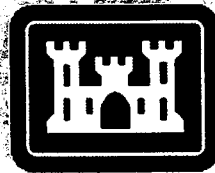


Draft Final
Proposed Plan
for the
Dry Cleaning Facilities Area
(Operable Unit 003)
at
Main Post
Fort Riley, Kansas

October 11, 2007

Prepared for



US Army Corps Of Engineers
Kansas City District

Prepared by



Contract Number: W912DQ-05-0050
Project Number: 43582



DCF_6_1_002

Draft Final Proposed Plan 2007 Dry Cleaning Facilities, Main Post Fort Riley, Kansas

UNITED STATES DEPARTMENT OF THE ARMY ANNOUNCES PROPOSED PLAN

This Proposed Plan, part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process (Figure 1), identifies the preferred alternatives for remediating the contaminated groundwater in the Kansas River alluvium associated with the Dry Cleaning Facilities Study Area, Main Post, Fort Riley, Kansas (Site); and provides the rationale for these preferences. In addition, this Plan includes summaries of other cleanup alternatives evaluated for use at this Site. This document is issued by the United States Department of the Army (Army), the lead agency for Site activities, in consultation with the United States Environmental Protection Agency, Region VII (EPA), and the Kansas Department of Health and Environment (KDHE), the support agencies. The final remedy will be selected for the Site after reviewing and considering all information submitted during the 30-day public comment period on the Proposed Plan (see right). Based on new information or public comments, the Army, in conjunction with the EPA and the KDHE, may modify the preferred alternatives or select other response actions. Therefore, the public is encouraged to review and comment on the alternatives presented in this Proposed Plan.

Dates to Remember:

Public Comment Period: (October 21 through November 22, 2007)
The Army will accept written comments on the Proposed Plan during the public comment period.

Public Meeting: (October 30, 2007) The Army will hold a public meeting to explain the Proposed Plan and the alternatives presented in the Feasibility Study Addendum (FSA). Oral and written comments will also be accepted at the meeting. The meeting will be held at 407 Pershing Court, Fort Riley, Kansas at 7 p.m. in conjunction with the Restoration Advisory Board.

Copies of the Remedial Investigation Addendum (RIA) and FSA reports and Proposed Plan are available for viewing at the following locations:

Dorothy Bramlage Public Library
230 West Seventh Street, Junction City, Kansas, 66441
(785) 238-4311

Hours: Mon - Thurs 9 a.m. - 9 p.m.
Fri 9 a.m. - 6 p.m.
Sat 9 a.m. - 5 p.m.
Sun 1 p.m. - 5 p.m.

Manhattan Public Library
629 Poyntz Avenue, Manhattan, Kansas 66502
(785) 776-4741

Hours: Mon - Thurs 9 a.m. - 9 p.m.
Fri 9 a.m. - 8 p.m.
Sat 9 a.m. - 6 p.m.
Sun 1 p.m. - 6 p.m.

The Administrative Record can be viewed at:

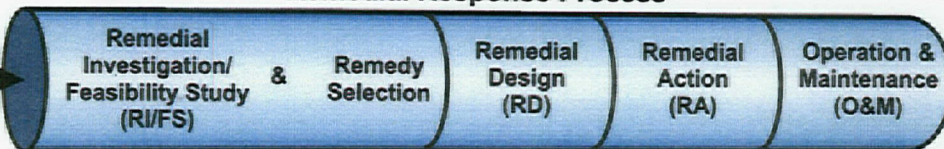
Directorate of Public Works
Environmental Division, IMNW-RLY-PWE
407 Pershing Court
Fort Riley, Kansas 66442-6016
(785) 239-8619
Hours: Mon - Fri 9 a.m. - 4 p.m.

**Figure 1
The CERCLA Process**

Pre-Remedial Response Process

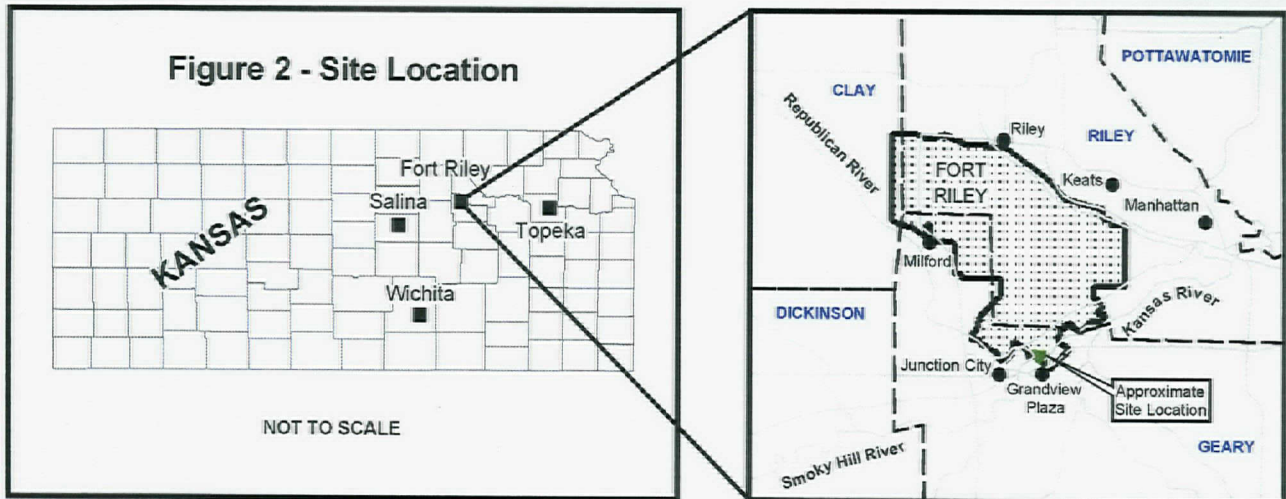
- Preliminary Assessment
- Site Inspection
- Placement on National Priorities List

Remedial Response Process



Proposed
Plan

Record of
Decision
(ROD)

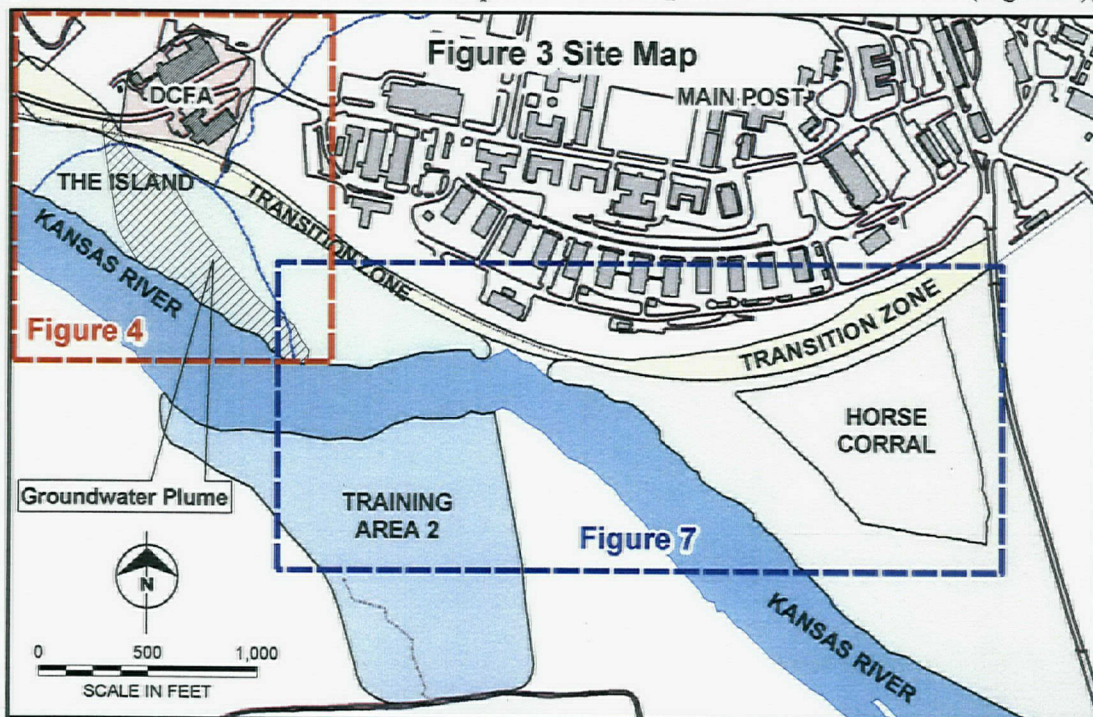


The Army is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the CERCLA of 1980 §117(a). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation Addendum (RIA) and the Feasibility Study Addendum (FSA), and other documents contained in the Administrative Record for this Site. The Pilot Study (PS) Report for this Site will be issued prior to the end of 2007 and will present in detail the results of remedial activities performed at the site that were based on the approved Pilot Study Work Plan which was designed to evaluate the effectiveness of technologies considered in the FSA. The PS report

