

# Focused Remedial Investigation of Operable Unit OU1 (Front Street site) and Operable Unit OU3 (old city dump), Franklin County, Missouri

## Executive Summary

### Introduction:

*The Riverfront Superfund Site is located in Franklin County, Missouri, about 40 miles west of St. Louis, Missouri, in the town of New Haven, Missouri. During routine public-supply well testing in 1986, the Missouri Department of Natural Resources (MDNR) detected the volatile organic compound (VOC) tetrachloroethene (PCE) in two public water supply wells in the northern part of New Haven. Several environmental investigations were conducted over the next 13 years to find the contaminant source areas and the extent of the contamination. Following the completion of an Expanded Site Inspection, the contaminated areas in New Haven were proposed to be included on the National Priorities List (NPL), and the contaminated areas became known as the Riverfront Superfund Site.*

*The United States Environmental Protection Agency (USEPA) began a Remedial Investigation (RI) at the Riverfront Superfund Site in 1999. The Riverfront Site has been divided into 5 separate areas of investigation or “Operable Units” (OUs). Two OUs, OU1 (the Front Street Site) and OU3 (the Old City Dump), were investigated during this RI. The purpose and scope of the RI is to determine the extent and magnitude of PCE contamination at OU1 and OU3, to determine the relation of the two OUs to the contaminated public-supply wells, and to characterize the human-health and ecological risks posed by each of these OUs.*

*The physical setting of the New Haven area is typical of other small towns along the Missouri River. The climate is characterized by warm, humid summers and cool, wet winters. The topographic relief in New Haven is accentuated by its proximity to the Missouri River, which controls the base level for most streams in western and central Missouri. New Haven has a population of 1,757 people and contains a mixture of medium- to high-density single family and multi-family residential areas within its 2.7 square miles of incorporated area. Industries located in New Haven employ several hundred people. Surrounding areas outside the city limits are dominated by row crop farming. There are eight species of rare or endangered wildlife located in the vicinity of New Haven.*

*There are two major aquifers in the New Haven area, the Ozark aquifer and the Missouri River alluvial aquifer. The Ozark aquifer supplies all domestic, industrial, and public water supply used in the New Haven area and consists of the following formations: the St. Peter Sandstone, the Powell Dolomite, the Cotter Dolomite, the Jefferson City Dolomite, the Roubidoux Formation, the Gasconade Dolomite, the Gunter Sandstone Member of the Gasconade Dolomite, the Eminence Dolomite, and the Potosi Dolomite. The Missouri River alluvial aquifer consists of saturated gravels, sands, and silts*

*that have an average thickness approximately 120 feet in New Haven. Recharge to the alluvial aquifer comes from infiltration from the Missouri River, recharge from the underlying Ozark aquifer, precipitation on the flood plain, and infiltration from streams flowing across the alluvium.*

*Shallow ground water flow in New Haven is controlled largely by local topography. Shallow ground water in the vicinity of OU1 and OU3 flows north towards the Missouri River. A shallow ground-water divide is centered just south of a topographic divide near State Highway 100. Regional deep ground-water flow is north towards the Missouri River.*

*Analytical Methods and Validation of RI Analytical Data:*

*Analytical methods used to investigate contamination at the Riverfront Site included use of a portable gas chromatograph to field screen for PCE and other VOCs in the soil, vegetation, and in drill cuttings. Soil and water samples were also analyzed using USEPA standard laboratory protocols. Analytical data was subject to external, Level II data validation. Data quality was determined to be acceptable.*

*Environmental Transport and Fate:*

*PCE and its degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride), belong to a chemical family known as chlorinated ethenes. These compounds were widely used from the 1950's to the 1970's as degreasing agents. While PCE can migrate down through soils and into aquifers as a dense non-aqueous phase liquid, PCE is also highly soluble and can migrate in the dissolved phase in the direction of ground-water flow. The factors that affect the migration of PCE through the water table, in order of importance, are advection, hydrodynamic dispersion, sorption, microbial degradation, volatilization, and hydrolysis.*

*Operable Unit 1 (OU1):*

*OU1 (the Front Street Site) is located on the northeast corner of the intersection of Front Street and Cottonwood Street in downtown New Haven. OU1 consists of a one story concrete building, a vacant*

