



PARSONS

**SUPPLEMENTAL FEASIBILITY STUDY REPORT
RIVERFRONT SUPERFUND SITE
OPERABLE UNITS NO. 2/6
NEW HAVEN, MISSOURI**

Prepared on behalf of Kellwood Company for:



**THE UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY
REGION 7**



NOVEMBER 2010

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**United States Environmental Protection Agency
Region VII**

Prepared on behalf of Kellwood Company by:

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400 Woods Mill Road South
Suite 330
Chesterfield, Missouri 63017

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LIST OF ACRONYMS

10 SS	the Recommended Standards for Water Works (10 State Standards for Water)
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund)
COCs	Chemicals of Concern
FS	Feasibility Study
FS Report	Feasibility Study Report
Kellwood	Kellwood Company
MCL	maximum contaminant level
MDNR	Missouri Department of Natural Resources
O&M	operation and maintenance
OU2	Operable Unit 2 of the Riverfront Superfund Site
OU6	Operable Unit 6 of the Riverfront Superfund Site
PCE	Tetrachloroethylene (also known as perchloroethylene and tetrachloroethene)
PWSD	public water supply district
RAOs	Remedial Action Objectives
Report	Supplemental Feasibility Study Report
SFS	Supplemental FS Report
Supplemental FS	Supplemental FS
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

SECTION 1 INTRODUCTION

1.1 PURPOSE

This Supplemental Feasibility Study (SFS) Report (Report) supplements the August 2010 Feasibility Study (FS) Report. The August 2010 report evaluated the feasibility of alternatives to remediate Operable Unit 2 (OU2) and Operable Unit 6 (OU6) of the Riverfront Superfund Site, located in New Haven, Franklin County, Missouri. This Report is prepared at the request of USEPA to further evaluate the means of providing potable water to residences in OU6 where the water supply is impacted by tetrachloroethene (PCE) at levels above the drinking water maximum contaminant levels (MCLs). The FS is a requirement of the Administrative Order on Consent (AOC), Docket No. CERCLA-07-2004-0078 (dated March 22, 2004) entered into by the United States Environmental Protection Agency (USEPA) with Kellwood Company (Kellwood). The operation of the whole-house treatment units (referenced herein) is required by AOC, Docket No. CERCLA-07-2002-0091 (dated 2002).

In the July 2010 Proposed Plan, USEPA recommended Alternative 2c, which among other items, specifies whole-house water treatment units for the affected residences. With regard to its decision to continue the whole-house water treatment units, USEPA stated:

Alternatives 2b, 2d, and 3b would provide a permanent alternative water supply. However, the absence of an agreement to extend the water supply to the unincorporated area to the south of New Haven renders these options unavailable. Alternatives 2a, 2c, 3a, 4a-4d, 5, and 6 require ongoing operation and maintenance (O&M) of the whole-house water treatment units at residences with wells contaminated by COCs at levels exceeding their MCLs. Such systems have been operated successfully in four residences for almost eight years. (Proposed Plan at p. 16.)

USEPA has requested a supplemental evaluation of several issues related to the means of providing potable water to the residents in OU6. The primary issue is related to the decision in the proposed plan to continue implementation of the whole-house treatment units at the four residences where they are currently in use, and at any future residence where the water used as the potable water source becomes impacted at levels above the Remedial Action Objectives (RAOs). The RAOs are the drinking water MCLs for the compounds of concern (COCs). In response to this issue, this Report evaluates three alternatives:

- Replacing the existing wells at each of the four residences currently using whole-house treatment systems with new domestic supply wells at each property in order to provide water below the RAOs without continued use of whole-house filtration.

- Formation of a Public Water Supply District (PWSD) in OU6 to produce and/or supply water in OU6.
- Extension of the New Haven Water Service to OU6.

1.2 REPORT ORGANIZATION

This Report is organized into the following four sections:

1. Section 1 – Introduction: Describes the purpose and organization of the document and the issues for evaluation.
2. Section 2 – Alternatives Description and Evaluation: Discusses alternatives to whole-house water treatment units and possible remedial actions.
3. Section 3 – Evaluation of Alternatives relative to FS Evaluation Criteria.
4. Section 4 – Summary and Conclusions: Summarizes the concerns and conclusions from the evaluations of the alternatives to whole-house water treatment units.
5. Section 5 – References.

1.3 ISSUES FOR EVALUATION

1.3.1 Replace Existing Impacted Wells

Replacing the existing impacted wells with new wells is one potential option for supplying potable water. The new wells would have multiple casings with the intent to supply water that is not impacted, and would not require treatment. At least one resident has submitted a comment on the July 2010 Proposed Plan, requesting that a replacement well be installed on their property. This comment also pointed out that new supply wells were constructed for two residents of the Wildcat Creek Estates subdivision. This installation of replacement wells would apply to the four wells that are currently receiving whole-house water treatment.

1.3.2 Formation of a Public Water Supply District in OU6

In the FS, alternatives 2b, 2d, and 3b, which included provision of an alternate water supply, were based on the City of New Haven water system being extended into OU6. These alternatives were identified as being impracticable given Kellwood's inability to obtain the legal right to access an alternative public water supply for OU6. Another option evaluated in this report is the formation of a new independent PWSD. This water district would service the homes that were the basis of the water line cost estimates in the August 2010 FS Report to extend water lines from the City of New Haven. The service area would include the homes within Wildcat Creek Estates, the adjacent homes along Highway C, and the homes along Boeuf-Lutheran Road within the area of impacted groundwater. A water district may be formed, and produce its own water or buy water from another water supplier. Both of these alternatives are evaluated in this supplemental report.

In addition to constructing a PWSD, there are other community water system formats in Missouri including an investor-owned system and an incorporated association. Moreover, private well systems are also available. The practicability of these types of systems will also be discussed.

1.3.3 Extension of New Haven Water Service

Additional details of the discussions that have occurred to date regarding potential connection to the New Haven public water system are discussed herein.

SECTION 2 ALTERNATIVES DESCRIPTION AND EVALUATION

2.1 REPLACE EXISTING IMPACTED WELLS

There are currently four residences with whole-house filtration systems. This evaluation discusses the viability of installing new individual residential supply wells on each of these properties as a long-term remedial option, based on effectiveness and cost. The location of these four residences and the estimated extent of impacted groundwater in the various formations are presented in **Figure 2.1**.

2.1.1 Historical vs. Current Understanding of Groundwater Impacts

Early in the remedial investigation phase of the project, Kellwood suggested replacement of the four affected wells (JS-14, JS-36, JS-38, and JS-52). This was based on the understanding of the nature and extent of the groundwater impacts at that time, but is no longer considered appropriate, based on more recent data. The understanding at the time replacement wells were proposed in 2004 was that COCs were only present at a shallow to intermediate depth at these locations, and that the existing well casings were not preventing this impacted water from entering the well. Furthermore, it was believed that groundwater in the lower portion of the Jefferson City Dolomite and the Roubidoux Formation at these locations did not contain PCE. Subsequent studies have indicated that three of the domestic wells (JS-38 in the Wildcat Creek Estates subdivision and JS-14 and JS-36 on Boeuf Lutheran Road) allowed water containing PCE to enter the well, flow downward along the well bore, and then flow out of the well at lower depths. The downward migration of PCE at well JS-38 also impacted well JS-52, located approximately 100 feet to the north of well JS-38. Thus, at these four residences, the lower Jefferson City/Roubidoux Formation, contrary to our understanding in 2004, contains PCE. Therefore, construction of new wells open to the lower Jefferson City/Roubidoux Formation at these four locations could potentially result in installation of four new wells that produce water that contains PCE, and therefore, may not eliminate the need for whole-house filtration systems at the residences where the new wells are installed.

2.1.2 Evaluation of Replacement Wells for JS-38 and JS-52

In April 2005, the USEPA, the USGS, and the MDNR suggested that well JS-38 had a casing that was not effectively sealed, allowing water with PCE to move down the borehole and to reach nearby well JS-52. They recommended that instead of installing a new well, a liner should be installed in JS-38 to prevent downward flow and to restrict the production of water to the lower portions of the well. There were two potential benefits to installing the liner: (1) preventing further downward migration of COCs in JS-38 and (2) removal and treatment by a whole-house carbon system of the water containing COCs that had previously flowed down the borehole and into the lower Jefferson City Dolomite. It was

suggested that if downward flow in JS-38 was the only mechanism allowing PCE to reach the deeper interval, that PCE concentrations would decrease substantially soon after the liner installation.

Figure 2.2 plots the PCE concentration in JS-38 over time, indicating that the influent (untreated) PCE concentration has declined markedly since the liner was installed. In fact, the concentration of PCE in JS-38 has been below the 5 µg/L maximum contaminant level (MCL) for the seven most recent quarterly sampling events (April 2009 through September 2010). **Figure 2.3** shows the PCE concentration over time for well JS-52. The influent concentration at JS-52 has a higher variability than in JS-38, but also shows a decline in PCE concentration since the installation of the liner in JS-38. The concentration of PCE at JS-52 has been at or below the 5 µg/L MCL in seven of the ten most recent sampling events. The trends demonstrate that the PCE concentrations will continue to decline in these wells as the PCE mass is being removed by additional pumping. In accordance with a 2002 Consent Order (CERCLA-07-2002-0091), the whole-house systems may be turned off after eight consecutive quarters where concentrations remain below the MCLs (5 µg/L for PCE).

It is known that the PCE in the lower Jefferson City/Roubidoux as a result of the downward flow prior to the installation of the liner at JS-38 is limited in extent. Wells to the northeast (JS-40), north-northwest (MW-2R), and west (MW-4) of wells JS-38 and JS-52 do not contain PCE. However, it is not known whether water in this unit contains PCE at the locations of potential replacement wells on the properties where JS-38 and JS-52 are located. Thus, the potential exists that replacement wells on these properties would also produce water that contains PCE. The property sizes associated with these wells are as follows: JS-38 – 4.06 acres, and JS-52 – 4.81 acres.