will include the remedial activities performed at the site, the results of the baseline sampling, and the results of the post performance monitoring. The Army encourages the public to review these documents to gain a more comprehensive understanding of the Site and of the investigation and remedial activities that have been conducted at the Site.

SITE SETTING AND HISTORY

Fort Riley is located along the Republican and Kansas Rivers in Clay, Geary, and Riley Counties (Figure 2). The Site is located in the southwest portion of the Main Post cantonment area in the southern region of Fort Riley. The Site consists of five separate but related areas (Figure 3), the Dry



Cleaning Facilities Area (DCFA) (where two former dry cleaners were located), the Transition Zone (a change in soil type located between DCFA and the Island), the Island (a point bar south of DCFA next to the Kansas River), the Horse Corral (east of the Island where horses are trained), and Training Area 2 (located south of the River where the Army holds field exercises). Details within the dashed areas are shown on Figure 4 and Figure 7.

Dry cleaning operations were conducted at former Buildings 180/181 and 183 (Figure 4). Former Buildings 180/181 operated as a laundry facility from 1915 to 1983 and as a dry cleaning facility from 1930 to 1983. From 1983 until 2000, former Buildings 180/181 were used for general storage. Former Building 183 was initially used as a laundry facility from construction in 1941 until 2002, and as a dry cleaning facility from 1983 to 2002. The site currently consists of 3 Areas of Concern (AOC). Soil is the medium of concern in AOC 1 and groundwater is the medium of concern in AOC2 and AOC 3.

Stoddard solvent, a petroleum distillate mixture, was used as the dry cleaning solution from 1944

until 1966. From 1966 until dry cleaning operations ceased, tetrachloroethene (PCE) was used as the cleaning solution. Buildings 180/181 and the surrounding structure, parking lots, and sidewalks were demolished in summer 2000. Building 183 and the surrounding structures were demolished in fall 2002. The locations where these buildings once stood are now empty, grassy lots.

On July 14, 1989, the EPA proposed inclusion of Fort Riley on the National Priorities List (NPL) pursuant to CERCLA. The EPA included Fort Riley on the NPL in August 1990. Effective June 1991, the Army entered into a Federal Facility Agreement (FFA), Docket No. VII 90-F-0015, with the EPA and KDHE to address environmental pollution subject to the Resource Conservation and Recovery Act (RCRA) and/or CERCLA. In 1993, the Army began a Remedial Investigation /Feasibility Study to identify the types, quantities, and locations of the contaminants at this Site and to develop a plan to address the contamination. The EPA and KDHE approved the RIA and the FSA Reports for this Site in 2004 and 2005, respectively.

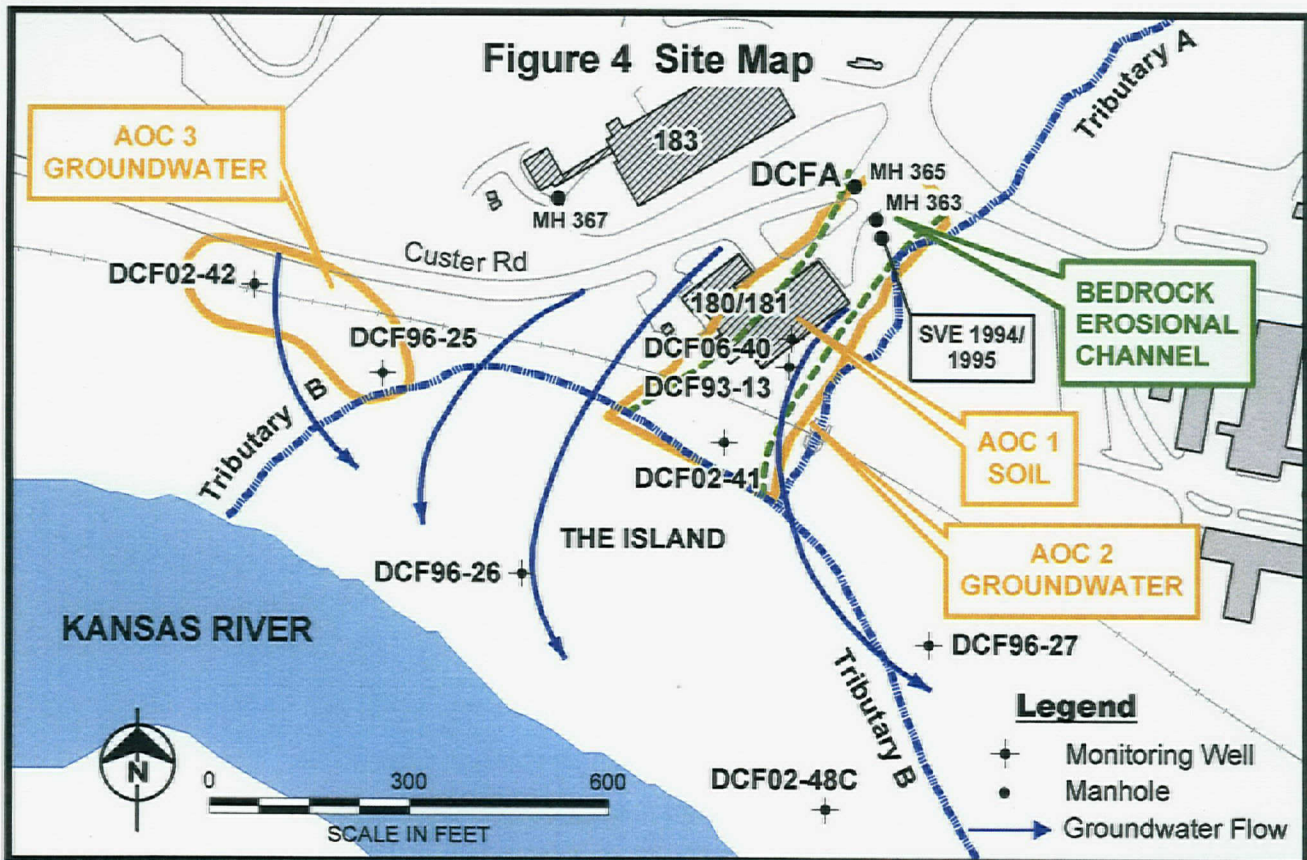
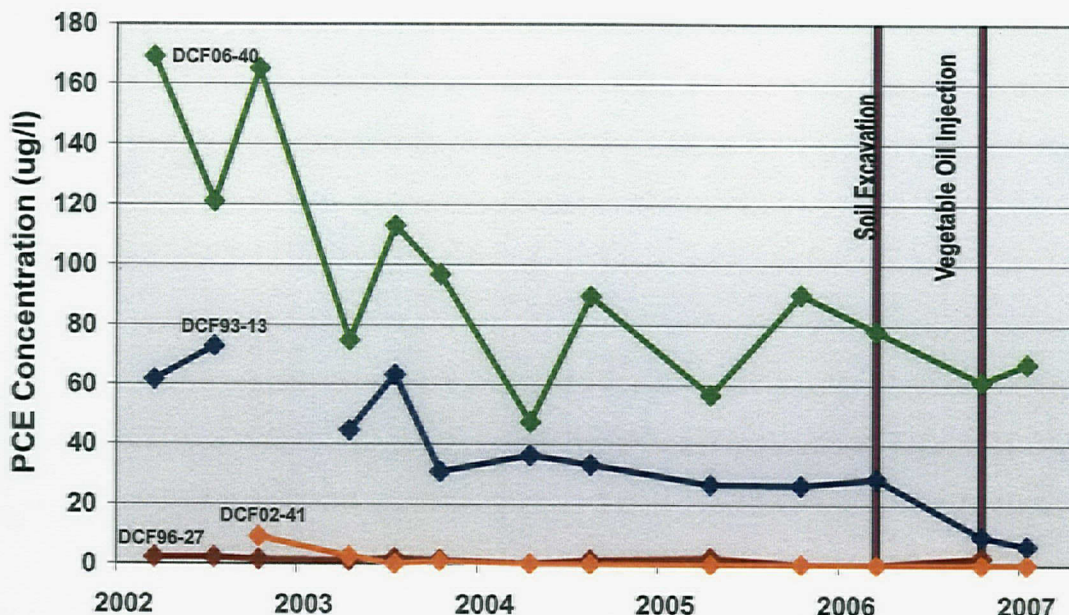


