

SMDS DOC ID #



2034305

TIAA Superfund Site, Area A & B Groundwater OU - Record of Decision Amendment

**Tucson International Airport Area
Superfund Site
Tucson, Arizona**

**Former West-Cap of Arizona and West Plume B Project Areas
Area A & B Groundwater Operable Unit**

RECORD OF DECISION AMENDMENT

September 2004

**United States Environmental Protection Agency
Region 9 - San Francisco, California**

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ACRONYMS AND ABBREVIATIONS

The definitions below are provided as clarification for abbreviations.

ADEQ	Arizona Department of Environmental Quality
AANG	Arizona Air National Guard
ARAR	Applicable or Relevant and Appropriate Requirement
AAC	Arizona Administrative Code
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
COC	Chemical of Concern
DCE	Dichloroethene (1,1-DCE and cis 1,2-DCE observed)
EPA	United States Environmental Protection Agency
FS	Feasibility Study
gpm	gallons per minute
HI	Hazard Index
MCL	Maximum Contaminant Level (Safe Drinking Water Act standard)
MCLG	Maximum Contaminant Level Goal
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCE	Tetrachloroethene (also Perchloroethylene and Tetrachloroethylene)
ppb	parts per billion (also micrograms per liter, µg/L)
PRGs	Preliminary Remediation Goals
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SVE	Soil Vapor Extraction
TARP	Tucson Airport Remediation Project
TCE	Trichloroethene (also trichloroethylene)
TI	Texas Instruments (formerly Burr-Brown Property)
TIAA Site	Tucson International Airport Area Site
µg/L	micrograms per liter (also parts per billion, ppb)
VOC	volatile organic compound
WC	former West-Cap of Arizona Corporation (Property)
WPB	West Plume B

PART I - DECLARATION FOR THE RECORD OF DECISION AMENDMENT

A. Site Name and Location

Tucson International Airport Area (TIAA) (CERCLIS ID #AZD980737530)
West-Cap and West Plume B Groundwater Project Areas
North of Los Reales Road (Area A & B Groundwater)
Tucson, Arizona

B. Statement of Basis and Purpose

This decision document presents the amendment to the Selected Remedial Action for the Tucson International Airport Area (TIAA) Site in Tucson, Arizona (Site). The original Record of Decision (ROD) was signed August 22, 1988 (1988 ROD). The 1988 ROD addresses groundwater contamination north of Los Reales Road, including the Area A and B plumes. This ROD Amendment presents EPA's selected remedial action for groundwater contamination at the West Cap and the West Plume B Project Areas, located within Area B. EPA chose to defer the remedy decision to address the West-Cap Project Area, originally identified in the 1988 ROD, pending further investigation. The West Plume B Project Area, also located within Area B, was identified in 1995, when Arizona Air National Guard (AANG) conducted a Remedial Investigation (RI) addressing on-site soil and groundwater contamination. The original ROD and this ROD Amendment present a remedial action that has been selected in accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. § 117, and, to the extent practicable, 40 C.F.R. § 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based on the Administrative Record file. This ROD Amendment will become part of the Administrative Record file in accordance with 40 C.F.R. § 300.825(a)(2) of the NCP. A copy of the Administrative Record is available for review at two locations:

- Tucson Public Library, El Pueblo Branch, 101 W. Irvington Rd., Tucson, AZ 85714, (520) 791-4733. Current hours: Monday and Tuesday 9 am to 6 pm; Wednesday and Thursday 10 am to 6 pm; and Friday 10 am to 5 pm.
- EPA Superfund Records Center, 95 Hawthorne St., 4th Fl., San Francisco, CA 94105, (415) 536-2000. Hours: Monday through Friday 8 am to 5 pm.

The U.S. EPA is the lead agency for this Site. The Arizona Department of Environmental Quality (ADEQ) is the support agency. ADEQ has concurred with the amended remedy selection.

C. Circumstances Requiring a ROD Amendment

This ROD Amendment modifies the previously selected remedy for the groundwater at the TIAA Site. This ROD Amendment adopts the same general process as the original ROD, extraction, treatment, and reuse, but incorporates and relies upon new information obtained since the signing of the original ROD in 1988.

Based on information that became available after the signature of the original groundwater ROD in 1988, EPA determined that a ROD Amendment was necessary to ensure protection of human health and the environment. The information that has become available concerning the Site includes: the identification of West Plume B and the further delineation of the West-Cap groundwater plume. These plumes exceed the Federal Maximum Contaminant Levels (MCLs) and pose a threat to the nearby remedial actions at the Texas Instruments (TI) Project Area and the (AANG) Project Area. EPA determined that this additional information was sufficient to warrant additional site investigations and further analysis of the potential remedy alternatives for the Site.

The amended remedy for this Site is based on information presented in the Supplemental Remedial Investigation and the Feasibility Study (RI/FS) that was completed in May 2002. The Supplemental RI/FS presents a detailed analysis of remedial alternatives addressing the updated information regarding the nature and extent of contamination at the Site.

D. Assessment of the Site

The response action selected in this Record of Decision Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances to the environment.

E. Description of the Revised Remedy

This ROD Amendment selects the remedy specifically for the West-Cap and West Plume B Project Areas of the Site and addresses only groundwater conditions. These conditions will be remediated primarily through extraction and treatment of contaminated groundwater, and reuse of the treated water. To ensure continued protection of the groundwater, the revised remedy will incorporate groundwater monitoring.

The major components of the revised remedy are as follows:

1. Implementation of groundwater extraction to achieve in situ cleanup standards for the contaminants of concern in the groundwater. Extraction wells will be located in both the West-Cap and West Plume B Project Areas. The existing extraction wells installed as part of a prior removal action will also be utilized;
2. Implementation of treatment systems, using either packed column air stripping or granular activated carbon;

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3. Treated water will be used for municipal drinking water, reinjected into the aquifer, treated for industrial use, or used for irrigation;
4. Implementation of groundwater monitoring, including data from remedial design wells, will be compared to the groundwater model to ensure the remedy is efficient and effective. If during Remedial Design or post construction, groundwater data and modeling indicates the remedy at either Project Area is not effectively addressing the remedial objectives in the anticipated schedule, EPA will reconsider the selected technology. This could include consideration of additional extraction wells. Alternatively, if groundwater monitoring data and modeling suggests that the plume is attenuating, EPA will reconsider Monitored Natural Attenuation (Alternative 2). Any fundamental changes would require appropriate administrative actions (i.e., an Explanation of Significant Differences (ESD) or ROD Amendment); and
5. Implementation of operation and maintenance (O&M) to ensure that all environmental systems and control components are functioning effectively.

F. ROD Amendment Data Certification Checklist:

The following information is included in the Decision Summary (Part II) of this ROD Amendment:

- The Contaminants of Concern (COCs, Section D), are trichloroethene (TCE), tetrachloroethene (PCE), 1,1-dichloroethene (1,1-DCE), and cis 1,2-dichloroethene (cis 1,2-DCE) and their respective health-based concentrations (Summary of Site Risks, Section F);
- The maximum risk would be 2×10^{-4} if water from contaminated supply wells within these Project Areas were served to individuals without treatment. (Summary of Site Risks, Section F);
- The 1988 ROD stated that extracted groundwater would be treated to 1.5 µg/L, representing an overall risk of one in one million. Consistent with the 1997 Air National Guard ESD, this ROD Amendment uses the MCL as the cleanup level for reinjected water. EPA will still meet the 1.5 µg/L cleanup level for water served in a public drinking water supply (i.e., Tucson Airport Remediation Plant). Since issuance of the Proposed Plan, EPA reevaluated the toxicity value for TCE. EPA considered the provisional TCE toxicity values in this ROD Amendment. The cleanup levels selected in this ROD Amendment are protective of human health and the environment and meet or are more protective than MCLs set under the Federal Safe Drinking Water Act (Cleanup Levels and Performance Standards established for the COCs, Section F);
- Principal threat wastes were not a factor in remedy selection as they have been addressed in the 1997 ROD for Soils and Shallow Groundwater;

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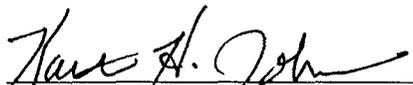
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the risk assessment and ROD Amendment (Section E);
- Potential groundwater use that will be available at the Site as a result of the Revised Remedy (Section K.6);
- Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section K.5); and
- Key factors that led to selecting the remedy are identified (Section K).

Additional information can be found in the Administrative Record file for this Site.

G. Statutory Determinations

The revised 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 remedial action, and cost-effective. This remedy uses permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this Site. Consistent with 40 C.F.R. § 300.435(c)(2)(ii) of the NCP and EPA guidance and directives, including Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA OSWER Directive October, 1988), EPA has selected containment and restoration to address the threat from the Site.

Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining within the Project Areas above levels that allow for unlimited use and unrestricted exposure, no statutory Five-Year Review is required. However, because the remedy is expected to be in place for more than five years before remedial action objectives and cleanup levels are attained, as a matter of EPA policy, a Five-Year Review will be conducted no less often than every five years following construction completion to ensure that the remedy continues to be protective of human health and the environment.


Kathleen Johnson

Chief, Federal Facilities Branch
Superfund Division
United States Environmental Protection Agency
Region 9

September 8th, 2004

PART II - DECISION SUMMARY

A. Site Name, Location and Description

The overall Tucson International Airport Area (TIAA) Superfund Site (Site) depicted in Figure 1, page II-2 comprises seven project areas encompassing approximately 10 square miles, or 1,319 acres.¹ This ROD Amendment addresses two project areas within the TIAA Site: the West-Cap of Arizona Corporation (West-Cap) Project Area and the West Plume B Project Area. (Figure 2, page II-5).

The West-Cap Project Area includes the former West-Cap property and all areas where contamination therefrom has reached, and any other areas necessary for the response action. The former West-Cap property is located at 2207 East Elvira Road, to the east of the Tucson International Airport. The land use over the West-Cap Project Area is industrial and commercial.

The West Plume B Project Area includes a contaminated groundwater plume originating at the Arizona Air National Guard (AANG) property to the south and extending to Drexel Road to the north as well as all areas necessary for this response action. The land use in the West Plume B Project Area is primarily residential. The Site data indicates that the AANG property is the source of the West Plume B contamination. AANG has addressed the source remedy under its own 1996 Site 5 Soils ROD.

The United States Environmental Protection Agency (EPA) is the lead agency for this Site. The Arizona Department of Environmental Quality (ADEQ) is the support agency. ADEQ has concurred with the amended remedy selection. Funding for remediation is expected to be provided through a combination of enforcement actions, the Superfund, and the State.

B. TIAA Site History & Enforcement Activities

Various aviation, military, aerospace and electronics industrial facilities have occupied the TIAA Site since 1942. Up until the 1970s, industrial solvents containing volatile organic compounds (VOCs) were typically disposed of directly onto the ground, or into unlined pits, trenches and sanitary sewers. These disposal practices, along with other releases, resulted in the current groundwater contamination at the TIAA Site.

In May 1981, VOCs were discovered in several City of Tucson (City) drinking water wells in the southwest part of the City. The City closed the contaminated wells to ensure that water served to the public would meet all regulatory drinking water standards. Since the initial

¹The site-wide TCE contour maps were produced by ADEQ using February 2002 data.

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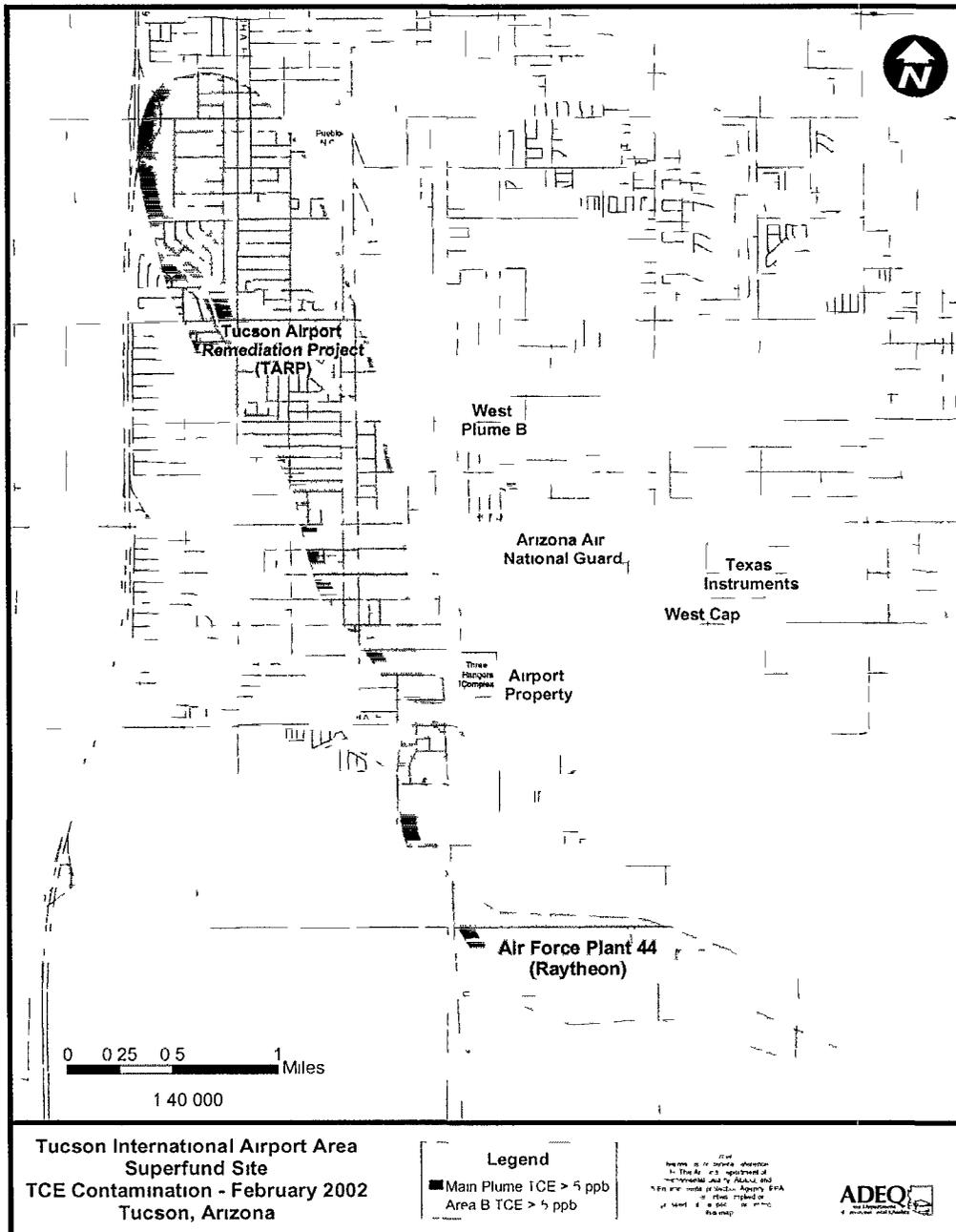


Figure 1

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discovery of VOCs in the groundwater, EPA and ADEQ have conducted and directed investigations and cleanup activities at the TIAA Site. The TIAA Site was placed on EPA's National Priorities List (NPL) in 1983. The TIAA Site consists of several distinct areas of contamination. To date, the sources of groundwater contamination that have been identified are:

- Tucson International Airport property, including adjoining properties under the control of the Tucson Airport Authority (TAA);
- United States Air Force (USAF) Plant No. 44 property, also known as the former Hughes Missile Systems plant (now the Raytheon facility);
- Arizona Air National Guard (AANG) Base property;
- Former Burr-Brown Corporation property (now Texas Instruments); and
- Former West-Cap property.