2.1.3 Evaluation of Replacement Wells for JS-14 and JS-36

The two homes with whole-house treatment systems on Boeuf Lutheran Road have higher PCE concentrations than JS-38 or JS-52. Following the interval sampling and liner installation at JS-38 (July 2004), similar studies were performed at these wells (JS-14 and JS-36), followed by installation of liners in both wells (May 2008). The concentration of PCE in JS-14 over time is shown in **Figure 2.4**. The installation of the liner resulted in a rapid, substantial decline in PCE concentration. However, the rate of decline has slowed since mid-2009. **Figure 2.5** shows the concentration of PCE in JS-36 over time. This well has had a relatively high variability in PCE concentration, which makes identification of trends difficult. The high PCE concentrations in the lower Jefferson City/Roubidoux indicated by the post-liner sampling suggest that it is unlikely that potential replacement wells for JS-14 or JS-36 would be free of PCE.

2.1.4 Two Previously Installed Residential Wells

In 2004 and 2007, wells were drilled that are being used as residential water supply wells for two homes in Wildcat Creek estates. The drilling of wells MW-2R (November 2004) and PA-55 (July 2007) for two homes in the Wildcat Creek

Estates subdivision was performed under differing circumstances than the four proposed replacement wells discussed in the previous subsections. A nest of monitoring wells (designated MW-2) was installed to provide detailed information on the vertical extent of PCE at the residence near JS-38 and JS-52. After performing several sampling events at the well nest and conducting an aquifer test to evaluate the interconnectivity of the multiple water-bearing zones, the deepest of the monitoring wells (open to the Roubidoux) was re-configured as a domestic well (MW-2R). The information from the MW-2 monitoring well cluster was then used to design the domestic well for the adjoining residence. This well (PA-55) was in an area with a high expectation that the water from the lower Jefferson City/Roubidoux would not contain PCE. This expectation was based on its location between the MW-2 monitoring well cluster and an existing domestic well (JS-39), both of which did not contain PCE.

The expectation that the water in the lower Jefferson City/Roubidoux would not contain PCE at these two wells (MW-2R and PA-55) is in direct contrast to the expectation at the four residences with whole-house treatment systems. At the four residences with whole-house treatment systems, the presence of PCE in the lower Jefferson City/Roubidoux is documented. Drilling replacement wells at these locations would cost approximately \$75,000 each, with no assurance of producing water with no PCE and, therefore, no assurance that whole-house filtration would not continue to be provided on the newly installed well(s).

2.1.5 Evaluation of Drilling Deeper to Obtain Clean Water

One potential means of constructing new wells that could produce water with no PCE would be to case the well through the Jefferson City Dolomite and the Roubidoux Formation, leaving the open-hole interval in the Gasconade unit. The two city wells (City Wells 3 and 4) produce water from the Gasconade and lower units. This interval provides public water to the City of New Haven and has remained non-detect for the COCs. Constructing boreholes that introduce even a limited risk of allowing COCs to reach this interval is not recommended.

2.2 FORMATION OF A PUBLIC WATER SUPPLY DISTRICT IN OU6

A PWSD serves water to a specified area or territory. A PWSD in OU6 may be formed as a new entity (with its own water source or purchasing water from an existing source) or may be created as an extension of an existing PWSD. This evaluation focuses on whether creating a PWSD as a permanent alternative water supply source is a viable alternative to the continued operation of the four domestic wells with whole-house filtration. The whole-house filtration systems have provided drinking water that satisfies RAOs for the last eight years.

Distance from Existing PWSDs

This discussion is based on a hypothetical newly formed PWSD purchasing water from an existing source. Although there are three active PWSDs in Franklin County, none of the PWSDs are located near the OU2/OU6 area (Cares, 2010). It would therefore be difficult to use the existing PWSDs to supply water south of New Haven in the OU2/6 area. The closest water district, Franklin

County PWSD No. 1, is approximately eight miles away. An 8-mile water transmission line to tie the existing PWSD to the OU6 area would require a number of technical issues to be resolved. These issues include:

- The closest PWSD, Franklin County PWSD No. 1, would require at least 8 miles of water transmission piping to interconnect the two systems. The transmission piping would run in the right-of-way of Missouri State Highway 100 and would need to cross approximately ten roads, including three state highways: Missouri 185, Missouri K-K, and Missouri C.
- The topography along Highway 100 varies by over 200 feet, which would require air relief valves at the high points.
- This transmission piping would cross over Boeuf Creek and St. John's Creek, requiring it to be hung from the bridge structures for Highway 100 or Highway C (depending on pipe routing). These sections of the transmission piping would need to be insulated and heated to protect from freezing. Other smaller creeks may also require crossing along the piping route.
- The state highways to be crossed would require boring below the road to avoid interrupting the flow of traffic.
- Access for installation of the transmission piping in the road rights-of-way, including the road crossings and the stream crossings, would need to be obtained from the appropriate regulatory agencies.
- An 8-mile section of water transmission piping, serving between 4 and 30 residences at the end, without any intermediate customers, will result in stagnation of water in the water main. This may result in increased production of sediment and the need to flush out the piping with a higher maintenance frequency, thus increasing the operational cost. The water rate would need to accommodate the cost of the water used for flushing the water mains.
- Lengthy dead end pipe runs such as an 8-mile run from Franklin County PWSD No. 1, are not recommended in guidance documents such as the Recommended Standards for Water Works (10 State Standards for Water (10SS)). Even if the distribution system piping is looped, the transmission piping is a dead end pipe run. Dead ends are to be minimized in order to provide increased reliability of service, reduce head loss, and minimize water stagnation.
- The piping systems should be designed to maximize turnover and to minimize residence times while delivering acceptable pressures and flows. This may be difficult, with such a long transmission line supplying the low demand that would be present in an OU6 PWSD.
- The OU6 PWSD would be required to conduct all maintenance and repairs on this transmission piping.

- If the water transmission line is not sized to transmit fire-flows, then fire hydrants are not required; however, flushing hydrants would still be required.

It is estimated that installing a water main over this distance to supply this area would cost more than \$4 million, not including possible requirements for booster pumping and other installation requirements, such as the numerous road crossings and creek crossings. Moreover, the distance creates significant challenges due to the large number of landowners from whom it would be necessary to acquire easement rights to build the necessary infrastructure.

Size of Water Supply District

Creating a new independent PWSD solely to provide water to four residences (those currently with whole-house filtration) or at most, to the 25-30 residences within the OU6 area, is impractical. In most instances, each PWSD in Missouri services hundreds, if not thousands, of water connections. The existing PWSDs in Franklin County are no exception. Of the active districts in Franklin County, PWSD #1 has 1,251 connections and serves 3,820 people; PWSD #3 has 2,775 connections and serves 6,800 people; and PWSD #4 has 285 connections and serves 760 people (MDNR 2010, New York Times, 2010). PWSD #2, located on the eastern portion of Franklin County near the Robertsville area, is non-operative at this time (Franklin County, 2010). Statewide, more than 50 percent of PWSDs in Missouri have between 500 and 5,000 service connections and more than 80 percent have over 200 service connections (MDNR, 2008). **Figure 2.6** presents the distribution of the number of PWSDs (both urban and rural) based on the number of service connections in Missouri. There are a few independent PWSDs in the entire state that only have 50 to 100 service connections, but no PWSDs have fewer than 50 connections.

The infrastructure of an independent water district includes either a separate supply well or purchasing water from an adjacent water system, and a distribution system. This infrastructure could not be adequately supported by the number of residences that would be served in the OU6 area. The operation and maintenance of the system would not be self-funding after installation without charging rates significantly higher than the typical rates for a community water system. For example, if water was purchased from the City of New Haven at the rate charged to City residents and re-sold to a newly created OU6 PWSD at the same rate listed by the City of New Haven for a charge to non-city residents (approximately a 50% markup), then based on an average use of 225 gallons per day per household and 28 households, the income to the PWSD (from all 28 households) to be used for operation and maintenance would be approximately \$400 per month. The administrative costs alone of operating the PWSD would likely exceed this income, not considering the operation, maintenance, and monitoring costs.

Discussions with a local supplier of full service contract water system operations indicated that the proposed system is too small for a full service company to accommodate. If a local operator was found, it may be possible to contract the

operation but not all of the system operation, financial, and managerial services. Also, regulations require provisions for contingency plans for a backup operator if the contracted operator becomes unavailable.

If the PWSD purchased water from an existing system, the regulations allow combining the monitoring requirements of the two systems and have the selling agency conduct all of the required monitoring of the water quality. The selling agency may also be willing to act as a contract operator for a fee. If the PWSD did not purchase water, but had its own groundwater production well system, then the system operation and maintenance costs would be higher and a higher level of operator would be required.

The PWSD would also be required to build up and maintain financial reserves of 10 percent of the annual operating budget and 10 percent of the most expensive equipment item to replace (emergency equipment reserve), and a debt service reserve (if funds are borrowed for capital improvements).

The Safe Drinking Water Act requires any PWSD to prepare and distribute an annual water quality report (Consumer Confidence Report) to the customers. Also, the PWSD would be required to have someone available to deal with compliance issues and to receive, investigate, resolve, and record customer complaints.

The capital costs for a PWSD are estimated (see Appendix A) as follows:

- A PWSD connected to the New Haven water system would have a capital cost of approximately \$1.6 million (from August 2010 FS Appendix B cost tables).
- If the hypothetical PWSD connected to a system other than the New Haven water system, the capital cost for the water system could exceed \$6.4 million (\$1.6 million for distribution system and over \$4.8 million for an eight mile long transmission system).
- If a PWSD with an independent water supply was formed, the estimated cost would exceed \$3 million (\$1.6 million for distribution lines and over \$1.4 million for locating a water supply well and installing a water supply system and transmission line).

There are currently four locations where whole-house treatment is being provided because the RAOs were not being met. At JS-38, the concentrations have been below the MCL for seven quarters. If the next sampling event is also below the MCL, the whole-house treatment unit may be removed and the well will be in compliance with the RAOs. At JS-52, the concentrations have been below the MCLs for seven of the last ten quarterly sampling events. The three events in which the concentration exceeded the MCL were less than 1 ppb over the MCL. The concentrations in this well are also trending downward and it is anticipated that the whole-house treatment unit will be able to be removed when the well is in compliance with the RAOs.

This capital expenditure of \$1.6 to \$6.4 million or more would provide an alternate water supply to two to four residences (a range of approximately \$0.4 million to \$1.6 million per residence, assuming four residences) which have successfully been using whole-house treatment units for over eight years. At most, the alternate supply would potentially provide water to an additional 24 households that currently have water meeting the RAOs, and are anticipated to continue to meet the RAOs in the future.