Figure 5
Post-Pilot Study PCE Trends at AOCs 1 and 2



RESPONSE ACTIONS

Several source removal actions were conducted at the Site. The first source removal action was a soil vapor extraction pilot test study performed at the DCFA from November 1994 through April 1995 and addressed contaminated soil above the water table near MH 363. This remediation effort was successful in removing from the soil an estimated 24 pounds of contaminants, primarily PCE.

In November and December 2005, Fort Riley conducted a soil source removal pilot study at AOC 1 (Figure 4). Two other pilot studies were conducted at AOC 2 and AOC 3 in 2006. The preferred remedial alternatives developed for the three AOCs in the FSA were performed during the PS. Soil was treated at AOC 1 and groundwater was treated at AOC 2 and AOC 3. A brief summary of the pilot studies are presented below.

AOC 1 (Figure 4)

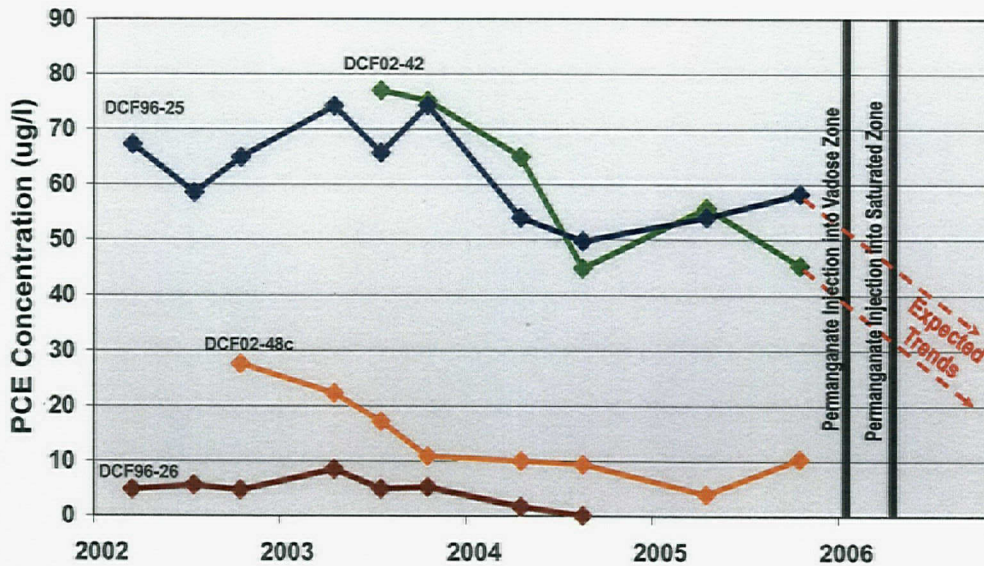
In November and December of 2005, shallow soil was excavated to a depth of 8 to 12 feet and was transported to an on-post treatment cell. The soil was treated at the treatment cell during spring 2006. Soil was excavated from two areas at or near the former Building 180 footprint. Approximately 2,400 cubic yards of soil were removed for treatment. Soil samples were collected from the excavations to confirm that the soil remaining was

below the KDHE Residential Risk-Based Value (RSK) levels of 180 micrograms per kilograms. The excavations were backfilled with clean, high-clay content soil. Soil around selected abandoned-in-place sewer lines and Manholes 363 and 367 were also excavated. Soil samples were collected from the sewer line backfill and analyzed for PCE, trichloroethene (TCE), and *cis*-1,2-dichloroethene (*cis*-1,2-DCE), which are breakdown products of PCE. No soil sample concentrations greater than the KDHE RSK levels were found within the manhole and sewer line excavations. A total of 3,692 gallons of 10% sodium permanganate solution (a chemical oxidant) was injected into the sewer lines associated with Manholes 367 and 365, at the base of Manhole 363, in the sewer line trench between Manhole 365 and 363, and in the abandoned high-pressure gas line trench. The sodium permanganate was added to destroy through oxidation any remaining chlorinated hydrocarbons. Groundwater sampling in fall 2006 of monitoring wells in the area of AOC 1 indicated a decrease in the levels of chlorinated hydrocarbons present (Figure 5).

AOC 2 (Figure 4)

In May of 2006, CAP 18™ (basically a vegetable oil product) was injected into the groundwater portion of AOC 2. This area includes a bedrock

Figure 6
Post-Pilot Study PCE Trends at AOC 3



erosional channel. The vegetable oil was injected to provide a nutrient source for naturally occurring microbial breakdown of PCE and associated breakdown products that are occurring in this area. Approximately 8,200 pounds of vegetable oil were injected through 72 injection locations using direct-push technology. Groundwater results from monitoring wells in the bedrock erosional channel (Figure 5) indicate that CAP 18 has enhanced the natural degradation causing a decrease in the PCE concentrations downgradient of Monitoring Well DCF06-40 and DCF 93-13. For example, the PCE concentration results for wells DCF02-41 and DCF96-27, located downgradient of the injection area, were less than 1.1 micrograms per Liter each,

respectively during the fall 2006 groundwater sampling event. Pre-injection results versus post-injection results for wells DCF06-40 and DCF93-13 located within the EAB injection zone, showed that for well DCF06-40 PCE decreased from 80.2 to 61.2 micrograms per Liter and for DCF93-13, PCE decreased from 26.5 to 9.6 micrograms per Liter. For the first time at DCF06-40, cis-1,2-DCE, a breakdown product of PCE, was detected during post-treatment sampling. For well 93-13, TCE decreased from 20.6 to 1.4 micrograms per Liter.

