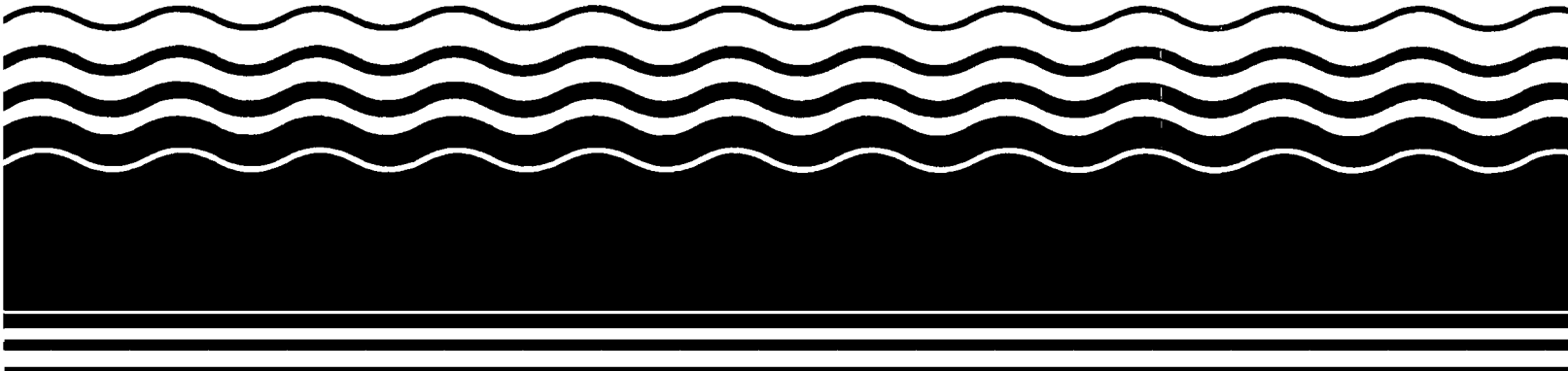




Superfund Record of Decision:

Chemical Sales, CO



REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA/ROD/R08-93/076	2.	3. Recipient's Accession No.																			
4. Title and Subtitle SUPERFUND RECORD OF DECISION Chemical Sales, CO Fourth Remedial Action - Final				5. Report Date 12/29/92																			
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7. Author(s)				8. Performing Organization Rept. No.																			
9. Performing Organization Name and Address				10. Project Task/Work Unit No.																			
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				(G)																			
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460				13. Type of Report & Period Covered 800/800																			
				14.																			
15. Supplementary Notes PB94-964414																							
16. Abstract (Limit: 200 words) The Chemical Sales site is an active chemical sales and storage facility in Commerce City, Adams and Denver Counties, Colorado. Land use in the area is predominantly industrial, with six residences located on the northern portion of the site. The site borders Sand Creek to the north and the Rocky Mountain Arsenal Superfund site to the east, and lies within the 100-year floodplain of Sand Creek. An estimated 30,000 residents living near the site use the South Adams County Water and Sanitation District Wells (SACWSD) 18, 21, and 47, which draw from the shallow alluvial aquifer, as their principal sources of drinking water. Since 1976, Chemical Sales has used the site to store and sell organic chemicals and acids. Site features include a warehouse and tank farm, including an associated system of above-ground and underground storage tanks and pipelines. In 1981, a random EPA sampling identified several organic chemicals in onsite wells located along the eastern portion of the site, and additional sampling in 1982 and 1985 confirmed these results. Between 1985 and 1990, three onsite chemical releases of hazardous substances into the soil and ground water from the facility were reported. In 1985, approximately 200 gallons of methylene chloride were released during an onsite chemical transfer. In 1986, VOC-contaminated rainwater was discharged directly into a nearby drainage ditch. In 1987, EPA selected a permanent water (See Attached Page)																							
17. Document Analysis <table border="0"> <tr> <td>a. Descriptors</td> <td colspan="5"> Record of Decision - Chemical Sales, CO Fourth Remedial Action - Final Contaminated Medium: gw Key Contaminants: VOCs (benzene, PCE, TCE) </td> </tr> <tr> <td>b. Identifiers/Open-Ended Terms</td> <td colspan="5"></td> </tr> <tr> <td>c. COSATI Field/Group</td> <td colspan="5"></td> </tr> </table>						a. Descriptors	Record of Decision - Chemical Sales, CO Fourth Remedial Action - Final Contaminated Medium: gw Key Contaminants: VOCs (benzene, PCE, TCE)					b. Identifiers/Open-Ended Terms						c. COSATI Field/Group					
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c. COSATI Field/Group																							
18. Availability Statement		19. Security Class (This Report) None		21. No. of Pages 56																			
		20. Security Class (This Page) None		22. Price																			

Abstract (Continued)

treatment plant to address the previously identified onsite ground water contamination along the eastern portion of the site. In 1990, approximately 3,700 gallons of methanol were spilled on the ground surface near the tank farm. As a result of these spills, subsequent EPA investigations have confirmed the contamination of onsite soil and ground water. This site was divided into four OUs for remediation. Three 1991 RODs addressed contaminated soil on and adjacent to the site and contaminated ground water south of Sand Creek, contaminated ground water north of Sand Creek, and exposure of residents to contaminated ground water through the use of affected private alluvial wells, as OUs 1, 2, and 3, respectively. This ROD addresses exposure or potential exposure to contaminated ground water used as a drinking water source from supply wells 18, 21, and 47. The primary contaminants of concern affecting the ground water are VOCs, including benzene, PCE, and TCE.

The selected remedial action for this site includes connecting wells 18, 21, and 47 to the Klein Water Treatment Facility, a local POTW; treating contaminated ground water offsite using granular activated carbon (GAC) to remove VOCs, followed by offsite regeneration of the spent carbon; installing an air stripping unit, if the GAC treatment system is not effective at reducing vinyl chloride contamination to below MCLs; storing treated ground water in an offsite reservoir for future use; and monitoring ground water. The estimated present worth cost for this remedial action is \$3,314,900, which includes an estimated annual present worth O&M cost of \$1,013,100.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific ground water cleanup goals are based on Federal and State ARARs and SDWA MCLs, and include benzene 5 ug/l; DCA 5 ug/l; 1,1-DCE 7 ug/l; 1,2-DCE 70 ug/l; PCE 5 ug/l; TCA 200 ug/l; TCE 5 ug/l; and vinyl chloride 2 ug/l.

THE H. C. B. SYSTEM COMPANY

SUPERFUND UNIT

RECORD OF DECISION

FOR OPERABLE UNIT 4

DECLARATION OF THE RECORD OF DECISION

The Chemical Sales Company (CSC) Superfund Site, Operable Unit 4 (OU4), Commerce City, south Adams County, Colorado

Statement of Basis and Purpose

This decision document presents the selected remedial action (RA) for Operable Unit 4 (OU4) of the CSC Site, located in Commerce City Colorado, which was chosen in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendment and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). OU4 includes South Adams County Water and Sanitation District (SACWSD) Wells 18, 21 and 47, which are currently used as sources of drinking water for south Adams County residents. This decision is based on the Administrative Record for the Site.

The State of Colorado concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The objective of the OU4 remedy is to minimize or eliminate exposure or potential human exposure to contaminants present in the contaminated ground water. SACWSD wells 18, 21, and 47 are used as a drinking water source. The RA for OU4 will connect these wells to the Klein Water Treatment Facility (KWTF). Water from those wells will be pumped to the existing treatment facility where it will be treated to drinking water standards before being distributed to users. The RA for Wells 18, 21, and 47 will continue as long as the KWTF is operating for purposes and reasons specified in the "EPA RMA Off-Post" ROD, June 1987.

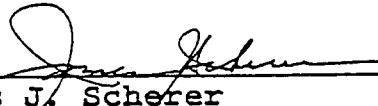
OU1 addresses soil and ground water remediation at CSC property and adjacent areas. OU2 addresses remediation of ground water north of Sand Creek. OU3 involved the connection of several residents to the municipal water supply. The RMA Off-Post OU1 ROD addressed contamination from various sources.

No principal threat exists in CSC OU4. Nevertheless treatment is used as a major component of the remedy.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the RA, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of RA to ensure that the remedy continues to provide adequate protection of human health and the environment.



James J. Scherer
Regional Administrator
Environmental Protection Agency
Region VIII

December 29, 1992
Date

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I. SITE NAME, LOCATION, AND DESCRIPTION

The CSC Superfund Site is located in Commerce City and north Denver, Colorado. It is approximately five miles northeast of downtown Denver, Colorado. Contamination at this Site consists of soils and ground-water contamination. The contaminated ground water is located in an unconfined alluvial aquifer, which extends to a maximum depth of 100 feet below the ground surface. Ground-water flow on the Site generally trends north to northwest. However, paleochannels also influence regional flow at times resulting in flow patterns that are not in the same direction as the above mentioned general flow patterns. The Site is divided into four OUs:

OU1: Includes the CSC property and addresses soil and ground-water contamination south of Sand Creek. The approximate boundaries are Forest Street to the west; Monaco Parkway to the east; I-70 to the south; and Sand Creek to the north (see Figure 1-1, page 2). The land use in OU1 is mainly industrial with six residences located in the northern portion.

The CSC property is the location of an operating chemical sales business. Soil contamination on and adjacent to the property is considered to be a source of ground-water contamination on this Superfund Site. The contaminated ground water flows northward into the other CSC OUs.

OU2: Addresses ground-water contamination generally downgradient of OU1. The approximate boundaries are Holly Street to the west; Quebec Street to the east; Sand Creek to the south; and 86th Avenue to the north (see Figure 1-1, page 2). The Rocky Mountain Arsenal (RMA) borders OU2 to the east. OU2 is approximately four square miles in area. The land use consists of single and multi-family residences, small businesses, and municipal facilities. Boundaries of OU1 and OU2 are defined by the approximate extent of ground-water contamination, and may expand as ground-water contaminants migrate. No soil contamination has been found in this OU.

OU3: OU3 provides for those residents located in OU2 that are using alluvial well water for domestic uses to be connected to the municipal water system. This reduces their exposure to the contaminated ground water of OU2. OU3 has the same boundaries as OU2.

OU4: OU4 addresses SACWSD Wells 18, 21, and 47, and is the subject of this ROD. Wells 18, 21 and 47 are wells that draw water from the contaminated alluvial aquifer in and north of OU2. These wells are for purposes of providing water for domestic uses for residents connected to the SACWSD.

