the identification of the selected alternative. A detailed description of the various remedial action alternatives and the individual and comparative analyses is presented in the FS. Brief summaries of the remedial action alternatives, including the selected remedial action alternatives, are provided below. Each remedial alternative evaluated also includes the IRMs already implemented at the Site, which are consistent with the technologies evaluated in the FS.

For each area discussed below, consistent with the NCP, a “No Action” alternative was evaluated as Alternative 1 to be used as a baseline for comparison to other remedial action alternatives. The “No Action” alternative generally assumes that the site is left unchanged, and no further remedial actions are evaluated or taken; no further actions would be taken to reduce contaminant mass, address potential exposure pathways, or reduce the potential for contaminant migration. Since no remedial action is taken, risks to human health and environment may not be addressed. The present

\textsuperscript{12} National Oil and Hazardous Substance Contingency Plan, 40 CFR 300 et seq.
value of cost of the “No Action” alternative is zero dollars ($0), not including the IRMs already implemented at the Site.

In addition to the “No Action” alternative, each specific source area (e.g. Hangar 1, Hangar 4, Potential Burial Area) within the Site had multiple remedial action alternatives that were evaluated as follows:

7.1. Hangar 1 Alternatives

Remedial alternatives evaluated for Hangar 1 include: ISCO, SVE, enhanced reductive dechlorination, and monitored natural attenuation.

7.1.1. Alternative 2 (Hangar 1): In-Situ Chemical Oxidation (ISCO) and Soil Vapor Extraction (SVE)

Alternative 2 utilizes ISCO for remediation of the shallow bedrock and perched water bearing unit directly under the area excavated during the 2005 removal action and SVE for the unsaturated zone under the Hangar 1 floor. ISCO destroys contaminants in the subsurface without having to pump the contaminated groundwater out of the ground for treatment. When the process is complete, only water and other harmless chemicals are left behind. In particular, sodium permanganate is the specific oxidant evaluated within the alternatives based on results of the already completed ISCO pilot study and IRMs. Injection wells were installed during IRM activities to facilitate injections utilizing the gravity fed method, as well as provide an easy option for follow-up injections as necessary. Alternative 2 assumes continued use of the three injection wells used for the IRM at Hangar 1 (MW-49 – Cresswell well, and MW-47A and MW-49A – Stovall wells). A baseline groundwater performance monitoring event for the Hangar 1 area was performed in October 2014 as part of the IRM activities. The groundwater performance monitoring results will be used to verify the radius of influence of the sodium permanganate and to evaluate future progress of the remediation towards achieving the site remedial action objectives.

Alternative 2 includes implementing SVE for residual impacted soil in the unsaturated zone. The process includes the placement of perforated pipe within the contaminated soil zone and applying a vacuum, using a vacuum blower, to either vertical or horizontal vapor extraction wells. The VOCs are volatized and transported out of the subsurface by the migrating soil gas. SVE pilot testing was completed in May 2003 in wells located northwest of Hangar 1. Two extraction wells (MW-33 and MW-49) were completed in the Cresswell and integrated into the SVE system to extract subsurface vapors from the impacted soil in the unsaturated subsurface zones as an IRM. Alternative 2 assumes the same SVE configuration and ongoing operation, monitoring and maintenance activities.

The cost estimate for Alternative 2, assuming implementation, operation and maintenance for 5 years of ISCO and 10 years of SVE is $464,019.

7.1.2. Alternative 3 (Hangar 1): Enhanced Reductive Dechlorination & SVE

Alternative 3 includes using in-situ reductive chlorination for remediation of the shallow bedrock aquifer beneath the former source area in Hangar 1, and SVE for the unsaturated zone under the
Hangar 1 floor. Reductive dechlorination occurs by sequential breakdown of chlorinated solvents to less harmful chemicals. Microorganisms capable of degrading TCE are normally present in the subsurface, but generally require amendments to enhance the process such as by adding a carbon source, bacteria, and/or nutrients. Results of a treatability study conducted indicated the addition of carbon substrates, especially emulsified soybean oil, achieved complete reductive dechlorination of TCE to ethane within a 15 week period. Alternative 3 allows for up to three injection events, and performance monitoring of eight wells.