AOC 3 (Figure 4)

In January and February of 2006, an aqueous solution of sodium permanganate was injected into a 375 square foot area of the soil zone above the water

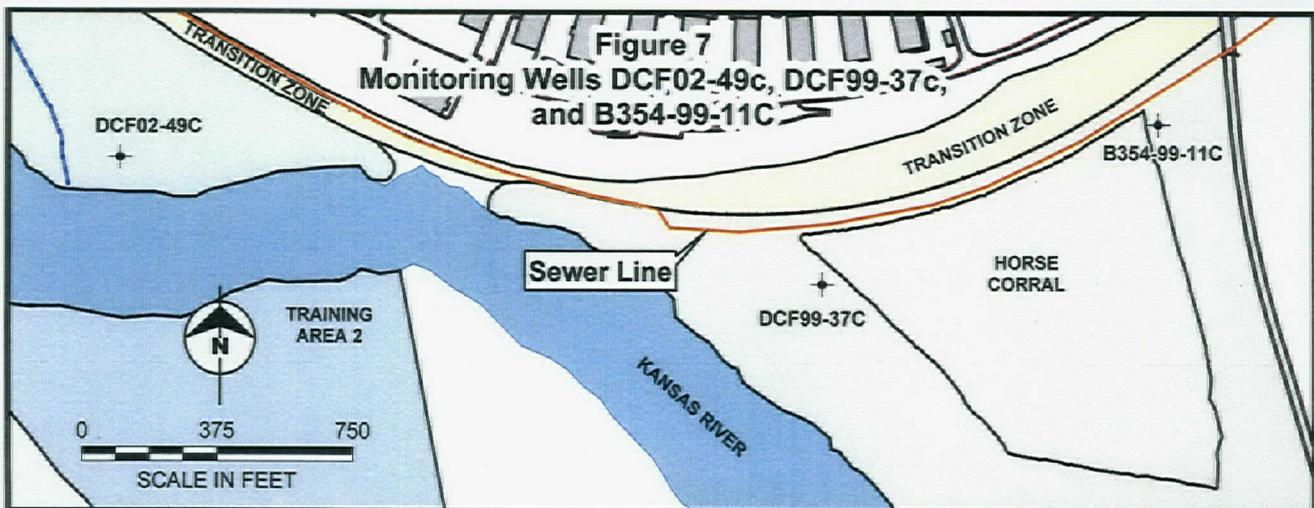


table located near Monitoring Well DCF02-42. 7,400 pounds of sodium permanganate was injected at 23 locations to reduce potential contamination present in this area near Monitoring Well DCF02-42. This was a potential source area for the groundwater contamination near Monitoring Wells DCF02-42 and DCF96-25. In April and May of 2006, a pilot study involving the chemical injection of potassium permanganate into the groundwater between Monitoring Wells DCF02-42 and DCF96-25 was conducted. Potassium permanganate destroys contaminants through oxidation. 21,755 pounds of potassium permanganate were injected into this area through 44 injection locations using direct-push technology. The potassium permanganate was emplaced throughout the zone below the water table between these two wells. Monitoring of the groundwater within the area treated indicates that potassium permanganate still remains in the wells. Following completion of treatment, the PCE concentrations for Monitoring Wells DCF06-25 and DCF02-42 are expected to decrease (Figure 6).

Additional Areas (Figure 7)

There were three additional areas addressed during

the pilot study that were not included as remedial alternatives in the FSA. These areas were addressed as part of Fort Riley's on-going commitment in regards to environmental concerns. The first area was upgradient of Monitoring Well DCF02-49c, which is located at the toe of the main groundwater plume. The second and third areas were upgradient of wells DCF99-37 and B654-11, which were located adjacent to an abandoned sanitary sewer line. In September of 2006, CAP18™ was injected in these three areas (Figure 7). Approximately 5,530 pounds of vegetable oil were injected through 37 injection points.

SITE CHARACTERISTICS

The major findings of the RIA and FSA Reports are listed below. Figure 8 is a general model of the Site.

- Soil concentrations of PCE above the KDHE RSKs for Kansas were detected at two shallow soil source areas to a maximum depth of 12 feet at AOC 1 (Figure 4). These soil sources were removed during the PS and soil (AOC 1) is no longer a concern.

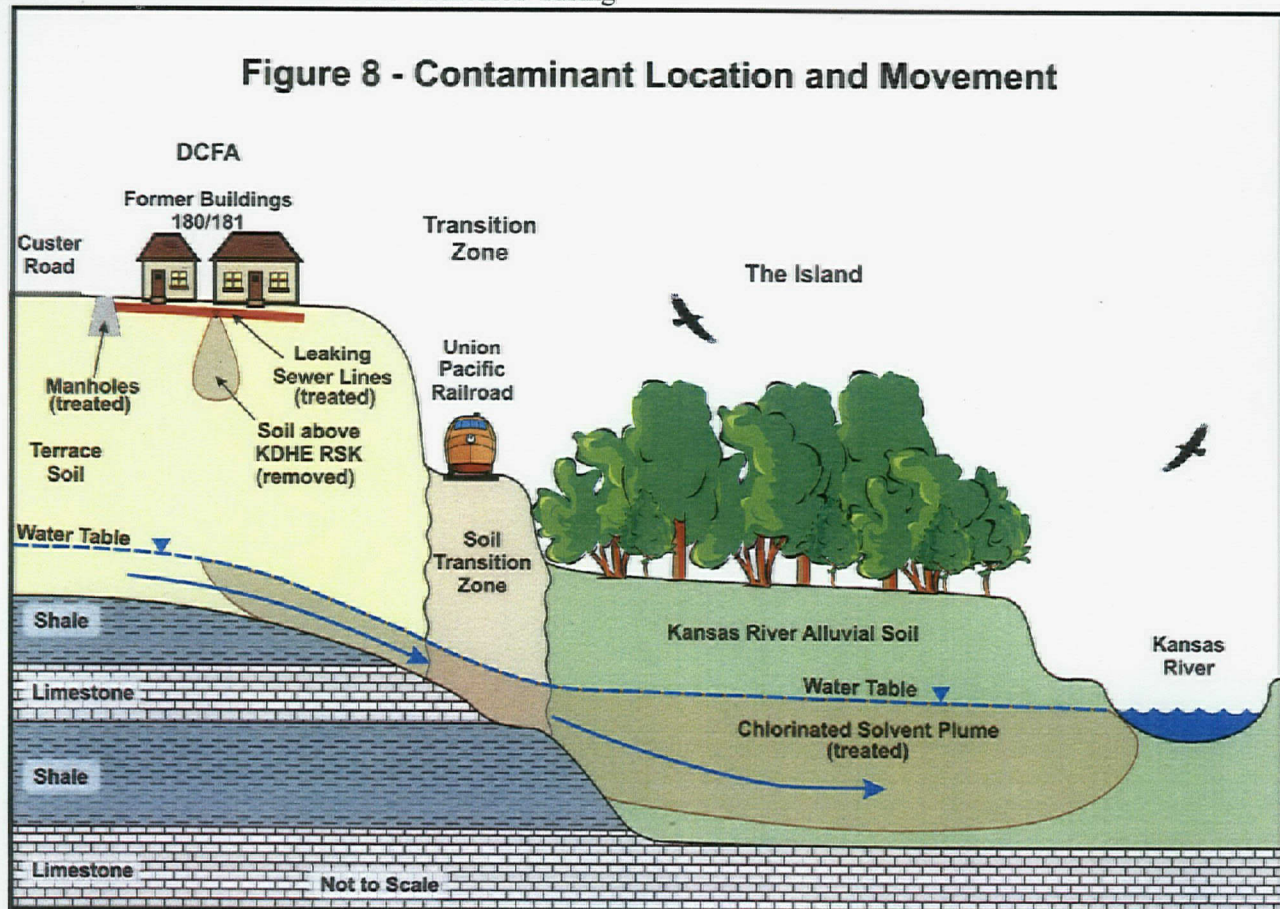
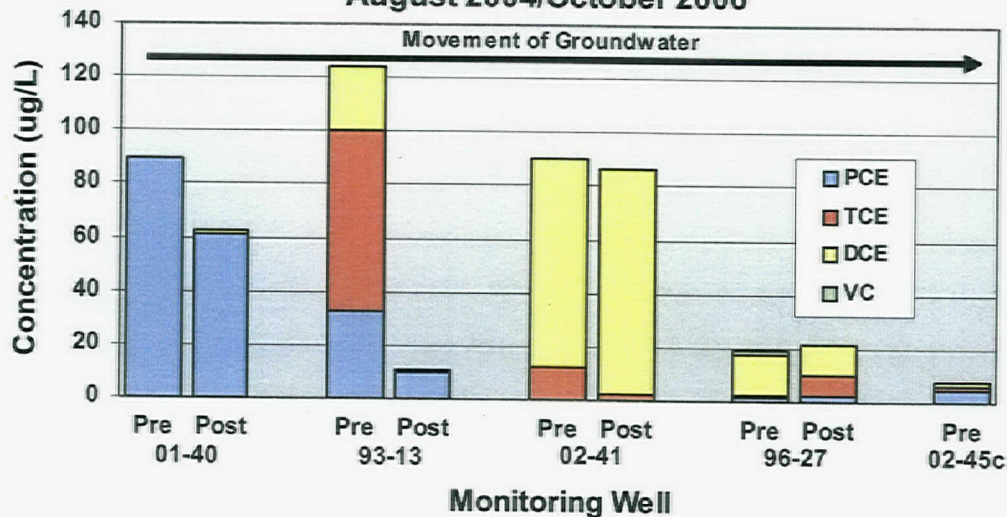