O&M costs for a PWSD water system, meeting all of the regulatory requirements, would add substantially to the capital costs, and the income from the water system is not anticipated to be able to sustain these O&M costs. However, if the system operation and maintenance work were to be performed by the water system supplying the water, the efficiency of using existing employees with a small incremental increase in work load may result in sufficient revenue to sustain the O&M costs. This would need to be negotiated with the providing water supplier, and there is no guarantee that they would agree to this arrangement or that the revenue would cover the operating costs.

Legal Requirements for Public Water Supply Districts

The absence of small PWSDs in Missouri suggests that an independent PWSD at OU6 may not be practical. In addition, the legal procedural rules for creating such a water district also suggest the impracticability of creating this district. In order to create a PWSD under Missouri law, the petition describing the proposed boundaries of the PWSD must be signed by at least fifty voters or owners of real property within the district [see Missouri Revised Statute §247.040.1]. Only four residences are on whole-house filtration, but there are a total of 25 to 30 other residences that could potentially be connected. However, these other residences may not be willing to connect because their water has not been impacted. Thus, it will be difficult to meet the statutory requirement to acquire at least fifty signatures from owners of real property within the proposed PWSD.

In fact, the Missouri Code of State Regulations (Missouri CSR) states that in order for any water system to be classified as a “public water system,” the water system must have at least 15 service connections or regularly serve an average of 25 individuals at least 60 days of the year [see 10 CSR 60-2.015(2)(P)(8)]. Since only four residences are on whole-house filtration, and the potential additional number of connections is limited, there may not be enough service connections to satisfy the minimum procedural requirements for a “public water system,” much less a PWSD.

Other Types of Community Water Systems and Private Well Systems

A community water system is a type of public water system which serves at least 15 service connections or regularly serves an average of at least 25 residents on a year-round basis. See 10 CSR 23-1.030(1). Entities that traditionally form a community water system are PWSDs (discussed in section 2.2 above), cities, larger mobile home parks, subdivisions, and condominiums. Importantly, no community water systems are located within close proximity near the OU2/OU6

area, other than the City of New Haven water system. The evaluation of connecting to the New Haven water system is discussed in Section 2.3.

Certain types of community water systems, such as those formed by a group of property owners in a subdivision, include an investor-owned system and an incorporated association. The proposed system is too small to interest an investor for an investor-owned system. An investor-owned system would need to be of sufficient size to be profitable. The small size of the system is not likely to produce sufficient income to cover the operating costs and provide a profit adequate to induce an investor to own and be responsible for the water system. In order for the system to be owned and operated by an incorporated association, all of the residents within the boundary of the association must agree to become part of the association. See 10 CSR 60-3.020(6)(a)(3). There currently is no association that covers all of the homes in the areas considered to be provided with water service. Informal discussions with residents during the RI work indicate that agreement of all residents within the proposed boundary to participate is not assured. Moreover, the incorporated association must own the facility, acquire the authority to lay all necessary lines, and handle the necessary management, operation, replacement, maintenance, and modernization of the facility. These barriers are significant and strongly suggest that a community water system would not be a viable option in this situation [see 10 CSR 60-3.020(6)(a)(3)].

A private water system is different from a community water system. 10 CSR 23-1.030(3) and (5) define two types of private water systems: (1) multiple family wells; and (2) domestic wells. A multiple family well is a private water supply well constructed for the purpose of serving more than three dwellings, but having less than 15 service connections and serving less than 25 individuals daily at least 60 days out of the year. A domestic well is a private water supply well that services three or fewer service connections. According to MDNR guidance (MDNR, undated), any well serving nine or more single-family dwellings will need to meet community public water supply well specifications because "it will likely" be serving a permanent population of 25 or more people. The private water system regulations are based on water that is provided from a common well. No definition for a private water system where the water is purchased could be located in the drinking water regulations.

A private water system would only be appropriate to service the limited number of homes with whole-house treatment units. As discussed in Section 2.1, the four residences with whole-house treatment units are within areas where it cannot be guaranteed that the water supply would not be impacted. A private water system for only the four homes currently utilizing whole-house treatment units may be technically and legally possible, but the operation and maintenance of both the water mains between the homes and the private well may be administratively and cost prohibitive. A private water system would require the establishment of responsibilities for operation and maintenance of the system. A mechanism to ensure that all parties pay their assigned share of the costs for the operation would need to be established. A procedure to fund repairs to the

pumping system as well as the distribution system would also need to be established.

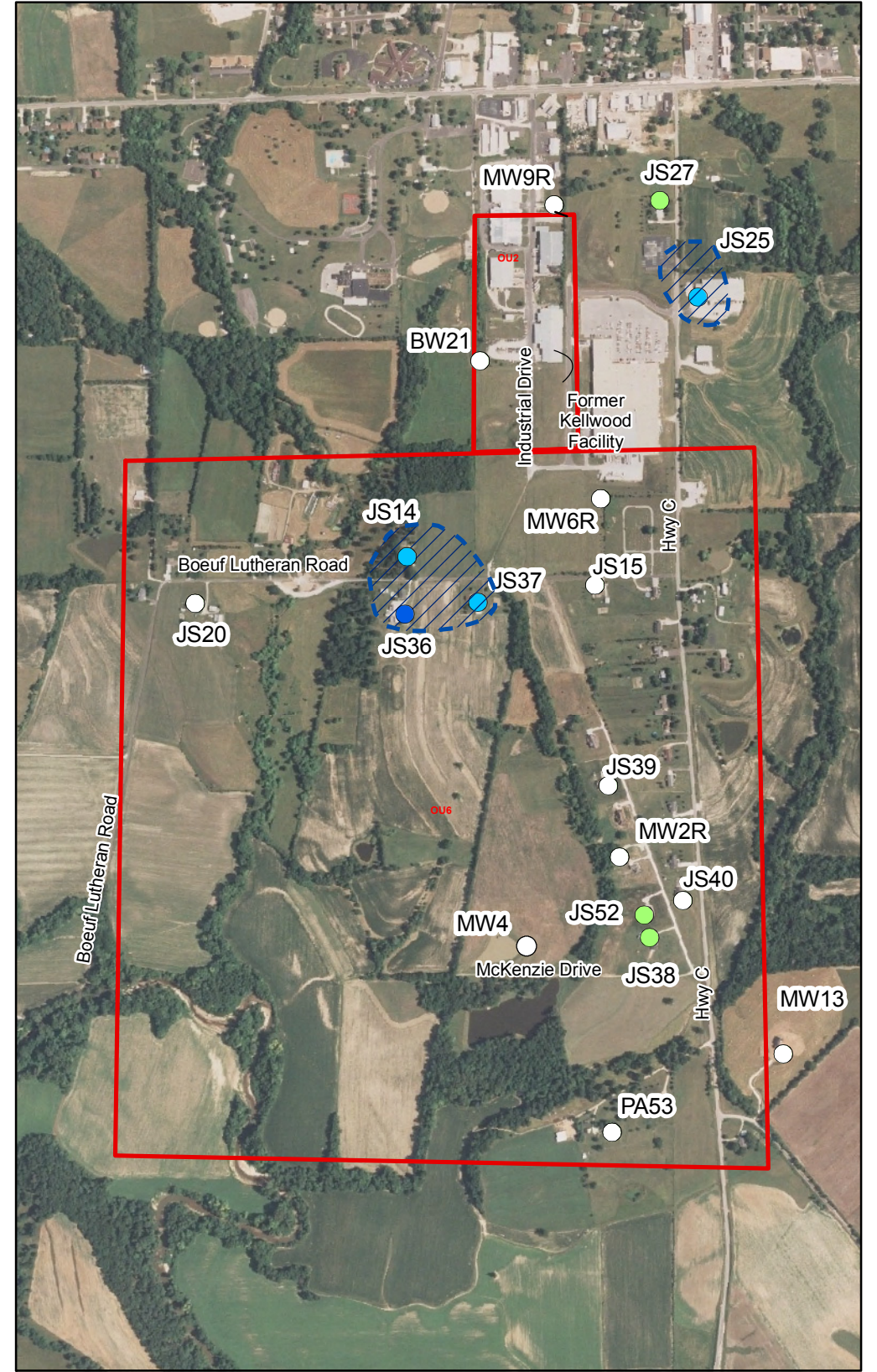
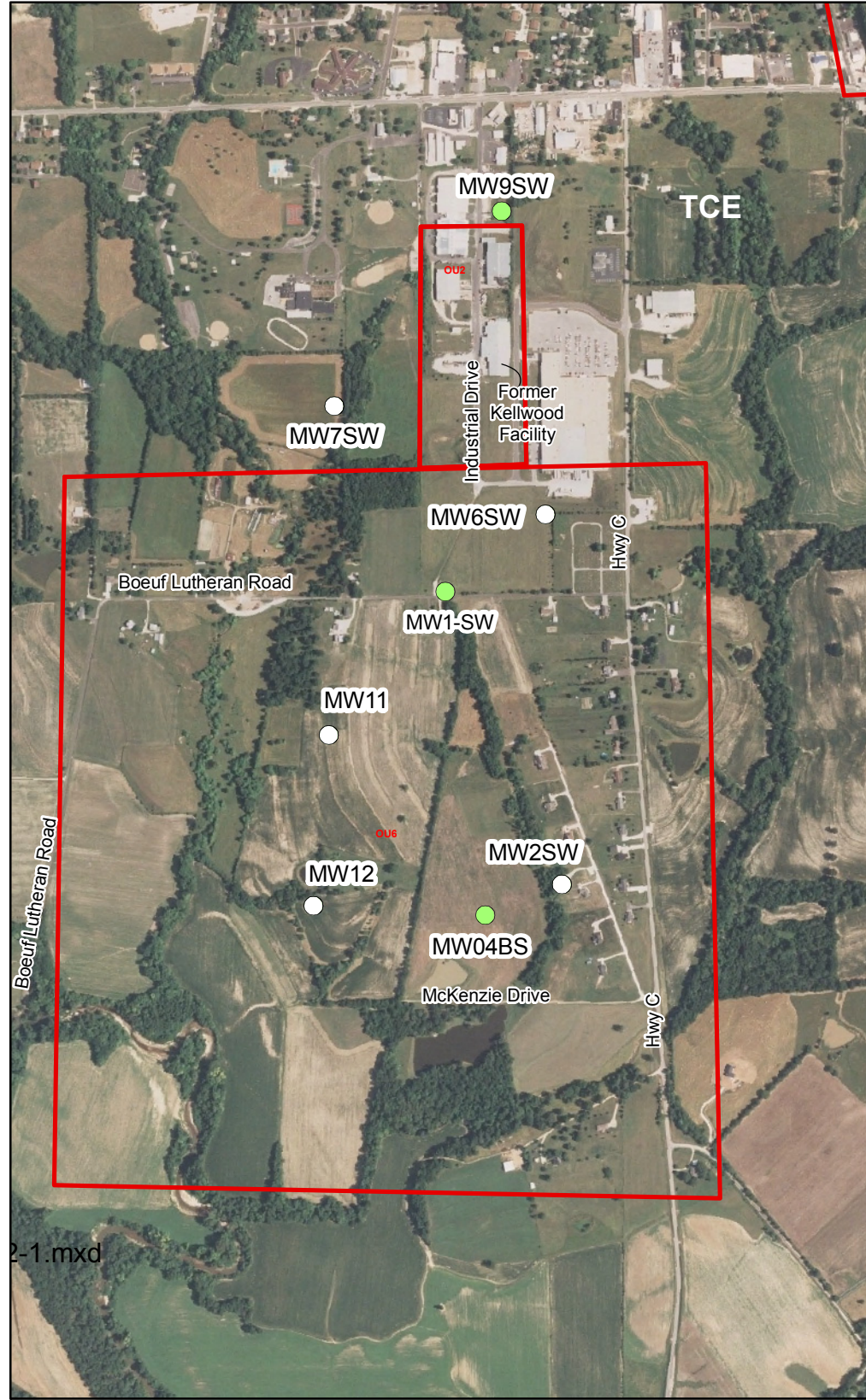
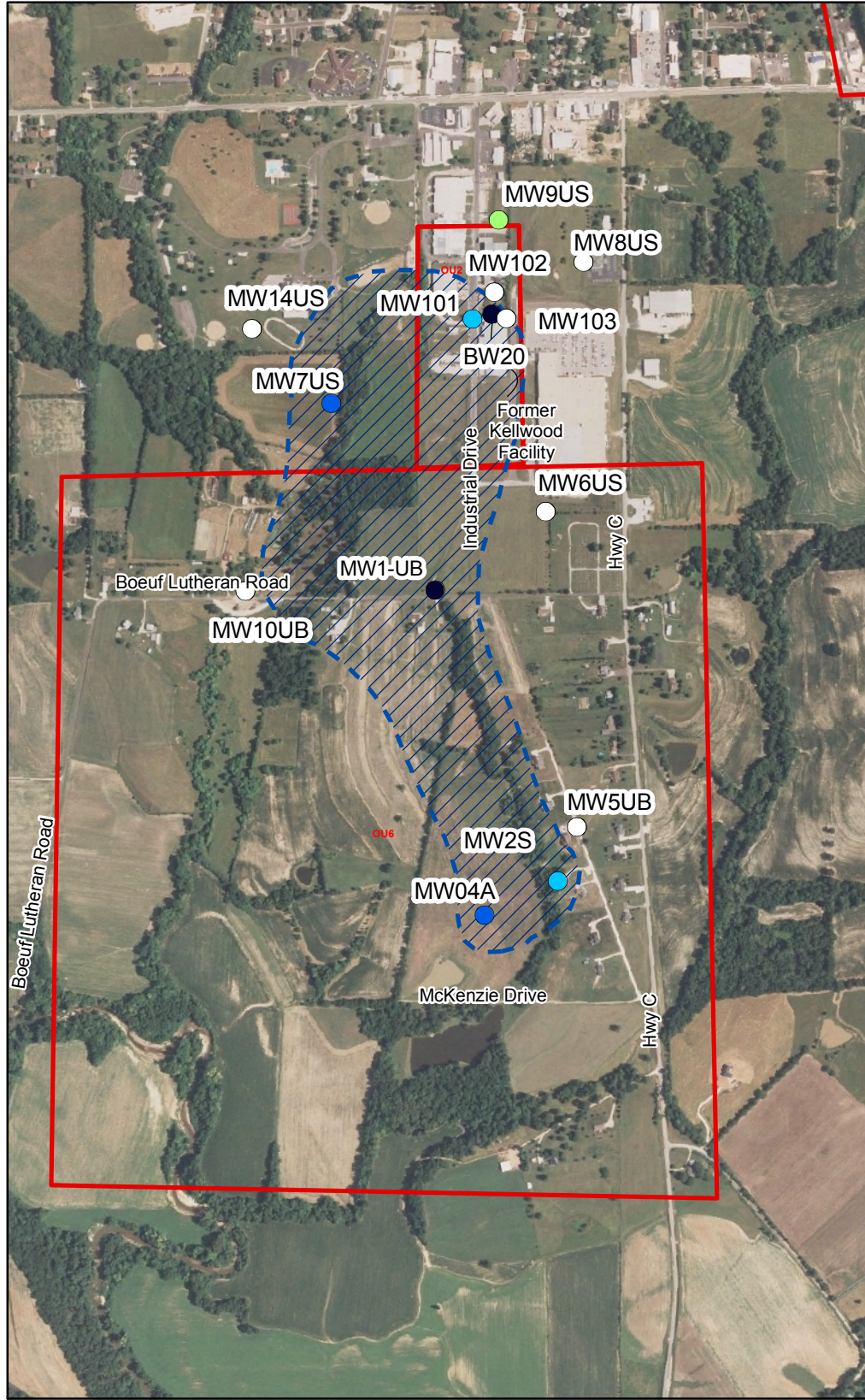
2.3 EXTENSION OF NEW HAVEN WATER SERVICE