In 1988, EPA issued a ROD that established cleanup requirements for the regional groundwater remedy (1988 ROD) for groundwater in the deeper aquifer north of Los Reales Road² as amended by the 1997 ESD for the AANG property. The 1988 ROD further divided areas of contamination within the regional aquifer. The western portion of groundwater contamination associated with the Tucson International Airport itself is designated as Area A. Area B is identified in the 1988 ROD as two smaller plumes; one located in the vicinity of the AANG property, and another located in the vicinity of the Burr-Brown property and the former West-Cap property. Remedial activity has begun at all groundwater project areas pursuant to the 1988 ROD, except West-Cap,³ which has thus far been treated in accordance with a 1998 removal action, and West Plume B.

Soil, soil gas, and shallow aquifer remediation activities throughout most of the Site are being conducted pursuant to the following RODs:

- 1996 ROD for Site 5 Soils at the AANG Project Area,
- 1997 ROD (Airport Property - Soils and Shallow Groundwater Zone, Burr-Brown Property - Soils, Former West-Cap Property - Soils), as amended by the 2001 ESD
- 1997 ROD for Sites 1,2 and 3 at the AFP 44 Site, and

²The USAF issued a ROD in 1985 for groundwater cleanup at its USAF Plant No. 44 south of Los Reales Road (1985 USAF ROD). The 1988 ROD cleanup requirements do not apply to the portion of the regional aquifer contamination addressed by the 1985 USAF ROD.

³EPA installed a temporary extraction system at the West-Cap property in 1998 as part of a Time-Critical Removal Action to prevent VOC contaminated groundwater from continuing to migrate towards the Burr-Brown (now TI) and Arizona Air National Guard properties. As part of that Removal Action EPA has been conveying the extracted water to the Burr-Brown air stripping unit for treatment. For further information, see the Action Memorandum and three subsequent 12-month exemption requests and ceiling increases contained in the Administrative Record.

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- 1997 ROD for Sites 4, 5 and 6 at the AFP 44 Site.

The 1988 ROD indicated that further investigation would likely be necessary to better characterize groundwater contamination in Area B. While treatment systems for the characterized contamination were constructed and began operation, additional areas of groundwater contamination were identified. Specifically, a plume of contaminated groundwater originating at the West-Cap property was confirmed to be migrating to the north and northwest threatening to commingle with the Burr-Brown and AANG plumes. The contamination in West Plume B was subsequently discovered to be migrating in a northwesterly direction from the northern boundary of the AANG property. This ROD Amendment presents the selected remedy for the West-Cap and West Plume B Project Areas, thereby completing the remedy selection for all portions of OU-1. Treated water will be used for municipal drinking water, reinjected into the aquifer, treated for industrial use, or used for irrigation. If the water is served, EPA will meet the TCE 1.5 µg/L cleanup level selected in the 1988 ROD. Consistent with the 1997 ESD for the AANG Project Area, if EPA selects reinjection, industrial use or irrigation, the water will be treated to the TCE MCL of 5 µg/L.

West-Cap Project Area

From the early 1960s to the late 1980s, the West-Cap property was owned and occupied by the West-Cap of Arizona Corporation, a currently bankrupt company. The West-Cap property is located northeast of the Airport terminal (Figure 2, page II-5 illustrates the location of the former West-Cap property within Area B). At the facility, West-Cap manufactured small film capacitors and magnets using organic solvents, including TCE, in the manufacturing process. Operations were conducted primarily in the structures identified as Buildings A, B and C, located along East Elvira Road between South Plumer Avenue and Tucson Boulevard.

Data collected during remedial investigations at the AANG and Burr-Brown Project Areas indicated that there could be additional contamination migrating from the shallow area of the aquifer. This information suggested that contamination coming from the former West-Cap property might be contributing to contamination at the AANG property.

In 1996, remedial investigation activities were reinitiated for the West-Cap Project Area. A shallow soil-vapor survey was used to screen potential source areas for VOC contamination at the former West-Cap property. The shallow soil-vapor survey confirmed two source areas: (1) the floor drains of former Building A, where elevated levels of both TCE and tetrachloroethene (PCE) were detected; and (2) an area near the southeast corner of Building B, where elevated levels of TCE⁴ and 1,1 - dichloroethene (1,1-DCE) were detected.

ADEQ began a Remedial Investigation (RI) for West-Cap in 1997, which consisted of sampling six groundwater monitor wells and two combination groundwater/soil-vapor monitor wells in the West-Cap Project Area and on the north-eastern portion of the Airport property. The RI revealed a groundwater plume, containing primarily TCE, originating from the vicinity of Building A.

⁴Dames and Moore, West-Cap's consultant at the time, mistakenly reported the identified compound as 1,1,1- TCA. However, the compound was subsequently determined to be TCE. TCA has not been detected during other sampling events at the West-Cap and West Plume B Project Areas.

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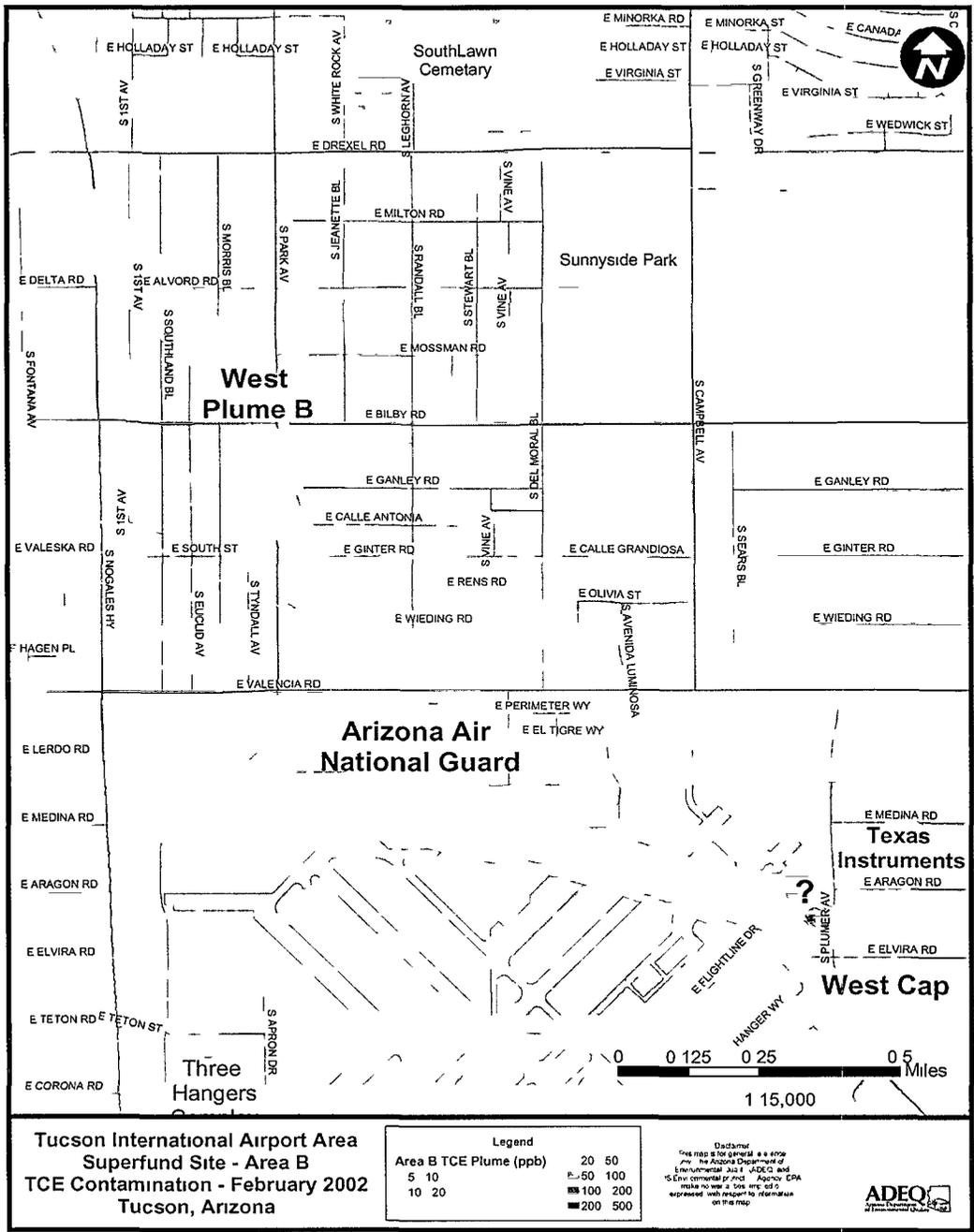


Figure 2

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The West-Cap plume extends west-northwest toward the AANG property. ADEQ recommended additional characterization and containment of the plume to prevent impacting the AANG and Burr-Brown Project Area groundwater extraction systems.

West Plume B Project Area

The extent of the contamination now identified as the West Plume B Project Area was discovered subsequent to EPA's 1988 Groundwater ROD. In 1995, the AANG produced an RI report addressing on-Base groundwater and soil contamination.

The AANG's 1995 RI identified several areas of TCE contamination related to past industrial activities at the Base. All groundwater monitoring wells, soil-vapor samples and soil matrix samples were collected on Base property, thus the AANG RI report did not provide data regarding migration of contamination beyond the Base boundaries. The AANG RI report and subsequent AANG FS addressed remediating the contamination in the groundwater directly beneath the Base. Sampling at down gradient monitor wells installed by EPA at the northwest portion of the AANG property and several private wells located farther north indicate that VOC groundwater contamination extends beyond the AANG property north of Valencia Road. EPA conducted an RI for the West Plume B contamination beyond the AANG boundary.

RI/FS Report

In 1998, based in part on earlier recommendations, EPA and ADEQ began a more comprehensive groundwater RI focused on characterizing the groundwater conditions and contamination in both the West Cap and West Plume B Project Areas.⁵ A Feasibility Study (FS) was completed addressing both project areas in May 2002.

Currently 31 monitoring wells comprise the groundwater monitoring network throughout the West Cap and West Plume B Project Areas. Groundwater sampling has been conducted to determine the nature and extent of TCE contamination in these areas as well as to characterize the flow patterns. The monitoring wells are sampled every six months⁶. Groundwater data will continue to be collected as part of the remedy to help monitor the remedy's effectiveness.

Enforcement Activities

EPA has identified potentially responsible parties (PRPs) for the project areas at the TIAA Site. For the groundwater cleanup north of Los Reales Road, EPA entered into a consent decree with the PRPs for contamination in Area A. The groundwater treatment plant for Area A has been functioning since September 1994. For Area B, EPA entered into a consent decree with Burr-Brown Corporation in 1990 to address the contamination from its facility. In 1996, EPA and

⁵ADEQ produced a draft RI report addressing groundwater at the West-Cap Project Area in 1998, but it was not finalized pending additional data collection and analysis from the West Plume B area. The RI/FS issued in May 2002 is the final RI Report for both Project Areas.

⁶Monitoring wells WC 3U, 3U2 and 3L are sampled quarterly.

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AANG entered into a Federal Facilities Agreement (FFA) wherein AANG would conduct the investigation and remedy contamination. In 1997, AANG began remediation of the TCE source areas through implementation of a groundwater extraction and treatment system and a soil vapor extraction (SVE) system at the Base.

In February 2000, EPA entered into a consent decree with the responsible parties to implement the cleanup described in the 1997 Soils and Shallow Groundwater ROD, for the Airport property, Burr-Brown (TI), and West-Cap. Remedial actions in accordance with the ROD are currently being implemented. Additionally, EPA began implementation of the Time-Critical Removal Action at the West-Cap property in 1998 to contain groundwater contamination potentially impacting the AANG and former Burr-Brown remediation systems. EPA has conducted a PRP search for both the West-Cap and West Plume B Project Areas. EPA has not currently identified any PRPs for the West-Cap Project Area, other than the bankrupt West-Cap of Arizona Corporation. The AANG is the only identified source for the West Plume B Project Area.

C. Community Participation

The RI/FS reports and the Proposed Plan for the West-Cap and West Plume B Project Areas have been available to the public in the TIAA Site Administrative Record since June 2002. The Administrative Record file for the TIAA Site is available to the public at the Tucson Public Library, El Pueblo Branch at 101 W. Irvington Road in Tucson, Arizona and at the EPA Region 9 Record Center at 95 Hawthorne Street in San Francisco, California.

The notice of availability of the Proposed Plan and Administrative Record, the date and location for the public meeting, and the announcement of the public comment period were published on June 25, 2002 in the Arizona Daily Star. In response to community requests, the comment period was extended until August 26, 2002, for a total of 60 days. The extension notice was published in the Tucson Citizen (same publisher, evening edition) on July 31, 2002.

EPA held a public meeting on July 18, 2002 at the El Pueblo Center in Tucson, to present a summary of the proposed remedy for the West-Cap and West Plume B Project Areas and answer community questions. Public comments at the meeting were recorded and a transcript of that meeting is part of the Administrative Record. Several written comments were also received during the Public Comment period. EPA's responses to comments, both written and oral, can be found in Part III of this ROD Amendment - the Responsiveness Summary.

Additional Community Involvement Activities

Since 1996, EPA has been convening meetings to provide interested community members with a forum to gather information and provide input on the soil and groundwater cleanup plans by the government agencies and PRPs at the TIAA Site. This group, which is composed of community members and PRPs, is known as the Unified Community Advisory Board (UCAB). The UCAB is logistically supported by EPA, AANG and the United States Air Force (USAF). The

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bimonthly UCAB meetings have been an effective means to provide information to the community and have been a vehicle for the community to provide EPA and the PRPs with input regarding cleanup activities. The Project Manager for the West-Cap and West Plume B Project Areas provided several briefings to the UCAB during the RI/FS process and during the Proposed Plan comment period.

D. Project Area Characteristics

1. Project Area Overview

This ROD Amendment addresses remedial actions at the West-Cap and West Plume B Project Areas of the TIAA Site as shown in Figure 2, page II-5. This ROD Amendment will complete remedy selection for the remaining groundwater contamination in Area B north of Los Reales Road.

2. Groundwater & Hydrogeology

The TIAA Site is located in the Tucson Basin, a large northwest-trending alluvial valley covering an area of approximately 750 square miles within the Santa Cruz River drainage. Major west-northwest trending drainages intersecting the TIAA Site include the Airport Wash and Hughes Wash, both of which are tributaries of the Santa Cruz River.