Figure 1-1
Site Location Map

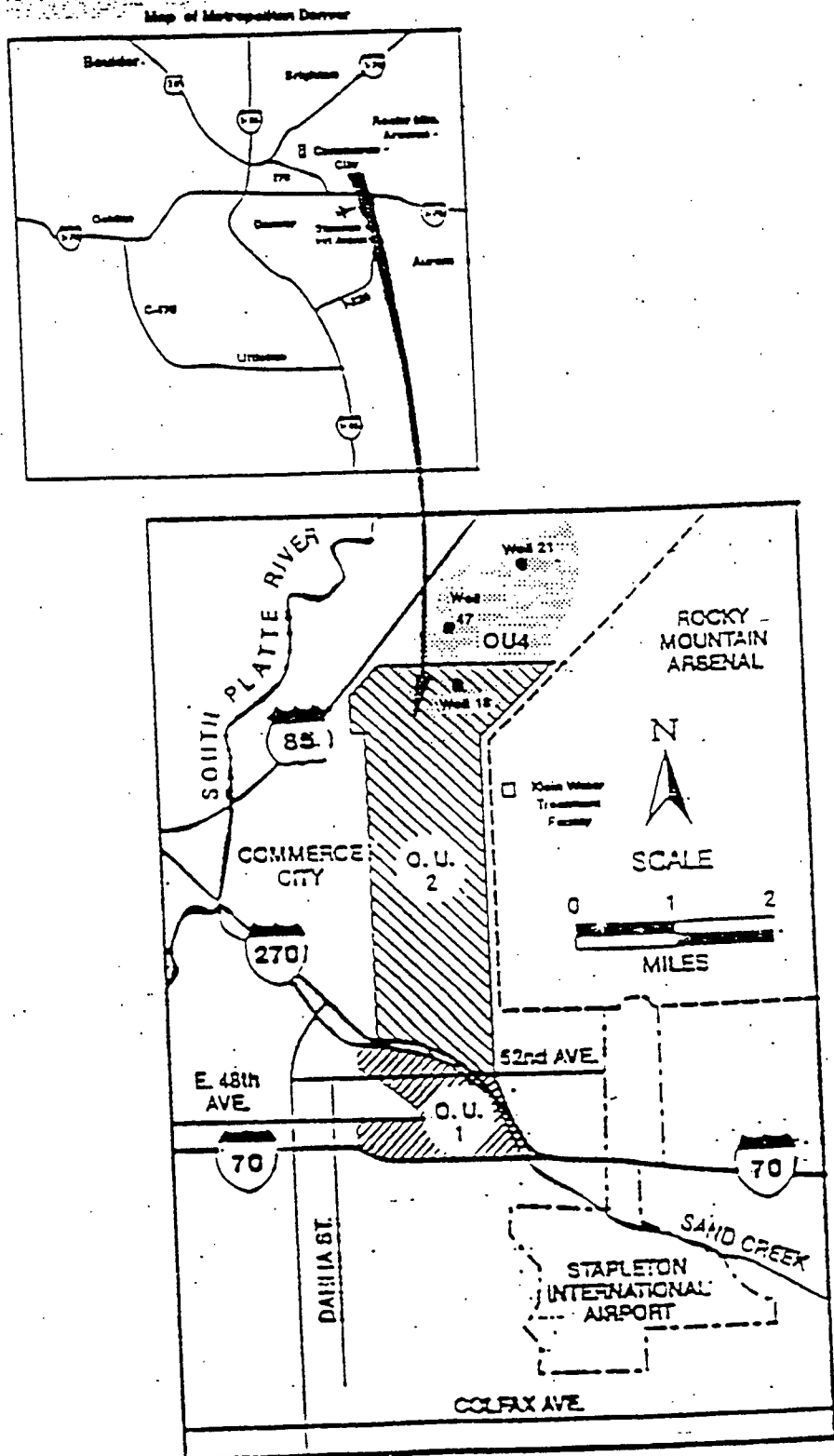
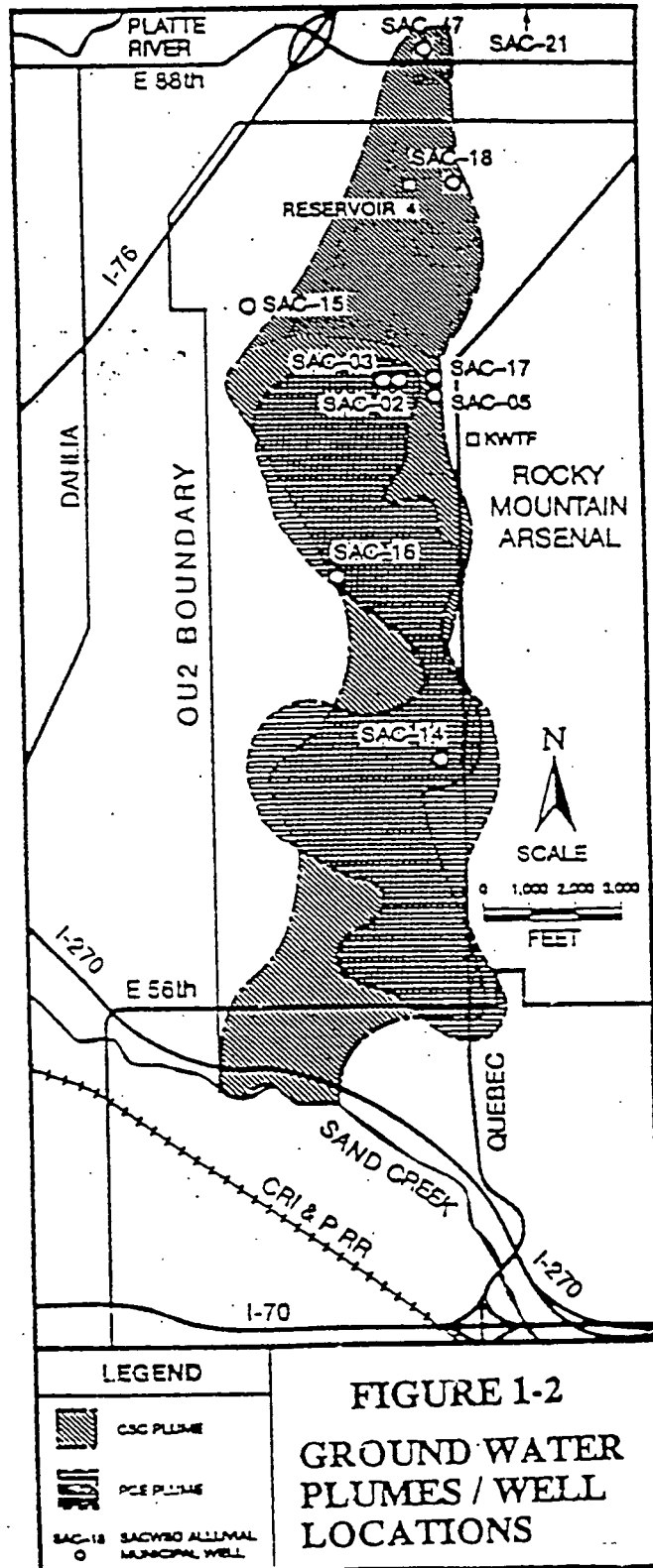


Figure 1-2
Groundwater Plumes/Well Location Map



Well 18 is located at 84th Avenue and Quebec Street and is within OU2 boundaries and is generally west of the RMA. Well 47 is located at 88th Avenue and Quebec Street, and is two blocks north of the OU2 northern boundary and is also generally west of the RMA. Well 21 is located at 90th Avenue and Ulster Street, and is four blocks north of the northern boundary of OU2 and is also generally west of the RMA (see Figure 1-2, page 3). These wells comprise a portion of the SACWSD municipal water supply, which is primarily drawn from the shallow alluvial aquifer mentioned above. SACWSD serves approximately 30,000 customers.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

In 1981, the Environmental Protection Agency (EPA) conducted a random national survey of drinking water systems. Several organic chemicals were found by EPA in SACWSD wells. Additional sampling in 1982 and 1985 confirmed this result. As a result, EPA initiated a Remedial Investigation (RI) and Feasibility Study (FS) on an area named "EPA's Off-Post RMA OU1". This area was bounded by East 80th Avenue to the north; East 56th Avenue to the south; South Platte River to the west; and the RMA to the east (see Figure 1-3, page 4). The results of the RI indicated extensive contamination of ground water along the eastern portion of the area. A permanent water treatment plant for SACWSD water was the selected remedy for the EPA Off-Post RMA OU1 ROD, June 4, 1987.

The permanent treatment plant was built and named the Klein Water Treatment Facility (KWTF). It is near the SACWSD municipal water supply center at East 77th Avenue and Quebec Street. KWTF began operating in October 1989. At that time, six SACWSD production wells were connected to the KWTF. It now protects the health of SACWSD municipal water supply users by treating alluvial ground water prior to distribution. Also, approximately 400 residents using private wells were connected to the SACWSD municipal water supply under EPA removal actions between 1986 and 1988.

The RMA was suspected as one of the potential sources of ground-water contamination in the EPA's Off-Post RMA Study Area due to its history of waste disposal practices. Investigations by the EPA's Field Investigation Team indicated the potential for other source areas also contributing to ground-water contamination. In 1986, the EPA conducted a soil gas survey near 48th Avenue and Leyden Street. This survey indicated elevated trichloroethylene (TCE) concentrations in the vicinity of the CSC facility. Ground-water investigations undertaken by EPA in August/September 1986, at 48th Avenue and Leyden Street and at East 50th Avenue and Ivy Street revealed the presence of volatile organic contaminants in the vicinity of the CSC facility. The presence of TCE and other chlorinated hydrocarbons near the CSC