Kellwood has been in discussions with the City of New Haven officials (City Manager, City Attorney, Mayor, and Board of Aldermen) regarding installation of a water line within OU6 for several years, with an increased frequency of discussions in 2010. Technical issues raised by an engineer retained by the City were addressed during a July 1, 2010 conference call between Kellwood (with their engineer) and the City of New Haven and their engineer. In July 2010, Kellwood offered to draft legal documents for the City to review. When contacted in late September, the City Manager suggested that Kellwood request (in writing) a meeting with the City Board of Aldermen, which is the governing body of the City, in conjunction with the Mayor. That meeting was held during November 2010.

Kellwood intends to continue negotiating with the City, but there are issues to be resolved between the parties. Neither the timeframe in which an agreement might be reached, nor whether an agreement might be reached, can be predicted at this time. The capital cost for this alternative is approximately \$1.6 million, not including legal fees for negotiating with the City of New Haven or addressing what the City of New Haven may require beyond the state law requirements for a water distribution system.

As discussed in Section 2.2, although a PWSD is impracticable, a community water system may be feasible in the situation where the infrastructure and administrative systems are already in place and the water supplier is in close proximity to OU6. This would require negotiating water rates with the entity supplying the water and providing the operation, maintenance, and administrative services. In this regard, the City of New Haven already has a published rate for customers outside the City limits.

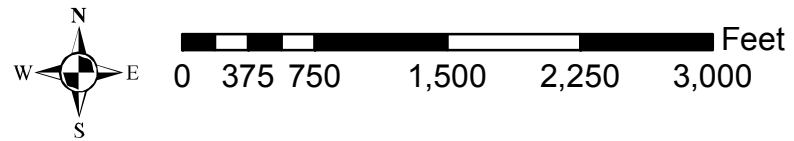
J:\442 PARCOM\442906_Kellwood\GIS\Kellwood\MXDs\RI_FS_Revision_May2011\01FS_Supplemental_Fig-1.mxd - 9/28/2010 @ 10:21:18 AM



Upper Sandstone Marking Bed/Upper Bedrock Permeable Zone

Swan Creek

Lower Jeff City/Roubidoux



 **Estimated Extent of Groundwater above Remedial Action Objective**

Screening Criteria: USEPA MCLs or Missouri Default Target Levels for Water

PCE Concentration






-  Not Detected
-  < 5 $\mu\text{g/L}$ (MCL)
-  5 - 100 $\mu\text{g/L}$
-  > 100 - 1,000 $\mu\text{g/L}$
-  > 1,000 $\mu\text{g/L}$