Saturated alluvial sediments within the Tucson Basin comprise a single regional aquifer system that has been divided into three major units underlying the vadose zone: the Upper Zone, the Lower Zone and the undivided regional aquifer. Throughout most of the Tucson Basin, the thickness of the vadose zone is over 100 feet. The Upper Zone, which consists of saturated sediments, extends from the water table to a depth of approximately 150 to 200 feet. The Upper Zone is underlain by a 100 to 160-foot thick aquitard (the Middle Aquitard). The Lower Zone underlies the Middle Aquitard to variable depths depending on the depth to bedrock. Where the Middle Aquitard does not exist, the regional aquifer system is undivided.

East of Nogales Highway, predominantly fine-grained material is interbedded with layers and lenses of sand and gravel. The specific water-bearing zones beneath the West-Cap and West Plume B Project Areas differ, affected by the presence or absence of sand, gravel, silt and clay that, in turn, impact how groundwater travels.

The Upper Zone is divided into undifferentiated and differentiated portions. The Upper Zone is highly heterogenous as a result of braided stream depositional geology. The West-Cap and West Plume B Project Areas overlie the differentiated portion of the Upper Zone, which is composed predominantly of fine-grained alluvium with interbedded coarse-grained layers.

The Upper Zone is further divided into upper and lower units based on depth below grade. At the Project Areas, the Upper Unit occurs between approximately 85 and 100 feet below grade

and may contain one or two coarse-grained subunits or may consist entirely of fine-grained sediments. The coarse-grained subunits are termed the Upper Subunit (USU) and the Lower Subunit (LSU). The LSU occurs between 145 and 200 feet. The USU occurs between 85 and 145 feet. There is a shallow groundwater zone (SGZ) consisting of saturated fine-grained material located in some areas within the differentiated portion of the Upper Zone. The USU and LSU exist at the West-Cap Project Area, but the LSU appears to diminish at the AANG property and is not known to be present in the West Plume B Project Area.

3. Location and Extent of Contamination

Contaminants identified in groundwater at the West-Cap and West Plume B Project Areas were limited to VOCs, including TCE, PCE, vinyl chloride, 1,1-DCE and cis 1,2-DCE. Only TCE, PCE and vinyl chloride are present at levels above the Maximum Contaminant Levels (MCLs), which are drinking water standards under the Safe Drinking Water Act. The MCL for both TCE and PCE is 5 micrograms per liter ($\mu\text{g/L}$); while vinyl chloride is 2 $\mu\text{g/L}$. The 1,1-DCE and cis 1,2-DCE detected were below their respective MCLs. Vinyl chloride, 1,1-DCE and cis 1,2-DCE are likely breakdown products of TCE and PCE. Figure 2, page II-5 illustrates the estimated delineation of the extent of groundwater contamination at both Project Areas based on information obtained from 1988 through 1999.

West-Cap

The highest levels of TCE and PCE detected in the West-Cap Project Area during the RI were 270 $\mu\text{g/L}$ and 43 $\mu\text{g/L}$, respectively. Since the RI report was completed, peak concentrations of 540 $\mu\text{g/L}$ for TCE and 74 $\mu\text{g/L}$ for PCE have been detected directly beneath the former West-Cap property (February 2004). TCE groundwater contamination above 5 $\mu\text{g/L}$ extends from the West-Cap property approximately 5,000 feet to the northwest. Based on review of groundwater data and the plume geometry described in the contaminant contour maps, the West-Cap plume appears to be bounded by East Elvira and South Plumer Roads at the southern extent and the AANG property at the northwestern extent of the plume. Due to the complex hydrogeology and the fact that the same contaminants were disposed of at West-Cap and the AANG, it is difficult to determine the exact extent of the West-Cap plume. However, considering the amount of time that has passed since disposal of TCE at West-Cap, the plume appears to have reached the AANG property, but it is unlikely that it has extended beyond it.

EPA installed an extraction system at the West-Cap property as part of the 1998 Removal Action. As part of the remedy selected in this ROD Amendment, monitoring wells will be added, one of which will be up gradient of the West-Cap Project Area to provide additional data about the groundwater behavior and to optimize the Remedy Design process. In addition, extraction wells will be added to increase plume capture.

West Plume B

TCE groundwater contamination at the West Plume B Project Area is defined as the plume extending toward the north-northwest from the AANG property located on Valencia Road and

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Randall at the southern extent to near Drexel Road and Nogales Highway (and Fontana) at the northwestern extent. The West Plume B Project Area contamination extends approximately 6,500 feet and is a maximum of 500 feet wide. The highest level of TCE contamination in West Plume B, 33 µg/L, was collected in February 1999. PCE has not been detected in the West Plume B Project Area above the MCL. Monitoring wells will be added at the leading edge of plume to provide additional data about the groundwater behavior and to optimize the Remedy Design process.

4. Identification of Contaminants of Concern (COCs)

The 1988 ROD identified several groundwater contaminants of concern (COCs) in addition to TCE within the TIAA Site study area, including PCE, 1,1-DCE, cis1,2-DCE, 1,1,1-trichloro-ethane (TCA), chloroform, benzene and xylene. Some hexavalent chromium was also found in a limited area north of Los Reales Road at levels, below the MCL. Of the Site-wide COCs, only VOCs have been identified at the West-Cap and West Plume B Project Areas. TCE is the primary COC, while PCE, 1,1-DCE, and cis 1,2-DCE have been detected at lower concentrations, albeit above the screening levels. Vinyl chloride was observed only once in 98 samples at 2.2 µg/L, slightly above the MCL of 2 µg/L and is considered an anomaly. Trace metals were not found at the West-Cap and West Plume B Project Areas.

Tables 1 and 2, below, identify the general risk characteristics of the COCs at the West-Cap and West Plume B Project Areas, respectively.

Table 1: Characteristics of Contaminants of Concern (COCs) at West-Cap

Chemical	Source	Maximum Concentration (µg/L)	Frequency of Detection	Mobility	Carcinogenic
trichloroethene (TCE)	Former WC activities	270	154/233	High	yes
tetrachloroethene (PCE)	Former WC activities	43	61/232	High	yes
1,1-dichloroethene (1,1-DCE)	Breakdown product	5	26/245	High	no
cis 1,2-dichloroethene (c1,2-DCE)	Breakdown product	2.8	3/233	Very high	no

Table 2: Characteristics of Contaminants of Concern (COCs) at West Plume B

Chemical	Source	Maximum Concentration (µg/L)	Frequency of Detection	Mobility	Carcinogenic
trichloroethene (TCE)	Former AANG activities	33	71/129	High	yes
cis 1,2-dichloroethene (c1,2-DCE)	Breakdown product	2	6/100	Very high	no
vinyl chloride	Breakdown product	2.2	1/98	Very high	yes

5. Risk Assessment

In December 1996, EPA issued the *TIAA Site Baseline Risk Assessment* (1996 Risk Assessment). The 1996 Risk Assessment examined the risk associated with ingestion of, inhalation of, or dermal contact with TIAA Site COCs. The 1996 Risk Assessment was based on the "Conceptual Site Model" for the TIAA Site. The Conceptual Site Model analyzed potential impacts to soil, air, and groundwater and illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential receptors for the TIAA Site. Because the COCs are essentially the same throughout the Site, and exposure pathways (i.e. ingestion, inhalation, dermal contact) are the same for these Project Areas as for other areas of the Site, this ROD Amendment relies in part on the 1996 Risk Assessment for conclusions regarding risk from exposure to Site contaminants. The remedy selected in this ROD Amendment is based on recent Project Area-specific data, the 1996 Risk Assessment, the Public Health Assessment (Agency for Toxic Substances and Disease Registry (ATSDR) and Arizona Department of Health Services (ADHS), and specific risk calculations⁷ for the West Cap and West Plume B Project Areas. Section F, Summary of Site Risks, provides additional detail regarding the 1996 Risk Assessment.

⁷Since issuance of the Proposed Plan, EPA reevaluated the toxicity values for TCE and 1,1-DCE. The provisional value, used in the current Region 9 PRG Table, increases the TCE toxicity value by a factor of 5 to 65. EPA considered the provisional TCE and 1,1-DCE toxicity values in this ROD Amendment.

E. Current and Potential Future Site and Resource Uses

1. Current Land Use

Land use in the West Plume B Project Area is primarily residential including large undeveloped areas and washes. Land use in the West-Cap Project Area is exclusively aviation and industrial/commercial with some undeveloped areas and washes.

2. Accommodation of Future Use of the Site

West-Cap Project Area

Future Project Area land uses are not expected to change in the foreseeable future. Land use in the West-Cap Project Area will likely continue to be industrial. The current owner of the West-Cap property has indicated interest in redeveloping the property to expand industrial operations.

The selected remedy is not expected to impede redevelopment of the West-Cap property. Extraction wells, monitor wells and any treatment facilities will ideally be located outside of the West-Cap property itself and are not expected to interfere with continued use of the property. Design measures will include consideration of below-grade well vaults and public right of ways to further minimize development impacts.

West Plume B Project Area

The West Plume B Project Area is primarily residential. All currently-known active private well users have been notified of the potential risks of using water from their private wells. The City of Tucson has offered to provide connections to the public water supply. EPA, ADEQ and Pima County Department of Environmental Quality continue to conduct outreach to notify area residents that may be impacted by the TIAA Site groundwater contamination. This outreach will continue throughout the cleanup process, along with groundwater monitoring to ensure accurate characterization of the extent of contamination. Although there are no state laws which prevent the construction of individual property-owner's wells in areas of contaminated groundwater or use of such private wells, continued outreach to affected well owners and users should deter construction and use of wells in contaminated areas.

The selected remedy is not expected to impede future development of the West Plume B Project Area. The extraction wells, monitor wells and any treatment facilities will be designed and located to minimize impacts on the community.

3. Anticipated Future Groundwater Use

The 1988 ROD anticipates that the groundwater treated at the TIAA Site would be used as drinking water. The 1988 ROD stated that groundwater would be extracted and treated to 1.5 µg/L for TCE, representing an overall risk of one in one million. EPA will meet the 1.5 µg/L treatment level for water served in a public drinking water supply pursuant to this ROD Amendment. However, consistent with the 1997 ESD for the AANG Project Area, if EPA selects reinjection, industrial use or irrigation, the water will be treated to the TCE MCL of 5 µg/L.

West-Cap Project Area

Currently, as part of the removal action, the treated groundwater extracted from the West-Cap Project Area, is used by Texas Instruments in its manufacturing processes. One option available pursuant to this ROD Amendment would be to continue to extract and treat the West-Cap contamination at the Texas Instruments facility for industrial use. Other end-use options include reinjection and irrigation, all of which will be evaluated during Remedial Design and selected in accordance with Applicable, or Relevant and Appropriate Requirements (ARARs).

West Plume B Project Area

The Tucson Airport Remediation Plant (TARP) treatment plant is located down gradient of the leading edge of the West Plume B Project Area. One option available in this ROD Amendment would be to extract the West Plume B contamination and transport it to the TARP treatment plant for treatment and use as drinking water. Other end-use options include reinjection and irrigation. These options will be evaluated during Remedial Design and selected in accordance with ARARs.

F. Summary of Project Area Risks

Risk assessments are used to identify the human health risk from exposure to Site contaminants. In 1996, EPA issued a TIAA Site Baseline Human Health Risk Assessment (Arizona Department of Health Services (ADHS), 1996) that evaluated the risks associated with the Site-wide COCs. Based on the TIAA Site Baseline Human Health Risk Assessment, EPA conducted a Human Health Risk Assessment Summary (HHRA Summary) in 2002, which accounted for the recent West-Cap and West Plume B Project Area groundwater data. The HHRA Summary estimates the human health and environmental risks that contamination at the TIAA Site would pose **should no remedial action be taken**. This section of the ROD Amendment summarizes the results of the HHRA for the TIAA Site which can be found in the RI/FS Reports for both the West-Cap and West Plume B Project Areas (EPA/ADEQ, 2002).

The only currently complete exposure pathway for contaminants at the West-Cap and West Plume B Project Areas is residential exposure to contaminated groundwater through use of private irrigation wells. Exposure to contamination from irrigation well water can be through inhalation, limited ingestion, and dermal exposures. Dermal contact can occur when watering yards or gardens and when children play in yards that are irrigated with contaminated water. Ingestion can occur when eating vegetables that have been irrigated with contaminated water (ATSDR & ADHS, Public Health Assessment, Groundwater Contamination in West Plume B, 2000). Although the only complete exposure pathway for these project areas is irrigation, when conducting a Site-specific risk assessment, EPA looks to the most conservative (i.e., most health protective) assumptions to determine the Site-specific risks. Accordingly, the 1996 Risk Assessment is based on the assumption that people could drink the untreated water.

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1. Identification of Contaminants of Concern

The COCs driving the need for Remedial Action (risk drivers) are based on the data collected during the West-Cap and West Plume B RI process between 1996 and 2001.⁸ For West-Cap, four different VOCs were detected in the groundwater and are considered COCs (Table 1, page II-10). For West Plume B, three VOCs were detected in the groundwater and are considered COCs (Table 2, page II-11).

2. Exposure Assessment

Exposure refers to the potential contact of an individual (receptor) with a chemical. Exposure assessment is the estimation of the magnitude, frequency, duration, and route of potential exposure. This section briefly summarizes the potentially exposed populations, the exposure pathways evaluated, and the exposure quantification from the HHRA Summary performed for the TIAA Site.

Currently, the anticipated future use of the West-Cap property and property overlying the West-Cap plume is industrial. The property overlying the plume at West Plume B is primarily residential and commercial. The 1996 Risk Assessment utilized a conservative, health-protective assumption that residents could be exposed to untreated, contaminated groundwater from these Project Areas. Federal, state and local regulations, such as the Safe Drinking Water Act, prohibit water purveyors from serving water to consumers with contamination in excess of drinking water standards (MCLs). All public drinking water wells showing VOC contamination were taken out of service when the VOCs were discovered in 1981. Although this water would more likely be used for irrigation purposes, this analysis assumes "worst case conditions" wherein residents use private, untreated contaminated water for drinking water (e.g. ingestion, dermal contact, and inhalation of groundwater contaminants for domestic usage (washing, bathing, laundry, etc.), and as a potable drinking water supply). If treated water at the Site is used as a public water supply, it will be treated to 1.5 ug/L TCE.

3. Toxicity Assessment

Tables 1 and 2, pages II-10 and 11, show the five COCs that are the major risk contributors for the TIAA Site. Of the five COCs in these Project Areas, one is classified as carcinogenic to

⁸West Plume B data collection began in 1998.

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humans, two have suggestive evidence of carcinogenic potential,⁹ and the remaining two are noncarcinogenic.

Five COCs have toxicity data indicating their potential for adverse noncarcinogenic health effects. The chronic toxicity data available for these compounds have been used to develop oral and inhalation reference doses (RfDs). The RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effects. Toxicity values for individual COCs are determined using: (1) EPA's Integrated Risk Information System (IRIS) database for toxicity values (EPA 2000b); and (2) the current edition of EPA's Health Effects Assessment Summary Tables (HEAST) (EPA 1997b).