*lot to the east of the building, and a vacant lot to the west of the building. OUI has the Missouri River as its northern boundary.*

*Since the 1950's, various industries have operated at OUI including: a metalworking business, a metal tent pole fabricator, a nursing home furniture manufacturer, and automotive fabrication and repair shops. PCE was used extensively by the New Haven Manufacturing Company, (which became part of the Kellwood Company), for the fabrication of metal tent poles. Interviews with former employees document that PCE was repeatedly washed out of the building through the south doors of the building. In addition, PCE may also have been used by Riverfront Industries in the manufacturing of furniture for nursing homes.*

*Field activities conducted during the RI included domestic well sampling, vegetation sampling, monitoring well drilling and sampling, soil sampling, surface water and stream sediment sampling. In addition, a Human-Health Risk Assessment and an Ecological Risk Assessment were conducted.*

*Tree-core sampling was conducted because the PCE contained in tree-cores tends to mimic PCE concentrations in the alluvial aquifer. While the highest concentration (estimated to be greater than 5,000 micrograms per kilogram) of PCE was found in a tree core on the south side of the Front Street building, results of the tree-core sampling indicate that the highest estimated PCE concentrations are generally on the north side of the Front Street Site building.*

*Soil sampling was conducted across OUI. PCE contamination was found to be widespread in the subsurface soils, with a maximum detection of 6,200,000 micrograms per kilogram. Overall, concentrations of PCE increased with increasing depths, with concentrations generally peaking at approximately the 6-foot depth. The fact that concentrations increase with depth may signify that volatilization of the PCE is occurring at shallow depths, while volatilization is limited at greater depths. The highest concentrations of PCE were detected beneath the southeast corner of the Front Street building and along Front Street immediately south of the building. Based on the lack of PCE degradation products in the soil (i.e., trichloroethene, cis-1,2-dichloroethene, and vinyl chloride), substantial degradation of PCE does not appear to be occurring in soils at the site. Because PCE degradation is not occurring in the soils, the soils at OUI may continue to be a source of ground-water contamination for years to come. Metals and sem-volatile organic compounds (SVOCs) were also detected in soils at OUI.*

*Ground-water sampling efforts included the sampling of private domestic wells north of the Front Street building, the installation and sampling of six alluvial aquifer monitoring wells, the installation*

*and sampling of two deep bedrock monitoring wells, and the collection of ground-water samples from temporary direct-push probes into the alluvial aquifer. PCE was detected in 22 of the 28 alluvial ground-water sampling locations in the vicinity of OUI. Sample results indicate that a plume of PCE contamination above the PCE maximum contaminant level (MCL) of 5 micrograms per liter extends from just south of the Front Street building northeast to the Missouri River. The plume is estimated to be approximately 600 feet long and less than 300 feet wide. It is unknown how far the plume reaches in alluvial sediments beneath the Missouri River. Travel times for the contaminants to migrate from the Front Street building to the Missouri River in the alluvial aquifer are estimated to be between 9 and 19 years.*

*The degradation products of PCE (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride) are also present in the ground water at OUI. The presence of PCE's degradation products in the alluvial aquifer signifies that reductive dechlorination is occurring, but the amount of reductive dechlorination that has occurred appears to be highly dependent on the contaminants' location and depth within the alluvial aquifer. The natural degradation of the chlorinated solvents can be a slow process, (one of the degradation products has a half-life of approximately 12 years).*

*PCE was detected in four bedrock aquifer wells, but concentrations were below the MCL for PCE. Because the bedrock monitoring wells at OUI are located near the end of the ground-water flow paths in the Cotter-Jefferson City Dolomite and the Roubidoux Formation, it is believed that the PCE contamination detected in the bedrock monitoring wells at OUI is the result of a source area south of public-supply well W2. Therefore, this contamination can not be attributed to OUI.*

*Surface water and stream sediment samples collected from the Missouri River did not detect any PCE in the vicinity of OUI. The absence of PCE detections in the surface water and the sediment samples indicate that although contaminants discharge into the Missouri River from the alluvial aquifer, the influx of contaminants into the river is not sufficient to be detectable. Given the extreme amount of dilution that occurs as ground water mixes into the river, this result is not surprising.*