Figure 2.1

Lateral Extent of Groundwater Impacted Above Remedial Action Objective

Riverfront Superfund Site OU2/6
New Haven, Missouri

PARSONS
40 LA RIVIERE DRIVE, SUITE 350, BUFFALO, NY 14202

Figure 2.2
PCE Concentration Time Plot JS-38

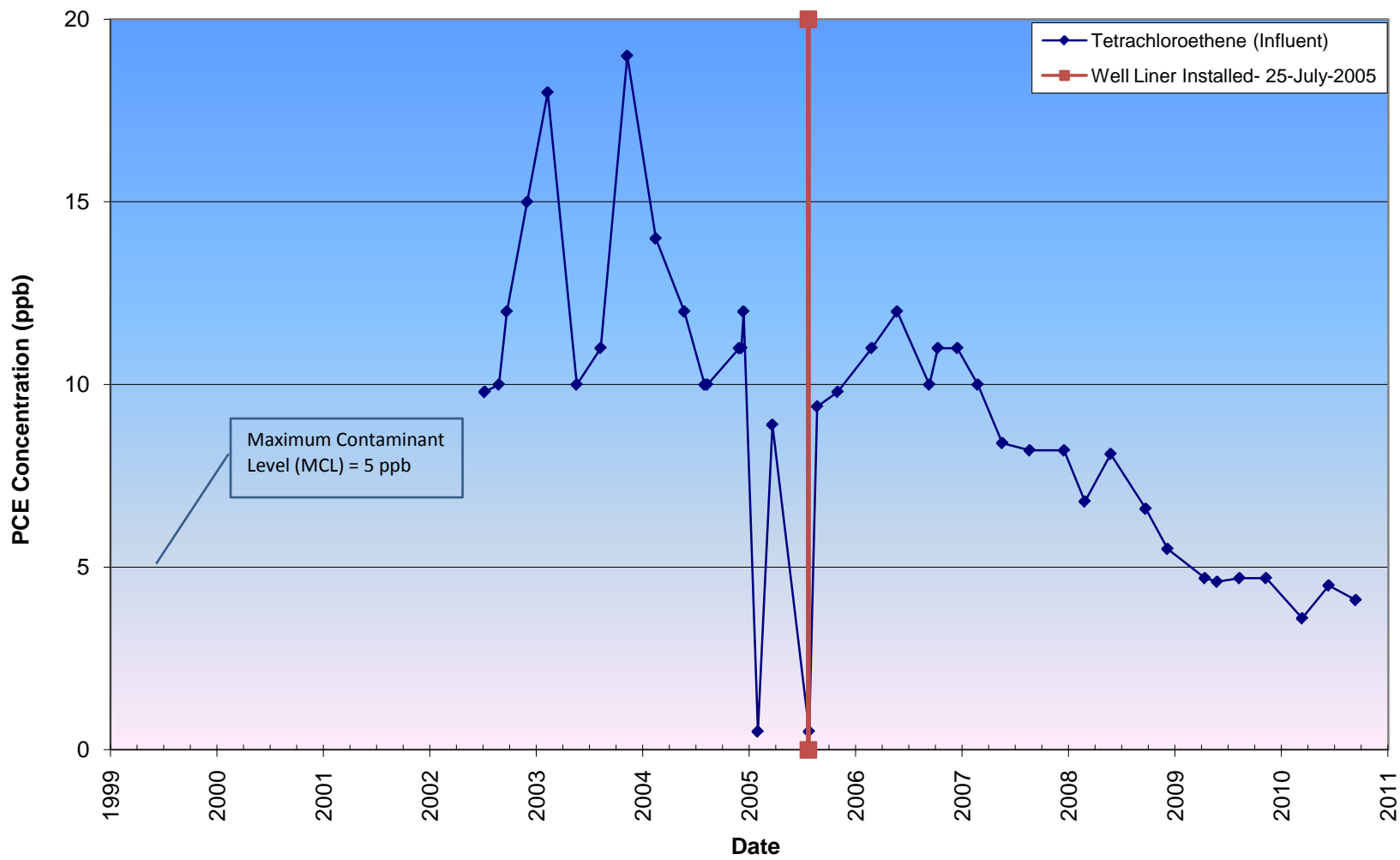


Figure 2.3
PCE Concentration Time Plot JS-52

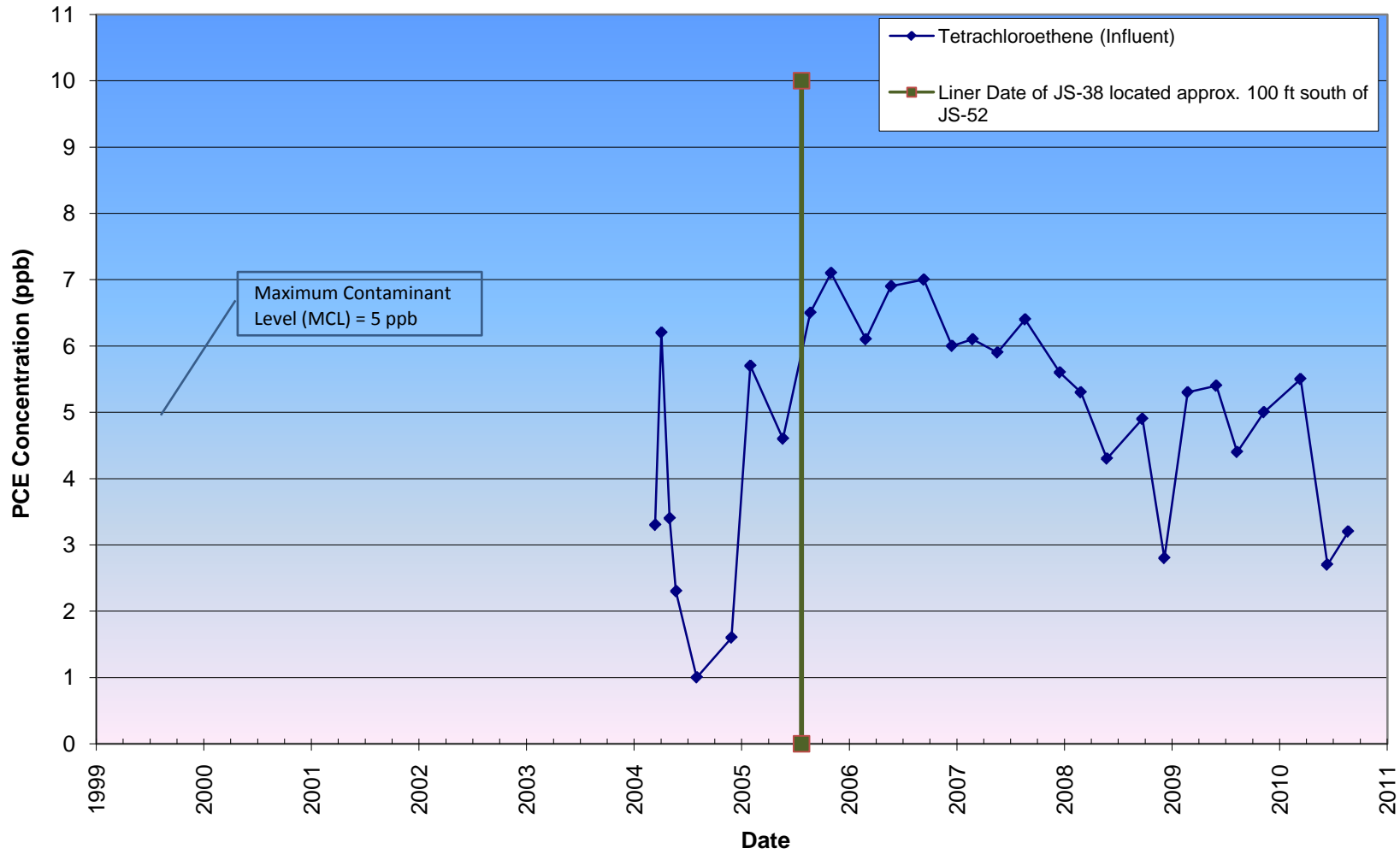


Figure 2.4
PCE Concentration Time Plot JS-14

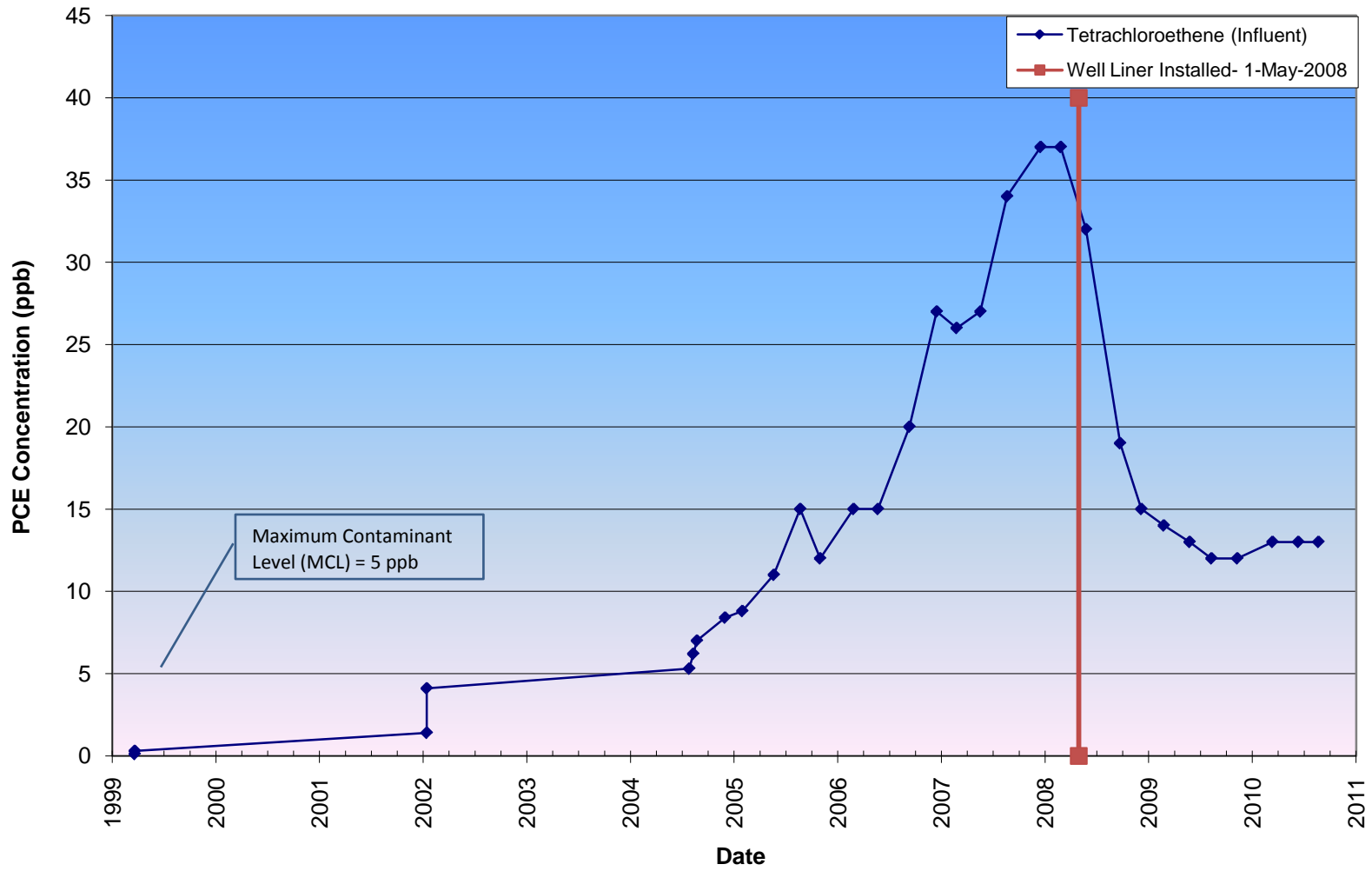


Figure 2.5
PCE Concentration Time Plot JS-36

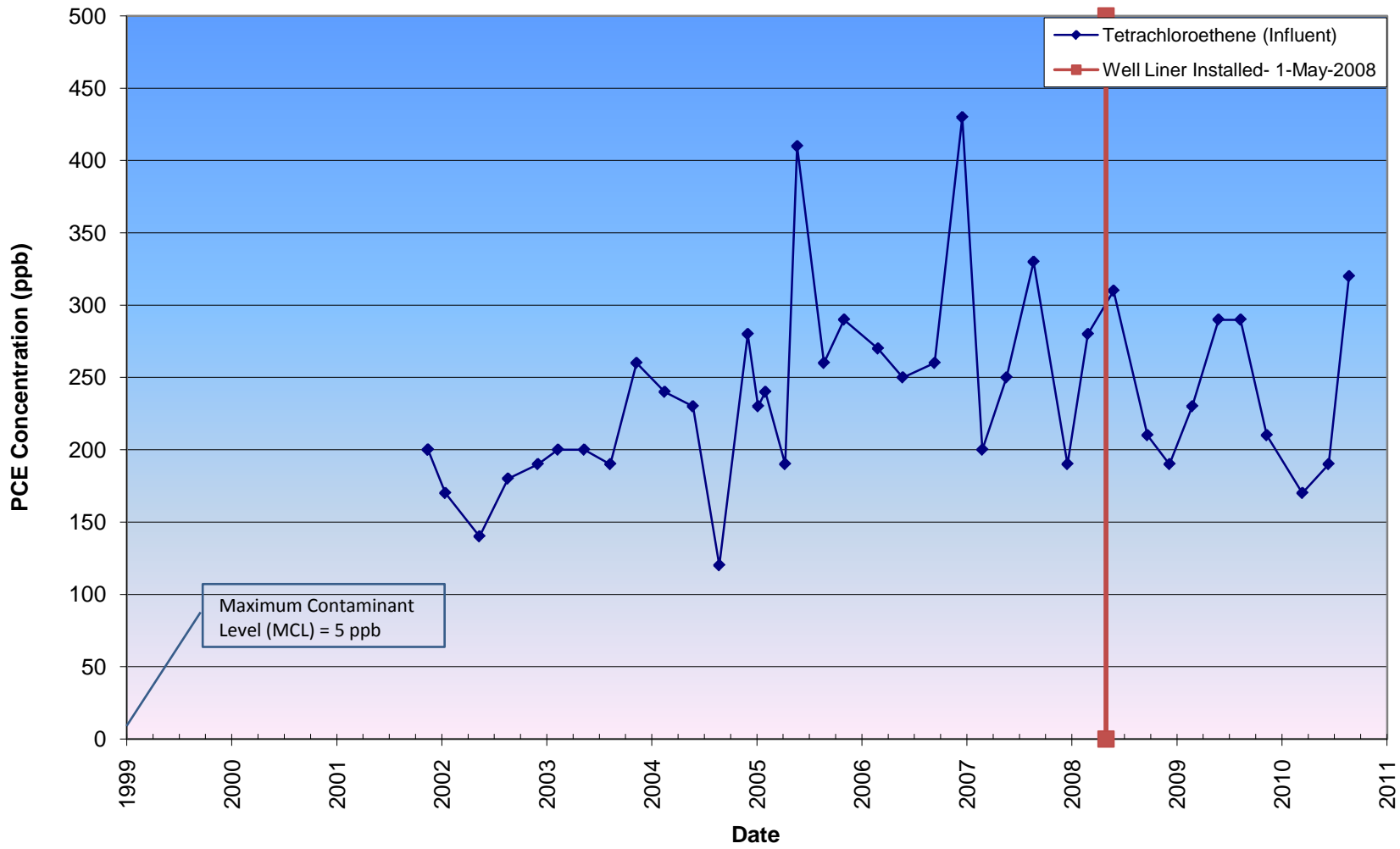
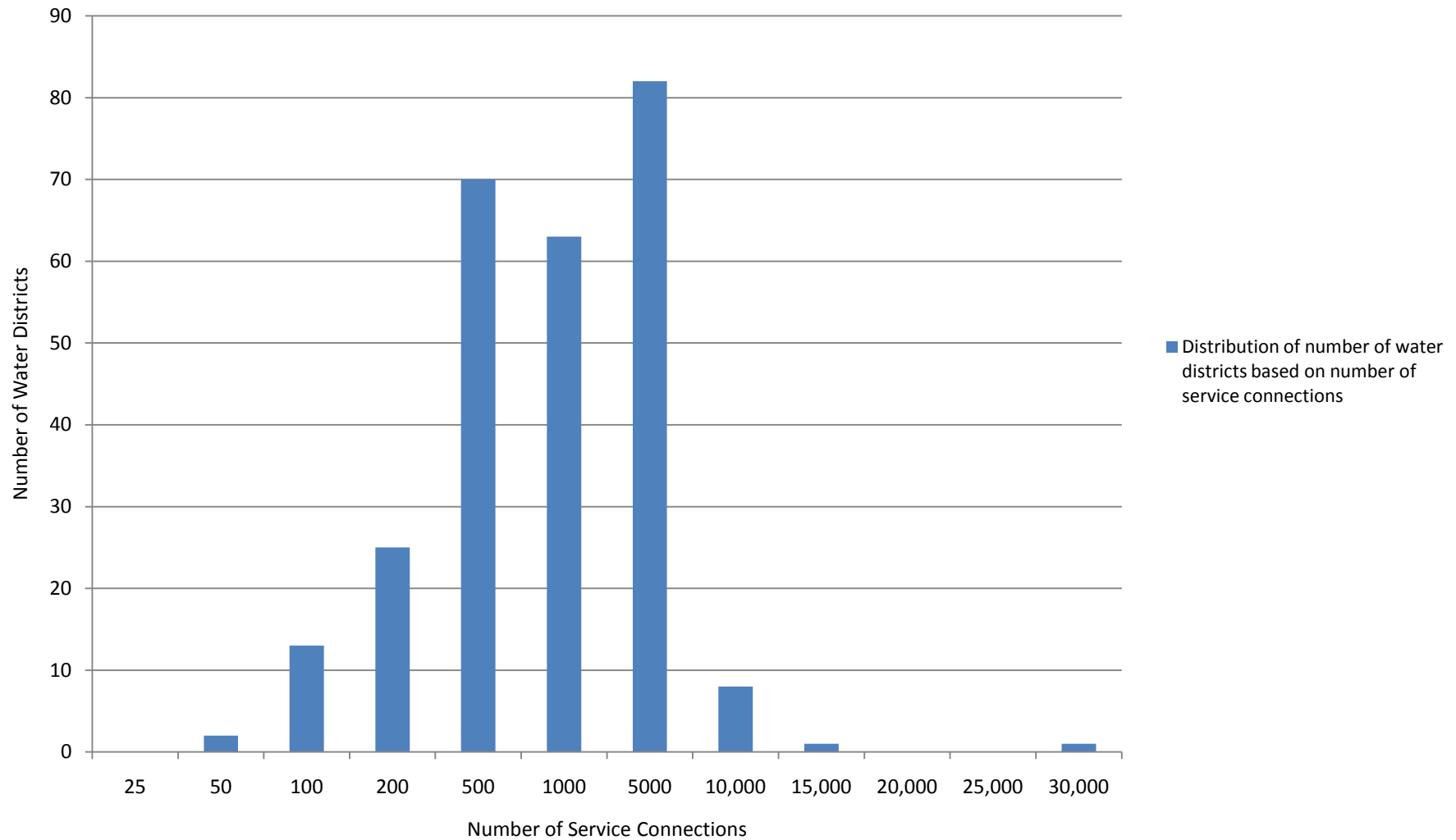


Figure 2.6
Missouri Public Water Supply Districts (PWSDs) - 2008
Distribution of Number of PWSDs
Based on Number of Service Connections



SECTION 3 EVALUATION OF ALTERNATIVES RELATIVE TO FS EVALUATION CRITERIA

3.1 INTRODUCTION

The August 2010 FS contains three alternatives (2b, 2d, and 3b) where an alternate water supply is provided in lieu of continued operation of the whole-house filtration systems. In the FS, the alternatives were evaluated against seven criteria as described in Section 5.1 of the FS. This section provides an evaluation of the three alternate water supply options discussed in this supplemental report. Table 3.1 lists the criteria and alternatives and an evaluation of whether the criterion is met based on the evaluation summarized below.

3.2 INDIVIDUAL EVALUATION

3.2.1 Replace Existing Impacted Wells

1. Overall Protection of Human Health and the Environment – There is no assurance that replacement wells could be drilled on the residents' properties at a location that would produce water with no PCE; therefore, this criteria is not met.
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) – Drilling of replacement wells could be conducted in accordance with the well construction restrictions for Special Area 3 described in 10 CSR 23-3.100.
3. Long-term Effectiveness and Permanence – Since there is no assurance that the new wells would not be impacted with PCE, installing new wells is no more effective or permanent an alternative than providing whole-house filtration on the existing wells.
4. Reduction of Toxicity, Mobility, and Volume – Since there is no assurance that the new wells would not be impacted with PCE, this alternative provides no greater impact on the toxicity, mobility, or volume of PCE in the groundwater than providing whole-house filtration on the existing wells.
5. Short-term Effectiveness – This alternative would not be effective in the short-term, as water without PCE cannot be guaranteed.
6. Implementability – This alternative is not implementable, due to the size of the properties. The property size would not allow installation of a new well at a sufficient distance from the location of the impacted groundwater in the lower Jefferson City/Roubidoux to assure that the new well would not contain PCE.