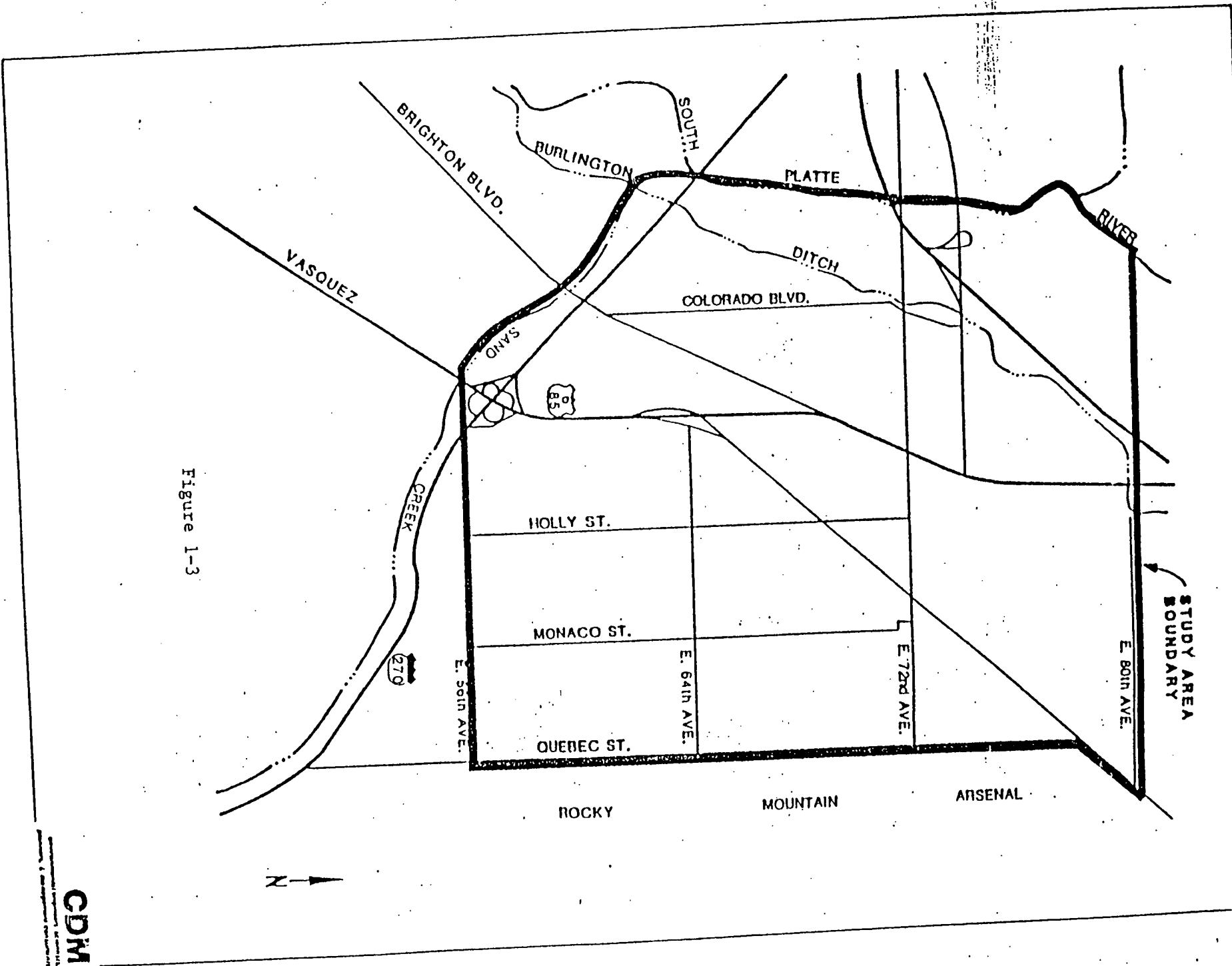


Figure 1-3

facility was confirmed by another soil gas survey in August 1987. Ground-water monitoring wells installed on CSC property have confirmed CSC as a source of ground-water contamination.

Based on these studies and additional work by EPA to define the source areas, the CSC Site was proposed for listing on the National Priorities List (NPL) in June 1988. Investigations for all EPA RMA Off-Post work was then transferred from the EPA Off-Post RMA Study Area to the CSC Site. The NPL listing was made final in August 1990. The EPA RMA Off-Post OU1 and CSC geographic areas overlap (see figures 1-2 and 1-3).

Two distinct ground-water plumes have been identified within the CSC Site. The first plume, known as the "CSC plume" or the "TCE plume", originates on CSC property south of Sand Creek and is characterized by high TCE concentrations. The second plume, known as the "perchloroethylene (PCE) plume", originates near 56th Avenue and Quebec Street and is characterized by high PCE concentrations. Both plumes are located in the shallow alluvial aquifer, with the direction of migration generally following the direction of the ground-water flow, which, as mentioned earlier, is generally north to northwest. The direction of flow has been noted to vary from the general flow directions when influenced by the presence of paleo-channels. Historically, there have been indications of contamination migration from the RMA property.

Although the plumes are noted to be characterized by TCE and PCE, they contain many other contaminants. A list of the current COCs at the Site is presented on page 9 of this document.

During the development of the RI/FS for CSC OU2, samples taken from SACWSD Well 18 showed TCE levels above the MCLs. Well monitoring has continued since that time, and elevated TCE concentrations have been recorded on a consistent basis. Currently Well 18 is utilized during high demand periods only (typically May - September). Since the initial detection in Well 18 in 1981, the presence of TCE in well water samples has persisted, while concentrations have fluctuated. In the past, water from Well 18 has been blended with treated water from SACWSD Wells 2 and 3 so that water distributed to SACWSD customers does not exceed the MCL for TCE. The effectiveness of the blending program is limited by the amount of treated water available to blend with contaminated flows. As future demands and contaminant levels rise, an insufficient quantity of treated water will be available to adequately blend the contaminated flows and continue to meet public water use demands. Thus, the blending program is a temporary solution to current well water contamination problems, and it is not considered to be a viable treatment alternative to meet RA objectives.

Wells 47 and 21 are situated north and hydrogeologically downgradient from Well 18. Well 47 was installed in 1990, with

sampling beginning at that time and continuing to present. No contamination had been detected in Well 47 until July 1991. From July 1991 to May 1992, eight out of ten samples have shown contamination. As of May 1992, TCE concentrations were below MCLs.

Well 21 had not exhibited any volatile organic compounds (VOC) contamination as of May, 1992. Considering Wells 18, 47, and 21 lie downgradient of the CSC plume and the PCE plume, EPA and the State believe that it is reasonable to expect future contamination of Well 21 and increased contaminant concentrations in Wells 18 and 47.

Notice Not to Issue Special Notice

Because the Potentially Responsible Parties (PRPs) have indicated that they are not willing to do any work north of Sand Creek on this Site, EPA issued notices not to invoke the special notice procedures to all of the PRPs involved with this Site. These notices were issued June 30, 1992. The purpose of these notices is to notify the PRPs of their liability and let them know that EPA will not conduct negotiations with them for performance of the work in this OU.

III. HIGHLIGHTS OF COMMUNITY INVOLVEMENT

Community interest in ground-water contamination in south Adams County was very intense in 1985 and early 1986. Initially the RMA was thought to be the sole source of the contamination. Local citizens formed a group, Citizens Against Contamination (CAC), which held a number of well attended meetings (over 600 attended the March 6, 1986, meeting). EPA and the Army responded to numerous public and media inquiries; issued press releases for new developments; and attended the public meetings. Community relations activities were coordinated among the EPA, the Army, and the SACWSD. The State conducted a separate program.

Public interest subsided in mid-1986 after a temporary water treatment system funded by the Army and authorized by a removal action by the EPA came into operation at SACWSD and treated water was thus made available to the affected residents. In the fall of 1986, EPA named the CSC as another source of the ground-water contamination. EPA has since issued a number of fact sheets discussing the progress of the investigation and activities at the Site. The CSC Site was also included in joint community relations activities with several other south Adams County Superfund Sites.

Proposed plans for OU1, OU2, and OU3 were issued concurrently on February 25, 1991. The public comment period was open from February 28, 1991, to April 1, 1991. A public meeting was held March 14, 1991, at the Commerce City Recreation Center

and was attended by 50-75 people. Details about community involvement throughout the RI/FSS and public comment period are included in the responsiveness summaries in the RODs for OU1, OU2, and OU3.

During the latter portion of the RI/FS for OU2, it was discovered that SACWSD Well 18 began to show levels of TCE above MCLs. In response to this finding, OU4 was created to address the contamination or potential contamination in SACWSD Wells 18, 21, and 47. The proposed plan for OU4 was issued on July 10, 1992. The public comment period was open from July 10, 1992, to August 8, 1992. A public meeting was held at the Commerce City Recreational Center on July 21, 1992. Fourteen individuals were present at the meeting, including representatives from EPA, Colorado Department of Health (CDH), CAC, State Senator Dennis Gallagher's office and SACWSD.

Responses to comments received during the public comment period on the proposed plan are presented in the Responsiveness Summary of this document (see Appendix A).

IV. SCOPE AND ROLE OF OPERABLE UNITS WITHIN SITE STRATEGY

As stated previously, the CSC Site has been divided into four OUs: OU1, which addresses contaminated soil on and adjacent to the CSC property and ground-water contamination south of Sand Creek; OU2, which addresses ground-water contamination north of Sand Creek; OU3, which addresses exposure of residents to contaminated ground water from use of private alluvial wells in OU2; and OU4, the subject of this ROD, which addresses exposure or potential exposure to contaminated ground water used as a drinking water source by SACWSD from supply wells 18, 21, and 47.

The EPA Off-Post RMA OU1 ROD is also relevant at the CSC Site. It first addressed exposure or potential exposure to contaminated ground water used as a drinking water source by SACWSD and by private alluvial well users. The EPA Off-Post RMA OU1 ROD was issued June 4, 1987.

The RA objective of OU4 is to minimize or eliminate exposure or potential exposure to contaminants present in the contaminated ground water, used as a drinking water source by SACWSD from Wells 18, 21, and 47, in order to protect human health in the present and future. Remedial alternatives evaluated under OU4 reduce exposure, for customers of SACWSD, to contaminated ground water from supply Wells 18, 21, and 47. The RA for Wells 18, 21 and 47 will continue as long as is necessary to insure the MCLs are met at the drinking water tap. MCLs at the drinking water tap will be achieved via treatment by the KWTF which was constructed as a result of the EPA RMA Off-Post OU1 ROD, dated June 1987.

The primary purpose of OU4 is to ensure the provision of an adequate drinking water supply to the residents of South Adams County. OUs 1 and 2 are for purposes of restoring the aquifer to MCLs for the COCs and this restoration will be enhanced by the actions taken in the EPA RMA Off-Post OU1 ROD.

The objective of the EPA Off-Post RMA OU1 was to minimize or eliminate the exposure to the contaminants present in the contaminated ground water used as a drinking water source by SACWSD in order to assure protection of the public health.

The ROD for the EPA Off-Post RMA OU1 called for the construction of the KWTF and treatment of drinking water to acceptable standards (see table B-4, Appendix B) using a Granulated Activated Carbon (GAC) system. At that time, six SACWSD supply wells were connected to the KWTF. At the time of KWTF construction (1987 to 1989), Wells 18 and 21 were not connected to the KWTF, because they failed to exhibit significant contamination. Well 47 was not installed until 1990. However, sampling in May 1990, showed contaminants had migrated to the ground water drawn by Well 18, and contamination was detected in Well 47 in July of 1991. To date, Well 21 has not exhibited detectable contamination, however its position downgradient of the CSC and PCE plumes and the RMA Off-Post area. This indicates contamination in the future is probable.

No principal threat exists in CSC OU4. A principal threat is defined as material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, to surface water, to air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material. An exception to this is the presence of Non-Aqueous Phase Liquids (NAPLs) in ground water (see Superfund Publication 9380.3-06FS, November 1991).

V. SUMMARY OF SITE CHARACTERISTICS

Nature and Extent of Contamination

The RI for CSC OU2 is the basis for information on the nature and extent of contamination in OU4. The results of the CSC OU2 RI showed extensive ground-water contamination by VOCs in the study area. Contaminants were not detected in other media. The chemicals of concern (COCs) in the ground water are:

- 1,1-dichloroethane (DCA)
- 1,1-dichloroethylene (DCE)
- Total 1,2-dichloroethylene (total 1,2-DCE)
(the sum of the trans and cis isomers)
- 1,1,1-trichloroethane (TCA)
- Trichloroethylene (TCE)

Tetrachloroethylene (PCE)
Benzene (BZ)
Vinyl Chloride (VC)

This group of contaminants is generally mobile in ground water. Please refer to Section VI of this document for the toxicity characteristics of the above COCs.