*The Baseline Risk Assessment found that there are human-health risks associated with the contamination at OUI. There are excess carcinogenic and adverse non-carcinogenic health risks associated with the use of ground water by future residents or occupational workers at OUI. In addition, there are excess carcinogenic health risks for future residents, for future and current occupational workers, for current trespassers, and for future recreational visitors from exposure to the soils at OUI.*

*The Ecological risk assessment for OUI was conducted using water and stream bed-sediment samples from the Missouri River in the vicinity of OUI. None of the samples used in the ecological risk assessment contained PCE or other chlorinated ethenes. Toluene was detected in surface water and stream bed-sediment samples from the Missouri River; however, the concentrations were small and do not present significant risk to ecological receptors. PCE and several other VOCs were detected in vegetation samples at OUI, but the concentrations were not at large enough levels to represent an unacceptable risk to herbivores. The overall conclusion of the ERA was that ecological risks are minimal at OUI.*

*Operable Unit 3 (OU3):*

*OU3, the old city dump, is located in the southeastern part of New Haven along the north side of State Highway 100. The dump consists of a steep ravine where wastes were dumped until the entire upper end of the ravine was filled. The top of the dump is covered by demolition debris (concrete and asphalt rubble, dirt, and gravel).*

*Between the mid-1950's and 1974, OU3 was used for the disposal of household, industrial, and demolition waste. OU3 was under private ownership until 1972 when the city of New Haven purchased the land. According to accounts by local citizens and former employees of local industries, the dump contains hundreds of drums of industrial wastes, (unused dyes, flammable solvents, waterproofing compounds, waste fabrics, etc.), from the manufacturing of tents by the Hawthorne Corporation (which is now part of the Kellwood Company).*

*Field activities conducted during the RI included vegetation sampling, domestic well sampling, monitoring well sampling, ground-water seep sampling, and surface-water sampling. In addition, a Human-Health Risk Assessment and an Ecological Risk Assessment were conducted.*

*Results of the tree-core sampling at 22 locations at OU3 indicate that PCE is not highly concentrated in the shallow ground water at OU3. Detections of PCE were low (a maximum of 1.01 micrograms per kilogram) in the tree-core samples at OU3 and were infrequent when compared to the results found at OUI.*

*PCE detections in ground-water samples from domestic wells, monitoring wells, and ground-water seeps were also low. All PCE detections were at concentrations below its MCL of 5 micrograms per liter. Based on these results, significant PCE contamination does not appear to be present in the*

*alluvial or bedrock aquifers below OU3. Since PCE contamination is not widespread at OU3 and because OU3 is far from the public water-supply wells, OU3 does not appear to be related to the contamination detected in the two New Haven public-supply wells. However, elevated concentrations of metals were detected in ground-water seeps at OU3. Antimony was detected in a ground-water seep at a concentration of 82 micrograms per liter, which is above antimony's MCL of 6 micrograms per liter. These elevated metal concentrations are probably representative of ground water that is being impacted by leachate from wastes in the old dump.*

*PCE concentrations in surface water collected from streams in the vicinity of OU3 were also low. A trace level of PCE, (0.02 microgram per liter), was detected in only one of the twelve samples that were field screened for PCE. Based on these field screening results, significant PCE contamination is not present in the surface water at OU3.*

*Baseline Risk Assessment scenarios for OU3 found that there are human-health risks associated with the contamination at OU3, but the risk is not related to PCE or its degradation products. The levels of antimony and boron that were detected in a ground-water seep from the dump would pose an excessive non-carcinogenic health risk, if ingested. However, it is unlikely that this ground-water seep would be used for a future drinking water supply. The human-health risks associated with surface soils at OU3 are unknown.*

*An Ecological Risk Assessment was also conducted at OU3. No chlorinated ethenes or other contaminants of concern were detected in the surface water or stream sediment sample collected from the creek north of the landfill. PCE and several other VOCs were detected in vegetation samples from OU3, but the concentrations were not at large enough levels to represent an unacceptable risk to herbivores. The overall conclusion of the ERA was that ecological risks are minimal at OU3.*