Figure 9
AOC 2 Pre-Treatment/Post-Treatment Comparison
August 2004/October 2006



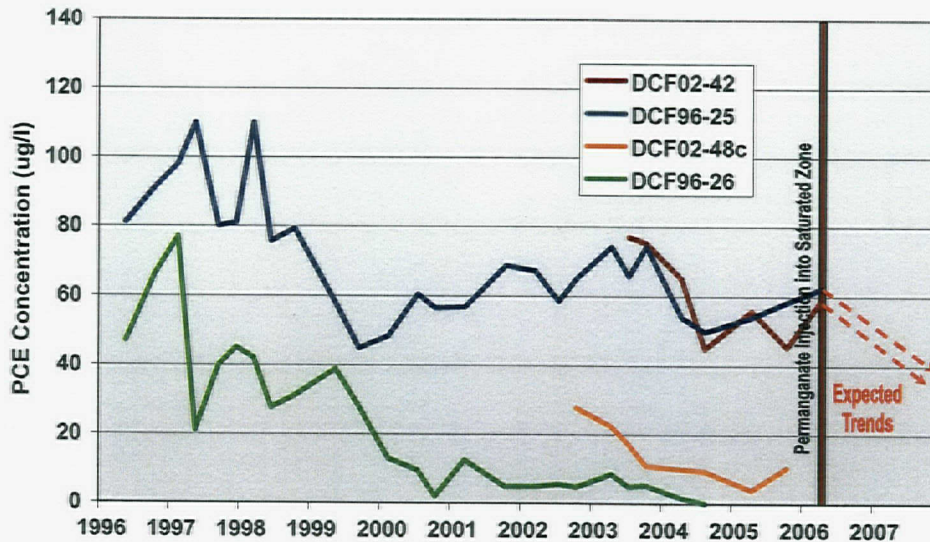
- Groundwater (AOCs 2 & 3) is a medium of concern at this Site, with PCE, TCE, *cis*-1,2-DCE, and vinyl chloride (VC) the chemicals of potential concern (COPCs). TCE, *cis*-1,2-DCE, and VC are the degradation products of the PCE that leaked from broken and cracked sanitary sewer lines. The groundwater contamination at the Site extends from the DCFA to the Kansas River and generally sinks with distance from the DCFA (Figure 8). Analytical samples collected from the Kansas River were nondetect for the COPCs.
- At AOC 2, groundwater contamination is naturally reduced upon entering the Kansas River alluvium (Figure 9). In 2006, injection of vegetable oil into the saturated zone of AOC 2 has further stimulated degradation of the chlorinated hydrocarbons. As shown on the chart in Figure 9, the levels of PCE, TCE, and *cis*-1,2-DCE in Monitoring Well DCF93-13, a well within the EAB treatment area, have dramatically reduced following treatment. Because natural attenuation and the vegetable oil treatment are degrading the COPCs to levels below the MCLs as the plume travels through the Kansas River alluvium, groundwater in AOC 2 is no longer a medium of concern but monitoring will continue as part of the monitoring well network.
- At AOC 3, in January 2006 as part of the PS, the vadose zone around Monitoring Well

DCF02-42 was injected with sodium permanganate to destroy any potential contamination that might be present in the soil. In May 2006, as part of the PS, the saturated zone between Monitoring Wells DCF02-42 and DCF96-25 was injected with potassium permanganate to decrease the amount of chlorinated hydrocarbons present in this area. Figure 10 shows the expected decreasing trends for PCE in groundwater at AOC 3. Current analytical results for DCF02-42 and DCF06-40 cannot be assessed at this time because these wells still contain potassium permanganate. Because natural attenuation is not degrading COPC to levels below the MCL in alluvial groundwater at AOC 3, and the groundwater pilot study has not been completed, groundwater in AOC 3 is a medium of concern, but is not considered a principal threat (see below).

What is a Principal Threat?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The principal threat concept is applied to the characterization of source materials at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be source material.

Figure 10
Decreasing PCE Trends at AOC 3



- In September 2006, vegetable oil was injected into three additional areas with contaminant levels slightly above maximum contaminant levels (MCLs) and limited extent and include the PCE contamination at DCF99-49c, DCF99-37c and B354-99-11c (Figure 7). All three areas have low human health and ecological risks associated with them.
- An additional area of limited extent with contaminant levels slightly above an MCL is located at DCF93-19. This well has intermittent concentrations of vinyl chloride above the MCL of 2 micrograms per Liter. The groundwater result for this well in fall 2006 showed 2.7 micrograms per liter. The only other COPC detected at this well is cis-1,2-DCE at 4.3 micrograms per liter. Based on these low concentrations, limited area of contamination, and the lack of contamination entering the alluvial aquifer, no remedial action is planned for this area.

SCOPE AND ROLE OF THE ACTION

The engineered remedial response action that was implemented during the PS for groundwater in AOC 3 is expected to be the final action for AOC 3. The objective for AOC 3 is to prevent unacceptable exposures to contaminated groundwater underlying this AOC.

SUMMARY OF SITE RISKS

As part of the RIA/FSA, the Army conducted a baseline risk assessment to determine the current and possible future effects of contaminants on human health and the environment. The Site is currently classified and will be classified in the future as an Open Area in the Fort's Real Property Master Plan. Open Areas have building restrictions and are used for safety areas, utility clearances and easements, conservation areas, and buffer zones. The baseline risk assessment at this Site consisted of a human health risk assessment and an ecological risk assessment. The baseline risk assessment was conducted using data that was obtained prior the PS. During the PS, soil with contaminant levels above RSK levels was removed from the Site and the three highest areas of groundwater contamination were treated; therefore, the baseline risk assessment can now be considered a very conservative estimate of risk at the site.

Human Health Risks

The human health risk assessment focused on health effects for on-post populations through direct contact with surface soil, subsurface soil, and sediment pore water in the Kansas River; and through inhalation of dust and chemical vapors from soil or groundwater exposure pathways. The on-post populations (those within the Fort Riley Army Reservation) characterized for the risk assessment

What is Risk and How is it Calculated?

A CERCLA human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a CERCLA site, EPA identifies a four-step process:

- Step 1: Identify Chemicals of Potential Concern
- Step 2: Estimate Exposure
- Step 3: Assess Potential Health Effects
- Step 4: Characterize Site Risk

In Step 1, the risk assessor compiles all the chemical data for a site to identify what chemicals are detected in each medium (i.e. soil and groundwater). Chemicals that are detected frequently at high concentrations, or are considered highly toxic, are considered "chemicals of potential concern" (COPCs) and are evaluated in the risk assessment.