7. Cost – Each replacement well would cost approximately \$75,000 to install, with no assurance of producing water without PCE and therefore, no assurance that whole-house filtration would not continue to be required on the newly installed well(s).

3.2.2 Formation of a Public Water Supply District in OU6

1. Overall Protection of Human Health and the Environment – To be protective of human health, the water system would need to be designed and operated to ensure that the water does not become stagnant in the piping. The environment would be impacted during the construction due to the quantity of piping required to be installed. Provision of water from a PWSD and abandonment of the existing water supply wells would result in elimination of potential pathways from the impacted groundwater in the overburden and Upper Sand down to the Lower Jefferson City / Roubidoux formation.
2. Compliance with ARARs – A water district supplied by another PWSD in the county may be difficult to install to provide water without having water quality issues. An independent water district supplied by a separate supply well could be installed in compliance with ARARs.
3. Long-term Effectiveness and Permanence – The water transmission line and water distribution mains would require ongoing monitoring and maintenance to remain effective. A water supply well and treatment system would require ongoing operation, maintenance, and monitoring to remain effective.
4. Reduction of Toxicity, Mobility, and Volume – This alternative would not impact the toxicity, mobility, or volume of PCE in the groundwater.
5. Short-term Effectiveness – This alternative would not be effective in the short-term as there would be a time period required to negotiate a connection to an existing system or to locate an independent supply well, conducting pre-design investigations along the transmission line route, obtaining agreements for installing the transmission line, forming the PWSD, designing the system, obtaining permits to install, and constructing the system.
6. Implementability – There are numerous legal and engineering obstacles that would be difficult to overcome, as discussed in Section 2.2.
7. Cost – The capital costs for this alternative are discussed in Section 2.2 and are presented in Appendix A. The capital expenditure would range from \$1.6 to \$6.4 million or more to provide an alternate water supply using a PWSD to two to four residences (a range of approximately \$0.4 million to \$1.6 million per residence, assuming 4 residences). O&M costs for a PWSD water system, meeting all of the regulatory requirements, would add substantially to the capital costs, and the income from the water system is not anticipated to be able to sustain these O&M costs.