SVE would be used for the unsaturated soils/shallow bedrock beneath the Hangar 1 floor. The SVE system design is generally consistent with what is described in Alternative 2. However, the configuration includes seven wells used to address VOCs in the shallow soils beneath the north end of Hangar 1.

The cost estimate for Alternative 3, including implementation, operation and maintenance for 10 years of in-situ reductive dechlorination and 10 years of SVE is $1,083,013.

7.1.3. Alternative 4 (Hangar 1): Monitored Natural Attenuation (MNA) and Environmental Use Control (EUC)

Alternative 4 includes MNA of the shallow bedrock aquifer in the Hangar 1 area. Natural attenuation includes various physical, chemical, and biological processes that reduce the mass, toxicity, and mobility of contaminants in soil and groundwater. These processes include biodegradation, dispersion, dilution, sorption, volatilization, stabilization, and transformation of contaminants. Groundwater samples would be collected for VOC analysis from nine monitoring wells on a quarterly basis for the first five years and then semi-annually for the following ten years. After the first fifteen years of monitoring, VOC monitoring would be required on an annual basis for the following fifteen years. MNA parameters would be sampled quarterly for the first two years, then annually for the remainder of the monitoring program. In addition, institutional controls would be implemented through KDHE’s EUC program to ensure no private or industrial wells are installed at the facility.

The cost estimate for Alternative 4, including implementation, monitoring and data evaluation for 30 years is $223,116.

7.2. Hangar 4 Alternatives

Remedial technologies that were evaluated for Hangar 4 include: several combinations of SVE, ISCO, and dual phase extraction (DPE).

7.2.1. Alternative 2 (Hangar 4): ISCO and SVE

Alternative 2 for Hangar 4 involves ISCO for treating the Cresswell and Stovall units. The ISCO treatment, which was implemented as an IRM in the spring of 2009, consists of injecting sodium permanganate through a network of wells. During the IRM, seven Cresswell and three Stovall wells were selected for connection to the injection system based on VOC concentrations exhibited. ISCO injections were focused on treating an area approximately 65,000 square feet with a saturated thickness of 10 feet. Oxidant has been documented to reach areas as far as 1,250 feet downgradient.
Alternative 2 assumes utilization of the existing injection configuration with ongoing operations, monitoring and maintenance activities.

Alternative 2 also includes SVE implementation to remediate the residual impacted soil in the unsaturated zone of the overburden/shallow bedrock and Cresswell formation. The design of the SVE system was based on a SVE pilot test that was conducted within the shallow bedrock and Cresswell unit at Hangar 4, which documented radius of influences ranging from 100-200 feet. As discussed in Section 4.4, SVE was implemented as an IRM and included three conveyance legs (east, west, and south) with 16 extraction wells, seven of which are in the shallow overburden, and six in the Cresswell. Alternative 2 assumes the same SVE configuration (operation sequentially varied at 13 wells) and ongoing operation, monitoring and maintenance activities.

The cost estimate for Alternative 2 including implementation, operations and maintenance for 10 years is $785,522.

7.2.2. Alternative 3 (Hangar 4): Dual-Phase Extraction (DPE)

Alternative 3 for Hangar 4 includes DPE technology targeting various depths to address both groundwater and unsaturated zones. DPE is an in-situ technology that uses a vacuum system, which can be combined with a downhole pump to remove various combinations of contaminated groundwater, separate phase product and vapors from the subsurface. DPE uses high-velocity airflow to lift suspended liquid droplets upward through an extraction to the land surface. Extracted fluids and vapors are trapped by an accumulation tank where the liquid phase drops out and the vapor phase is exhausted to the atmosphere. The accumulated water would be treated and discharged to the surface, and vapors would be released into the atmosphere. Treatment in the Cresswell would be accomplished by installing 15 extraction wells across the full thickness of the Cresswell formation. These wells would be installed both inside and outside of the Hangar 4 building.