In Step 2, the risk assessor considers the different ways that people might be exposed to the COPCs identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of those exposures through ingestion, inhalation, or dermal contact. The risk assessor uses this information to calculate a "reasonable maximum exposure" (RME) scenario representing the highest level of human exposure that could reasonably be expected to occur.

In Step 3, the risk assessor compiles toxicity information on each COPC, including numeric values for assessing potential risks. The EPA maintains the primary database used to obtain toxicity information for both cancer and other noncancer adverse health effects.

In Step 4, the risk assessor uses the exposure information from Step 2 and toxicity information from Step 3 to calculate potential cancer and noncancer health risks. The results are compared to the EPA acceptable levels of risk to determine whether site risks are great enough to potentially cause health problems for populations at or near the CERCLA site. The likelihood of any kind of cancer resulting from a site is generally expressed as an upper bound probability; for example, "1 in 10,000 chance" or expressed exponentially as 1×10^{-4} . In other words, one extra cancer may result for every 10,000 people exposed to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected from all other causes. For noncancer health effects, the risk assessor calculates a "hazard index" (HI). If the HI is less than the "threshold level" (or index of one) then adverse health effects are not predicted.

included groundskeeper, utility worker, and youth trespasser scenarios.

The total excess lifetime cancer risks for the on-post populations were:

- Groundskeeper - 6.0×10^{-11} ,
- Utility Worker - 2.0×10^{-10} , and
- Youth Trespasser - 2.0×10^{-08} .

All of these are **below the EPA's generally acceptable risk range** of up to 1.0×10^{-04} to 1.0×10^{-06} (or 1 in 10,000 to one in a million) which denotes risk at the site is noncancer in nature.

In the event that chemical concentrations and/or land use at the Site change in a manner that could result in a greater exposure potential than that evaluated in the RIA Report, the Army will conduct a comprehensive review of all factors related to the potential risk to ensure adequate protection of human receptors at the Site into the future.

Ecological Risks

The Site was evaluated for the presence of ecological receptors (plants, animals, and aquatic organisms) and completed ecological exposure pathways in surface soils, subsurface soils, and groundwater. Potentially completed exposure pathways were identified at the Site, and these pathways were evaluated. Representative terrestrial receptors were assessed semi-quantitatively. Based on the results of the semi-quantitative and qualitative evaluations of soil contaminants, **ecological risk is minimal** to terrestrial flora and fauna inhabiting the Site.

Potential for risk to aquatic organisms inhabiting the Kansas River was assessed semi-quantitatively. Current volatile organic compound concentration conditions within the river sediment are unlikely to pose appreciable risk to aquatic organisms in the Kansas River. Critical habitat for the bald eagle, piping plover, and interior least tern occurs along the Kansas River. There is **minimal ecological risk to these species** at the Site.

In the event that conditions at the Site change in a manner that could result in a greater exposure potential than that evaluated in the RIA Report, ecological risk will be reviewed to ensure adequate protection of ecological receptors at the Site into the future.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are the cleanup objectives for protection of human health and the environment. The RAOs for AOC 3 at this Site are:

- Prevent further degradation of groundwater in the Kansas River alluvium and off-site migration in groundwater of COPCs that exceed cleanup goals.
- Achieve cleanup goals of MCLs for COPCs in groundwater in the Kansas River alluvium.

Based on current and potential future use, one beneficial use of groundwater at this Site could be as a drinking water source. There are two chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) for the groundwater at this site. First, the Anti-Degradation Policy of the Kansas Water Pollution Control Act requires that the existing water quality of surface waters (including the alluvial ground water) be maintained and protected. Second, the Safe Drinking Water Act and its associated MCLs apply to the alluvial groundwater.

The Preliminary Remediation Goals for alluvial groundwater are established at levels equivalent to the MCLs set by the Safe Drinking Water Act which are presented below:

- PCE - 5 micrograms per liter ($\mu\text{g/L}$)
- TCE - 5 $\mu\text{g/L}$
- *cis*-1,2-DCE - 70 $\mu\text{g/L}$
- VC - 2 $\mu\text{g/L}$

SUMMARY OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

Common Elements

Many of the alternatives evaluated for this Site have common components, including institutional controls. Since the Army owns the site, institutional controls rather than land use controls will be used to manage activities at this Site and will include the DCFA area outlined as shown on Figure 3. Further institutional control considerations will be provided in the Remedial Design/Remedial Action Plan, but the Fort Riley Real Property Master Plan will contain the details.

The Real Property Master Plan is the comprehensive installation planning document focused on the orderly development of Fort Riley. It defines the direction for development, how it will be achieved, and what planning efforts are needed. This plan designates Installation Restoration Program areas of influence and specifies the institutional controls associated with each site. Coordination with the Installation Restoration Program is required prior to any action within an IRP area of influence.

The purpose of institutional controls at this Site is to limit exposure to contaminants in the groundwater.

This will control the drilling and use of water wells for domestic or other purposes until the concentrations of hazardous substances in the alluvial aquifer are at such levels to allow for unrestricted use and exposure.

Although it is highly unlikely in the foreseeable future that Fort Riley would be closed or the DCFA site excised and transferred to a private owner, environmental oversight would be transferred from Fort Riley to the Department of Defense's Base Realignment and Closure program. This program would ensure that the institutional controls will be carried over to the appropriate land use controls.

During development of the FSA, the following alternatives and total project cost were evaluated at each AOC:

AOC 1

- No Action (\$612,000)
- Excavation and landfarming at existing treatment cell (\$309,000)
- Excavation and landfarming at a new treatment cell (\$334,500)
- Excavation with offsite incineration (\$1,847,880)

AOC 2

- No Action (\$612,000)
- Enhanced anaerobic bioremediation (EAB), monitored natural attenuation (MNA), and institutional controls (\$2,548,550)
- Chemical oxidation, MNA, and IC (\$2,750,120)

AOC 3

- No Action (\$612,000)
- EAB, MNA, and IC in groundwater (\$2,544,230)
- Chemical oxidation, MNA, and institutional controls (\$2,750,120)

Following completion and acceptance of the FSA, a PS was conducted at each AOC using the remedial alternatives considered in the FSA for each AOC. The following alternatives were implemented based on effectiveness, implementability, site specific characteristics which included shallow depth of contaminated soil above action levels (AOC 1), presence of natural attenuation in groundwater (AOC 2), soil type amenable to chemical oxidation

(AOC 3), and cost. The remedial alternatives selected for each AOC included the following:

AOC 1

- Soil excavation and landfarming
- Chemical oxidation of vadose zone soils
- Chemical oxidation of utility corridors

AOC 2

- EAB application in groundwater

AOC 3

- Vadose zone chemical oxidation
- Chemical oxidation in groundwater
- EAB application in groundwater

As the PS was successful in removing the relative hotspots in the soil at AOC 1 and groundwater at AOC 2, remedial alternatives for the Site will only need to address the remaining contamination present in the groundwater at AOC 3. Because the groundwater hot spots in AOC 3 were treated during the pilot study with chemical oxidation and EAB, the remaining remedial alternatives considered for AOC 3 are summarized below.

Alternative 1 - No Further Action

CERCLA generally requires that the "no action" alternative be evaluated to establish a baseline for comparison with the other alternatives considered. Under this alternative, the Army would take no further action at the Site to prevent exposure to the groundwater contamination.

Alternative 2 - Monitored Natural Attenuation (MNA) with Institutional Controls

With the exception of the No Action Alternative, each of the remedial alternatives presented in the FSA for each AOC, including AOC 3, has MNA in addition to institutional controls. Because the engineered portion of each alternative selected for AOC 3 has already been conducted during the PS, MNA with institutional controls is the only portion of the remedial alternatives presented in the FSA that remains to be implemented. Natural attenuation refers to naturally-occurring processes in soil and groundwater environments that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in those media. These processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of

contaminants. Microorganisms play a significant role in the degradation and destruction of toxic compounds. MNA refers to the periodic sampling and monitoring of geochemical and contaminant conditions at a site to verify that natural attenuation is ongoing. Although engineered remediation was conducted as part of the PS, there are still some areas where contaminant levels in groundwater remain above cleanup goals. However, it is anticipated contaminant levels will continue to decrease due to naturally occurring MNA processes combined with the completed engineered remediation; and that eventually the RAOs will be achieved through MNA.