3.2.3 Extension of New Haven Water Service

1. Overall Protection of Human Health and the Environment – If installed as proposed in the FS, this alternative would be protective of human health and the environment. Provision of water from the New Haven water supply system and abandonment of the existing water supply wells would result in elimination of potential pathways from the impacted groundwater in the overburden and Upper Sand down to the Lower Jefferson City / Roubidoux formation.
2. Compliance with ARARs – The system as proposed in the FS could be installed in accordance with ARARs.
3. Long-term Effectiveness and Permanence – The water transmission line and water distribution mains would require ongoing monitoring and maintenance to remain effective. This would be the responsibility of the City of New Haven once the system was connected and put into service.
4. Reduction of Toxicity, Mobility, and Volume – This alternative would not impact the toxicity, mobility, or volume of PCE in the groundwater.
5. Short-term Effectiveness – This alternative would not be effective in the short-term as there would be a time period required to negotiate a connection to an existing system, to conduct pre-design investigation along the transmission and distribution line routes, to obtain agreements for installing the transmission and distribution lines, agreements of the residents for connection to the system, to design the system, obtain permits to install, and to construct the system.
6. Implementability – This alternative is implementable from an engineering aspect; however, it is currently not implementable as no agreement has been reached for extension of the New Haven water system.
7. Cost – The capital costs for this alternative are included in Alternatives 2b, 2d, and 3b of the August 2010 FS. These costs have been separated from these alternatives and are included in Appendix A. The capital cost for extension of the New Haven water supply as shown in the August 2010 FS is \$1.6 million.

3.3 COMPARATIVE EVALUATION

The comparison of the three alternatives in meeting the seven criteria is presented below, and summarized in Table 3.1.

1. Overall Protection of Human Health and the Environment – The alternative for replacing the existing wells does not meet this criterion as there is no assurance that replacement wells would produce water with no PCE. The other two alternatives may meet this criteria.
2. Compliance with ARARs – All three alternatives could be installed in accordance with ARARs.

3. Long-term Effectiveness and Permanence –The alternative for replacing the existing wells is no better relative to this criterion than the continued operation of the whole-house filtration systems on the existing wells. The water transmission line and water distribution mains for the other two alternatives would require ongoing monitoring and maintenance to remain effective.
4. Reduction of Toxicity, Mobility, and Volume – The two alternative water supply options would have no impact on the toxicity, mobility, or volume of PCE in the groundwater. The existing whole-house filtration systems do provide a reduction in mobility and volume, as the water is being treated with carbon. The replacement wells would perform no better than the existing wells with regard to this criterion.
5. Short-term Effectiveness – None of the three alternatives would be effective in the short-term.
6. Implementability – None of the three alternatives are implementable due to legal and/or engineering obstacles.
7. Cost – The costs for these alternatives are presented in Section 3.2. The lowest cost is for the well replacement, but there is no assurance that replacement wells could be installed to produce water not impacted with PCE. Extension of the New Haven Water System would have a lower capital and operating cost than formation of a PWSD in OU6, but no agreements have been reached with the City of New Haven regarding an extension. The costs associated with options other than extending the City of New Haven water line are prohibitive, and the O&M costs are not sustainable.

**TABLE 3.1
EVALUATION OF FS CRITERIA
RIVERFRONT SUPERFUND SITE OU2/OU6
NEW HAVEN, MISSOURI**

Criteria	Alternatives for an Alternate Water Supply		
	Replace Existing Impacted Wells	Formation of A Public Water Supply District in OU6	Extension of New Haven Water Service
Overall Protection of Human Health and the Environment	-	+*	+
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	+	+	+
Long-term Effectiveness and Permanence	-	+*	+*
Reduction of Toxicity, Mobility, and Volume	O	O	O
Short-term Effectiveness	-	-	-
Implementability	-	-	-
Cost	Capital Cost \$75,000 per well	Capital Cost \$1.6 to \$6.4 Million	Capital Cost \$1.6 Million

Legend

- Does not meet Criteria
- + Meets Criteria
- +* Meets Criteria Under Certain Conditions
- O Not Applicable

See Section 3 for more detailed evaluation of FS criteria.

SECTION 4 SUMMARY AND CONCLUSIONS

4.1 SUMMARY

4.1.1 Replace Existing Impacted Wells

In summary, replacing currently impacted wells or wells that may potentially become impacted in the future is not recommended for the following reasons:

- At JS-14 and JS-36, because of the relatively high PCE concentrations, replacement wells would not be expected to be free of PCE.
- At JS-38 and JS-52, the PCE concentrations are generally at or below the MCL, and PCE concentrations are continuing to decline. At JS-38, the concentration has been below the MCL for seven quarters. With one additional quarterly sample below the MCL, the whole-house treatment system would be allowed to be shut down in accordance with the AOC. Although PCE concentrations are lower at JS-38 and JS-52 than at JS-14 and JS-36, new wells at or near these locations also have the potential to contain PCE.

4.1.2 Formation of a Public Water Supply District in OU6

Creating a PWSD at the Site is an impracticable alternative for the following reasons:

- Distance from Existing PWSDs: The relatively large distances of the existing PWSDs in Franklin County from OU2/OU6 (at least eight miles), would result in logistical difficulties such as multiple road and bridge crossings, stagnation of water in transmission line, increased frequency of transmission line flushing, etc. Such a connection would also have a high cost to implement and maintain. The maintenance costs would potentially increase the water rate beyond what the limited number of consumers would consider reasonable.
- Size: The number of residences that would be part of a PWSD is too small to make creation of a PWSD practical without having unwarranted capital costs (in the range of \$1.6 to \$5.6 million) to provide an alternate water supply to two to four households that are currently being provided with a treated water supply meeting the RAOs. The limited number of service connections would be insufficient to cover operation, monitoring, and maintenance costs. If the water is purchased from a supplier adjacent to OU6, and the water supplier agrees to contract for the administration, monitoring, and maintenance of the OU6 PWSD, then the income from the system may or may not meet the costs for operating the system. It is not known whether an adjacent water supplier is willing or able to provide such services at a rate that would make formation of a PWSD viable.

The PWSD would be required to build up a financial reserve. There are numerous administrative and monitoring requirements depending on whether the system produces its own water or buys from another supplier. The cost to independently operate and maintain the water system, meeting all of the regulatory requirements, is anticipated to be greater than the revenue.

- Legal Requirements: The creation of a PWSD is procedurally impracticable due to the limited number of residences involved. The statutory requirements may be difficult, if not impossible, to meet.
- Other Types of Water Systems: With respect to other community water systems, due to the limited income generated by the proposed system, an investor-owned water system is not viable. An incorporated association requires that all residents within the boundary of the association agree to establish the association. There currently is no association that covers all of the homes in the areas under consideration for provision of water service. Further, it is doubtful that all residents in this area would agree to such an association to provide water service. A private water system for only the four homes currently utilizing whole-house treatment units may be technically and legally possible, but the operation and maintenance would be cost-prohibitive.

4.1.3 Extension of New Haven Water Service

Kellwood currently remains in discussions with the City of New Haven regarding extending their water system to OU6. Although negotiations are planned to continue, an eventual agreement is not certain, and a schedule cannot be currently predicted.

4.2 CONCLUSION

None of the three alternatives evaluated within this Report have been determined to be practicable for the reasons stated herein. Thus, the recommendations of the USEPA in the July 30, 2010 Proposed Plan should remain in place. Whole-house filtration at the four affected residences should continue until sampling of water at each residence meets the criteria for removal of the systems (at or below MCLs for eight consecutive quarterly sampling events), or until an alternate water supply becomes available. Although a PWSD is impracticable for the reasons stated within this document, a community water system may be possible in the situation where the infrastructure and administrative systems of an adjacent water supplier are already in place (i.e., through the City of New Haven).

SECTION 5 REFERENCES

Cares, 2010, the Center for Agricultural, Resource and Environmental Systems, map for Franklin County indicating the locations of the existing PWSDs (PWSD#2 is currently inactive).

<http://ims.missouri.edu/moims/step1.AOI/countylist.asp>

Franklin County, 2010, 2010 Master Plan, page 63.

<http://www.franklinmo.org/Planning%20&%20Zoning/Master%20Plan/PLAN%20CHAPTER%20II.pdf>

MDNR, undated, Water Well Types online web page,
<http://www.dnr.missouri.gov/env/wrc/welltypes.htm>

MDNR, 2007, 10 DNR 23 Chapter 3 — Well Construction Code 10 CSR 23-3.100 Sensitive Areas (7) Special Area 3

<http://www.sos.mo.gov/adrules/csr/current/10csr/10c23-3.pdf>

MDNR, 2008, Census of Missouri Public Water Systems 2008,

<http://www.dnr.mo.gov/env/wpp/census.htm>

MDNR, 2010, Drinking Water Branch online publication,

<http://www.dnr.mo.gov/DWW/index.jsp>, water system numbers MO6024211, MO6024213, MO6024214

Missouri Code of State Regulations, 10 CSR 60-2.015(2)(P)(8).