The cost estimate for treating the Cresswell was estimated at $1,503,105. The cost estimate for using this technology to treat the Stovall is $1,367,101.

7.3. Potential Burial Area/Bulk Storage Area Alternatives

Remedial technologies that were evaluated for the Potential Burial Area/Bulk Storage Area include: enhanced reductive dechlorination, monitored natural attenuation, and ISCO.

7.3.1. Alternative 2 (Potential Burial Area): Reductive Dechlorination

Alternative 2 utilizes in-situ reductive dechlorination to destroy TCE and its degradation products in the perched water located in the shallow bedrock zone in the Potential Burial Area/ Bulk Storage Building area. The reductive dechlorination technology is the same as described in Section 7.1.2. The physical characteristics in the area, such as the silty clay and shale bedrock, could limit the distribution of the carbon substrate. In this alternative, infiltration trenches would be installed and the carbon substrate (EOS 450) would be injected into the trenches for an estimated 10 year time frame as necessary to remediate the area.
7.3.2. Alternative 3 (Potential Burial Area): Monitored Natural Attenuation

Alternative 3 relies on the natural processes described in Section 7.1.3 to degrade TCE and TCE degradation products to less harmful chemicals. The cost estimate for Alternative 3 including implementation, monitoring and data evaluation for 30 years is $226,840.

7.3.3. Alternative 4 (Potential Burial Area): ISCO

Alternative 4 utilizes ISCO, using sodium permanganate for remediating impacted perched and shallow bedrock groundwater. ISCO has been successfully implemented as part of the Hangar 1 and Hangar 4 IRMs and was demonstrated to be an effective remedial action for remediating TCE and TCE degradation products in other residual source mass areas at the Site. For the Potential Burial Area, a 1 to 10% solution of sodium permanganate will be injected into select well locations. There are two targeted areas within the area: northern and southern areas. Approximately 1,250 gallons of solution will be injected initially into each well on an annual basis. With time, injections will vary to optimize remediation effectiveness. The current ISCO injection well in the area is MW-47A, located in the southern residual impacted area. Ongoing performance monitoring of the ISCO injections will be conducted in accordance with the approved performance and Site-wide monitoring locations, frequencies, and type of analysis presented in the approved IRM Work Plan and Groundwater Monitoring Plan.

The cost estimate for ISCO in the Potential Burial Area, including implementation, operation, and maintenance for 30 years is $202,651.

7.4. Non-Source Area Groundwater

Remedial technologies evaluated for the non-source area groundwater included monitored natural attenuation and long-term monitoring with institutional controls.

Under either condition, a Long-Term Monitoring Program (LTMP) would be implemented to monitor the stability, extent and remaining residual concentrations of VOCs at the Site and to monitor progress toward compliance with the RAOs. Monitoring would consist of the collection of hydro-geochemical data from a multitude of wells across the Site to assess the current state of each groundwater system. Results from the LTMP would be reviewed and evaluated to verify adequate data are being collected to document progress.

In addition to the proposed LTMP, institutional controls would be developed to establish controls on the facility for current and future tenants. Receptor management including periodic water well surveys would be completed. Controls would be implemented in accord with KDHE’s EUC program.

The cost estimate for this alternative for 30 years ranged from $1,301,144 for long-term monitoring to $1,601,144 for monitored natural attenuation, which includes additional monitoring parameters.
8. **DESCRIPTION OF THE SELECTED REMEDY**

KDHE evaluated each remedial action alternative, individually and comparatively, while considering the threshold and balancing criteria discussed above in Section 7. On the basis of the information available in the Administrative Record and summarized above, KDHE has selected **ISCO and SVE** for Hangar 1 (Alternative 2), **ISCO and SVE** for Hangar 4 (Alternative 2), **ISCO** for the Potential Burial Area (Alternative 4), **Institutional Controls** for the facility as a whole, and **Long-term Monitoring and Water Well Management** for the Site as a whole. The selected remedy satisfies or meets Federal, State and local requirements and will be protective of human health and the environment.