Institutional and other controls would be used with MNA to limit exposure to contaminants in the groundwater. Institutional controls at this Site will likely consist of restrictions written into the Fort Riley Real Property Master Plan to restrict the installation or use of water wells for domestic or other purposes. Other controls, including community awareness and groundwater monitoring, are also components of this alternative. Groundwater monitoring provides information that can be used to identify if additional protection for human health and the environment is needed; and, if so, how and where to implement that protection.

EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the two remaining alternatives individually and against each other in order to select a remedy for the Site. This section of the Proposed Plan evaluates the relative performance of each alternative against the nine criteria. Two of the criteria (Overall Protection of Human Health and the Environment and Compliance with ARARs) are threshold criteria. These two criteria must be met for an alternative to be considered acceptable. The next five criteria - Long-term Effectiveness and Permanence; Reduction of Toxicity, Mobility or Volume; Short-term Effectiveness; Implementability; and Cost - are used to identify the best alternative. The last two criteria - State/Support Agency Acceptance and Community Acceptance - are fully assessed based on comments received on this Proposed Plan and are addressed in the Record of Decision (ROD).

Overall Protection of Human Health and the Environment

Based on the baseline risk assessments (human health and ecological) reported in the RIA, both alternatives are protective of human health and the environment because the **risk estimates for current and future scenarios do not exceed the EPA accepted risk levels.**

Evaluation Criteria for CERCLA Remedial Alternatives

Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Cost includes estimated capital, periodic, and annual operations and maintenance (O&M) costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

State/Support Agency Acceptance considers whether the State agrees with the Army's analyses and recommendations, as described in the RIA/FSA and Proposed Plan.

Community Acceptance considers whether the local community agrees with Army's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Compliance with ARARs and State Guidelines

Alternative 1 does not comply with the Anti-degradation Policy or the MCL ARARs. This alternative does not provide for groundwater monitoring to document whether further degradation is or is not occurring. Therefore, Alternative 1 is

dropped from further consideration because it does not meet the threshold criterion. Alternative 2 – MNA does comply with this criterion.

Long-Term Effectiveness and Permanence

Since there is no remaining source at the Site, Alternative 2 – MNA is anticipated to be able to provide long term effectiveness and permanence at the Site.

Reduction of Toxicity, Mobility, and Volume

Natural attenuation within the aquifer in combination with the engineered remediation already conducted at AOC 3 will reduce the concentrations of contaminants. Monitoring of the natural attenuation will be conducted to ensure that natural attenuation is adequately reducing contaminants at the Site. Institutional controls are anticipated to be in place to limit or prevent exposure to contaminated groundwater.

Short-Term Effectiveness

Alternative 2 – MNA relies on natural processes to remediate contaminants in groundwater and can require many years of monitoring before the Site reaches RAOs. This alternative will have low impact on the Site, with low risk to on-Site workers and has been demonstrated to be actively occurring at the Site. The inclusion of a groundwater monitoring program and institutional controls address short-term reliability of MNA to reach the RAOs. Institutional controls will also address potential receptors during MNA by limiting or preventing exposure to contaminated groundwater.

Implementability

The implementation of Alternative 2 – MNA would include the monitoring of the Site for natural attenuation through selective monitoring well sampling. This is currently ongoing at the Site. Institutional controls would be implemented through the Real Property Master Plan.

Cost Evaluation

The **Total Cost** for MNA, assuming that monitoring is required to be conducted for 20 years at 22 wells on a semiannual basis with semiannual reports on the MNA, 5-year review reports, and a final closure report, is \$2,120,000 with a **Total Present Value Project Cost** of \$1,540,000 (based on a 30-year

treasury bill using a 3.2% discount rate). This cost would be reduced if monitoring was only conducted annually, if the number of wells to be monitored was reduced, or if the RAOs were met sooner.

State/Support Agency Acceptance

Based upon prior regulatory agency approval of the RIA and the FSA, the EPA and KDHE support the Preferred Alternative presented for this Site. Final discussion of state and support agency acceptance will be presented in the ROD.

Community Acceptance

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be addressed in the ROD for the Site.

SUMMARY OF THE PREFERRED ALTERNATIVE

The Preferred Alternative for remediation of the groundwater contamination at AOC 3 is Alternative 2 – MNA with Institutional Controls. This alternative relies on engineered remedial processes already performed as well as natural degradation, dispersion, and dilution processes already occurring at the Site to further reduce the contaminants to levels below the MCLs. With this alternative, groundwater at the Site will be sampled annually for three years in 2008, 2009, and 2010, followed by 5-Year Review Sampling. This will monitor progress of the natural attenuation. Additionally institutional controls will remain in place and be enforced to prevent exposure of receptors.

COMMUNITY PARTICIPATION

The public comment period begins on October 14, 2007, and ends on November 13, 2007. The purpose of the public comment period is to offer members of the public an opportunity to provide their views on the Proposed Plan and the Preferred Alternative to Army, EPA, and KDHE. The Army, EPA, and KDHE provide information regarding the cleanup of this Site to the public through public meetings; presentations and discussions at the Restoration Advisory Board (RAB) meetings; the Administrative Record for the Site; and announcements published in the *Junction City Daily Union* and *Manhattan Mercury* newspapers. A final decision on a remedial action will not be made until

review of the substantive comments received during the comment period has been undertaken. Comments must be postmarked no later than November 13, 2007. Based upon public comments or new information, the Army and EPA may decide to modify the Preferred Alternative or to select another remedial alternative from the Feasibility Study. It is important to comment on the Proposed Plan and the alternative proposed for the remediation. The Army will respond to all substantive comments received during the public comment period. These responses will be documented in the Responsiveness Summary in the Record of Decision.

An Availability Session will be held during the public comment period to present the conclusions of the RIA and the FSA Reports, to further elaborate on the selection of the Preferred Alternative, and to receive public comments. The dates for the public comment period and the date, location, and time of the public meeting as well as the locations of the Administrative Record are provided on Page 1 of this Proposed Plan.

For further information on the Dry Cleaning Facilities Site, Main Post, Fort Riley, Kansas, please visit the locations identified on Page 1 to view various site documentation or contact:

Mr. John Shimp
Project Manager
(785) 239-3343

Mr. Craig Phillips
Installation Restoration
Program (IRP) Manager
(785) 239-8574.

Directorate of Public Works
Environmental Division
IMNW-RLY-PWE
407 Pershing Court
Fort Riley, Kansas 66442-6016

ACRONYMS

AOC	Area of Concern
ARARs	Applicable or Relevant and Appropriate Requirements
Army	United States Department of the Army
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
<i>cis</i> -1,2-DCE	<i>cis</i> -1,2-dichloroethene
COPCs	Contaminants of Potential Concern
DCFA	Dry Cleaning Facilities Area
EAB	Enhanced Anaerobic Bioremediation
EPA	United States Environmental Protection Agency, Region VII
FFA	Federal Facility Agreement
FSA	Feasibility Study Addendum
KDHE	Kansas Department of Health and Environment
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NPL	National Priorities List
PCE	Tetrachloroethene
PS	Pilot Study
PRGs	Preliminary Remediation Goals
RAB	Restoration Advisory Board
ROD	Record of Decision
RAOs	Remedial Action Objectives
RIA	Remedial Investigation Addendum
RCRA	Resource Conservation and Recovery Act
RSK	Risk-Based Value
TCE	Trichloroethene
µg/L	Microgram per Liter
VC	Vinyl Chloride

GLOSSARY OF TERMS

Specialized terms used in this Proposed Plan are defined below:

Administrative Record – The body of documents available to the public associated with characterization and remedy selection at a site.