TCE was first discovered in SACWSD Well 18 in August 26, 1982, and first exceeded the MCL of 5 parts per billion (ppb) in May 1990. Since May 1990, measurable concentrations of TCE have persisted. Thus far the highest concentration of TCE has been 12 ppb. This was recorded in May 1990. Concentrations of PCE, 1,1,1-TCA, 1,1-DCA, Cis-1,2-DCE, and 1,1-DCE have also been detected, but the concentrations are below their respective MCLs. BZ and VC have not been detected in Well 18.

Well 47 first showed TCE contamination in July 1991. All subsequent samples obtained have exhibited detectable levels of TCE with two exceptions: Those obtained in December 1991 and January 1992. All Well 47 concentrations for TCE have measured below the MCL. PCE concentrations of 1.0 ppb were recorded in three sampling events during October and November, 1991. Samples obtained since that period have not exhibited PCE concentrations above detection level. The other COCs are either not present or are in concentrations below detection level.

Well 21 has not shown contamination to date, but its downgradient position from Wells 18 and 47 indicates that future contamination is probable. The contamination trends of Wells 21 and 47 can be expected to follow the trend of Well 18, i.e. after initial detection, the presence of contamination persists. Based on ground-water flow direction and recent sampling of upgradient wells, it is anticipated that contaminant concentrations in Wells 18, 21, and 47 will increase in the future.

Sources of contamination for areas affecting Wells 18, 21 and 47 are the TCE plume emanating from OU1, the PCE plume emanating from OU2 and from the on-post RMA.

As mentioned previously, the TCE plume originates from the CSC facility in OU1. The plume follows the flow of ground water north into OU2. The plume is characterized by high levels of TCE in mean concentrations exceeding 50 ppb in upgradient portions of OU2. PCE, TCA, and 1,2-DCE are also present within the plume bounds, the areal extent of which ranges from the CSC property in OU1 to SACWSD Well 47, (see Figure 1-2, page 3 of this document). Concentrations decrease steadily downgradient from the CSC property. This is believed to be due to dilution, dispersion, adsorption, and biodegradation of the contamination.

The PCE plume appears to emanate from the vicinity of the northwest corner of the intersection of East 56th Avenue and Quebec Street. It is characterized by PCE, with concentrations as high as 110 ppb. This plume is also moving northward. The exact source of the PCE plume has not been determined. It has been assumed that the PCE plume source is degrading for two reasons: 1) field investigations to date have not located a source and 2) recent sampling indicates the plume is dispersing.

In addition to the TCE/CSC and PCE plumes in CSC OU2, a plume consisting of dibromochloropropane (DBCP) and other VOCs lies east of CSC OU2, on RMA property. This contamination was detected in Irondale community wells in 1980 and was traced back to the western tier of RMA. A ground-water interception system, known as the Irondale System, was installed at the RMA boundary in December 1981, to prevent this contamination from further migrating off RMA.

Subsequent to the 1981 installation of the Irondale System, it was observed that the behavior of the contamination on the western tier of the Arsenal was influenced by SACWSD ground-water extraction practices and schedules. During normal operations, SACWSD pumps considerably more water during the summer than at other times of the year. There was concern that during periods of higher rates of SACWSD ground-water extraction, the direction of local RMA ground-water flow might be altered, causing contamination on the western tier of the Arsenal to deflect to the south and partially bypass the Irondale System. This was evidenced by detection of low levels of DBCP in some SACWSD wells in 1989. Improvements to the Irondale System were made in 1990, and there has been no detection of DBCP in SACWSD wells since.

Vinyl chloride was detected during the CSC OU2 RI and subsequent field sampling programs. This compound is a breakdown product of other chlorinated hydrocarbons detected at the Site (see Figure 1-4, page 12 of this document). It was detected only sporadically with respect to location and concentration, and it did not appear to define a continuous plume. The ROD for the EPA Off-Post RMA OU1 Site contains provisions to upgrade the KWTF with an air stripper to remove vinyl chloride from the SACWSD water supply if it becomes a threat to public health via the water supply from KWTF.

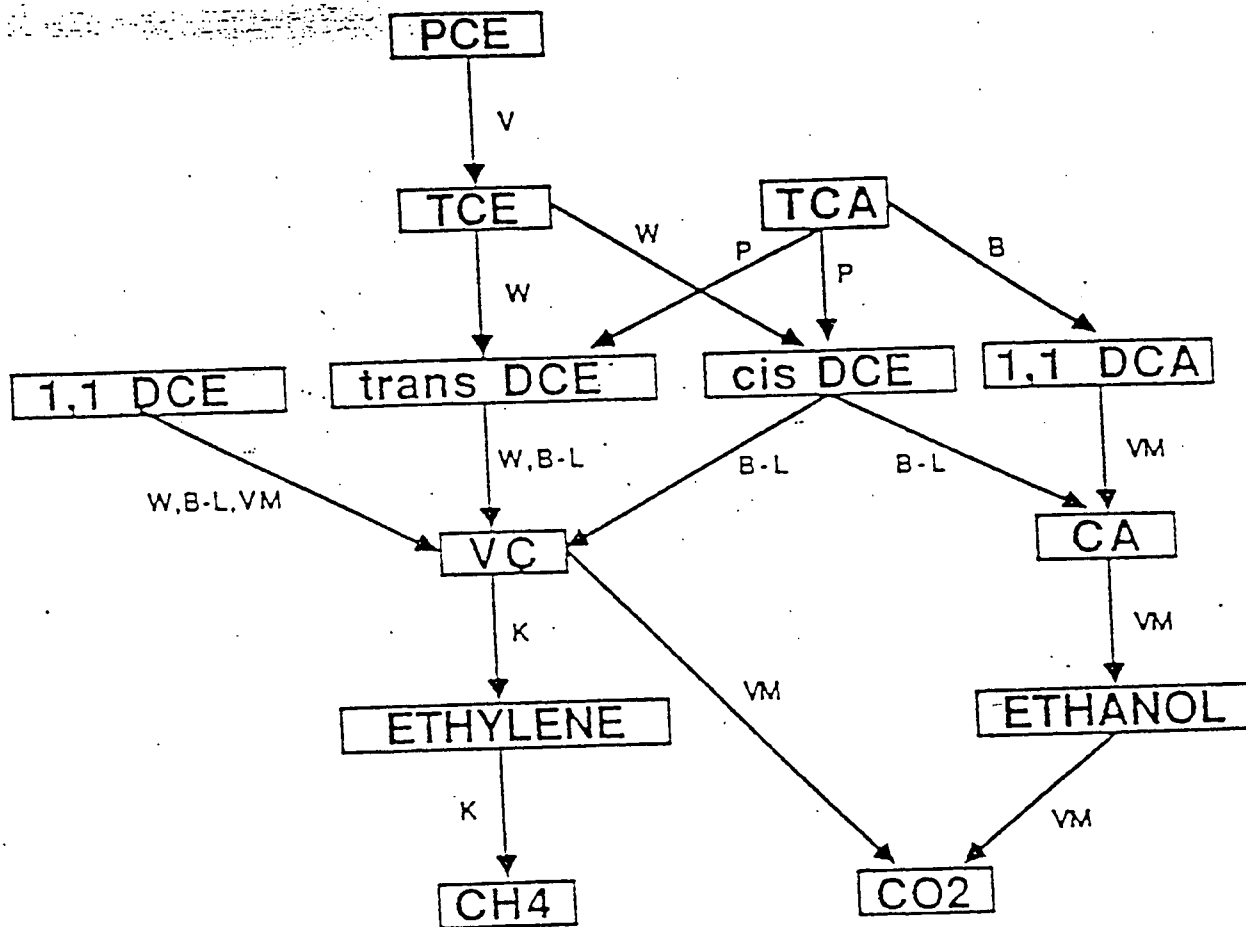
The CSC OU2 RI and subsequent sampling in OU2 and OU4 constitute the RI for this CSC OU4 ROD.

VI. SUMMARY OF SITE RISKS

A. Human Health Risks

Actual or threatened releases of hazardous substances from CSC OU4, if not addressed by implementing the response action

ANAEROBIC BIODEGRADATION PATHWAYS



B-L = BARRIO-LAGE, 1986
K = KUHN, 1986
V = VOGEL, 1985
W = WOOD, 1985
VM = VOGEL AND McCARTY, 1987

B = BOUWER, 1983
P = PARSONS ET AL., 1982, 1983

Figure 1-4

CSC SITE OUI RISK ASSESSMENT	
ANAEROBIC BIODEGRADATION PATHWAYS	
<u>CAMP DRESSER & MARKEE INC.</u> 04/01/90 ANARDEC.DWG	SHEET NO. CDM OF 7780-004

selected in this ROD, may present an imminent and substantial endangerment to public health.

The major potential health risk to area residents is associated with the use of ground water contaminated by VOCs. Currently, all of the ground water is treated or blended prior to distribution to the community. SACWSD Wells 18 and 47 are currently impacted by contamination. It is expected that Well 21 will be impacted in the future. Water from Wells 18 and 47 is blended with treated water from the KWTF to levels below MCLs, before distribution to residents.

As mentioned previously, eight COCs have been identified based on their toxicity, widespread occurrence, or concentration. These compounds are PCE, TCE, TCA, DCA, DCE, 1,2-DCE, VC, and BZ. These contaminants are judged to be the source of the potential health risks at the Site for OU4.

Toxicity Assessment

The COCs are a diverse group of volatile halogenated hydrocarbons and solvents. Most of the COCs are central nervous system depressants. They are also known to be liver/kidney toxins at high doses. BZ is toxic to the blood forming system.

Non-Carcinogenic Effects - TCE is a central nervous system depressant in humans. Inhalation and oral exposure studies in animals indicate that bone marrow, central nervous system, liver, and kidneys are the target organs. The principal toxic effects of PCE in humans and animals are central nervous system depression and liver and kidney damage. TCA is a central nervous system depressant at high concentrations and adverse effects on the cardiovascular system have also been reported. Exposure to high concentrations of DCA has been reported to cause cardiac arrhythmia and liver damage in humans. DCE can induce neurotoxicity after short-term inhalation exposure, and also is possibly associated with liver and kidney toxicity after repeated, low-level exposure in humans. Benzene has demonstrated toxic effects on the central nervous system, blood-forming system, and immune system in both animals and humans. Long-term inhalation of vinyl chloride by workers is associated with liver damage, central nervous system disturbances, pulmonary insufficiency, cardiovascular toxicity, and osteolysis.

Carcinogenic Effects - TCE is classified as a Group B2 carcinogen (a probable human carcinogen). PCE and DCA are also classified as Group B carcinogens. DCE is classified as a Group C carcinogen (a possible human carcinogen). Benzene and vinyl chloride have been classified as human carcinogens (Group A).