Elements of KDHE’s selected remedy are summarized by type of remedial strategy presented below.

**8.1. Elements of Selected Remedy**

This section describes the common elements of the selected remedy across the specific areas. Figure 8 shows the locations of the selected remedies.

- **ISCO** – ISCO, which has been implemented as an IRM (see Section 4.3), will continue as part of the selected remedial alternative for the Site. Specifically, ISCO will be implemented in the Hangar 1 area (overburden/shallow bedrock), Hangar 4 area (Cresswell and Stovall water bearing units), and in the Potential Burial Area/Bulk Storage Area (perched and overburden) until reaching the active remediation goals approved in the FS. This in-situ remedy has been proven to directly reduce contaminants during implementation. As previously discussed, ISCO implementation began at the Site in 2009 as part of an IRM. Performance monitoring results have demonstrated that the injections achieved efficient oxidant distribution and TCE concentration reductions by orders of magnitude following remediation of the most heavily impacted portion of the plume. Additionally, expanded ISCO has been identified as a contingent remedy. The contingency will be implemented in targeted areas if monitoring results demonstrate persistent or increasing concentration of contaminants in groundwater.

- **SVE** – SVE, which has been implemented as an IRM (see Section 4.4), will continue as part of the selected remedial alternative for the Site. Specifically, SVE will continue to be implemented in Hangar 4. Expanded SVE or DPE have been identified as contingent remedies in the event SVE is not effective in treating the residual impacts.

- **Institutional Controls** – An EUC would be formally established through the EUC program administered by KDHE. An EUC protects human health and the environment from risks posed by remaining contaminants by placing restrictions, prohibitions, and conditions on land use to reduce or eliminate potential human exposure. The EUC agreement runs with
the property and is binding on the landowner and any other subsequent owners, lessees, and other property users. An important component of the EUC is a Soil Waste Management Plan (SWMP) that describes notification, planning and field procedure requirements including procedures for screening, sampling, handling and disposal of any impacted soil or unknown waste encountered during soil disturbance activities within the EUC area.

- **Long-Term Monitoring** – Groundwater, springs, surface water and seep (if any) sampling are currently being conducted on various KDHE-approved frequencies. A monitoring network sufficient for monitoring the plume and extent thereof has been established and will continue to be updated as conditions improve. Groundwater monitoring will continue on a KDHE-approved frequency until the Site meets closure criteria established in KDHE’s Policy #BER-RS-024 *Site Closure in the State Cooperative Program*. Routine evaluation of remedial performance will demonstrate the overall protectiveness and effectiveness of the remedial strategies and indicate whether contingency measures are necessary to achieve RAOs.

- **Water Well Management** – Water well management and monitoring will continue to ensure protection of private wells and monitoring programs updated as conditions improve until no longer necessary in accord with the applicable regulatory framework. Periodic water well surveys will continue to be conducted in off-site areas where TCE concentrations are detected in groundwater. The surveys focus on identifying new wells within the Site as well as periodically evaluating existing wells to ensure that conditions remain protective of human health and the environment. Although not anticipated, as VOC concentrations have significantly diminished following implementation of IRMs as discussed previously, in the event that drinking water wells are identified as being impacted by TCE or TCE degradation products migrating from the Site, an alternate acceptable drinking water source will be provided for as long as the drinking water well(s) remain contaminated above the cleanup standards.

- **Financial Assurance** – Financial assurance will be established and maintained in accord with KDHE guidance for the costs associated with implementing the final remedy outlined above.

