

Section 8

Summary and Conclusions

The national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste. The remedial process requires extensive data gathering and analysis to characterize the scope of the problem and the potential threats to human health and the environment. CERCLA authorizes the President, and this authority has been delegated to the Director of the Superfund Division, EPA Region 6, to conduct remedial activity or to enter into site-specific agreements to allow other agencies and/or groups or parties to conduct remedial activity. Remedial actions are those actions consistent with a permanent remedy taken to prevent or minimize a release.

The remedial process is made up of the following six phases:

- Remedial Investigation (RI)
- Feasibility Study (FS)
- Selection of Remedy
- Remedial Design (RD)
- Remedial Action (RA)
- Operation and Maintenance (O&M)

The RI is an assessment of the nature and extent of site-related contamination and the associated health and environmental risk associated with the site-related contaminants. The RI is much more detailed and comprehensive than initial site inspection activities, which may be performed prior to the site being added to the NPL, and is designed to provide information needed to develop and evaluate cleanup alternatives. The RI determines the existence and nature of any actual threat that could be posed to human health or the environment, and defines the extent of the threat posed to human health or the environment by the contamination found at a site. This report provides the RI for the GWP site.

The FS provides for the development and analysis of a range of cleanup alternatives for the site. In the FS, EPA identifies alternatives for remedial action consideration and compares the advantages

and disadvantages of each alternative. Options for cleaning up the site are considered, described, and evaluated against specific criteria defined for this purpose. The FS is comprised of two main phases: development and screening of alternatives and detailed analysis of the alternatives (**EPA, 1992**). The FS for the GWP site is provided separately.

This summary and conclusions section of the RI Report provides an overview of the assessment performed in terms of the nature and extent of environmental impacts, the sources of contamination and migration pathways, and potential effects on human health and the environment. This information forms the basis for the identification and evaluation of potential remedial alternatives in the FS. The data collected during the RI is sufficient to support the selection of a RA for the site. Data needs that remain, as discussed in **Section 8.4**, may be considered during the RD or RA to support design and/or implementation of the selected RA.

8.1 Nature of Environmental Impacts

The GWP site contains soil vapor and ground water contaminated with PCE. PCE is a solvent used in the United States since the 1930's for dry cleaning and parts-cleaning operations. There is some evidence that PCE may have the potential to cause cancer after long-term exposure (**EPA, 1995**). The GWP site contamination is located in the subsurface generally between East Griggs Avenue and East Hadley Avenue, extending east to beyond I-25, and west to beyond North Solano Avenue. This is an area dominated by recreational, light industrial/ commercial, and residential land uses.

The ground water contaminated with PCE at the GWP site occurs within the Mesilla Bolson Aquifer, which is used by the CLC for public drinking water supply and irrigation. Along with municipal water supply wells, a limited number of private wells also tap into this aquifer; of those private wells that are still in use, the owners of these wells use them primarily for irrigation. None of the private wells are located within the GWP plume boundary or downgradient of the plume boundary within one-half mile of the site. Four municipal drinking water supply wells (CLC Well Nos. 18, 19, 21, and 27) are affected by the PCE known to be associated with the GWP site. NMED first identified the PCE contamination associated with the GWP site beginning in 1993, in CLC Well Nos. 21 and 27.

Of the four affected supply wells, only CLC Well No. 21 remains in service. PCE concentrations at this well have been detected at, slightly above, or below the MCL of 5 µg/L. The CLC manages Well No. 21's usage under a blending program approved by the NMED DWB on September 24, 2002 (**NMED, 2002a**). The CLC designed the Well No. 21 blending program to mix affected water with unaffected water in the Upper Griggs Reservoir to reduce PCE concentrations to levels below the

MCL before the water reaches the distribution system. The CLC monitors the concentration of PCE in the Upper Griggs Reservoir to ensure compliance below the MCL. Periodic sampling performed in 2005 (from January 2005 through December 2005) revealed PCE concentrations at the Upper Griggs Reservoir ranged from not detected to 3.2 µg/L (with an average concentration of about 1.7 µg/L).