Six of the COCs (PCE, TCE, DCE, DCA, VC, and BZ) are known to cause carcinogenic effects in animal studies. Of the six,

vinyl chloride and benzene are both classified as Class A - Carcinogens based on weight-of-evidence for carcinogenicity (see EPA Risk Assessment Guidance, EPA/540/1-89/002, December 1989, page 7-11). When a carcinogen is classified as a Class A, that means that there is sufficient evidence from epidemiological studies to support a causal relationship between the compound and human cancer.

In the risk characterization, the aggregate carcinogenic risk due to indicator contaminants at the Site is compared to an acceptable target risk. Carcinogenic effects are evaluated based on a calculated increase in the risk of contracting cancer that is a direct result of exposure to COCs at a Site. The EPA has defined an increased risk, exceeding the 10^{-4} to 10^{-6} range, due to exposures at a Site as being unacceptable regarding the protection of public health and the environment (i.e. 1 person in 10,000 to 1 person in 1,000,000 will contract cancer). RA objectives are established based on applicable or relevant and appropriate requirements (ARARs) (i.e., MCLs and MCLGs) and acceptable risk levels (i.e., 10^{-6}), while ARARs and the 10^{-6} cancer risk point of departure are used as the basis for developing preliminary remediation goals. The chance of one person developing cancer per one million (or 10^{-6}) is used as the target value or point of departure above which carcinogenic risks may be considered unacceptable. The 10^{-6} point of departure is used for determining remediation goals when ARARs are not available (i.e., no MCLs or proposed MCLs exist for the indicator contaminant) or are not sufficiently protective of human health and the environment because of the existence of multiple contaminants at a Site or multiple pathways of exposure.

Exposure Assessment

The final CSC OU2 RI report contains a risk assessment for the CSC Site north of Sand Creek. This risk assessment will serve as the risk assessment for this ROD. Two exposure scenarios were developed to describe a range of potential health risks. Case 1 scenario addresses reasonable maximum exposures within the entire OU. The Case 2 scenario in this risk assessment was developed to provide information regarding the potential health risks associated with SACWSD Well 18. At the time the risk assessment was compiled, average TCE concentrations ranged from 4 to 6 ppb, with the maximum concentration at 12 ppb. Water from Well 18 is currently blended with treated water from the KWTF, to ensure that any potential contaminant concentrations in the untreated water are diluted to safe levels. The case 2 scenario provides an estimate of potential health risks if the water from Well 18 were to be used directly. The same risk assessment is applied to Wells 21 and 47.

The two routes or exposure pathways evaluated quantitatively were:

1. Ingestion of the water during normal residential use, and
2. Inhalation of volatiles during showering.

Results

Based upon the toxicity profiles and the exposure scenarios developed for the COCs, carcinogenic effects were evaluated for the Site. For the Case 2 scenario, the total excess cancer risk was determined to be 2.0×10^{-5} , indicating that with blending of treated water from the KWTF, operation of Well 18 did not pose an unacceptable risk to receptors of that water. Risks for each of Wells 21 and 47 are considered to be the same as those calculated for Well 18 and thus the Case 2 analysis is applied to Wells 21 and 47. Although contamination has not reached Well 21 yet, it is expected that it will in the future and the risk calculated for Well 18 will be present.

While the above risk does not exceed the 10^{-6} point of departure, the criteria of meeting MCLs does necessitate remedial action.

Currently, the blending operations are sufficient for providing drinking water below MCLs. However, based on higher upgradient ground-water contaminant concentrations, a general increasing trend in contaminant concentrations at the wells that are already contaminated and, the knowledge of the general ground-water flow directions, it is anticipated that blending will not be sufficient to supply ground water from Well 18 at contaminant levels below MCLs. This same scenario applies to Wells 21 and 47. It is anticipated that all three wells may reach contaminant levels such that blending will not be sufficient to provide water at contaminant levels below MCLs. This will result in a shortage of water supply for the residents in south Adams County during peak demand periods.

The chronic Hazard Index (HI) estimate for Case 2, which was 0.008, indicated an extremely low potential for non-carcinogenic adverse health effects. Risk Assessment Guidance for Superfund, Vol I: Human Health Evaluation (EPA/540/1-89/002) defines HI to be the ratio of the exposure level over a specified time period to a reference dose, below which even sensitive populations are unlikely to exhibit adverse health effects. A HI of 1.0 would be the threshold where sensitive populations would possibly begin to show adverse health effects.

B. Environmental Risks

Environmental risks for OU4 were not considered because there is no identified exposure pathway by which significant exposure to environmental receptors could occur. There is no environmental risk for OU4, however, there is potential environmental risk related to the protection of wildlife on the adjacent RMA during construction activities.

VII. DESCRIPTION OF ALTERNATIVES

The CSC OU4 FS was conducted to develop and evaluate remedial alternatives that would effectively minimize threats to and provide adequate protection of public health from contaminated ground water drawn by SACWSD Wells 18 and 47 and will be potentially drawn by SACWSD Well 21 for use as a portion of the SACWSD municipal water supply. The OU4 FS was conducted in three phases: Phase I, development of alternatives; Phase II, screening of alternatives; and Phase III, detailed analysis of alternatives. These alternatives were initially evaluated for effectiveness, implementability, and cost. The favorable alternatives were then evaluated in detail in Phase III with respect to the criteria specified in the NCP (see page 22 of this document for a listing of the criteria).

Remedial Action Objectives and Goals

RA objectives for establishing ground-water remediation and exposure levels were developed from ARARs and from risk-based considerations (please see table B-4, Appendix B). The standards, requirements, limitations, and criteria that were considered to be ARARs for remediation at CSC OU4 include chemical, location and action-specific requirements (see Appendix B of this document).

The chemical-specific ARARs pertaining to the CSC OU4 Site include the Federal Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), the Clean Air Act (CAA), and the Resource Conservation and Recovery Act (RCRA). State standards include the Colorado Primary Drinking Water Regulations and the Colorado Water Quality Control Act. The primary chemical-specific criteria for the CSC Site are the MCLs established under the Federal SDWA and Colorado Primary Drinking Water Regulations. MCLs are the maximum permissible levels of contaminants in water delivered to any user of a public water system. Only those State standards which are more stringent than the Federal standards are considered ARARs.

The action-specific ARARs pertinent to remediation activities at CSC OU4 include wildlife protection (for the adjacent RMA), noise abatement, and air emission control

regulations. Applicability of these regulations and standards is dependant upon specific remedial actions undertaken at CSC OU4. If air stripping is utilized, then the National Ambient Air Quality Standards (NAAQS) and the Colorado Air Quality Control Act would become ARARs. The Colorado Noise Abatement Statute and Colorado Wildlife Enforcement and Penalties are potentially relevant and appropriate during construction activities.

RA objectives define the overall purpose of the remediation and consist of media and site-specific goals for protecting human health and the environment. This project objective was determined based upon the identified COCs for the Site, the exposure routes and the acceptable contaminants levels which are developed from the ARARs. The RA objective can be summarized as follows:

To minimize or eliminate human exposure or human potential exposure to contaminants present in contaminated ground water used as a drinking water source by the SACWSD from Wells 18, 21, and 47, in order to assure protection of public health in the present and in the future.

The primary purpose of this RA is to ensure the provision of an adequate drinking water supply to the residents of south Adams County. In addition, the extraction of the conataminated ground water by Wells 18, 21 and 47 will assist in capturing contaminants in the ground water and is consistant with the OUs 1 and 2 RODs. The above objective is consistent with the RA objective statement in the EPA Off-Post RMA OU1 ROD calling for the construction of the KWTF, whereby ground-water contamination in SACWSD wells south of 80th Avenue was addressed.

Alternative 1 - No Action

This alternative provides the baseline against which the other alternatives are evaluated. Under the No Action alternative, the current status of the Site remains the same. Activities currently being conducted for OU4, which would continue under the No Action scenario, include the blending program, which combines water from Wells 18, 21, and 47 with treated water from Wells 2 and 3, and the monitoring program.

The No Action alternative does satisfy the RA objective of the statutory requirement of protectiveness of human health on a short-term basis only. Human exposure to contaminated water through either ingestion or inhalation is temporarily reduced. The blending program is a short-term temporary means of ensuring that the water presently delivered to the SACWSD distribution system meets the MCLs. Given the short-term time limitation of the blending program, however, the RA objective will not be met in the future under this alternative.

The No Action alternative is both technically and administratively implementable, as it does not involve any activities beyond those which are currently taking place at OU4.

Costs associated with the No Action alternative include monitoring and sampling expenses. No capital costs are incurred, as the blending program is in place and operational. The cost breakdown for the 30 year life of the alternative includes:

Capital Costs	\$0
Present Worth of Annual O&M	\$0
Present Worth Annual Monitoring	\$147,600
	=====
Total Present Worth	<u>\$147,600</u>

Alternative 2 - Increased Pumping of SACWSD Wells 2 and 3

This remedial action alternative was not carried forward into the detailed analysis of the OU4 FS, because it was determined that it would not capture the plume. Therefore, this alternative would not be effective because blending of the contaminated ground water would not meet ARARs. (see section 3, page 4 of 12 of the OU4 FS Report).

Alternative 3 - Connection to the Klein Water Treatment Facility

This alternative is a Granular Activated Carbon (GAC) treatment option. Alternative 3 involves the connection of Wells 18, 21, and 47 to the KWTF where the existing GAC system would treat the contaminated ground water to below MCLs. The treated water would then be transported back to a storage reservoir for distribution.

The KWTF, located at 74th Avenue and Quebec Street, consists of 16 downflow, fixed-bed GAC pressure contactors, with two additional units for carbon storage and reserve capacity. Chlorine and chloramines can be added to the flow either before or after carbon adsorption, and provisions have been made for, via the EPA Off-Post RMA OU1 ROD, the addition of an air stripping unit if it is determined that VC contamination is evident and in exceedence of the MCLs. The spent carbon, which was delisted by CDH in January 1992, is categorized under the "nonhazardous" designation. It is currently transported off site and regenerated in compliance with the EPA Off-Post RMA OU1 ROD. Following treatment, the water is pumped to a clearwell and then pumped to SACWSD's storage reserves. The monitoring program at the KWTF tracks influent and effluent water quality and plant performance to aid SACWSD in the effective operation of the facility.

Wells 18, 21, and 47 currently pump to Reservoir 4, a 2,000,000 gallon reservoir and pumping station located at 85th Avenue and Quebec Street. The capacity of the storage reservoir and the 12 million gallon per day (mgd) KWTF are adequate to handle the treatment and storage of water from the wells in CSC OU4.