4. Risk Characterization Assessment

For carcinogenic contaminants, risk assessments express long-term risks to human health as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to Site-related contaminants. Nationally, the chance of an individual developing cancer from all other causes (i.e., not Site-related causes) has been estimated to be as high as one in three.

These risks are probabilities that are expressed in scientific notation (e.g., 1×10^{-6}) for the purpose of comparison. An excess lifetime cancer risk of 1×10^{-6} indicates that an individual has a 1 in 1,000,000 chance of developing cancer as a result of Site-related exposure. The Superfund acceptable risk range is between 10^{-4} and 10^{-6} . The future cancer and non-cancer risks considered to pose potential threats to human health in groundwater at the West-Cap and West Plume B Project Areas (calculated during the RI/FS) are presented in Tables 3 and 4, page II-18. The tables also identify the maximum concentrations detected for each COC, the cancer Preliminary Remediation Goal (PRG), the non-cancer PRG, and the reasonable maximum exposure (RME) for both cancer risk and non-cancer hazards.

The potential for noncarcinogenic effects is evaluated by comparing the RfD to an average daily exposure. The ratio of the average daily exposure to the RfD is referred to as the hazard quotient (HQ). When a HQ is less than one (where the average daily exposure is less than the RfD), adverse toxic noncarcinogenic effects are unlikely. The sum of all of the chemical and route-specific HQs is called the hazard index (HI). A HI of less than one indicates that noncarcinogenic effects from all the Site contaminants are unlikely.

⁹Since the release of the Proposed Plan in June 2002, EPA has begun the process of reassessing the carcinogenicity of TCE. 1,1 - DCE is no longer considered a human carcinogen. Draft Final Guidelines for Carcinogenic Risk Assessment (External Review Draft, February 2003) U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, 2003.

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Conclusions

Federal drinking water standards, or maximum contaminant levels (MCLs), were exceeded for all of the groundwater COCs. Tables 3 and 4, page II-18, present the risk characterization summaries for carcinogenic and noncarcinogenic effects conducted during the RI/FS, for the West Plume B and West Cap Project Areas respectively. The risk estimates presented in these tables are based on RME scenarios and were developed by taking into account various conservative assumptions about the frequency and duration of exposure to groundwater, as well as the toxicity of the COCs.¹⁰ The groundwater exposure pathways for the future resident driving the health risks are ingestion, inhalation, and dermal contact.¹¹ The carcinogenic risk drivers are TCE, vinyl chloride and PCE. Table 3, page II-18, summarizes the excess carcinogenic risk for a future resident drinking untreated groundwater (i.e. the West Plume B Project Area), estimated at one in ten thousand (1×10^{-4}), and representing a non-carcinogenic Hazard Index of 4. Most of the risk is attributed to exposure through inhalation. The hazards presented by these risk drivers are based on a hypothetical, future on-site residential exposure to these COCs through ingestion and inhalation of water from an untreated groundwater supply in the West Plume B Project Area.

Table 4, page II-18 summarizes the excess carcinogenic risk for the hypothetical future resident drinking untreated groundwater from the West-Cap Project Area, even though the expected land use for the foreseeable future will be industrial and commercial. Federal drinking water standards, or maximum contaminant levels (MCLs), were exceeded by all of the groundwater COCs.

¹⁰There are inherent uncertainties in the risk evaluation that can overestimate or underestimate the potential human health risks. The most common uncertainty related to toxicity information includes using: (1) dose-response information from animal studies to predict effects in humans; and (2) dose-response information for effects observed at elevated doses to predict adverse effects following exposure at low levels. The oral RfDs and slope factors (SFs) were used to determine risks for dermal exposure. These toxicity values are generally based on an administered dose which is not directly comparable to absorbed doses through the skin, or for target organs other than the skin. Consequently, health risks or adverse effects identified through this exposure route are estimated and should be viewed with a moderate to high degree of uncertainty. Other uncertainties include the following: 1) use of conservative and health-protective exposure factors; 2) maximum concentrations used for Exposure Point Concentrations are likely to overestimate the overall chemical concentrations throughout the TIAA Site; and 3) the assumption that contaminated groundwater in the shallow water-bearing zone underlying the TIAA Site would be used as an untreated source of potable drinking water.

¹¹The 1997 Shallow Groundwater and Soils ROD addressed the issue of worker inhalation of VOCs from soil and incorporated institutional controls to prevent Site access to source area soils (i.e., at the former West-Cap property).

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Tables 5a and 5b, page II-19, summarize the groundwater cleanup levels for COCs and the risk corresponding to the chosen cleanup level. The 1988 ROD stated that extracted groundwater would be treated to 1.5 µg/L for TCE, representing an overall site risk of one in one million. Consistent with the 1997 Air National Guard ESD, this ROD Amendment uses the 5 µg/L MCL for TCE as the cleanup level for reinjected water. The 5 µg/L MCL for TCE will also be used if extracted water is used for industrial use or irrigation. EPA will meet the 1.5 µg/L treatment level for TCE for water served in a public drinking water supply. Since issuance of the Proposed Plan, EPA reevaluated the toxicity value for TCE. EPA considered the provisional TCE toxicity values in this ROD Amendment. However, due to scientific uncertainty, EPA Region 9 is not relying exclusively on the provisional toxicity value. Instead, Region 9 is evaluating a range of toxicity using both the original and the provisional TCE toxicity values. Using this approach, the risk range for TCE alone for served water (1.5 µg/L) is between approximately 9×10^{-7} and 5×10^{-5} , while for water reinjected (or other end use options) at the MCL (5 µg/L), the risk is between approximately 3×10^{-6} and 2×10^{-4} . These levels are protective of human health and the environment and meet or are more protective than MCLs set under the Safe Drinking Water Act.

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Table 3: Future Risk Summary at West Plume B

Chemical of Concern	Maximum Concentration Detected (µg/L)	Cancer PRG (µg/L)	Reasonable Maximum Exposure (Risk)	Non-Cancer PRG (µg/L)	Reasonable Maximum Exposure (Hazard)
trichloroethene (TCE)	33	1.6	2×10^{-5}	9.5	3.47
vinyl chloride	2.2	.02	1×10^{-4}	72	.03
cis 1,2-dichloroethene (c1,2-DCE)	2.0	-	-	61	.03
Total			1×10^{-4}	-	4

Table 4: Future Risk Summary at West-Cap

Chemical of Concern	Maximum Concentration Detected (µg/L)	Cancer PRG (µg/L)	Reasonable Maximum Exposure (Risk)	Non- Cancer PRG (µg/L)	Reasonable Maximum Exposure (Hazard)
perchloroethene (PCE)	43	.66	7×10^{-5}	280	0.15
trichloroethene (TCE)	270	1.6	2×10^{-4}	9.5	28.42
1,1-dichloroethene (1,1-DCE)	5	-	-	340	0.01
cis 1,2-dichloroethene (c1,2-DCE)	2.8	-	-	61	0.05
Total			2×10^{-4}	-	30

Tables 3 and 4 refer to the risks prior to cleanup, while Table 5a and 5b, refer to the risk following implementation of the remedy.

Table 5a: In-Situ Groundwater Cleanup Levels for Contaminants of Concern

Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level	Non-Cancer Hazard at Cleanup Level
trichloroethene (TCE) ¹²	5 µg/L	MCL	3×10^{-6} to 2×10^{-4}	0.53
perchloroethene (PCE)	5 µg/L	MCL	7.6×10^{-6}	0.02
vinyl chloride	2 µg/L	MCL	1×10^{-4}	0.01
1,1-dichloroethene (1,1-DCE)	7 µg/L	MCL	-	0.02
cis 1,2-dichloroethene (c1,2-DCE)	70 µg/L	MCL	-	1

Table 5b: Drinking Water Groundwater Cleanup Levels for Contaminants of Concern

Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level	Non-Cancer Hazard at Cleanup Level
trichloroethene (TCE) ¹²	1.5 µg/L	1988 ROD	9×10^{-7} to 5×10^{-5}	0.16
perchloroethene (PCE)	5 µg/L	MCL	7.6×10^{-6}	0.02
vinyl chloride	2 µg/L	MCL	1×10^{-4}	0.01
1,1-dichloroethene (1,1-DCE)	7 µg/L	MCL	-	0.02
cis 1,2-dichloroethene (c1,2-DCE)	70 µg/L	MCL	-	1

¹²Since issuance of the Proposed Plan, EPA reevaluated the toxicity values for TCE and 1,1-DCE. The provisional value, used in the current Region 9 PRG Table, increases the TCE toxicity value by a factor of 5 to 65. EPA considered the provisional TCE and 1,1-DCE toxicity values in this ROD Amendment.

5. Ecological Risk Assessment

A review of potential ecological receptors concluded there were no completed pathways of exposure (1997, Black)¹³. Because groundwater in the TIAA Site area does not seep up to the surface or impact any of the small washes on the Site directly, there are no known receptors for an ecological assessment. There is no evidence of agency-listed endangered, threatened, or otherwise sensitive or protected species within the Site boundaries. The likelihood of any such species occupying the Site is low given its history of surface disturbance, recent remedial activities, and effects of human intrusion from adjacent development.

G. Circumstances Prompting the Revised Remedy

From 1996 to 2002, EPA worked with ADEQ to characterize the extent of contamination in the West-Cap and West Plume B Project Areas. Investigation of the Project Areas confirmed that there is currently uncontained, untreated groundwater contamination in these two areas. Because the groundwater remedy selected in the 1988 ROD did not specifically delineate these Project Areas for treatment, this ROD Amendment updates the 1988 ROD by identifying the contamination and EPA's selected remedy for addressing it.

H. Remedial Action Objectives

ROD guidance at the time that the 1988 ROD was issued did not require the identification of Remedial Action Objectives (RAOs). However, the RAOs implicit in the 1988 ROD are the same as the RAOs for this ROD. The RAOs for the remedy are to:

- Maintain protection of human health and the environment by reducing the risk of potential exposure to contaminants;
- Expedite Site cleanup and restoration;
- Use permanent solutions to the maximum extent practicable;
- Restore contaminated groundwater to the extent practicable to support existing and future land uses;
- Achieve compliance with ARARs;
- Minimize untreated waste;
- Protect human health by minimizing the potential for human exposure to groundwater that has contaminant concentrations exceeding cleanup standards;
- Cost-effectively reduce contamination in groundwater to concentrations that meet the in situ cleanup standards described in Table 5a, page II-19;

¹³The memo addressed the 1997 Shallow Groundwater and Soils remedy, including the West-Cap Project Area. EPA is applying the same rationale to this remedy decision for both the West-Cap and West Plume B Project Areas, due to the fact that the groundwater contamination is much deeper and at lower concentrations.

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- Treat groundwater served as drinking water to concentrations that meet the drinking water standards described in Table 5b, page II-19;
- Return groundwater to its beneficial uses to the extent practicable within a time frame that is reasonable, given the particular circumstances of the Site; and
- Protect groundwater resources by preventing or reducing migration of groundwater contamination above MCLs.

These RAOs are based on the present use of the Site, the anticipated potential for future use of the Site, and the potential for groundwater in the area to be used as a drinking water supply.

I. Description of Alternatives

EPA has selected the remedy after evaluation of multiple alternatives. The three alternatives, which included evaluation of the original remedy selected in the 1988 ROD, were evaluated in the West-Cap and West Plume B Feasibility Study.

1. Remedy Selected in 1988 ROD as modified by the ESDs

The remedy selected in the 1988 ROD, as modified by subsequent Explanations of Significant Differences (ESDs) – containment and aquifer restoration – consists of the following major components:

Area A

- Extraction and in situ remediation from both the Upper Divided Aquifer and the Regional Undivided Aquifer and treatment of groundwater contamination using packed column aeration
- Sealing of wells that form vertical conduits between the Upper and Lower Aquifers to limit the spread of contamination
- Use of granular activated carbon (GAC) where airborne VOC emissions potentially exceed 2.4 pounds per day
- The TCE cleanup level for treated water is 1.5 µg/L to account for the presence of multiple Site contaminants. This treatment level results in an overall excess cancer risk below one in a million.¹⁴

Area B

- Extraction and in-situ remediation of contaminated groundwater from the Upper Aquifer and treatment with packed column aeration
- Due to lower contamination levels, air emissions controls were not found to be necessary in Area B

¹⁴Taking into account the toxicity reassessment for TCE, the 1.5 µg/L cleanup level represents a provisional risk of 5×10^{-5} .

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- In 1997, AANG signed an ESD, permitting use of cascading trays rather than packed column aeration for VOC air stripping and a TCE cleanup level of 5 µg/L (instead of the 1.5 µg/L contained in the 1988 ROD) for treated water reinjected into the aquifer.

Groundwater monitoring is conducted to verify (1) the control of contaminant migration, and (2) the decrease in contaminant concentrations. It is expected that, over the life of the remediation, at least two pore volumes of groundwater will be withdrawn from the aquifer.

2. Alternatives Evaluated for the Revised Remedy

EPA identified, reviewed, and evaluated three alternatives in the West-Cap and West Plume B FS. The alternatives evaluated were: (1) No Action; (2) Monitored Natural Attenuation; and (3) Containment and Restoration of contaminated groundwater with extraction, treatment, monitoring, and long-term O&M. Table 6, page II-27, summarizes the estimated costs of the alternatives.

Alternative #1: NO FURTHER ACTION

The National Contingency Plan (40 C.F.R. § 300.430(e)(6)) requires that a ROD include a No Action Alternative as a basis of comparison to other alternatives. The No Action Alternative assumes the discontinuation of all remediation, including groundwater monitoring. The No Action Alternative would not contain the migration of the contaminated groundwater plumes, would not meet the RAOs, is not protective of human health and the environment, and does not comply with ARARs.

Alternative #2: MONITORED NATURAL ATTENUATION

Monitored natural attenuation is a remedy that uses natural processes to change the concentration or physical structure of contaminants into less harmful forms. Monitored natural attenuation uses long-term groundwater monitoring to verify the effectiveness of the attenuation processes. Additional monitoring wells would be added to those already in place and community notification would be used to minimize human exposure to the contamination while the remedy is in place.

Alternative #3: GROUNDWATER EXTRACTION AND TREATMENT

Alternative 3 consists of extraction and treatment of contaminated groundwater, monitoring and reuse or reinjection of the treated groundwater to the cleanup levels. The alternative includes the installation of groundwater extraction wells located in both the West-Cap and West Plume B Project Areas. In addition to the existing West-Cap extraction wells (installed as part of the Removal Action), new extraction wells would create an inward hydraulic gradient and capture contaminated groundwater before it migrates further from the sources. At West Plume B, the goal is to create an inward hydraulic gradient and capture contaminated groundwater before it

migrates further from the source. The selection of the specific components of Alternative 3 for each Project Area, such as treatment system location, treatment type and water end uses will be determined during Remedial Design (RD).

J. Comparative Analysis of Alternatives for Revised Remedy

In accordance with the 40 C.F.R. § 300.430(f)(i) and 300.430(e)(9), the remedial alternatives are evaluated using nine criteria for selection of a preferred remedial alternative. A summary of the estimated cleanup costs of the alternatives can be found in Table 6, page II-27. The nine criteria are:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Long-term Effectiveness
- Reduction of Toxicity, Mobility, or Volume Through Treatment
- Short-term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

Threshold Criteria: For an alternative to be acceptable as a remedy, it must meet EPA's two threshold criteria: (1) Overall Protection of Human Health and the Environment; and (2) Compliance with ARARs.

1. Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether an alternative provides adequate protection of human health and the environment. EPA evaluates short- and long-term protection from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the Site. The criterion also evaluates how risks would be eliminated, reduced or controlled through treatment, engineering, institutional controls or other remedial activities.

Only Alternative 3 is fully protective of human health and the environment and eliminates, reduces, or controls risks posed by the contamination at West-Cap and West Plume B through treatment. Alternative 3 uses extraction wells to hydraulically contain all contaminated groundwater exceeding MCLs. Through active pumping, the aquifer would eventually reach cleanup standards. Based on data gathered to date, the two Project Area plumes are not fully attenuating without active remediation. Thus, although Alternative 2 would track the migration of contamination through monitoring, it is less protective than the active remediation actions taken under Alternative 3, because it would not prevent contaminant migration into currently uncontaminated areas of the aquifer. However, if future groundwater monitoring indicates that the plumes are degrading sufficiently without treatment, then Alternative 2 could be protective.

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Because the No Action Alternative takes no action to treat, monitor or prevent access to contamination, that alternative does not meet the threshold criterion of providing overall protection to human health or the environment.

Alternative 3 is protective of human health and the environment and it meets or is more protective than the MCLs.

2. Compliance with ARARs

Section 121(d) of CERCLA and 40 C.F.R. § 300.430(f)(1)(ii)(B) require that remedial actions attain all applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, unless such ARARs are waived under CERCLA section 121(d)(4). These requirements are collectively referred to as ARARs.

Applicable requirements are those substantive requirements or limitations promulgated under federal or state laws that specifically address a contaminant, location, or remedial action found at a CERCLA site. Relevant and appropriate requirements are those substantive requirements or limitations promulgated under federal or state laws that, while they do not specifically address a contaminant, location, or remedial action found at a CERCLA site, they address situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only state standards that are more stringent than federal requirements may be ARARs for a particular site.

Alternative 1 - The No Action Alternative does not meet the ARARs required for drinking water source protection. Both Alternatives 2 and 3 meet the Site ARARs. Alternative 3 would bring the aquifer contamination to below the chemical-specific ARAR of 5 µg/L TCE more quickly than Alternative 2. Alternative 2 would eventually reach the 5 µg/L TCE level, though the lack of active remediation would mean that it would take longer before those chemical-specific MCLs are met.

Alternatives 1 and 2 reach the result of achieving MCLs at the same time. However, without monitoring, Alternative 1 does not allow for protection from exposure until those levels are reached.

Alternative 3 complies with ARARs. If water extracted pursuant to this ROD Amendment is sent to existing treatment facilities, such as the TARP treatment plant or the Texas Instruments (formerly Burr-Brown) treatment plant, then the ARARs identified in the 1988 ROD will apply to the extracted water once it reaches an existing treatment plant or pipeline. The ARARs set forth in the following paragraph and Tables 8 and 9 (beginning on page II-36) shall apply to all other response work done pursuant to this amended ROD, including but not limited to, construction of extraction wells and monitoring wells, construction and operation and maintenance of pipelines, and construction and operation of any new ground water treatment facilities.

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Subtitle C of the Resource Conservation and Recovery Act ("RCRA"), as amended, regulates hazardous waste. Forty C.F.R. § 262.11 and AAC § R-18-8-262 require waste generators to determine whether wastes from construction and operation of the remedial action are hazardous wastes and establishes procedures for such determinations. If waste generated from construction and operation of the remedial action is a hazardous waste, then the substantive provisions of RCRA regarding the management of hazardous waste is an applicable ARAR, and such waste must be managed in accordance with the applicable substantive provisions of RCRA. However, the contaminated groundwater that will be extracted pursuant to this ROD Amendment is not a listed waste because EPA has not identified the source with enough specificity to classify the untreated groundwater as a listed waste. The groundwater is also not a characteristic waste because the contaminants in the groundwater are below the levels established for the characteristic of toxicity. However, since the remedy involves treatment of wastes similar to RCRA listed hazardous wastes, EPA has determined that the RCRA regulations identified in Tables 8 and 9 are relevant and appropriate for the remedy. The non-RCRA ARARs are set forth in Tables 8 and 9 as well.

Primary Balancing Criteria: Each alternative considered is also evaluated against five "balancing criteria": (3) Long-term Effectiveness; (4) Reduction of Toxicity, Mobility, or Volume Through Treatment; (5) Short-term Effectiveness; (6) Implementability; and (7) Cost.

3. Long-term Effectiveness and Permanence

Long-term effectiveness and permanence are the ability of the remedy to maintain protection of human health and the environment once cleanup levels have been achieved. This criterion includes consideration of residual risk that will remain following active remediation and the adequacy and reliability of any institutional controls.

Alternative 3 uses extraction and treatment processes that are well-established, reliable and capable of meeting performance requirements. Long-term monitoring will confirm that cleanup objectives continue to be met over time.

Because neither Alternative 1 nor 2 uses active remediation, the two alternatives have a higher magnitude of residual risk. Both Alternative 1 and 2 rely on natural attenuation thereby leaving waste in place for a longer period of time. Extraction and treatment of contaminated groundwater pursuant to Alternative 3 will reduce residual risk to acceptable levels within a shorter period of time than the other alternatives.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of selected treatment technologies to actually remove contaminants from the contaminated medium. Here the contaminated medium is the groundwater.

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Only Alternative 3 actively reduces the toxicity, mobility and volume of Project Area contamination through use of an extraction and treatment system that will capture and eventually remediate the contaminated plume, and treat extracted VOC contamination. Alternative 3 is expected to remove 99.9 percent of the VOCs extracted from the groundwater, either utilizing air stripping or utilizing liquid phase granular activated carbon.

Neither Alternative 1 nor 2 uses an active treatment system to reduce toxicity, mobility or volume of contamination.

5. Short-term Effectiveness

Short-term effectiveness addresses adverse impacts that may be posed to the community, workers, and the environment during construction and operation of the remedy until cleanup levels are achieved. Alternative 3 is expected to require 10 years to attain cleanup levels; Alternatives 1 and 2 are expected to take 30 to 50 years. Because the remedy will be completed more quickly with Alternative 3, there is less potential impact to the community before cleanup levels are achieved.

However, because Alternative 3 requires more construction of remedial systems than Alternative 2, there are higher construction risks associated with Alternative 3. Alternative 1 poses no short-term construction risk because no construction would be required. Short-term risks for Alternative 3 are manageable and will be addressed.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are considered in this criterion.

All three alternatives are implementable. However, the reliability of Alternative 2 is less proven than the extraction and treatment technologies used in Alternative 3. Although the technology required for Alternative 3 is fairly standard, that alternative requires installation of extraction wells, connection of these wells to either existing treatment facilities (including modification of the facilities to accommodate the additional groundwater), or construction of new treatment facilities. With respect to end use, Alternative 3 requires installation of either recharge wells; or connection to the municipal supply, to irrigation systems, or to industrial systems. Both Alternatives 2 and 3 require installation of and operation and maintenance of additional monitoring wells. Alternative 3 can be designed and completed relatively easily and in a reasonable time frame. However, Alternative 3 would be more difficult to implement than Alternative 2. Because it requires no construction, Alternative 1 is the most readily implementable. The selected Alternative 3 is implementable, reliable and utilizes a proven technology.

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7. Cost Effectiveness

Cost refers to the total net present worth associated with capital expenditures required for a remedy as well as the annualized costs associated with operation and maintenance (O&M) of the system. The cost estimates assume a range of 10 to 30 years of O&M for comparison purposes. Cost effectiveness was determined by comparing cost with overall remedy effectiveness. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. Some of the components of Alternatives 2 and 3 have already been constructed.

Table 6: Comparison of Estimated Cleanup Costs

Alternative	Capital Cost	Annual O&M	Present Worth
No Action	\$0	\$0	\$0
West-Cap Monitored Natural Attenuation (30 year estimate)	\$152,000	\$131,000	\$2.1 million
West Plume B Monitored Natural Attenuation (30 year estimate)	\$152,000	\$131,000	\$2.1 million
West-Cap Extract & Treat (10 year estimate)	\$448,000 - 464,000	\$356,000 - 456,000	\$3.6 - 4 million
West Plume B Extract & Treat (10 year estimate)	\$720,000 - 1.3 million	\$258,000 - 324,000	\$3.3 - 3.6 million

Table 6, above, presents the additional capital costs associated with the alternatives. Although the cost to complete construction of Alternative 3 is higher than Alternative 2, the time estimate for O&M and monitoring is only 10 years instead of between 30 and 50 years for Alternative 2.

Alternative 3 is the most cost-effective in terms of providing short and long-term protectiveness of public health and the environment and achieving remedial objectives in a timely manner.

Modifying Criteria: Both (8) State Acceptance and (9) Community Acceptance of the selected remedy are considered modifying criteria for evaluation of each alternative.

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8. State Acceptance

State acceptance refers to whether the State of Arizona supports, opposes or has no comment on EPA's selected alternative. During the Proposed Plan public comment period, ADEQ raised concerns regarding the cost and effectiveness of Alternative 3 in the West Plume B Project Area given the relatively low VOC concentrations. ADEQ also raised concerns regarding the need to optimize coordination of the SVE and groundwater extraction and treatment systems at the West-Cap Project Area. EPA has addressed the State's comments in the Responsiveness Summary attached in Section III. The State concurred with EPA's selected remedy: Alternative 3.

9. Community Acceptance

Community acceptance refers to community preferences about the selected remedy. Written comments received during the public comment period, as well as comments presented at the public meeting, indicate that Alternative 3 is the only remedy considered acceptable by the community. A strong preference was expressed for remediation that would physically remove all contaminated groundwater from the Project Areas.

During the public meeting, those commenting expressed concern regarding the remedy design, including the use of off-gas treatment for VOCs if air stripping is used. Additionally, end use of the treated water, as well as installation of a transport system (i.e., piping) of the contaminated water for treatment, were concerns raised by commenters. EPA has taken these concerns into account in selecting the remedy and responded to community comments in the attached Responsiveness Summary.

K. Selected Remedy: Preferred Alternative

Based on the requirements of CERCLA Section 121(b), analysis of the alternatives using the nine criteria specified in the 40 C.F.R. § 300.430(f)(1)(i) and (e)(9)(iii), EPA has selected Alternative 3 as the groundwater remedy for the West-Cap and West Plume B Project Areas of the TIAA Site. Alternative 3 requires groundwater extraction and treatment to meet the in situ cleanup levels listed in Table 5a, page II-19, and ongoing groundwater monitoring.

Specifically for the West-Cap Project Area, Alternative 3 consists of enhancement and expansion of the extraction well system presently in operation as the Removal Action. The existing system uses two extraction wells to convey contaminated water to the air stripping treatment facility at the former Burr-Brown property, as is described in Section B, page II-3, footnote 3. EPA will add additional extraction wells and determine during RD whether to install additional air stripping systems, carbon units or whether to continue using the former Burr-Brown treatment system. Additional Upper Subunit wells would be added to the existing monitor well network at the West-Cap Project Area. However, EPA acknowledges that if the additional groundwater extraction wells installed pursuant to this ROD Amendment cause additional drawdown and significant residual contamination is still present in the exposed soils, applying SVE should be

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considered. To that end, the groundwater extraction well installed in the source area will be designed so that SVE can be added. In the event that SVE is added following implementation of the West-Cap groundwater remedy, it will be added pursuant to the 1997 Soils ROD.

At the West Plume B Project Area, EPA will either install a new treatment system or extract the contaminated groundwater and convey it for treatment at the TARP treatment system. Upper Subunit monitoring wells will be added to the existing monitoring well network at the West Plume B Project Area.

If during Remedial Design or post construction (including the Five Year Reviews), groundwater data and modeling indicates the remedy at either Project Area is not effectively addressing the remedial objectives in the anticipated schedule, EPA will reconsider the selected technology and/or constructing additional extraction wells. Alternatively, if groundwater monitoring data and modeling suggests that the plume is attenuating, EPA will reconsider MNA (Alternative 2). Any fundamental changes would require appropriate administrative actions (i.e., an Explanation of Significant Differences (ESD) or ROD Amendment).

Alternative 3 provides both long-term and short-term protectiveness of human health and the environment. Design of the extraction system at the West-Cap Project Area will be closely coordinated with the West-Cap Soil Vapor Extraction remedy (1997 Soils ROD) which was the subject of a treatability study, now completed.

Alternative 3 complies with ARARs and is implementable using readily available and proven extraction and treatment technologies. Alternative 3 is cost-effective, providing a high level of protectiveness at reasonable cost. Alternative 3 also considers current and future land uses and anticipates the likelihood that the West Plume B Project Area will continue to be residential while the West-Cap Project Area will be targeted for industrial redevelopment.

1. Rationale for the Revised Remedy

Alternative 3 has been selected as the revised remedy for the TIAA Site because: (1) it provides both short-term and long-term protectiveness of human health and the environment; (2) it complies with ARARs; (3) it is implementable; (4) it is acceptable to the State of Arizona and the local community; and (5) it is cost-effective.

2. Description of the Revised Remedy

The remedy selected in this ROD Amendment addresses VOC contamination at the West-Cap and West Plume B Project Areas. This remedy utilizes extraction and treatment with reuse or reinjection of the treated water. Additional data from Remedial Design monitoring wells will be evaluated to determine whether this remedy adequately addresses the area of contaminated groundwater. If groundwater monitoring data suggests that the plume is more extensive, EPA will reconsider the selected technology and/or constructing additional extraction wells.

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Consistent with the 1997 Air National Guard ESD, this ROD Amendment uses the MCL as the cleanup level for reinjected water. EPA will still meet the 1.5 µg/L cleanup level for TCE for water served in a public drinking water supply. If other reuse options are selected during the remedial design, the water will be treated to the TCE MCL of 5 µg/L. The selected remedy also selects MCLs as the in situ cleanup standard. The cleanup levels selected in this ROD Amendment are protective of public health and the environment.

The revised remedy includes long-term O&M of all groundwater environmental control systems to ensure that all systems are functioning effectively. Long-term monitoring of remedial systems will be conducted to demonstrate that performance standards and ARARs are achieved. Based on these monitoring results, EPA may require implementation of additional remedial systems and corrective actions as required to assure that performance standards and ARARS are met. Long-term O&M includes work needed to provide aesthetic mitigation measures to minimize community impacts and ensure that Project Area systems are aesthetically compatible with the surrounding land uses to the maximum extent practicable.