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

Baseline Risk Assessment – An evaluation of the potential threat to human health and the environment in the absence of any remedial action.

Bioremediation – The use of microorganisms to transform or alter, through metabolic or enzymatic action, hazardous organic contaminants into non-hazardous substances.

Carcinogen – Capable of causing the cells of an organism to react in a manner to produce cancer.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – was enacted by Congress on December 11, 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

Contaminant Plume – A column of contamination with measurable horizontal and vertical dimensions that is suspended in and moves with ground water.

Ecological Risk Assessment – Study that assesses risks to aquatic and terrestrial receptors posed by contaminant releases from a site.

Excess Lifetime Cancer Risk – Cancer posed by a contaminated site in excess of the lifetime probability of developing cancer from other causes.

Feasibility Study (FS) – Identifies and evaluates the appropriate technical approaches and treatment technologies to address contamination at a site. An addendum to the FS is composed of additional studies (FSA).

Federal Facility Agreement (FFA) – A written agreement between the EPA and a federal agency

that sets forth the roles and responsibilities of the agencies for performing and overseeing the activities. States are often parties to interagency agreements.

Groundwater – Underground water that fill 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.

Groundwater Monitoring – Ongoing collection of groundwater information about the environment that helps gauge the effectiveness of a clean-up action.

Human Health Risk Assessment – A study that determines and evaluates risk that site contamination poses to human health.

Institutional Controls – Actions taken to limit unauthorized access to the site, control the way in which an area of the site is used, and monitor contamination migration.

Maximum Contaminant Level (MCL) – The maximum permissible level of a contaminant in water that is delivered to any user of a public water system under the Safe Drinking Water Act.

Microgram per Liter (µg/L) - A unit of measurement equivalent to one microgram of contaminant per liter of water.

Monitored Natural Attenuation (MNA) – refers to the periodic sampling and monitoring of geochemical and contaminant conditions at a site.

National Oil and Hazardous Substance Pollution Contingency Plan (NCP) – Regulations governing cleanups under EPA's Superfund program.

National Priorities List (NPL) – EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for cleanup under the Superfund program.

Natural Attenuation – The processes in soil and groundwater environments that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentrations of contaminants in those media. These in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants.

Pilot Study – Field test to evaluate the success of a technology and potentially determine design criteria for a full-scale test.

Preferred Alternative – Final remedial alternative that meets NCP evaluation criteria and is supported by regulatory agencies.

Present Value Cost – A method of evaluation of expenditures that occur over different time periods. By discounting all costs to a common base year, the costs for different remedial action alternatives can be compared on the basis of a single figure for each alternative. When calculating present worth cost for Superfund sites, total operations & maintenance costs are to be included.

Remedial Action – Action(s) taken to correct or remediate contamination.

Remedial Action Objectives (RAOs) – Remediation objectives for protection of human health and the environment.

Record of Decision (ROD) – A formal document that is a consolidated source of information about a Superfund site, the remedy selection process, and the selected remedy.

Receptor – An organism that receives, may receive, or has received environmental exposure to a chemical.

Remedial Investigation (RI) – A study conducted to identify the types, amounts, and locations of contamination at a site. An addendum to the RI is composed of additional studies (RIA).

Resource Conservation and Recovery Act (RCRA) – The federal act that established a regulatory system to track hazardous wastes from the time they are generated to their final disposal. RCRA also provides for safe hazardous waste management practices and imposes standards for transporting, treating, storing, and disposing of hazardous waste.

Newspaper Ad

Fort Riley Proposes Cleanup Plan for Contaminated Soil and Groundwater

Proposed Plan
Fort Riley, Kansas
October 11, 2007

The United States Department of the Army (Army), the lead agency for Site activities, with support from the Kansas Department of Health and Environment (KDHE) and the United States Environmental Protection Agency (EPA), will hold a Public Meeting to discuss the Remedial Investigation Addendum/Feasibility Study Addendum (RIA/FSA) Report and Proposed Plan for the cleanup of contaminated groundwater associated with the Dry Cleaning Facility Area (DCFA) at Main Post, Fort Riley, Kansas (Site). The RIA/FSA Report discusses the risks posed by the Site and presents an evaluation of cleanup options for three areas of concern (AOCs). Fort Riley conducted a pilot study which included the engineered portions of the alternative selected in the FSA for each AOC. The Proposed Plan identifies the remaining portion of the preferred cleanup alternatives for the public to comment on. The Army, KDHE, and EPA evaluated the following options for addressing the contaminated soil and groundwater at each AOC for this Site:

AOC 1 Shallow Soil Contamination

- Soil excavation/treatment at existing treatment cell
- Soil excavation/treatment at new treatment cell
- Soil excavation/treatment at offsite incinerator

AOC 2 Groundwater Contamination

- In-Situ Chemical Oxidation (Chemox) with Institutional Controls (IC) and Monitored Natural Attenuation (MNA)
- Enhanced Anaerobic Bioremediation (EAB) with IC and MNA

AOC 3 Groundwater Contamination

- In-Situ Chemox with IC and MNA
- EAB with IC and MNA

During the pilot study, Fort Riley performed the following engineered portions of the alternatives considered in the FSA for each AOC:

- **Soil excavation/treatment at existing treatment cell** for AOC 1
- **EAB** for AOC 2
- **In-Situ Chemox and EAB** for AOC 3

Based on all available information, the preferred alternatives proposed for public comment at this time are MNA with IC. The remaining portion of each alternative selected in the FSA to be implemented is MNA. Natural attenuation refers to naturally-occurring processes in soil and in groundwater aquifers that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants. These in-situ processes include biodegradation, dispersion, dilution, adsorption, and volatilization. Microorganisms play a significant role in the degradation and destruction of toxic compounds. MNA refers to the periodic sampling and monitoring of geochemical and contaminant conditions at a site to determine whether natural attenuation is taking place within the aquifer. IC will also be implemented to limit exposure to contaminants in the soil and groundwater and will likely consist of drilling or water well usage restrictions written into the Fort Riley Real Property Master Plan. The Army, KDHE, and EPA welcome the public's comments on all of the alternatives listed above. The formal comment period ends on November 22, 2007. The Army, KDHE, and EPA will choose the final remedy after the comment period ends and may select any one of the options after taking public comments into account.

Public Comment Period:

October 21 – November 22, 2007

The Army will accept written comments on the Proposed Plan during the public comment period.

Public Meeting:

October 30, 2007 7:00 p.m.

The Army will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at 407 Pershing Court at 7:00 p.m.

Copies of the RIA/FSA reports and Proposed Plan are available for viewing at the following locations:

Dorothy Bramlage Public Library

230 West Seventh Street
Junction City, Kansas
(785) 238-4311

Hours: Mon – Thurs 9 a.m. – 9 p.m.
Fri 9 a.m. – 6 p.m.
Sat 9 a.m. – 5 p.m.
Sun 1 p.m. – 5 p.m.

Manhattan Public Library

629 Poyntz Ave
Manhattan Kansas 66502
(785) 776-4741

Hours: Mon – Thurs 9 a.m. – 9 p.m.
Fri 9 a.m. – 8 p.m.
Sat 9 a.m. – 6 p.m.
Sun 1 p.m. – 6 p.m.

The Administrative Record can be viewed at:

Directorate of Public Works
Environmental Division
IMNW-RLY-PWE
407 Pershing Court
Fort Riley, Kansas 66442-6016
(785) 239-8619

Hours: Mon – Fri 9 a.m. – 4 p.m.

For further information or to submit written comments, please contact:

Mr. John Shimp
Project Manager
(785) 239-3343

Mr. Craig Phillips
IRP Program Manager
(785) 239-8574

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