### 9. COMMUNITY INVOLVEMENT

A Community Involvement Plan 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 *Dickinson County New-Times (includes former Herington Times)* on October 29, 2020. In addition, KDHE established a webpage dedicated to the Site, available online at [http://www.kdheks.gov/remedial/site_remediation/tricounty_airport.html](http://www.kdheks.gov/remedial/site_remediation/tricounty_airport.html). The draft CAD and other relevant site documents were made available on the webpage. In addition, electronic copies of the draft CAD and key technical documents were made available for review and copying during normal business hours at the Herington Public Library in Herington, Kansas.
10. RESPONSIVENESS SUMMARY

The purpose of the Response to Comments Summary is to summarize the comments made by private citizens and other interested parties during the public comment period for the draft CAD. A public comment period was offered from October 29, 2020 to November 30, 2020. No written comments were received by KDHE during the public comment period; therefore, a response to comments has not been prepared. No significant changes have been made to the final CAD.
Tables
Table 1 – VOC Analytical Results Summary – Groundwater

<table>
<thead>
<tr>
<th>Compound</th>
<th>Historical Maximum Concentration µg/L</th>
<th>Current Maximum Concentration (May 2018) µg/L</th>
<th>Groundwater MCL or KDHE Tier 2 Level‡ µg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCE</td>
<td>310,000</td>
<td>3,260</td>
<td>5</td>
</tr>
<tr>
<td>cis-1,2-DCE</td>
<td>20,000</td>
<td>4,470</td>
<td>70</td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>56,000</td>
<td>21.4</td>
<td>2</td>
</tr>
</tbody>
</table>

‡KDHE Tier 2 Levels default to MCLs where available. Tier 2 Level for groundwater provided from KDHE’s RSK Manual, October 2010, and any subsequent revisions.

µg/L: micrograms per liter

Red bold font indicates concentration is above KDHE Tier 2 values
## Table 2 – VOC Analytical Results Summary – Soil

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Compound</th>
<th>Historical Maximum Concentration (µg/kg)</th>
<th>Maximum Current Concentration (µg/kg)</th>
<th>KDHE Tier 2 Soil Pathway ‡ (µg/kg)</th>
<th>KDHE Tier 2 Soil to Groundwater Pathway ‡ (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hangar 1</td>
<td>TCE</td>
<td>2,300,000</td>
<td>ND</td>
<td>5,850</td>
<td>84.2</td>
</tr>
<tr>
<td></td>
<td>Cis–1,2–DCE</td>
<td>300,000</td>
<td>430</td>
<td>23,000</td>
<td>855</td>
</tr>
<tr>
<td></td>
<td>Vinyl Chloride</td>
<td>32,000</td>
<td>900</td>
<td>4,470</td>
<td>20.5</td>
</tr>
<tr>
<td>Hangar 4</td>
<td>TCE</td>
<td>8,200</td>
<td>770</td>
<td>5,850</td>
<td>84.2</td>
</tr>
<tr>
<td></td>
<td>Cis-1,2-DCE</td>
<td>960</td>
<td>140</td>
<td>23,000</td>
<td>855</td>
</tr>
<tr>
<td>Potential Burial</td>
<td>TCE</td>
<td>770</td>
<td>26.7</td>
<td>5,580</td>
<td>84.2</td>
</tr>
<tr>
<td>Area</td>
<td>Cis-1,2-DCE</td>
<td>810</td>
<td>14.5</td>
<td>23,000</td>
<td>855</td>
</tr>
<tr>
<td></td>
<td>Vinyl Chloride</td>
<td>70</td>
<td>ND</td>
<td>4,470</td>
<td>20.5</td>
</tr>
</tbody>
</table>

‡ KDHE Tier 2 Levels for provided from KDHE’s RSK Manual, October 2010 and subsequent revisions.