Comparison with Original 1988 ROD-Selected Remedy

The Selected Remedy for these Project Areas is generally consistent with the requirements of the 1988 ROD. However, there are several important differences. The 1988 ROD stated that groundwater would be extracted, treated to 1.5 µg/L for TCE and served as drinking water. Pursuant to this ROD Amendment, EPA will meet the 1.5 µg/L TCE treatment level for water served in a public drinking water supply. However, this ROD Amendment allows additional end uses - including reinjection. Consistent with the 1997 Air National Guard ESD, this ROD Amendment uses the MCLs as the treatment levels for reinjected water. These levels are protective of human health and the environment and meet or are more protective than MCLs set under the Safe Drinking Water Act. For other end uses authorized by this ROD Amendment, such as irrigation and industrial use, EPA will treat extracted water in accordance with ARARs (e.g. MCLs). Except for the differences noted above, EPA is basically selecting the same remedy pursuant to this ROD Amendment as EPA selected in the 1988 ROD for a different area, based upon new information and further delineation of the nature and extent of contamination.

3. Components of the Revised Remedy

The Selected Remedy consists of the following:

- Groundwater plume containment and restoration in the Upper and Lower Subunits of the Regional Aquifer at West-Cap and the Upper Subunit at West Plume B as measured by monitoring of sentinel wells and demonstration of inward hydraulic gradient;
- Groundwater monitoring, including the periodic input of current groundwater data into a groundwater model, to assess the accuracy over time of model projections;

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- Extraction of contaminated groundwater from the West-Cap and at the West Plume B Project Areas;
- Treatment of contaminated groundwater to Site cleanup levels either through an existing treatment plant or a newly constructed plant; and
- Reuse of treated water in a manner consistent with the Maximum Beneficial Use goal of Arizona Department of Water Resources.

Institutional controls are administrative mechanisms used as part of remedies to prevent exposure to contamination either during or after remedy completion. Where groundwater cleanup is expected to take a significant amount of time, institutional controls can be used, for instance, using notification to avoid installation of drinking water wells into areas of groundwater contamination or to prevent pumping of wells which influence the effectiveness of a cleanup.

Residences located in the West Plume B Project Area may install or use private wells. EPA will use administrative controls, including community outreach, to discourage the use of private wells for drinking water prior to reaching the cleanup levels. Although water is available throughout the TIAA Site through regulated water providers, it is possible for residents to obtain water for domestic use from private wells. Because there is the potential for residents to drill into the contaminated aquifer, the Selected Remedy requires continued public education and notification regarding the extent of contamination and the consequences of drilling and using wells constructed within the contaminated plume.

Additionally, because large volume production wells installed in the area could affect groundwater movement and therefore compromise the effectiveness of the Selected Remedy, the Arizona Well Spacing and Impact Rules will need to account for cleanup activities in these Project Areas when permitting the placement of new and replacement production wells in the TIAA Site area. In addition, ADWR regulates well construction to prevent vertical cross-contamination between aquifers.

4. Cleanup and Performance Standards

The performance standards for the Selected Remedy are as follows:

Groundwater Monitoring:

- An up-to-date groundwater monitoring and evaluation program (GM&EP) will be developed.
- The GM&EP will include the periodic input of current groundwater data into a groundwater model to assess the accuracy over time of model projections to assess the effectiveness of the Selected Remedy.

Extraction and treatment of groundwater from the West-Cap and West Plume B Project Areas:

- The goal for total annual average pumping rate shall be 120 gallons per minute for the West-Cap extraction wells.
- The goal for total annual average pumping rate shall be 20 gallons per minute for the West Plume B extraction wells.
- The Remedial Design Work Plan (RDWP) for implementation of the Selected Remedy shall include, but not be limited to, the following:
 - ▶ Identification of existing wells or installation of new wells to act as sentinel wells to evaluate achievement of capture;
 - ▶ Identification of criteria necessary to demonstrate achievement of capture. Such criteria should include, but not be limited to, demonstration of inward hydraulic gradient.

Groundwater Cleanup Standards:

- Treated groundwater from the West-Cap and West Plume B Project Areas that is used as part of a drinking water supply shall be treated to 1.5 µg/L for TCE and MCLs for the other COCs.
- Treated groundwater from the TIAA Site that is used to recharge the groundwater, irrigation, or industrial use, shall be treated to MCLs and shall be treated to meet the substantive requirements of National Pollution Discharge Elimination System (NPDES) permits or Underground Injection Control Program requirements respectively.
- *Aquifer Restoration:* The Upper and Lower Subunits of the Regional Aquifer shall be restored to their beneficial use and treated to the levels cited in Table 5a.

5. Summary of the Estimated Remedy Costs

The estimated cost of the Selected Remedy is detailed in Table 7. The costs are broken down into the following: projected capital costs, projected annual O&M, and 10 years present worth.

The cost estimate summary table is based on the best available information regarding the anticipated scope of the Selected Remedy. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. If alternative wells and treatment facilities are required, the costs will increase. Should the cost estimates increase significantly, an Explanation of Significant Difference or a ROD Amendment will be developed accordingly.

Table 7: Alternative 3 Costs

Description	Cost
PROJECTED CAPITAL COSTS¹⁵	
Installation of extraction wells & pipelines	\$828,000
Treatment	\$152,210
Administrative costs	\$759,000
total	\$1,739,210
PROJECTED ANNUAL O&M COSTS	
	\$634,000
10 YEARS Present Worth	
	\$7,546,000

Note: With the exception of the first item, costs reflect both project areas.

6. Expected Outcome of the Selected Remedy

The expected outcome of the Selected Remedy is the restoration of the aquifer to cleanup levels applicable for use as a drinking water source. This goal is expected to be achieved within an estimated 10 years. Final cleanup levels for groundwater are provided in Table 5a, page II-19.

7. Key ARARs (see Tables 9 a, b and c)

The key ARARs are the following:

- The clean-up levels for the VOCs in the aquifer are set at MCLs. Federal Safe Drinking Water Act (SDWA), 42 U.S.C. § 300g-1, 40 C.F.R. 141.161.
- Any new treatment facility delivering drinking water must comply with the notification requirements of the Arizona Safe Drinking Water Act. AAC § R18-4-701 to R18-4-704 and R18-4-706, R18-4-708 to 709, App. B.
- If the remedy selected will reinject groundwater to the aquifer, then the design, construction, operation and maintenance of injection wells must comply with the Federal Safe Drinking Water Act. 42 U.S.C. §300f et seq (40 C.F.R. §§ 144.12 - 144.16, § 144.24(a).

¹⁵ Values represent maximum amounts considered for the range of extraction and treatment component options, which will be determined during Remedial Design.

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- All aquifers in the State of Arizona and any other aquifers subsequently discovered are classified for drinking water protected use. (ARS 49-224).

L. Statutory Determinations

The following section addresses how the Selected Remedy meets CERCLA's statutory requirements and preferences.

1. Protection of Human Health and the Environment: Exposure to contaminated groundwater through drinking water supplies is the potential risk. The Selected Remedy will contain and treat the contaminated groundwater plumes to drinking water standards. Where treated water will be served as part of a drinking water supply, it will be treated to below drinking water standards for TCE.

The remedy will not have detrimental cross-media impacts. Treatment systems will comply with air quality requirements. Treated water will be used for municipal drinking water, reinjected into the aquifer, treated for industrial use, or used for irrigation. If treated groundwater is reinjected it will be used to recharge the Lower Subunit of the Upper Zone of the Regional Aquifer.

2. Compliance with ARARs: The Selected Remedy will comply with all ARARs. The ARARs for the action identified in this ROD Amendment are identified in Tables 8 and 9.
3. Cost-Effectiveness: The NCP provides that a remedy is cost effective where "its costs are proportional to its overall effectiveness." 40 C.F.R. § 300.430(f)(1)(ii)(D). The relationship of the overall effectiveness of remedial Alternative 3 was determined to be proportional to its costs. Alternative 3 actively remediates contamination in the Project Areas at an overall cost that is higher than monitored natural attenuation. However, it is anticipated to reach the cleanup goals in a far shorter timeframe. Hence, the Selected Remedy was determined to be cost-effective.
4. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable: The Selected Remedy utilizes cleanup technology that permanently removes contaminants from the groundwater. The Selected Remedy is the remedy used at the vast majority of Superfund sites with VOC contamination in groundwater. This treatment will permanently remove contaminants from groundwater and eliminates the need for institutional controls much sooner than more passive remedies.
5. Preference for Treatment as A Principal Element: There are no known remaining unaddressed sources in the two Project Areas. The Selected Remedy will treat the contaminated groundwater to achieve the cleanup levels. The extraction systems

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will contain the contaminated groundwater plumes and restore the aquifer, thereby preventing further migration of contamination.

6. Five-Year Review Requirements: Because the remedy is expected to be in place for more than five years before remedial action objectives and cleanup levels are attained, as a matter of EPA policy, a Five-Year Review will be conducted no less often than every five years following construction completion to ensure that the remedy continues to be protective of human health and the environment.

M. Documentation of Significant Changes to the Proposed Plan:

Per the Risk Assessment Section, EPA has considered the toxicity reassessment for TCE and 1,1-DCE in this ROD Amendment and the cleanup levels selected herein are still protective of human health and the environment.

N. Summary

EPA and ADEQ completed the RI/FS for the West-Cap and West Plume B Project Areas in May 2002. EPA issued its Proposed Plan with a 30-day comment period from June 26 to July 26, 2002. A public hearing was held July 18, 2002. Based on community requests, EPA extended the comment period until August 26, 2002. EPA is amending the 1988 ROD because the RI/FS for the West-Cap and West Plume B Project Areas identified a broader extent of groundwater contamination, and because the remedy identified for these Project Areas fundamentally changes the scope and cost of the originally selected remedy.

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Table 8
Chemical-Specific ARARs for VOC-Contaminated Groundwater (Concentrations in µg/L)

Parameter	Relevant and Appropriate ^a	To Be Considered ^b
Organics^c		
Benzene	5	-
Bromodichloromethane	100 ^d	-
Chloromethane	-	2.7
Chloroform	100 ^d	-
1,2-Dibromoethane	0.05	-
1,2-Dichloroethane	5	-
1,1-Dichloroethene	7	-
cis 1,2-Dichloroethene	70	-
trans 1,2-Dichloroethene	100	-
1,2-Dichloropropane	5	-
Methylene Chloride	5	-
1,1,2,2-Tetrachloroethane	-	0.18
Tetrachloroethene (PCE)	5	-
Trichloroethene (TCE)	5	-
Vinyl Chloride	2	-

^aMCL - Unless otherwise noted, the cleanup levels are the Primary Maximum Contaminant Levels.

^bHBGL - Human Health-Based Guidance Levels (ADEQ). For the COCs for which there is no MCL, if these compounds are found at a future date, EPA will consider the HBGL as a cleanup level.

^cThe only COCs consistently detected at West-Cap and West Plume B were the organics TCE, PCE, 1,1-DCE and cis 1,2-DCE. The additional analytes are listed in case treated water is served in the municipal water system.

^dFor total trihalomethanes.

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**Table 8
Chemical-Specific ARARs for VOC-Contaminated Groundwater (Concentrations in µg/L)**

Parameter	Relevant and Appropriate ^a	To Be Considered ^b
Inorganics^c		
Antimony	6	-
Arsenic	10	-
Barium	2,000	-
Beryllium	4	-
Cadmium	5	-
Chromium (total)	100	-
Copper	1,300 ^d	-
Cyanide	200 ^e	-
Lead	15 ^h	-
Mercury	2	-
Nickel	100 ^f	-
Selenium	50	-
Thallium	2	-
Zinc	-	2,100

^aMCL - Unless otherwise noted, the cleanup levels are the Primary Maximum Contaminant Levels.

^bHBGL - Human Health-Based Guidance Levels (ADEQ). For the COCs for which there is no MCL, if these compounds are found at a future date, EPA will consider the HBGL as a cleanup level.

^cInorganic compounds are not considered COCs at West-Cap or West Plume B. The additional analytes are listed in case treated water is served in the municipal water system.

^dAction level, not to be exceeded in more than 10 percent of samples.

^eThe MCL applies if treated water is reused for water supply or reinjection. If discharged as surface water, such as a wash or irrigation, the Aquatic and Wildlife standard (9.7) applies.

^fArizona State MCL

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Table 9a
Chemical-Specific ARARs for VOC-Contaminated Groundwater
TIAA Site Groundwater ROD Amendment

Source	Standard, Requirement, Criteria or Limitation	Applicable or Relevant and Appropriate	Description of Standard, Requirement, Criteria or Limitation	Manner in Which ARAR Applies to Alternative
Arizona Aquifer Water Quality Standards, A.R.S. § 49-223	R18-11-405, R18-11-406	Relevant and Appropriate	Sets chemical-specific narrative and numeric groundwater standards.	The numeric standards are ARARs with respect to any discharges to a drinking water aquifer, but are not in situ standards.
Arizona Surface Water Quality Standards A.R.S. 49-222	AAC § R18-11-101 <i>et seq</i>	Applicable	Regulates discharges to surface water.	Discharges from treatment systems must comply with narrative and numeric Arizona State Water Quality Standards for Surface Waters if treated water is discharged to surface water.
Clean Water Act §402; Arizona Pollutant Discharge Elimination System (AZPDES) A.R.S. 49-255, et seq.	40 CFR § 125; A.A.C. 18-9-A-901 to 906	Relevant and Appropriate	The AZPDES permit program regulates discharges into "waters of the United States" by establishing numeric limits and monitoring requirements for such discharges.	The discharge of treated water to "waters of the United States" will meet the substantive effluent limitations of these provisions.
Federal Safe Drinking Water Act, 42 U.S.C §300g-1, 40 C.F.R. 141.161	40 C.F.R. Part 141 (Subparts B & G), Federal Primary Drinking Water Standards - MCLs	Relevant and Appropriate	MCLs are health-based drinking water standards. The NCP, 40 C.F.R. §300.430(e)(2)(i)(B), provides that remedial actions generally must attain MCLs and non-zero MCLGs (when MCLGs are determined to be relevant and appropriate) when the groundwater is a source or potential source of drinking water.	The clean-up levels for the VOCs in the aquifer are set at MCLs. The selected remedy will comply with these requirements.

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Table 9b

**Location-Specific ARARs for VOC-Contaminated Groundwater
TIAA Site Groundwater ROD Amendment**

Source	Standard, Requirement, Criteria or Limitation	Applicable or Relevant and Appropriate	Description of Standard, Requirement, Criteria or Limitation	Manner in Which ARAR Applies to Alternative
Archaeological Discoveries, Historic Preservation	41 Arizona Revised Statutes ("A.R.S") §§ 844 and 865	Relevant and Appropriate	Preserves archaeological artifacts and remains.	If any archaeological artifacts, human remains, or funerary objects are discovered during construction, excavation or other on-site activities, the activity must cease temporarily to allow for investigation and preservation of such artifacts, remains, or objects in accordance with these procedures.
Arizona Administrative Code ("AAC") § R18-4-501	AAC § R18-4-501	Relevant and Appropriate	Identifies siting requirements for new public water systems.	If the remedy requires construction of a system which will provide water to the public, these siting requirements will be complied with, to the extent practicable.
Endangered Species Act, 16 U.S.C. § 1531, <i>et. seq.</i>	50 C.F.R. Part 402	Applicable	Establishes procedures for determining presence of endangered and threatened species and their habitats, and for mitigating adverse impacts.	If any native plants or species are identified as endangered or threatened, impacts of construction activities will be mitigated to avoid affecting such species or its habitat.
Federal Aviation Administrative Rules	AC 70/7460-1K, 150/5345-43E	Relevant and Appropriate	Establishes marking and lighting requirements for construction equipment or permanent structures near airports.	Applies to construction of extraction wells on airport property.
Federal Aviation Administrative Rules	AC 150/5380-5B	Relevant and Appropriate	Sets procedures for debris containment and cleanup during construction and operation on airport property.	Applicable to construction and ongoing operations on airport property.