Instantaneous decreed and design flows are as follows:

SACWSD Well	Instantaneous Decreed Flow (gpm)	1989 Design Flow (gpm)
18	3088*	1500
21	2000	2000
47	1500	1500

- * Well 18 is an alternate point of diversion for Wells 2 and 3. Therefore, Wells 2, 3 and 18 have a combined maximum withdrawal rate of 3088 gpm. (Black & Veatch, 1989).

Based upon SACWSD design flow rates and approximate pipe slopes and velocities of 3 to 5 feet per second, the connection of all three wells to the KWTF would consist of the following arrangement (these specifications may be modified during system design if necessary):

- 24" collection line from the junction of Wells 18, 21, and 47 at Reservoir 4 to the KWTF; and
- 20" transmission line from the KWTF to Reservoir 4.

The connection of Wells 18, 21, and 47 to the KWTF would reduce the contamination levels in the water, thereby minimizing future public exposure to the contaminated ground water and meeting the RA objectives. The GAC system at KWTF has proven to be effective in removing the VOCs found in the CSC shallow alluvial aquifer, resulting in potable water meeting the state and federal drinking water standards. The treatment of water from the three wells via the KWTF would ensure adequate removal of all COCs with the exception of vinyl chloride. If vinyl chloride is detected at the KWTF at concentrations in excess of MCLs an air stripper will be added to the treatment process.

Alternative 3 is technically and administratively implementable. The Klein GAC system is fully operational and is designed to provide adequate capacity for the treatment of contaminated water from Wells 18, 21, and 47. Construction of approximately 20,000 feet of pipe would be necessary in order to implement Alternative 3. The acquisition of the necessary easements and/or rights-of-way will also be necessary. The

preliminary general alignment of the connection to the KWTF primarily runs parallel to existing roadways where SACWSD easements have already been acquired. The widening of existing easements and/or the acquisition of new easements is not anticipated to be difficult to implement.

Costs associated with Alternative 3 include collection and transmission lines, new well pumps, and design and construction engineering. The cost breakdown for the 30 year life of the alternative includes:

Capital Costs	\$2,301,800
Present Worth of Annual O&M	\$865,500
Present Worth of Annual Monitoring	\$147,600
	=====
Total Present Worth	\$3,314,900

Alternative 4 - Granular Activated Carbon Treatment

Alternative 4 involves the use of a new GAC treatment system for the contaminated water from Wells 18, 21, and 47, as opposed to the use of the KWTF GAC system. This treatment option consists of constructing a permanent GAC system at the Reservoir 4 storage facility.

The GAC system would require 14 downflow fixed-bed GAC pressure contactors with one additional unit for carbon storage and reserve capacity. As at the KWTF, chlorination would be provided prior to pumping the treated water to Reservoir 4. A monitoring program similar to that established at the KWTF would be implemented. All contactors would be tested and monitoring of the influent and effluent water quality would be necessary to ensure that all flows entering the SACWSD distribution system meet the State and Federal drinking water standards. Provisions for the addition of an air stripping unit would be made should the presence of vinyl chloride be detected in the plant influent.

The RA objectives would be met and public contact with contaminated water would be reduced by installing a GAC system for the treatment of water from Wells 18, 21, and 47. Reduction of the toxicity, mobility and volume of the COCs would be accomplished, with the exception of vinyl chloride. If vinyl chloride is detected, an air stripping unit would be added to the treatment process.

Alternative 4 is technically and administratively implementable. Construction of the GAC treatment system would be required to implement the alternative. The system would not require pilot testing, since a GAC system is currently being utilized at the KWTF, and is effectively treating the COCs. Components of the GAC system are readily available and adaptable to the CSC OU4 Site.

Costs associated with alternative 4 include the GAC system design and construction costs. Costs for the installation of an air stripping unit are not included, as the need of an air stripper is not anticipated. The cost breakdown for the 30 year life of the alternative includes:

Capital Costs	\$1,772,600
Present Worth of Annual O&M	\$2,587,200
Present Worth of Annual Monitoring	\$147,600
	=====
Total Present Worth	\$4,507,400

Alternative 5 - Air Stripping Treatment

Alternative 5 involves the use of an air stripping treatment system for addressing the contaminated water from Wells 18, 21, and 47. Construction of a packed column aeration (PCA) air stripping unit at the Reservoir 4 storage facility would be necessary. The air stripping unit would consist of a single packed tower with forced air blowers and a storage tank. The contaminated water from the three wells would be collected and pumped to the packed tower, where water would flow down the packing by gravity while the air flows upward. Based upon previous studies regarding air stripping emissions, it was determined that VOC emission controls would not be necessary at this location. The total VOC emission rates were estimated to be below the rate requiring a State permit (one pound per day), thus emissions could be discharged directly to the atmosphere. Actual emissions would need to be verified and continuously monitored to ensure compliance.

The air stripping system proposed for Alternative 5 would be effective in reducing the VOC contamination from Wells 18, 21 and 47, thus the RA objectives would be satisfied. Air stripping has been proven to be effective for the removal of organics similar to those at CSC OU4, with the added advantage that vinyl chloride would also be removed from the water.

Alternative 5 is technically and administratively implementable. Components of the air stripping technology are readily available and adaptable to the CSC OU4 Site. Construction of the air stripping treatment system would be necessary in order to implement the alternative. No pilot testing would be required, but continued air emissions monitoring would be critical.

Costs associated with Alternative 5 include the air stripping unit design and construction costs. Annual O&M costs include operating and maintaining the system as well as routine monitoring.

The cost breakdown for the 30 year life of the alternative includes:

Capital Costs	\$869,400
Present Worth of Annual O&M	\$2,917,000
Present Worth of Annual Monitoring	\$147,600
	=====
Total Present Worth	<u>\$3,934,000</u>

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives developed in the CSC OU4 FS were analyzed in detail using the nine evaluation criteria of the NCP. The resulting strengths and weaknesses of the alternatives were then weighed to identify the alternative for CSC OU4 which would provide the best balance among the nine criteria. These criteria are:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

Each of these criteria is described and analyzed below.

Overall Protection of Human Health and the Environment

This criterion addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled.

Alternative 1 provides current minimal protection of human health and the environment through the blending program, but would not in the future. Both Alternatives 3 and 4 provide protection of human health and the environment by reducing the contamination in Wells 18, 21, and 47. Alternative 5 is protective of human health through the reduction of contamination in well water. Protection of the environment is maintained by Alternative 5 as long as VOC emissions are within acceptable limits.

Compliance with ARARs

This criterion addresses whether or not a remedy will meet all Federal and State environmental laws and/or provide grounds for a waiver.

Alternative 1 is presently in compliance with the ARARs established for OU4, but will not provide compliance in the future due to the limitations of the blending program. Alternatives 3 and 4 will meet the ARARs. With respect to MCLs, they will be met at the drinking water tap. Should VC be detected in excess of the MCLs, and KWTF capacity is not sufficient to treat it, an air stripping unit will be added to the GAC system. This will ensure compliance with all ARARs. Alternative 5 will meet the ARARs as long as air emission standards are maintained. If the VOC emissions for Alternative 5 exceed acceptable limits, the addition of off-gas treatment will be required prior to release.

It should be noted that the aquifer is being remediated by actions taken in OUs 1 and 2 and that the remediation is enhanced by the actions taken in the EPA RMA Off-Post OU1 ROD and this ROD. For ground-water remediation standards and ARARs compliance, please refer to the RODs for CSC OUs 1 and 2 and the above mentioned EPA RMA Off-Post OU1 ROD.

Long-Term Effectiveness

This criterion refers to the ability of a remedy to provide reliable protection of human health and the environment over time.

No long-term effectiveness is provided by Alternative 1.

Alternatives 3 and 4 both provide the greatest long-term effectiveness, since the COCs, with the exception of VC, are permanently removed from the well water and destroyed off-site through the regeneration of the spent carbon. Alternative 5 provides long-term effectiveness through permanent removal of contaminants from well water. While the COCs are not permanently destroyed, they are diluted to acceptable levels after release to the atmosphere.

Reduction of Toxicity, Mobility, or Volume

This criterion refers to the preference for a remedy that reduces health hazards, the movement of contaminants, or the quantity of contaminants at the Site.

Alternative 1 provides minimal reduction in the toxicity, mobility, and volume of the contaminants through the blending program. Alternatives 3 and 4 permanently reduce and/or eliminate the toxicity, mobility, and volume of the COCs, with the exception of VC, through the utilization and regeneration of GAC. Alternative 5 reduces the toxicity of contamination through dilution in ambient air.

Short-Term Effectiveness

This criterion addresses the period of time needed to complete the remedy, and any adverse effects to human health and the environment that may be caused during the construction and implementation of the remedy.

Short-term effectiveness is provided by Alternative 1 through the blending program. Alternatives 3, 4, and 5 provide significant short-term effectiveness as the treatment of the water from Wells 18, 21, and 47 is provided in a relatively short period of time. No increased risks or exposure to contamination will occur during implementation.

Implementability

This criterion refers to the technical and administrative feasibility of a remedy. This includes the availability of materials and services needed to carry out the remedy. It also includes coordination of Federal, State, and local governments to clean up the Site.

All of the alternatives under consideration are both technically and administratively implementable. Alternative 1 is the easiest to implement as no additional activities are required. Alternatives 3, 4, and 5 involve the utilization of proven technologies that are readily available. Easements will need to be obtained for pipeline routes.

Cost

Cost evaluates the estimated capital and operation and maintenance costs of each alternative in comparison to other equally protective alternatives. Please see the OU4 FS for cost breakdown and evaluation.

Alternative 1 has the lowest total cost, as minimal activity is required. Among the treatment options, Alternative 3 has the greatest capital cost, followed by Alternatives 4 and 5. The treatment alternative with the greatest O&M cost is Alternative 5 followed by Alternatives 4 and 3. Total present worth for the treatment alternatives from the most expensive to the least expensive are for Alternatives 4, 5 and 3, respectively.

State Acceptance

This criterion indicates whether the State agrees with, opposes, or has no comment on the preferred alternative.

EPA has involved CDH throughout the RI/FS and remedy selection process. The State concurs with EPA's selected alternative, Alternative 3.

Community Acceptance

This criterion includes which components of the alternatives interested persons in the community support, have reservations about, or oppose. At the public meeting and in the comments received, all have fully supported EPA's selected alternative. Please refer to Appendix A of this document for a summary of the written public comments received and EPA responses.

IX. SELECTED REMEDY

EPA has selected CSC OU4 Alternative 3, connection of SACWSD Wells 18, 21, and 47 to the KWTF, as the remedy for CSC OU 4.

The remedy for OU 4 is made up of the following components:

- connection of Wells 18, 21, and 47 to the KWTF
- treatment of well water at the KWTF by granulated activated carbon to below MCLs (please see table B-1, Appendix B), in compliance with the EPA Off-Post ROD
- regeneration of spent carbon off site in compliance with the Off-Post RMA OU1 ROD
- transmission of treated water to Reservoir 4 for storage
- quarterly monitoring of Wells 18, 21, and 47, and Reservoir 4

The RA for Wells 18, 21, and 47 will continue as long as is necessary to insure the MCLs are met at the tap. MCLs at the tap will be achieved via treatment by the KWTF which was constructed as a result of EPA RMA Off-Post OU1 ROD, dated June 1987.