Environmental investigations performed at the site since the contamination was first discovered show PCE has been detected at the GWP site in ground water at depths of up to 635 feet (ft) below ground surface (bgs) (an approximate elevation of 3,500 ft above mean sea level [MSL]) and in soil vapor in the unsaturated zone above the affected ground water (from ground surface to the water table, which occurs at about 100 to 200 ft bgs (an approximate elevation of 3,850 ft MSL).

At the time the site was added to the NPL in June 2001, EPA initiated the RI/FS. The first RI field mobilization was performed by EPA with support from NMED during April through February 2003. EPA summarized the results and conclusions from this first mobilization in the IDRA report (**EPA, 2003a**). Based on the observed nature and extent of contamination, described in further detail in the IDRA report, EPA identified areas where PCE was released to the environment and resulted in contamination of soil vapor and ground water. The IDRA report concluded that the PCE was released at the surface to the soil and that PCE migrated down to ground water over time. Three areas where higher relative concentrations of PCE occurred in the soil vapor were identified as source areas.

These three areas are located as follows:

1. Near the intersection of East Hadley Avenue and North Walnut Street (along the former airport runway and the former arroyo parallel to and south of the former airport runway).
2. At the Doña Ana County Transportation Department (DACTD) maintenance facility on East Griggs Avenue.
3. At the former National Guard Armory on East Hadley Avenue.

In January 2004, a comprehensive ground water sampling event was performed to evaluate potential changes in the ground water plume. In this event, EPA collected samples from all GWP site monitor wells. This sampling event is described in a Technical Memorandum entitled *Results of the January 2004 Ground Water Sampling Event* (**CH2M HILL, 2004**).

The second field mobilization was performed by EPA with support from NMED during October through December 2003. The field tasks performed included installation of two additional monitor wells, installation of one additional deep SVMP, collection of additional shallow subsurface soil

vapor samples, and collection of ground water samples in new and existing monitor wells. In addition to the field data collection data efforts, the JSP provided computer simulation of flow and transport of PCE in the ground water to refine the conceptual site model and to support the evaluation of remedial alternatives in the FS.

In addition to PCE, uranium, and VOCs benzene, toluene, methyl tertiary butyl ether (MTBE), and PCE degradation products TCE, and 1,2 cis- and 1,2 trans-DCE have been detected in the ground water within the footprint of the PCE plume at the site. Of these, only benzene has been detected in site monitor wells above its corresponding MCL (in seven monitor wells), and MTBE is detected above its corresponding EPA Region 6 MSSL in one monitor well. Benzene is not detected in any municipal supply wells. MTBE is detected in one municipal supply well at concentrations below the MSSL. Uranium exceeds its corresponding MCL in seven municipal supply wells. However, elevated concentrations of uranium are naturally occurring, and the CLC is addressing the elevated uranium concentrations in the drinking water supply as part of compliance with the SDWA. As the most widespread contaminant at the GWP site in both soil vapor and ground water, found in both monitor wells and municipal supply wells, PCE is considered the primary Contaminant of Concern (COC) for the GWP site for purposes of the RI/FS.

The current extent of contamination of PCE, fate and transport of the PCE, and assessment of risk associated with PCE in the environment is summarized in the following sections.

8.2 Extent of Environmental Impacts

The first 80 to 240 ft bgs in the vicinity of the plume consists of unsaturated sands, gravels, and interbedded silts and clays. Soil vapor sampling within this zone indicated low levels of PCE (ranging from not detected to 1,186 ppbv) in SVMPs between 15 and 184 ft bgs. The highest and most consistent detections occur beneath and in the vicinity of the three source areas. Shallow soil vapor sampling confirms that broad areas of the subsurface are impacted by the contamination at the source areas. More than half of the samples collected from the shallow subsurface in the residential area northeast of the intersection of East Hadley Avenue and North Walnut Street exceeded screening criteria for PCE. Laterally, the concentration of PCE in soil vapor decreases away from each source area.