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Table 9b
Location-Specific ARARs for VOC-Contaminated Groundwater
TIAA Site Groundwater ROD Amendment

Source	Standard, Requirement, Criteria or Limitation	Applicable or Relevant and Appropriate	Description of Standard, Requirement, Criteria or Limitation	Manner in Which ARAR Applies to Alternative
Federal Aviation Administrative Rules	AC 150/5300-13	Relevant and Appropriate	Restricts structure heights near airports.	Applies to using a drill rig on site to drill and construct a monitor or an extraction well.

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Table 9c

**Action-Specific ARARs for VOC-Contaminated Groundwater
TIAA Site Groundwater ROD Amendment**

Source	Standard, Requirement, Criteria or Limitation	Applicable or Relevant and Appropriate	Description of Standard, Requirement, Criteria or Limitation	Manner in Which ARAR Applies to Alternative
Arizona Safe Drinking Water Act	AAC § R18-4-701 to R18-4-704 and R18-4-706, R18-4-708-709, App. B	Relevant and Appropriate	Identifies requirements for annual consumer confidence reports for treatment facilities delivering drinking water.	Requires any treatment facility delivering drinking water to comply with these notification requirements.
Arizona Groundwater Management Act	ARS 45-454.01; 45-494, 45-495, 45-496, 45-600	Applicable	Requirements for wells, groundwater withdrawal, treatment, and reinjection	<p>Exempts new well construction, withdrawal, treatment, and reinjection into the aquifer of groundwater that occur as a part of a CERCLA Remedial Action from requirements of Arizona Groundwater Code, except that Remedial Action must comply with the substantive requirements of:</p> <p>ARS 45-594 (well construction standards) ARS 45-595 (well construction requirements) ARS 45-596 (notice of intent to drill a well) ARS 45-600 (filing of log by driller of well).</p>
A.R.S. § 49-221	AAC §4 R18-11-101 <i>et seq.</i>	Applicable	Regulates discharges to surface water.	Discharge from treatment systems must comply with Arizona State Water Quality Standards for Surface Waters. This requirement is applicable at times when treated water is discharged to surface water.
Arizona Water Quality Remedial Action Requirements	ARS § 49-282.06 (A)(2)	Relevant and Appropriate	Describes criteria for remedial actions.	To the extent practicable, the remedial action shall provide for the control, management or cleanup of the hazardous substances in order to allow the maximum beneficial use of the waters of the state.

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Table 9c

**Action-Specific ARARs for VOC-Contaminated Groundwater
TIAA Site Groundwater ROD Amendment**

Source	Standard, Requirement, Criteria or Limitation	Applicable or Relevant and Appropriate	Description of Standard, Requirement, Criteria or Limitation	Manner in Which ARAR Applies to Alternative
Clean Air Act, 42 U.S.C. §§7401 <i>et seq.</i>	Pima County Bureau of Air Pollution Control Rules and Regulations, Title 17 Pima County Air Quality Code, 17.16.430, Subparagraph F.	Relevant and Appropriate	Limits pollution emissions from unclassified sources and requires use of available control equipment from a stationary source that emits VOCs.	Reasonably available control equipment is required for stationary sources that emit VOCs.
Arizona Water Quality Standards Title 49, Art. 2	A.R.S. § 49-224	Relevant and Appropriate	All aquifers in the state identified under § 49-224(A) and any other aquifers subsequently discovered are classified for drinking water protected use, unless otherwise specified pursuant to § 49-224	Aquifers at West Cap and West Plume B are classified for drinking water protected use.
RCRA Subtitle C; ARS §49-921 <i>et seq.</i>	40 C.F.R. § 264.1(j)(2-6, 10-12); AAC § R18-8-264.1(j)(2-6, 10-12)	Relevant and Appropriate	Requirements for remediation waste management sites	Requires waste analysis, inspection requirements, personnel training requirements, and contingency and emergency plans.
RCRA Subtitle C; ARS §49-921 <i>et seq.</i>	40 C.F.R. § 264.18(a & b) ;AAC § R18-8- 264.18(a & b)	Relevant and Appropriate	Location standards	Requirements for and/or prohibition of treatment, storage, or disposal facilities in a floodplain or on a fault.
RCRA Subtitle C; ARS §49-921 <i>et seq.</i>	40 C.F.R. Part 264, Subpart G, Sections 264.111(a & b) and 264.114, and AAC § R18-8-264.111(a & b) and 264.114	Relevant and Appropriate	Closure performance standards and requirements	Closure performance standards and requirements
RCRA Subtitle C; ARS §49-921 <i>et seq.</i>	40 C.F.R. Part 264, Subpart I Sections 264.170-178, and AAC §R18-8-264.170-178	Relevant and Appropriate	Establishes requirements for containers holding RCRA hazardous waste for treatment, storage or disposal including condition, management, and inspection of containers, container compatibility with wastes and design and operation of container storage areas.	Containers storing treatment system waste must comply with substantive provisions.

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Table 9c

**Action-Specific ARARs for VOC-Contaminated Groundwater
TIAA Site Groundwater ROD Amendment**

Source	Standard, Requirement, Criteria or Limitation	Applicable or Relevant and Appropriate	Description of Standard, Requirement, Criteria or Limitation	Manner in Which ARAR Applies to Alternative
RCRA Subtitle C; ARS §49-921 <i>et seq.</i>	40 C.F.R. Part 264, Subpart J, except 264.192(a) and AAC §R18-8-264.190 <i>et seq.</i> , except AAC § R-18-8-264.192(a)	Relevant and Appropriate	Establishes requirements for tank systems used to store or treat hazardous waste, including design and installation, containment and detection of releases, operating requirements, inspections, responses to leaks or spills and closure and post-closure.	Tanks used for treatment or storage (e.g. VGAC vessels for off-gas treatment) must comply with substantive provisions.
RCRA Subtitle C; ARS §49-921 <i>et seq.</i>	40 C.F.R. § 264.601 ;AAC § R18-8- 264.601	Relevant and Appropriate	Miscellaneous treatment unit requirements.	Requirements for owners and operators of miscellaneous treatment units
Safe Drinking Water Act, 42 U.S.C. §300f <i>et seq</i>	40 C.F.R. §§ 144.12 - 144.16, § 144.24(a)	Applicable	Criteria and standards for the Underground Injection Control (UIC) Program. These criteria regulate the reinjection of groundwater.	Applies to design, construction, operation and maintenance of injection wells, if the remedy selected will reinject groundwater to the aquifer.

PART III - RESPONSIVENESS SUMMARY

The ROD Amendment to which this responsiveness summary is attached, sets forth EPA's selected remedial action for groundwater contamination at the West Cap and the West Plume B Project Areas, located within Area B of the Tucson International Airport Area (TIAA) Site. The original Record of Decision (ROD) was signed August 22, 1988 (1988 ROD). The 1988 ROD addresses groundwater contamination north of Los Reales Road, including the Area A and B plumes. EPA deferred the remedy decision to address the West-Cap Project Area, originally identified in the 1988 ROD, pending further investigation. The West Plume B Project Area was first identified in 1995. The Remedial Investigation and Feasibility Study (RI/FS) addressing groundwater for the West Cap and West Plume B Project Areas was completed in May 2002 by EPA and ADEQ. After completing the RI/FS, EPA determined that a ROD Amendment was necessary and published a Proposed Plan for public comment in June of 2002. EPA extended the comment period at the request of the community. On July 18, 2002, EPA held a public meeting to answer questions about the Proposed Plan. The comment period ended on August 26, 2002. Forty C.F.R. § 300.430(f)(3)(i)(F) of the NCP requires EPA to respond to significant comments. After considering the comments, EPA selected groundwater extraction and treatment to achieve in situ cleanup standards for the contaminants of concern in the groundwater for both the West-Cap and West Plume B Project Areas. Treated water will be used for municipal drinking water, reinjected into the aquifer, treated for industrial use, or used for irrigation. To ensure continued protection of the groundwater, the revised remedy will incorporate groundwater monitoring.

A. Support Agency Comments and Agency Responses

ADEQ COMMENTS REGARDING THE PROPOSED PLAN

ADEQ Comment 1: After review of the Proposed Plan, ADEQ acknowledged in its July 17, 2002 comments that "source control and groundwater plume containment measures are critical to successful remedial actions." However, ADEQ requested additional information regarding "the cost effectiveness and technical feasibility of additional source removal options (including air sparging) at the West-Cap source area."

EPA Response: During the FS development, EPA screened out several remedial technologies. In-situ treatment, including air sparging, was screened out due to cost effectiveness and concerns regarding community acceptance. EPA is currently conducting a soil vapor extraction (SVE) treatability study at the West Cap Project Area pursuant to the 1997 Soils ROD. EPA also installed a temporary extraction system at the West-Cap property in 1998 as part of a Time-Critical Removal Action. Based on data collected during the SVE treatability study, there does not appear to be significant residual mass in soils exposed from the operation of the existing

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groundwater extraction wells.¹ However, to address ADEQ's concern, the groundwater extraction well installed in the source area will be designed so that SVE can be added if necessary.² See Section K (Selected Remedy: Preferred Alternative) of the ROD Amendment Decision Summary.

ADEQ Comment 2: ADEQ also requested additional information regarding the "cost-effectiveness and technical feasibility of using existing extraction and treatment system infrastructure down gradient of West Plume B (TARP) and West-Cap (Arizona Air National Guard 162nd) to achieve plume containment."³ ADEQ acknowledged that this would require the collection and evaluation of additional data.

EPA Response: The FS did not explicitly evaluate the scenario of allowing the West Plume B groundwater plume to merge with the down gradient TARP groundwater extraction system or allowing West Cap to flow into and be treated by the Arizona Air National Guard (AANG). However, allowing TARP to function as the extraction system was screened out early in the evaluation process. Using TARP as the extraction system is analogous to the No Action or monitored natural attenuation (MNA) alternatives and was therefore rejected for many of the same reasons. EPA rejected these approaches to the West-Cap and West Plume B Project Areas for the following reasons:

a) It is inconsistent with the statutory preference for remedies that have treatment as a principal element. 42 U.S.C. § 9621(b);

b) Both AANG and TARP are so far from the known sources of the West-Cap (West Cap of Arizona) and West Plume B Project Areas (AANG) that allowing the plumes to merge into the other plumes would not result in a protective remedy in the near future. Applying ADEQ's modeling conclusions, MNA was estimated to require between 30 and 50 years for the plumes to reach MCLs. MNA, and/or allowing the plumes to merge into other Project Areas, would greatly increase the likelihood that private well users could be

¹ The water table has dropped approximately 3-feet due to the operation of EPA's extraction wells, in addition to the approximately 20 to 50 foot regional decline since the 1950s.

² EPA will determine if it is necessary to implement an SVE system pursuant to the 1997 Soils ROD in conjunction with the groundwater extraction and treatment performed pursuant to this ROD Amendment based upon whether the new West Cap extraction wells result in significant residual contamination in the exposed soils.

³ "TARP," as used in this comment, refers to the extraction and treatment system being used to address groundwater in the TARP Project Area (Main Plume). "AANG 162nd" refers to the extraction and treatment system in place at the Arizona Air National Guard Project Area.

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exposed to hazardous substances at levels that are not protective of human health and the environment.⁴ Thus, based on current information, MNA is not protective of human health and the environment as required by the NCP. See 40 CFR 300.430(f)(1)(i)(A);

c) The NCP requires EPA to consider Community Acceptance when selecting a remedy. See 40 CFR 300.430(e)(9)(iii)(I). The community comments urged EPA to select the extraction and treatment alternative in order to protect their health. Based upon comments received by EPA at the public meeting and in the written responses to the Proposed Plan, the community would not accept an alternative that relied upon allowing the plumes to merge into other Project Areas;

d) Not pursuing active groundwater remediation at the West Cap and West Plume B Project Areas would be counter to the goals expressed in the 1988 Groundwater ROD; and

e) Although the active treatment remedy is estimated to cost more than twice as much as MNA would for 30 years, extraction and treatment is more cost effective because it will restore the aquifer in an estimated 10 years, instead of an estimated 30 to 50 years. Furthermore, MNA could cost as much or more than extraction and treatment if MNA takes 50 years to restore the aquifer, instead of the 30 year cost estimate used in the ROD Amendment.

It is not necessary to separately evaluate allowing the West-Cap and West Plume B plumes to migrate uncontrolled into the AANG Project Area and the TARP Project Area respectively,⁵ because this alternative is basically the MNA alternative EPA evaluated and rejected for the reasons noted above. Furthermore, allowing the West Cap and West Plume B plumes to migrate uncontrolled into other Project Areas would interfere with the ongoing response actions being implemented in these Project Areas and could significantly increase the cost and duration necessary to address them.

⁴ EPA will continue to use education and outreach pursuant to this ROD Amendment to discourage private well users from installing or using private wells in contaminated areas of the Site. However, the longer it takes to restore the aquifer, the greater the likelihood that people could be exposed from private wells.

⁵ If this approach were taken, part of the West Cap plume could migrate into the Texas Instruments Project Area. In addition, part of both plumes could bypass all existing treatment facilities.

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However, EPA has included the following components in the selected groundwater remedy to address ADEQ's concern that EPA reevaluate the remedy if new data indicates that either plume is attenuating naturally:

- EPA will install downgradient monitoring wells at the West Plume B Project Area to fully characterize the leading edge of the groundwater plume during the Remedial Design. See Section K (Selected Remedy: Preferred Alternative) of the ROD Amendment Decision Summary.
- EPA will reevaluate the remedy periodically (notably during the Remedial Design, post construction, and during the Five Year Reviews) using new data collected. If new information suggests that natural attenuation processes are more feasible than currently observed, then EPA will reconsider the remedy.⁶ Significant remedy changes would require an additional administrative step (i.e., ESD or another ROD Amendment). See Section K (Selected Remedy: Preferred Alternative) of the ROD Amendment Decision Summary.

B. Comments Received and Agency Responses

Summary of Community Comments:

During the public comment period for the Proposed Plan, a total of 11 written comments were received. One of the letters received included a petition with 156 signatures. There were no significant objections voiced to EPA's proposed remedy during the public meeting or in the written comments. Generally, the commenters 1) strongly supported EPA's proposed extraction and treatment remedy, 2) requested that any air stripping units utilized include off-gas air treatment, and 3) requested that EPA continue monitoring for other potential contaminants including 1,4-Dioxane (a solvent stabilizer found at other Project Areas) and chromium. The commenters were split about their preference for (1) reinjecting treated water into the aquifer, (2) piping it to the TARP and/or the TI systems, or (3) treating the West-Cap and West Plume B water within the respective Project Areas. However, the commenters agreed that the water should not be discharged into the sewer.