The selection of this remedy is based upon the comparative analysis of alternatives presented in the previous section. This remedy provides the best balance with respect to the nine evaluation criteria, is protective of public health, and will comply with all identified State and federal ARARs.

For CSC OU4, connection of SACWSD Wells 18, 21, and 47 to the KWTF will ensure that residents of south Adams County are provided with adequate drinking water and protected from exposure to contaminated ground water.

Alternative 1 was not chosen because it is not a permanent solution and will not comply with all ARARs in the future. Alternative 3 was chosen over Alternative 4 because it is less costly and Alternative 3 utilizes an existing facility for treatment and Alternative 4 would require the construction of a

new GAC system. Alternative 3 was chosen over Alternative 5 because it is less costly and Alternative 5 would not destroy contaminants, but would only reduce toxicity by dilution in the atmosphere.

VC has not been detected in ground water extracted by the SACWSD municipal supply wells. As mentioned previously, if VC is detected at quantities in which the KWTF cannot treat to performance standards (MCLs), an air stripper will be retrofitted to the KWTF as specified in the provisions of the EPA Off-Post RMA ROD.

X. STATUTORY DETERMINATIONS

EPA's primary responsibility at CERCLA sites is to select RAs that are protective of human health and the environment. CERCLA also requires that the selected remedial action for the Site comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws, unless a waiver is granted. The selected remedy must be cost-effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that include treatment as a principal element. The following sections discuss how the selected remedy for CSC OU4 meet these statutory requirements.

Protection of Human Health and the Environment

The remedy selected for OU4 addresses the exposure or potential exposure to contaminated ground water through SACWSD Wells 18, 21, and 47. Alternative 3 is protective of human health by ensuring that the water extracted by Wells 18, 21, and 47 used as part of the municipal water supply is treated to levels below MCLs.

Attainment of Applicable or Relevant and Appropriate Requirements

All ARARs would be met by the selected remedy. ARARs for CSC OU4 were discussed in Section VIII of this ROD.

Cost Effectiveness

EPA believes that the selected remedy is cost-effective in mitigating the risk of exposure to contaminated ground water. Section 300.430(f) (ii) (D) of the NCP requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria, protection of human health and the environment, against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and

produces the best overall effectiveness in proportion to their cost. The estimated cost for the selected remedy is \$3,314,900.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA believes the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for CSC OU4. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability; and cost, and also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

As mentioned previously, OU4's primary purpose is to provide a drinking water supply that meets MCLs. OUs 1 and 2 address the restoration of the ground water aquifer which is the source of water for Wells 18, 21 and 47. The restoration of the aquifer will be enhanced by the actions taken in both the EPA RMA Off-Post OU1 ROD and this ROD.

The selected remedy (Alternative 3) provides a permanent remedy at minimal costs. Additional costs after connecting Wells 18, 21, and 47 to the KWTF include quarterly ground-water monitoring and annual operation and maintenance costs at the KWTF. The selected remedy was the least costly of the alternatives that met the threshold criteria.

Alternative 1 does not have a long-term effectiveness and permanence component. Alternatives 3, 4 and 5 are equal in their long-term effectiveness.

Alternatives 3 and 4 reduce toxicity, mobility and volume through treatment equally. These two alternatives remove the contaminants from the water via activated carbon. The contaminants are immobilized through carbon regeneration. Alternative 5 reduces toxicity in the water via transfer to the atmosphere. However, mobility and volume are not reduced by this alternative. Alternative 1 only reduces toxicity by dilution.

All alternatives are equally effective on a short-term basis. Alternative 1 has the advantage that it is already in place.

Alternative 1 is the most easily implemented. The rest of the alternatives are equally implementable.

Of the viable alternatives, 3, 4 and 5, 3 is the most cost effective and least costly in the long run.

Long-term effectiveness and permanence and cost were the most decisive of the above 5 criteria in selection of the remedy.

The State of Colorado concurs with selection of Alternative 3.

Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for treatment as a principal element. No principal threat exists in CSC OU4. A principal threat is defined as material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, to surface water, to air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material. An exception to this is the presence of NAPLs in ground water (see Superfund Publication 9380.3-06FS, November 1991).

Documentation of Significant Changes

There are no significant changes to EPA's preferred alternative as presented in the OU4 Proposed Plan. EPA's preferred alternative is the connection of SACWSD Wells 18, 21 and 47 to the KWTF.

REFERENCES

Black & Veatch 1989. South Adams County Water and Sanitation District, Organic Contaminant Ground water Quality Information. B & V Project 13720.167.

CDM Federal Projects Corp. 1990. Final Remedial Investigation Report, Chemical Sales Co. Operable Unit 2, Chlorinated Hydrocarbon Ground water Plume. Document Control No. 7760-004-RI-BLFT.

URS Consulting 1992. Feasibility Study Report - Chemical Sales Co. Site, Operable Unit 4.

USEPA 1987. Record of Decision - EPA's Off-Post Rocky Mountain Arsenal Operable Unit 1.

USEPA 1991. Record of Decision - Chemical Sales Co. Site, Operable Unit 1.

USEPA 1991. Record of Decision - Chemical Sales Co. Site, Operable Unit 2 and Operable Unit 3.

APPENDIX B

TABLE B-1

Summary of ARARs: Chemical-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
FEDERAL ARARs				
Safe Drinking Water Act	42 USC § 300g	Establishes regulations governing the quality of water that is being provided directly to 25 or more people, or that will be supplied to 15 or more service connections.	See below	See below
National Primary Drinking Water Standards	40 CFR Part 141	Establishes health-based standards for public water supply systems (maximum contaminant levels).	Yes	These standards are applicable since the CSC OU4 alluvial aquifer is used as a public drinking water source. Table 2-4 provides action levels for the CSC chemicals of concern.
National Secondary Drinking Water Standards	40 CFR Part 143	Establishes welfare-based standards for public water supply systems (secondary MCLs)	No	These standards are neither applicable nor relevant and appropriate since there are no secondary standards for contaminants of concern. Secondary MCLs relate to welfare concerns and not contamination.
Maximum Contaminant Level Goals (MCLGs)	40 CFR § 300.430 Pub. L. No. 99-339 100 Stat. 642 (1986)	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety.	No	For those chemicals of concern at CSC with established MCLGs (vinyl chloride, trichloroethane, and 1,2-dichloroethane), MCLGs are zero and therefore not ARARs. MCLGs are potential TBCs for chemicals without ARARs.

TABLE B-1
(Continued)
Summary of ARARs: Chemical-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
Clean Water Act	CSC § § 1251-1376	See below	See below	See below
Water Quality Criteria (WQC)	40 CFR 131	Sets criteria for water quality, based on toxicity to aquatic organisms and human health. Guidance to be used by states in setting their water quality standards for surface water. CERCLA § 121 specifically provides that WQCs may be used as relevant and appropriate standards for groundwater if adjusted, or surface water.	Yes	These standards are potentially applicable and relevant and appropriate since the CSC OU ₄ alluvial aquifer is a current public drinking water source.
Resource Conservation and Recovery Act and Regulations	P.L. 94-580 as amended 40 CFR §§ 260-270	Establishes regulations governing the disposal and treatment of listed or characteristic wastes.	See below	See below
Land Disposal Restrictions	40 CFR § 268	Prohibits land disposal of hazardous waste unless the wastes are treated to particular concentrations.	No	Land disposal restrictions are an ARAR only if remedy involves disposal of contaminated material
Clean Air Act	42 USC § § 7401-7642	Establishes regulations to protect and enhance the quality of the nation's air resources.	See below	See below
National Emission Standards for Hazardous Air Pollutants (NESHAP)	40 CFR 61	Establishes emission standards for hazardous air pollutants.	Yes	These regulations are potentially applicable and relevant and appropriate if air emissions occur (air stripping alternative).

TABLE B-1
(Continued)
Summary of ARARs: Chemical-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
STATE ARARs				
Colorado Primary Drinking Water Regulations	5 CCR 1003-1 Part I, Title 25 C.R.S.	Establishes drinking water regulations (MCLs) for public water systems and allows the state to assume responsibility for the enforcement of State Drinking Water Act (SDWA) standards.	Yes	These standards are potentially applicable since the CSC OU4 alluvial aquifer is used as a public drinking water source.
Colorado Water Quality Control Act	5 CCR 1002.8 Part II, Title 25 C.R.S. Sections 25-8-202, 25-8-203, 25-8-204	Establishes a system to classify groundwater and adopts water quality standards to protect existing and potential beneficial users of groundwaters.	See below	These standards are applicable if they are more stringent than federal standards. Table B-4 provides action levels for the CSC chemicals of concern.
The Basic Standards for Groundwater	5 CCR 1002.8, Section 3.11.0	Pertains to direct discharges to groundwater.	Yes	These standards are applicable if they are more stringent than federal standards. Table B-4 provides action levels for the CSC chemicals of concern.

TABLE B-2

Summary of ARARs: Location-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
FEDERAL ARARs				
National Historic Preservation Act	16 U.S.C. § 470 40 CFR § 6.301 36 CFR § 8900	Requires federal agencies to take into account the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.	No	The alternatives under review will not affect any district, site, building, structure, or object listed on, or eligible for, the National Register of Historic Places.
Archeological and Historic Preservation Act	16 U.S.C. § 469 40 CFR § 6.301(c)	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	No	The alternatives under review will not affect historical or archaeological data.
Historic Sites, Buildings and Antiquities Act	16 U.S.C. §§ 461-467 40 CFR § 6.301(a)	Requires federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	No	The alternatives under review will not affect any natural landmark.
Fish and Wildlife Coordination Act	16 U.S.C. § 661-666 40 CFR § 6.302(g)	Requires consultation when a federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	No	There are no natural streams or other water bodies impacted by the project.

TABLE B-2
(Continued)
Summary of ARARs: Location-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
Endangered Species Act	16 U.S.C. 1531 50 CFR § 200 50 CFR § 402	Requires action to conserve endangered species within critical habitats upon which endangered species depend and includes consultation with Department of Interior.	No	No endangered species have been identified on the CSC site. The area could receive minimal use by bald eagles that winter at Rocky Mountain Arsenal.
Clean Water Act	33 U.S.C. §§ 1251-1376	See below	See below	See below
Dredge or Fill Requirements (Section 404)	40 CFR §§ 230, 231 33 CFR § 323	Requires permits for discharge of dredged or fill material into navigable waters.	No	There will be no discharge of dredged or fill material into navigable waters.
Executive Order on Floodplain Management	40 CFR § 6.302(b) & Appendix A Exec. Order No. 11988	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the maximum extent possible, the adverse impacts associated with direct and indirect development of a floodplain.	No	The alternatives under review will not affect Platte River or Sand Creek floodplains.
Executive Order on Protection of Wetlands	40 CFR § 6.3029(a) and Appendix A Exec. Order No. 11990	Requires federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practical alternative exists.	No	No remedial action is being considered that would affect a wetland.
Wilderness Act	16 USC 1131; 50 CFR 35.1	Restricts activities within federally owned wilderness areas.	No	There are no wilderness areas on site or adjacent to the site.