The ground water system beneath the study area consists of the UHZ and LHZ, the tops of which are approximately 80 to 240 ft bgs and 300 to 325 ft bgs, respectively. The two zones are separated by relatively low permeability clayey and silty sands that are discontinuous across the site. Water levels

in the UHZ are approximately 4.5 to 12.5 ft higher than in the LHZ, and depths to water in the two zones are approximately 80 to 240 ft bgs and 90 to 250 ft bgs, respectively. The UHZ and LHZ are hydrologically connected, as water levels in monitor wells screened in both zones show responses to pumping of the City's municipal wells. However, water levels in wells screened at the water table (UHZ) show a much less pronounced response to pumping as compared with monitor wells screened in the LHZ across similar depths of the aquifer as where the municipal wells are screened.

Ground water is the primary source of potable water for the area, and most, if not all, municipal, industrial, and private wells are screened in the LHZ. Within the LHZ, medium to coarse sand layers, often containing gravel, are the primary conduits for horizontal ground water flow.

The low permeability strata between the zones are not continuous and are generally absent in the eastern portion of the site. These strata do not provide significant impedance to vertical ground water flow, and they do not appear to significantly retard the vertical migration of contamination. The highest levels of PCE contamination at the site occur in the UHZ and the upper portion of the LHZ.

Vertical contaminant sections through the site show that the highest detections of PCE are typically in wells screened at the water table or the upper portion of the LHZ at the DACTD maintenance facility. Lower levels of PCE occur in shallow wells located near the other two source areas.

Ground water contamination in the LHZ is more extensive due to the presence of higher permeability strata that serve as the primary production zone for the City's municipal wells. Pumping of these wells has resulted in the vertical migration of PCE contamination into deeper portions of the aquifer. Four municipal supply wells are currently impacted by PCE, 1 of which is still operational (CLC Well No. 21). The city manages the PCE in these wells through an NMED DWB-approved blending plan.

The ground water plume (based on detections of PCE) is currently known to extend approximately 9,500 ft west-to-east and approximately 2,700 ft north-to-south. The plume is not defined laterally to concentrations below the MCL for PCE west and northwest of up-gradient monitor well GWMW06 or east of down-gradient monitor well GWMW15. Laterally, there are two areas where PCE concentrations exceed the MCL, an area located near monitor well GWMW06 and a second area extending from the DACTD maintenance facility east to monitor well GWMW15. These two areas are separated by intervening wells where the PCE concentrations are less than the MCL. The plume extends vertically to a depth of approximately 635 ft bgs. The plume is defined vertically to concentrations below the MCL for PCE. The JSP Team has completed a draft ground water model report for the site. The results of the model indicate that the PCE plume located at and down-gradient

of the DACTD maintenance facility will migrate towards the southeast towards CLC Wells 20, 24, 26, and 61. [Section 8.4](#) provides a discussion of additional data needs identified as a result of the RI.

8.3 Migration Pathways

PCE in ground water is likely the result of surface spills with subsequent leaching/infiltration and volatilization into the soil vapor. DNAPL has not been found to exist within the unsaturated zone or aquifer at the site. Dissolved phase PCE in ground water is likely a result of induced infiltration and air diffusion. Local pumping from CLC municipal supply wells has pulled PCE horizontally and vertically across the site into deeper portions of the aquifer. Shallow soil vapor data collected during the first field mobilization also suggested a potential migration pathway for PCE to enter residential homes northeast of the intersection of East Hadley Avenue and North Walnut Street.

The current distribution of contaminants in the vadose zone as well as both the UHZ and LHZ ground water indicates that the contaminants in the subsurface are at or near equilibrium. While the soil vapor is believed to be a source of contamination to ground water, the low levels present in soil vapor indicate a decreasing threat to ground water. Although it is plausible that some contamination could volatilize from the water table to the vadose zone down-gradient from the three source areas, the levels of PCE present near the water table down-gradient of these sources are low and not likely to present a significant source of PCE contamination to the vadose zone.

The existing ground water plume is likely to continue migrating toward operational municipal supply wells, acting as a low level source of PCE to these wells. Natural attenuation, principally via dispersion and diffusion of PCE in both soil vapor and ground water, is anticipated to further reduce the concentrations of PCE over time.