<http://www.sos.mo.gov/adrules/csr/current/10csr/10c60-2.pdf>

Missouri Revised Statutes 247.040.1. <http://www.moga.mo.gov/statutes/C200-299/2470000040.HTM>

New York Times, 2010, publication, <http://projects.nytimes.com/toxic-waters/contaminants/mo/franklin/>

Parsons, 2009, Remedial Investigation Report

Parsons, 2010, Feasibility Study Report, August 2010

USEPA, 2002, Administrative Order on Consent Docket No. CERCLA-07-2002-0091

USEPA, 2004, Administrative Order on Consent for Remedial Investigation/Feasibility Study Docket No. CERCLA-07-2004-0078

USEPA, 2010, Proposed Plan for Riverfront Superfund Site Operable Units 2 and 6, New Haven, Missouri, July 2010,

<http://mo.water.usgs.gov/epa/nh/OU2/OU2ProposedPlan.pdf>

APPENDIX A
WATER SYSTEM COST ESTIMATES

Feasibility Study Cost Estimate for Alternative 2b (partial - Water Supply only)

Job No.: 445737
Riverfront Superfund Site OU2 / OU6

PARSONS
ESTIMATE WORK SHEET

Location: New Haven, Missouri

Item	Description	Ref.	Quant.	Unit	Cost		
					Unit Cost	Total	
	Mobilization and Demobilization of Equipment and Personnel		1	LS	\$25,000	\$25,000	
	Temporary Facilities and Equipment (During Drilling and Construction Activities)						
	Temporary Construction Trailers		1	LS	\$5,000	\$5,000	
	Temporary Decontamination Equipment		1	LS	\$5,000	\$5,000	
	Emergency Spill Equipment		1	LS	\$1,000	\$1,000	
	Sediment and Erosion Controls		1	LS	\$3,000	\$3,000	
	Temporary Work Zone Fencing and Signs		1	LS	\$3,000	\$3,000	
	Health and Safety Air Monitoring and Preparation of H&S Records						
	Construction Surveys and Final Record Drawings		1	LS	\$5,000	\$5,000	
	Preparation of Plans and Schedules						
	Preparation of H&S Plan / Spill and Emission Control Plan		1	LS	\$5,000	\$5,000	
	Preparation of a Sediment and Erosion Control Plan		1	LS	\$5,000	\$5,000	
	Preparation of a General Earthwork Plan		1	LS	\$5,000	\$5,000	
	Preparation of the Construction Schedule		1	LS	\$5,000	\$5,000	
	Water Mains						
	Water Main Installation and Connection		1	LS	\$1,000,000	\$1,000,000	
	Tie In to Water Main		30	Ea	\$5,500	\$165,000	
	Existing private water well abandonment		30	Ea	\$5,000	\$150,000	
	Design and Oversight						
	Pre-design Investigation for Water Line		1	LS	\$50,000	\$50,000	
	Water Piping Design		1	LS	\$115,000	\$115,000	
	Subtotal Construction Costs					\$1,552,000	
	Subtotal Construction Costs w/ Contingency (5%)					\$1,630,000	
	TOTAL REMEDIATION CONSTRUCTION COSTS					Total	\$1,630,000

NOTES

- 1 Estimate is based on distribution line connected to New haven Water System at intersection of Hihway C and Boeuf-Lutheran Road.
- 2 Distribution line runs along Highway C, Boeuf-Lutheran Road, and Wildcat Creek Lane. Line to be jacka nd bored beneath Highway C and Boeuf-Lutheran Road.
- 3 Water line would be sized for fire flow.
- 4 No O&M costs included. O&M costs to be covered by water usage fees.
- 5 Cost estimate has been developed based on historical experience of similar work and from Means Estimating Guide.
- 6 The cost estimate is order-of-magnitude level estimate (typical accuracy is +50 percent to -30 percent).

Cost Estimate
New PWSD Using Water From An Existing PWSD
8 Mile Long Transmission Line and Distribution System at OU6

Job No.: 445737

Riverfront Superfund Site OU2 / OU6

PARSONS

ESTIMATE WORK SHEET

Location: New Haven, Missouri

Item	Description	Ref.	Quant.	Unit	Cost	
					Unit Cost	Total
	Mobilization and Demobilization of Equipment and Personnel		1	LS	\$50,000	\$50,000
	Temporary Facilities and Equipment (During Drilling and Construction Activities)					
	Temporary Construction Trailers		1	LS	\$30,000	\$30,000
	Temporary Decontamination Equipment		1	LS	\$30,000	\$30,000
	Emergency Spill Equipment		1	LS	\$50,000	\$50,000
	Sediment and Erosion Controls		1	LS	\$50,000	\$50,000
	Temporary Work Zone Fencing and Signs		1	LS	\$50,000	\$50,000
	Health and Safety Air Monitoring and Preparation of H&S Records					
	Construction Surveys and Final Record Drawings		1	LS	\$50,000	\$50,000
	Preparation of Plans and Schedules					
	Preparation of H&S Plan / Spill and Emission Control Plan		1	LS	\$10,000	\$10,000
	Preparation of a Sediment and Erosion Control Plan		1	LS	\$10,000	\$10,000
	Preparation of a General Earthwork Plan		1	LS	\$10,000	\$10,000
	Preparation of the Construction Schedule		1	LS	\$10,000	\$10,000
	Water Transmission Line					
	Transmission Line Installation and Connection		42,000	LF	\$75	\$3,150,000
	Jack and Bore Under Highways		3	LS	\$100,000	\$300,000
	Hang Pipeline to Bridge Structure		2	LS	\$50,000	\$100,000
	Water Distribution Mains					
	Water Main Installation and Connection		1	LS	\$1,000,000	\$1,000,000
	Tie In to Water Main		30	Ea	\$5,500	\$165,000
	Existing private water well abandonment		30	Ea	\$5,000	\$150,000
	Design and Oversight					
	Pre-design Investigation for Water Distribution and Transmission Line		1	LS	\$300,000	\$300,000
	Water Piping Design		1	LS	\$500,000	\$500,000
	Subtotal Construction Costs					\$6,035,000
	Subtotal Construction Costs w/ Contingency (5%)					\$6,340,000
TOTAL CONSTRUCTION COSTS					Total	\$6,340,000

NOTES

- 1 Estimate is based on transmission line connected to PWSD #! Near Washington, Mo.
- 2 Transmission line runs along Highway 100 and crosses Highway C, Highway K-K, and Highway 185.
- 3 Major bridge crossings would include Boeuf Creek and St. John's Creek.
Distribution line runs along Highway C, Boeuf-Lutheran Road, and Wildcat Creek Lane. Line to be jack and bored beneath Highway C and Boeuf-Lutheran Road.
- 5 Water line would not be sized for fire flow.
- 6 No O&M costs included. O&M costs to be covered by Water District System fees.
- 7 Cost estimate has been developed based on historical experience of similar work and from Means Estimating Guide.
- 8 The cost estimate is order-of-magnitude level estimate (typical accuracy is +50 percent to -30 percent).

**Cost Estimate
New PWSD Using Alternative Water Supply (New Well)**

Job No.: 445737

Riverfront Superfund Site OU2 / OU6

PARSONS
ESTIMATE WORK SHEET

Location: New Haven, Missouri

Item	Description	Ref.	Quant.	Unit	Cost	
					Unit Cost	Total
	Mobilization and Demobilization of Equipment and Personnel		1	LS	\$50,000	\$50,000
	Temporary Facilities and Equipment (During Drilling and Construction Activities)					
	Temporary Construction Trailers		1	LS	\$12,000	\$12,000
	Temporary Decontamination Equipment		1	LS	\$12,000	\$12,000
	Emergency Spill Equipment		1	LS	\$4,000	\$4,000
	Sediment and Erosion Controls		1	LS	\$7,500	\$7,500
	Temporary Work Zone Fencing and Signs		1	LS	\$7,500	\$7,500
	Health and Safety Air Monitoring and Preparation of H&S Records		1	LS	\$10,000	\$10,000
	Construction Surveys and Final Record Drawings		1	LS	\$15,000	\$15,000
	Preparation of Plans and Schedules					
	Preparation of H&S Plan / Spill and Emission Control Plan		1	LS	\$7,000	\$7,000
	Preparation of a Sediment and Erosion Control Plan		1	LS	\$7,000	\$7,000
	Preparation of a General Earthwork Plan		1	LS	\$7,000	\$7,000
	Preparation of the Construction Schedule		1	LS	\$7,000	\$7,000
	Water Well and Transmission Main					
	Water Well Installation and Connection		1	LS	\$472,000	\$472,000
	Transmission Line Installation and Connection		2,000	LF	\$125	\$250,000
	Jack and Bore Under Highways		1	LS	\$100,000	\$100,000
	Hang Pipeline to Bridge Structure		1	LS	\$50,000	\$50,000
	Water Distribution Mains					
	Water Main Installation and Connection		1	LS	\$1,000,000	\$1,000,000
	Tie In to Water Main		30	Ea	\$5,500	\$165,000
	Existing private water well abandonment		30	Ea	\$5,000	\$150,000
	Design and Oversight					
	Pre-design Investigation for Water Well and Transmission Line		1	LS	\$160,000	\$160,000
	Water Well and Transmission Piping Design		1	LS	\$150,000	\$150,000
	Water District O&M Program Development		1	LS	\$40,000	\$40,000
	Pre-design Investigation for Water Distribution Line		1	LS	\$50,000	\$50,000
	Water Distribution Piping Design		1	LS	\$115,000	\$115,000
	Subtotal Construction Costs					\$2,848,000
	Subtotal Construction Costs w/ Contingency (5%)					\$3,000,000
TOTAL DESIGN AND CONSTRUCTION COSTS					Total	\$3,000,000

NOTES

- 1 Costs do not include purchase of land for water well.
- 2 Well Installation estimate provided from Layne and includes well, pump, controls, and pumphouse
- 3 Water well Installation and Connection includes a hydropneumatic tank (1200 gallons). Budgetary cost provided by Hydro-Air Systems.
- 4 Hydropneumatic tank does not provide fire protection.
- 5 Transmission line estimated size is 10 inch. Location of well estimated to be at Highway C and Burt Lane, south of Wildcat Creek.
- 6 Water line would be sized for fire flow.
Distribution line runs along Highway C, Boeuf-Lutheran Road, and Wildcat Creek Lane. Line to be jack and bored beneath Highway C and Boeuf-Lutheran Road.
- 7
- 8 No O&M costs included. O&M costs to be covered by water usage fees.
- 9 Cost estimate has been developed based on historical experience of similar work and from Means Estimating Guide.
- 10 The cost estimate is order-of-magnitude level estimate (typical accuracy is +50 percent to -30 percent).