TABLE B-2
(Continued)
Summary of ARARs: Location-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
National Wildlife Refuge System	16 USC 668; 50 CFR 27	Restricts activities within a National Wildlife Refuge.	No	There are no wildlife refuges on-site or adjacent to the site.
Wild and Scenic River Act	16 USC 1271; 40 CFR 6.302(e)	Prohibits adverse effects on a scenic river.	No	There is no scenic river in the area.
Coastal Zone Management	16 USC 1451	Requires coastal activities to be conducted in accordance with state-approved management program.	No	The area is not in a coastal zone.
STATE ARARs				
Colorado State Historical Society	C.R.S. Sections 24-80-201, 202, 211; Sections 24- 801-101, 102, 103, 104, 108	Sites within state or federal historic preservation areas will be required to preserve historic character.	No	The alternatives under review will have no effect on state or federal historic preservation areas.
Requirements for Siting of Hazardous Waste Disposal Sites	6 CCR 1007-2, Pt II, Sections 2.1, 2.4, and 2.5.	Geologic/hydrologic conditions must assure waste isolation from exposure pathways from 1000 years. Siting must assure short and long term protection of human health and environment.	No	No on-site hazardous waste disposal facility is contemplated.
Colorado Hazardous Waste Management Regulations	6 CCR 1007-3	Siting is restricted in vicinity of recent faulting. No hazardous waste disposal can occur in a 100-year floodplain. Disposal into or below surface water and groundwater is prohibited.	No	No on-site hazardous waste disposal facility is contemplated.

TABLE B-2
(Continued)
Summary of ARARs: Location-specific

Standard, Requirement, Criteria, or Limitation	Citation	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
Regulations Pertaining to Solid Waste Disposal Sites and Facilities	6 CCR 1007-2, Sections 1.3.2, 2.1, 2.2, 2.4, 4.1, 6.1.	Siting must maximize wind protection and minimize upstream drainage area. No solid waste disposal can occur in a 100-year floodplain. Disposal into or below surface water and groundwater is prohibited. Impoundment design is controlled by a site's location in relation to the upper-most aquifer and by water quality in that aquifer.	No	No on-site hazardous waste disposal facility is contemplated.

TABLE B-3

Summary of ARARs: Action-specific

Standards, Requirement, Criteria or Limitation	Criteria	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
FEDERAL ARARs				
Occupational Safety and Health Act (OSHA)	29 CFR 1910	Regulates worker health and safety.	Yes	Health and safety requirements of the Act apply to all remedial actions.
Hazardous Materials Transportation Act	49 U.S.C. §§ 1801- 1813	Regulates transportation of hazardous materials.	No	Applicable only if an alternative under review would involve transportation of hazardous materials
Hazardous Materials Transportation Regulations	49 CFR §§ 107, 171- 177	Regulates transportation of hazardous materials.	No	Applicable only if an alternative under review would involve transportation of hazardous materials
Resource Conservation and Recovery Act and Regulations	40 CFR §§ 260-270	Regulates generation, treatment, storage and disposal of hazardous waste.	See below	See below
Land Disposal Restrictions	40 CFR § 268	Prohibits land disposal of hazardous waste unless the wastes are treated to particular concentrations.	No	Applicable only if an alternative under review would involve the treatment, storage or disposal of hazardous wastes
Underground Injection Control Program	40 CFR §§ 144-147	Requirements for underground injection by wells. Promulgated under Part C of the Safe Drinking Water Act.	No	Not applicable or relevant and appropriate since the reinjection of groundwater is not being considered as a remedial action for the CSC OU4 site.

TABLE B-3
(Continued)
Summary of ARARs: Action-specific

Standards, Requirement, Criteria or Limitation	Criteria	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
Clean Water Act	33 USC §§ 1251-1376	See below	See below	See below
National Pollution Discharge Elimination System (NPDES)	40 CFR 403	Regulates the unpermitted discharge of any pollutant or combination of pollutants to waters of the U.S. from a point source.	No	The NPDES provisions of the Clean Water Act are not applicable or relevant and appropriate since there is no current or proposed point source discharge from the site.
Clean Air Act	41 USC § 7401-7642	See below	See below	See below
National Ambient Air Quality Standards (NAAQS)	40 CFR 50	Establishes air quality standards for regulated air pollutants.	Yes	The NAAQS would be applicable if air emissions occur (air stripping alternative) which would impact the ambient air quality.
STATE ARARs				
Rules and Regulations Governing the Trans- portation of Hazardous Materials Within Colorado	4 CCR 723-18, HMT 1-9	Establishes specific requirements for the transportation of hazardous materials, especially regarding labelling and placarding.	No	Applicable only if an alternative under review would involve transportation of hazardous materials.
Colorado Hazardous Waste Act Hazardous Waste Regulations	C.R.S. Title 25, Article 15 6 CCR §§ 260-267	Regulates generation, treatment, storage and disposal of hazardous waste.	No	Applicable only if an alternative under review would involve the treatment, storage or disposal of hazardous wastes.

TABLE B-3
(Continued)
Summary of ARARs: Action-specific

Standards, Requirement, Criteria or Limitation	Criteria	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
Colorado Noise Abatement Statute, Sections 25-12-101 through 108	C.R.S. § 25-12-103,	Establishes standards for controlling noise.	Yes	Potentially relevant and appropriate during construction activities.
Colorado Wildlife Enforcement and Penalties	2 CCR Sections 33-6- 101 through 105, 108 through 111, 113 through 130.	Prohibits specific actions in order to protect wildlife.	Yes	Potentially relevant and appropriate for protecting wildlife near the site during construction activities.
Wildlife Commission Regulations	2 CCR 406-0, Articles I, III, IV, V, VI, VII, VIII, IX, X, XI	Establishes specific requirements for protection of wildlife.	Yes	Potentially relevant and appropriate for protecting wildlife near the site during construction activities.
Closure, Transportation, On- Site Disposal of Treatment Residues	6 CCR 1007-3, §§ 262 and 264	Colorado Hazardous Waste Management Regulations governing closure of hazardous waste TSD facilities, transportation of hazardous wastes and on-site disposal of treatment residue.	No	Regulations to be reviewed if alternatives involve disposal of hazardous waste on the site or removal and disposal off site.
Colorado Air Quality Control Act	5 CCR 1001	See below	See below	See below
Common Provisions Regulation	5 CCR 1001	Establishes intent of air emission control regulations.	Yes	Applicable if air emissions occur (air stripping alternative).

TABLE B-3
(Continued)
Summary of ARARs: Action-specific

Standards, Requirement, Criteria or Limitation	Criteria	Description	Potential to be Applicable/ Relevant and Appropriate	Comment
Stationary Emissions Sources; General Controls for Remedial Activities	5 CCR 1001-5, Sec. IVD	Source cannot cause an exceedance in any attainment area of any NAAQS.	Yes	Non-attainment area. The site could be considered a major source if it emits more than 100 tons/year of CO or VOCs. Applies to air-stripping activities.
	5 CCR 1001-5 Sec. IVD	Source cannot interfere with attainment and maintenance of any state AAQS.	Yes	Non-attainment area.
	5 CCR 1001-3 Sec. IUD	Minimize fugitive dust emissions, submit fugitive particulates emission control plan.	Yes	Potentially applicable during construction activities.
Regulation No. 7 Emissions of Volatile Organic Compounds	5 CCR 1001-9	Regulates emissions of volatile organic compounds in ozone non-attainment areas.	Yes	Applicable if emissions of volatile organic compounds occur (air stripping).
Regulation No. 8 Control of Hazardous Air Pollutants	5 CCR 1001-10 Part A	Sets forth emission control standards for hazardous air pollutants.	Yes	Applicable if air releases of vinyl chloride, asbestos, benzene, beryllium, mercury, lead or hydrogen sulfide occur (air stripping alternatives).
Colorado Ambient Air Quality Standards	5 CCR Part 14	Establishes quality standards for ozone, carbon monoxide, nitrogen dioxide and sulfur dioxide.	Yes	Applicable to all emission regulations.

TABLE B-4

Performance Standards for Chemicals
of Concern

Chemical of Concern	Action Level (ppb)	ARARs
PCE	5	MCL 40 CFR 141
TCE	5	MCL 40 CFR 141
TCA	200	MCL 40 CFR 141
DCA	5	MCL 40 CFR 141
1, 1-DCE	7	MCL 40 CFR 141
1, 2-DCE (cis and trans isomers)	70	*Colorado Basic Standard for Groundwater
VC	2	MCL 40 CFR 141
BZ	5	MCL 40 CFR 141

The MCLs from 40 CFR 141 are as follows: 70 ppb for cis-1,2-DCE, 100 ppb for trans-1,2-DCE. The MCL from the Colorado Basic Standards for Groundwater for both the cis and trans isomers is 70 ppb. The state standard is more stringent and, therefore, takes precedence.

APPENDIX C

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

Dedicated to protecting and improving the health and environment of the people of Colorado

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Roy Romer
Governor

Patricia A. Nolan, MD, MPH
Executive Director

December 28, 1992

Mr. James J. Scherer
Regional Administrator
US EPA VIII RA
999 18th Street, Suite 500
Denver, Colorado 80202-2466

RECEIVED
SUPERFUND DIVISION
DEC 28 AM 11:52

Subject: Chemical Sales Co. Superfund Site OU 4 Record of Decision

Dear Mr. ^{Jim}Scherer:

The State of Colorado has reviewed the Record of Decision (ROD) for the Chemical Sales Company Superfund Site (the Site) Operable Unit 4 and concurs with the United States Environmental Protection Agency's (EPA) decision to select Alternative 3 as the remedy. Implementation of this remedial action will assist with ground-water restoration.

As part of this concurrence, the State of Colorado requests that EPA maintain a strong and diligent effort towards the evaluation of contaminants from all viable responsible parties for the Site. This, we believe, should include strong efforts to secure payment for both capital construction costs and additional operation and maintenance costs required to implement this action, as well as efforts to address ground water in the geographic area of Operable Unit 4. Absent such efforts the State of Colorado may be unable to enter into a formal contractual agreement to finalize the remedial action.

We look forward to a continued strong working relationship during the Remedial Design and Remedial Action phases for this Operable Unit as well as during the cleanup of the sources (Operable Unit 1) and the alluvial aquifer (Operable Unit 2).

Sincerely,

Thomas P. Looby
Director
Office of Environment

cc: David C. Shelton, CDH
Jim Lewis, CDH
Robert Eber, AGO
Jim Berkley, EPA
John Barth, EPA/ORC