8.4 Considerations for Remedial Design/Remedial Action

As noted in the introduction to [Section 8](#), the data collected and evaluated in the RI is sufficient to support the evaluation of alternatives in the FS. Three issues identified in this RI through the assessment of the nature and extent of environmental impacts should be considered during the detailed design and implementation of the selected alternative at the GWP site. These issues are:

- The up-gradient extent of the PCE plume northwest and west of monitor well GWMW06 is not yet completely defined.
- The down-gradient extent of the PCE plume east of monitor well GWMW15 is not yet completely defined.

- The ground water fate and transport model suggests the PCE plume is or will migrate to the south and southeast towards CLC Well Nos. 20, 24, 26, and 61 in the area between CLC Well Nos. 19 and 27. Field data is not yet available to confirm this conclusion.

Each of the identified issues for consideration during RD/RA is discussed further in the following sections.

8.4.1 Definition of Up-Gradient Extent of PCE Plume

PCE is currently detected in ground water at concentrations above the MCL in upgradient monitor well GWMW06, port 1. PCE currently exceeds the MCL in the UHZ only in this area. Monitor well GWMW06 is currently the furthest up-gradient well at the site, and the extent of the PCE detections in this area to concentrations below the MCL is not defined in the up-gradient direction (west and north-west). CLC Well No. 10 is located up-gradient of GWMW06. CLC Well No. 10 is screened deeper (within the LHZ). PCE was not detected in the sample collected from CLC Well No. 10 during the RI, and PCE has not been detected in samples collected from CLC Well No. 10 as part of the sampling conducted for compliance with the requirements of the SDWA (see [Table 1-2](#)). During the initial site investigations conducted by NMED between 1998 and 2000, PCE was detected at concentrations exceeding the MCL in nearby monitor wells MW-SF6, MW-SF7, MW-SF8, and the Gas Card monitor well (since abandoned) (see [Table 2-3](#)). These wells are located in an area extending from the Former National Guard Armory to the northwest (see [Figure 2-1](#)). The PCE concentrations in these monitor wells, provided in [Table 2-3](#), have been decreasing since the initial NMED site investigation was conducted, and in the latest sampling performed in December 2005, all samples from the MW-SF wells listed above were below the MCL (the Gas Card well was abandoned previously, and has not been sampled since July 1999).

Further west of CLC Well No. 10 (and upgradient), NMED is investigating a plume in the area of North Main Street. Low concentrations (less than 5 µg/L) of PCE and 1,1,2,2-tetrachloroethane have been detected in monitor wells at several UST sites in the 1800 and 1900 blocks of North Main Street. The NMED has recommended that additional ground water sampling be performed in that area. The current extent and source of this plume, and its potential impact or lack of impact on the GWP site plume, are not yet determined (NMED, 2002b).

The primary concern relative to northwest area of the plume around GWMW06 is to ensure that CLC Well No. 10 does not become impacted by the PCE detected in the UHZ in this area. It is currently unknown if PCE is present in ground water in the UHZ at CLC Well No. 10 above its screened interval (in the LHZ). CLC Well No. 10 will continue to be monitored for PCE, and, if warranted,

further investigation may be considered to verify the extent of PCE in the UHZ at CLC Well No. 10 and to monitor for potential migration of PCE, if present, from the UHZ into the LHZ. If it is determined that another source has resulted in the PCE detected in this area, the ground water contamination will be referred for evaluation under other regulatory authorities (such as authorities under the Resource Conservation and Recovery Act [RCRA]).

8.4.2 Definition of Down-Gradient Extent of PCE Plume (East of GWMW15)

PCE is currently detected in ground water at concentrations above the MCL in down-gradient monitor well GWMW15-S. PCE currently exceeds the MCL in the upper portion of the LHZ in this area. Monitor well GWMW15 is currently the furthest down-gradient well at the site, and the extent of the PCE detections in this area to concentrations below the MCL is not defined in the down-gradient direction (east). There are no known current receptors (either municipal or private wells) located immediately down-gradient of this monitor well. The ground water model does not show migration of PCE to this area using two of the three model scenarios (JSAI, 2006a). Therefore, the model cannot necessarily be used to adequately predict how far the PCE plume extends in this area or if the PCE will continue to migrate beyond GWMW15, although any migration is expected to be limited by the regional hydrostratigraphy known to be present to the east. An additional monitor well in this area would be appropriate to support LTM during the selected RA, to confirm the expectation that migration is limited in this area and provide a downgradient monitor point outside the extent of PCE above the MCL.