µg/kg: micrograms per kilogram

Red bold font indicates concentration is above KDHE Tier 2 values
**Table 3 – Remedial Action Objectives – Cleanup Levels for Groundwater, Soil and Surface Water**

<table>
<thead>
<tr>
<th>Compound</th>
<th>MCL or KDHE Tier 2 Level Groundwater‡ (µg/L)</th>
<th>Active Treatment Goal for Groundwater* (µg/L)</th>
<th>KDHE Tier 2 Soil Pathway (µg/kg)</th>
<th>KDHE Tier 2 Soil to Groundwater Pathway (µg/kg)</th>
<th>Kansas Surface Water Quality Standard Domestic Use</th>
<th>Alternate Treatment Goal for Surface Water** (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCE</td>
<td>5</td>
<td>50</td>
<td>5,850</td>
<td>84.2</td>
<td>2.7</td>
<td>30</td>
</tr>
<tr>
<td>Cis-1,2-DCE</td>
<td>70</td>
<td>700</td>
<td>23,000</td>
<td>855</td>
<td>70</td>
<td>11,600</td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>2</td>
<td>20</td>
<td>4,470</td>
<td>20.5</td>
<td>2</td>
<td>20</td>
</tr>
</tbody>
</table>

‡ KDHE Tier 2 Levels default to MCLs where available. Tier 2 Level for groundwater provided from KDHE’s RSK Manual, October 2010 and subsequent revisions. Cleanup levels are applicable to impacts to groundwater attributable to an on-site source. Not applicable to impacts related to on-site migration from off-site contamination sources.

* Active Treatment Goal for groundwater will be used to determine the need for active versus passive remediation on-site. It does not preclude active remediation from occurring when the levels are obtained, and only applies when receptor management is continually conducted.

** Alternate Treatment Goal for surface water will be used if receptor management indicates the surface water body is not used for domestic purposes (i.e. drinking water/surface water intake) through receptor management. µg/kg: micrograms per kilogram
µg/L: micrograms per liter
## Table 4 – Summary of the Selected Alternative

<table>
<thead>
<tr>
<th>MEDIA OF INTEREST</th>
<th>Area</th>
<th>Selected Alternative</th>
<th>Present Value Cost</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Hangar 1</td>
<td>SVE, EUC, SWMP</td>
<td>$464,019</td>
<td>Expanded SVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SVE, ISCO, EUC</td>
<td></td>
<td>Expanded ISCO, and SVE</td>
</tr>
<tr>
<td>Source Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>Hangar 4</td>
<td>SVE, EUC, SWMP</td>
<td>$785,522</td>
<td>Expanded SVE, DPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SVE, ISCO, EUC</td>
<td></td>
<td>Targeted ISCO</td>
</tr>
<tr>
<td>Source Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>Potential Burial Area</td>
<td>SWMP, EUC</td>
<td>$202,651</td>
<td>Targeted ISCO</td>
</tr>
<tr>
<td>Source Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-Site</td>
<td>Off-site Groundwater</td>
<td>Long-Term Monitoring and Receptor Management</td>
<td>$1,601,144</td>
<td>Targeted ISCO</td>
</tr>
<tr>
<td>Groundwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$3,053,336</strong></td>
<td></td>
</tr>
</tbody>
</table>

*SVE: Soil Vapor Extraction  
EUC: Environmental Use Control  
SWMP: Soil Waste Management Plan  
ISCO: In-Situ Chemical Oxidation  
DPE: Dual Phase Extraction*
Figures
Towanda Water Bearing Unit
ISO-Contour Map
First Half 2020

FIGURE: 4B

SA

LEGEND

Monitoring Well Sampling and Gauging Location
Monitoring Well Gauging Location
Monitoring Well Dry, Not Gauged or Sampled
Data Anomalous or Outside Lab Accuracy Range
TCE Concentration (µg/L)
TCE Isoconcentration Contours (µg/L)
(dashed where inferred)
State Highways
County Roads
Rivers
City Limits

0 2,500 5,000 Feet
1" = 2500'
Offsite Groundwater - Preferred Remedy is long-term groundwater monitoring and receptor management.

Hangar 1 - Preferred Remedy is ISCO for groundwater, SVE for soil and Environmental Use Covenant

Hangar 4 - Preferred Remedy is ISCO for groundwater, SVE for soil and Environmental Use Covenant

Potential Burial Area - Preferred Remedy is ISCO for groundwater and Environmental Use Covenant