8.4.3 Definition of South and Southeast Expansion of the PCE Plume

The model results show that a cone-of-depression exists south of the site that is centered at CLC Well No. 24. This cone-of-depression results in a south and southeasterly ground water flow direction. The ground water model predicts that the PCE plume will migrate to the south and southeast in the area between CLC Well Nos 19 and 27 (JSAI, 2006a). As discussed in [Section 3.7.2.4.4](#), water level data collected during the RI indicates that ground water flow at the site is generally towards the east. However, water level data are limited to the monitor wells present at the site, which occur in a narrow west-to-east area between monitor wells GWMW06/GWMW07 (located at the west end of the site) and GWMW15 (located at the east end of the site – see [Figure 2-8](#)). Water levels collected from locations that cover a larger area might demonstrate that a south and/or southeasterly ground water flow direction exists at the site.

There are currently no monitor wells located south of East Griggs Avenue between CLC Well Nos. 19 and 27. An additional monitor well in this area would be appropriate to support LTM during the

selected RA, to confirm the results of the ground water model and to confirm the cross- or downgradient extent of PCE in this area.

8.5 Potential Effects on Human Health

The risk assessment team performed a BHHRA to assess whether site-related contaminants pose a current or future risk to human health if no remedial actions are performed. Potentially complete exposure pathways were determined to be shallow soil vapor (through vapor intrusion to buildings) and ground water (through the water supply distribution system, or through private domestic wells). The assessment of risk is not affected by the remaining ground water data needs described in [Section 8.4](#); the higher concentration areas of the PCE plume are sufficiently defined, and the PCE contamination is completely defined at all potential receptor points within the area surrounding the extent of PCE detections associated with the GWP site.

Potential exposure points for shallow soil vapor intrusion were identified in the neighborhood northeast of the East Hadley Avenue and North Walnut Street intersection, the PAL Boxing Facility, and the Meerscheidt Recreation Center. Samples in the area of the neighborhood and the PAL Boxing Facility exceeded the initial screening of 120 ppbv. The Meerscheidt Recreation Center samples did not exceed the initial screening level, and this area was dropped from further evaluation. Based on the comparison to initial screening levels, PCE was identified as a COPC for soil vapor at seven of eight residential locations sampled and at the PAL Boxing Facility, all located above the current ground water plume. EPA identified no COPCs for soil vapor at one residence and at the Meerscheidt Recreation Center building. The risk assessment team calculated the potential indoor air concentrations of PCE resulting from soil vapor intrusion using the Johnson and Ettinger model as presented in the *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (EPA, 2004), and the results were within EPA's acceptable risk range (one-in-10,000 to one-in-1,000,000; 10^{-4} to 10^{-6}).

Based on the comparison between ground water concentrations and MCLs and EPA Region 6 MSSLS, PCE, benzene, and MTBE were identified as COPCs in ground water. PCE is known to be site-related, and benzene and MTBE are co-mingled with the PCE plume. Concentrations at current ground water exposure points were measured below the MCLs for potable ground water. However, a potential for future unacceptable exposure above the MCL exists if (1) PCE is not maintained below the MCL in the municipal water supply; (2) if private wells are completed in the plume; or (3) if the ground water plume expands beyond the current site boundary. This potential risk supports the selection of PCE as a COC for the GWP site.

Uranium was detected above the MCL in seven CLC wells; however, elevated concentrations of uranium are thought to be naturally occurring in the area ground water. Uranium contributes to the site risk because the concentrations exceed the MCL in seven CLC wells. The CLC is addressing the elevated uranium concentrations in the drinking water supply as part of compliance with the SDWA.

In conclusion, current and future exposures to indoor air concentrations from vapor intrusion are within acceptable levels. Current exposures to the municipal water supply are within acceptable levels as long as CLC maintains compliance with drinking water standards. As the most widespread contaminant at the GWP site in both soil vapor and ground water, found in both monitor wells and municipal supply wells, PCE is considered the primary COC for the GWP site because a potential for future unacceptable exposure exists.