Verbal Comments from the July 18, 2002 Public Meeting:

EPA responded to comments and questions at the July 18, 2002 meeting on the record. The transcript includes comments made at the public meeting and EPA's responses to the comments.

⁶ In addition, if new data indicates that more wells, or a different treatment option is necessary, then EPA will reconsider the extraction and treatment remedy.

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However, EPA is summarizing the following comments in writing and providing responses because they warrant further explanation.

1. **Comment from Tom Stubblefield:** Mr. Stubblefield supports Alternative 3 (extraction and treatment) for both West-Cap and West Plume B Project Areas and recommended that EPA utilize existing treatment systems. Mr. Stubblefield recommended piping the West-Cap contaminated water to Texas Instruments and the West Plume B contaminated water to TARP. Mr. Stubblefield suggested using a pipeline on Drexel Road or to follow the Airport Wash, in order to minimize disruption to the community. Mr. Stubblefield asked the distance between West-Cap and TI facility as well as between West Plume B and the TARP system.

EPA Response: EPA thanks Mr. Stubblefield for his support and will consider using existing treatment systems as well as the feasibility of tying into an existing water line along the Airport Wash during the Remedial Design. EPA will take community concerns expressed in response to these comments into account when selecting the treatment plant location and share its decision with the community. On page 25 of the Public Meeting transcript, EPA estimated the distance from West-Cap to the TI facility was a couple hundred yards and from West Plume B to the TARP facility was 1500 feet. The actual distance from West-Cap to the TI facility is approximately 200 yards. The distance from West Plume B to TARP system is approximately 3400 feet.

2. **Comment from Myra Jones:** Ms. Jones supports Alternative 3 (extraction and treatment) for both the West-Cap and West Plume B Project Areas with air stripping and carbon treatment [for the air strippers]. Ms. Jones asked for clarification whether our projections were to begin treatment in 10 years or to last 10 years.

EPA Response: EPA thanks Ms. Jones for her support. EPA expects the life of the project to be 10 years. EPA hopes to begin treatment, depending on availability of public funding, in 2004. EPA will take community concerns into account when selecting the treatment plant location. See response to petition forwarded by Center for Environmental Connections with August 25, 2002 letter regarding off gas treatment for air strippers.

3. **Comment from Embarto Federico:** Mr. Federico expressed frustration with the EPA findings predicting 3 in 10,000 excess cases of cancer from site exposure. He voiced that the actual cancer incidence due to the Tucson Site did not adequately account for the far greater number of cancers he has observed in his family, friends and the community.

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EPA Response: EPA expresses sympathy for Mr. Federico's losses. EPA recommends that Mr. Federico contact the Agency for Toxic Substances and Disease Registry (ATSDR) to learn more about several Public Health Assessments and clinical studies related to the TIAA Site and to assess personal health concerns. The ATSDR contact for the Site is:

Bill Nelson, Regional Representative
75 Hawthorne St. (HHS-1)
San Francisco, CA 94105
(415) 947-4316 or (800) 231-3075
email: nelson.bill@epa.gov

The EPA risk assessment is a tool used to predict the expected risk and hazard posed to the population by particular chemicals found at the site, including TCE, in order to justify setting cleanup levels. It is not a measurement of who developed or will develop cancer. Approximately 25-33% of the population (or 25-33 people out of 100) of the United States will develop cancer as a result of non-site related causes.

- 4. Comment from Ignacio Gomez, Co Chair, TIAA Unified Community Advisory Board (UCAB):** Mr. Gomez supports Alternative 3 (extraction and treatment) for both West-Cap and West Plume B Project Areas with on-site reuse, rather than conveying it to TARP. Mr. Gomez also encouraged the public to attend UCAB meetings to learn more about the TIAA Site issues and to get involved with solutions.

EPA Response: EPA thanks Mr. Gomez and the UCAB for their support. EPA will evaluate the feasibility of the treatment plant location during the Remedial Design and take community concerns into account when selecting the treatment plant location.

Written Community Comments:

- 1. Various commenters requested that EPA extend the public comment period, including: 1) Sandra Davenport, Tucson Women's Commission (postcard received July 15, 2002); 2) Denise L. Di Santo (email dated July 18, 2002); 3) Center for Environmental Connections (July 1, 2002 letter signed by Rob Kulakofsky, Executive Director); and 4) the Environmental Justice Action Group (July 11, 2002 letter signed by Pat Birnie, Facilitator).**

EPA Response: Pursuant to the above commenters requests, EPA extended the comment period until August 26, 2002. A paid advertisement was placed in the Tucson Citizen on August 5, 2002 notifying the public of the extension.

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2. **Comment from Stefani Hines, Director, Community Outreach & Education Program, Center for Toxicology, Southwest Environmental Health Sciences Center, College of Pharmacy, University of Arizona, Tucson (email sent July 25, 2002):** Ms. Hines stated support for Alternative 3 (extraction and treatment) of the West-Cap and West Plume B Project Area contamination. Ms. Hines stated she had no preference for utilizing existing systems versus constructing a new facility, other than not to compromise system efficiency. Ms. Hines stated her preference for end use options that reuse rather than discharge to the sewer in order to preserve water resources. Ms. Hines thanked EPA for involving the community in the decision making process.

EPA Response: EPA thanks Ms. Hines for her support of the selected remedy and agrees with her about reusing treated water. The State of Arizona's water policy is Maximum Beneficial Use, which includes reinjection of treated water into the aquifer or usage in a public water supply. EPA will evaluate the cost and feasibility of each end use component during Remedial Design and will select an end use consistent with the State's Maximum Beneficial Use policy.

3. **Petition signed by 156 individuals (forwarded by Center for Environmental Connections with August 25, 2002 letter from Rob Kulakofsky, Executive Director):** Petitioners requested that all existing and future air strippers at the Site should include off-gas air treatment, even if the levels emitted are within EPA's standards.

EPA Response: EPA appreciates the concern raised by petitioners regarding off-gas treatment for air strippers and notes that a similar comment was made by several other commenters. EPA will consider the feasibility of adding off-gas treatment equipment during the Remedial Design.

4. **Comment from Center for Environmental Connections (August 25, 2002 letter signed by Rob Kulakofsky, Executive Director):** The Center for Environmental Connections stated 1) support for extraction and treatment; 2) off-gas treatment should be applied to any existing and future air strippers; 3) treated water from West-Cap should be either treated on-site or piped to the TI facility; 4) treated water from West Plume B should be treated on-site and reinjected into the aquifer to preserve the water resource; 5) extracted water should not be piped to TARP for treatment because of the additional cost, construction disruption and community health perceptions about a potential pipeline leak; 6) monitoring should include analysis of compounds such as 1,4-Dioxane, chromium and perchlorate; and 7) EPA should take proactive measures to address potential problem levels for such compounds.

EPA Response: 1) EPA thanks the Center for Environmental Connections for their support of the extraction and treatment remedy; 2) see response to petition forwarded by

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Center for Environmental Connections with August 25, 2002 letter from Rob Kulakofsky regarding off gas treatment for air strippers; 3-5) EPA will evaluate the feasibility of each end use option to deal with extracted water during the Remedial Design. EPA will take the communities concerns into account when selecting an end use option. EPA will also consider the State of Arizona's Maximum Beneficial Use Policy (which includes reinjection of treated water into the aquifer or usage in public water supply) when evaluating end use options. EPA notes that it will not be possible to satisfy all members of the community because different commenters expressed support for different end use options; 6) EPA has previously sampled for 1,4-Dioxane, chromium, and perchlorate in these two Project Areas. Chromium, perchlorate and 1,4-Dioxane have not been detected above the quantitation limit. None of these contaminants are a contaminant of concern in the West-Cap and West Plume B Project Areas. During the Remedial Design and Remedial Action phases, EPA will continue to periodically monitor 1, 4-Dioxane, chromium, perchlorate and other potential contaminants; and 7) if new contaminants are found at levels of concern, EPA will take appropriate action to address such contaminants.⁷

5. **Comment from Sierra Club, Rincon Group (August 25, 2002 Letter signed by Todd Schram, Conservation Coordinator):** The Sierra Club, Rincon Group stated 1) support for on-site extraction and treatment such as air stripping; 2) off-gas treatment should be applied to future air strippers since VOCs would be transferred to the air; 3) treated water from West Plume B should be reinjected into the aquifer to preserve water resources; and 4) monitoring shall include analysis of new compounds such as 1,4- Dioxane and chromium.

EPA Response: EPA thanks the Sierra Club, Rincon Group for their support of the selected remedy. See response to Comment from Center for Environmental Connections above.

6. **Comment from Environmental Justice Action Group (August 24, 2002 Letter signed by Pat Birnie, Facilitator):** The Environmental Justice Action Group stated 1) support for Alternative 3 (extraction and treatment) of West-Cap Project Area contamination; 2) utilizing the existing Texas Instruments air stripping facility; 3) re-injecting Texas Instruments treated water due to the increased extraction system volume; 4) off-gas treatment should be applied to all air strippers, including Texas Instruments; 5) treated water from West Plume B should be re-injected into the aquifer to preserve water

⁷ Discovery of new contaminants in the West Cap and West Plume B Project Areas at levels of concern may require addition administrative action (such as an ESD or ROD Amendment).

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resources; 6) West Plume B contamination should not be piped to TARP for treatment because of the additional cost and construction disruption; and 7) that monitoring shall include analysis of new compounds such as 1,4-Dioxane and chromium.

EPA Response: EPA thanks the Environmental Justice Action Group for their support of the selected remedy. See response to Comment from Center for Environmental Connections above. In addition, re-injection will not be considered if the Texas Instrument's treatment system is used to treat water extracted from West Cap because the Texas Instruments facility consumes more water than would be produced by the treatment system. Thus, any water used at the Texas Instruments facility from the West Cap Project Area would reduce the amount of water Texas Instruments would consume from other sources.

**Letter from Arizona Air National Guard dated August 23, 2002
EPA Tucson International Airport Area Superfund Site Newsletter [Proposed Plan]
(June 2002)**

As noted in the ROD Amendment, the (AANG) Project Area is being addressed by the AANG pursuant to a Federal Facility Agreement. See ROD Amendment, Decision Summary, Section B.

AANG Comment 1: AANG has yet to receive resolution to comments and responses presented to the United States Environmental Protection Agency (EPA) and the Arizona Department of Environmental Quality (ADEQ). These comments and responses were presented in the following documents:

- 1) Comments on Draft Remedial Investigation Report: West Plume B TIAA CERCLA Site (submitted by MWH on January 2, 2002);
- 2) AANG Responses to Agencies' Responses to AANG Comments on Draft West Plume B Remedial Investigation Report, January 2002 (submitted by MWH on June 26, 2002);⁸ and
- 3) Comments on Draft Feasibility Study of Former West-Cap Property and West Plume B with Supplemental RI Results (submitted by MWH on March 28, 2002).

Response: The Agencies have addressed AANG's comments regarding the draft RI and FS reports in previous response letters. See EPA letters dated March 29, 2002 and June

⁸ EPA considered AANG's comments on EPA's Responses to AANG Comments on the Draft West Plume B Remedial Investigation Report, and incorporated them, where appropriate, in the reports and in this ROD Amendment.

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11, 2002 responding to items 1 and 3 above. Furthermore, EPA considered AANG's comments on the final West-Cap and West Plume B RI and FS reports, and incorporated them, where appropriate, in the reports and in this ROD Amendment. EPA acknowledges that AANG and EPA disagree on several issues and that AANG does not agree with how EPA addressed some of AANG's comments on previous reports. Since EPA has already considered and addressed AANG comments regarding the RI/FS, this Responsiveness Summary is limited to new comments raised by the AANG regarding the Proposed Plan.

AANG Comment 2: The EPA's preferred alternative (Alternative 3) for the West-Cap Project Area does not capture the entire 5 parts per billion (ppb) trichloroethene (TCE) plume emanating from the former West Cap property. According to results presented by the EPA in the Feasibility Study (FS), more than two extraction wells will be necessary to capture the entire TCE plume, unless they are located in a downgradient location currently described by the EPA as being inaccessible.

Response: Comment noted. EPA acknowledges that due to access issues associated with the active runway at Tucson International Airport, a portion of the West-Cap plume may commingle with the AANG plume in the southern extent of the AANG facility and may be extracted and treated by AANG. As indicated in the FS, and as reiterated previously, the exact locations of the new extraction wells may shift based on data obtained during the Remedial Design and accessibility. Every effort will be made to install the proposed extraction wells such that they will provide a verifiable cutoff boundary for the 5 ppb plume, and prevent migration into the AANG plume. Additionally, Alternative 3 requires continued evaluation of the remedy to assess the success of the proposed system.

AANG Comment 3: According to analytical results provided to AANG, the highest TCE concentration detected at West Cap is greater than 270 ppb. In August 2001, a groundwater sample collected from monitoring well WC-6 had a TCE concentration of 420 ppb.

Response: Comment noted. A cutoff date for data evaluation for inclusion in the RI report was selected prior to receipt of this elevated value. At the time that the RI was begun, the most recent validated data available was February 2001, with a maximum TCE value of 270 ppb. EPA considered more recent data, which included the 420 ppb sample, before selecting the remedy in this ROD Amendment.

AANG Comment 4: TCE concentration contours presented to the public should consist of recent data. The data shown is from February 1999, which is over three years old. Data is currently available from nine sampling rounds conducted since February 1999.

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Response: Comment noted. TCE concentration contours showing the entire TIAA Site (Figure 1) and the magnified view of West-Cap, AANG and West Plume B (Figure 2) have been updated by ADEQ using February 2002 data. EPA considered data up to June 2004 in selecting the remedy in this ROD Amendment.

AANG Comment 5: Connection of the TCE plume beneath the AANG Project Area to the TCE plume within the West Plume B Project Area is not supported by collected data or site geology. Data show these plumes to be separate and distinct.

Response: EPA disagrees. The following data and information indicate that contamination from the AANG property is the source of the West Plume B contamination:

- Applying the hydraulic conductivity values presented in the AANG's RI report it is estimated that contamination released at AANG would have migrated the length of West Plume B.
- AANG did not fully remediate Site 5 (a source of groundwater contamination) until 1997. AANG did not start operating their groundwater pump and treat system until 1997. In addition, it is unknown whether they have achieved complete capture to date. Since natural attenuation is negligible, and contamination released prior to establishing substantial capture migrated well beyond the capture zone and will continue to migrate downgradient; it is clear that the AANG plume is a source of West Plume B.
- Since 1998, TCE has been present in AANG's wells MW-101-U, MW-102U, MW-100U, WR-072S; and EPA's wells WPB-01, WPB-02, WPB-03 and WPB-04.
- EPA acknowledges that there could be other sources of contamination in West Plume B. However, based on an extensive records search, interviews of owners or managers from facilities adjacent to the West Plume B Project Area and data review of sampling conducted at other possible sources, EPA has not identified any other sources.

Conclusion: When all of these factors are considered together, they demonstrate that West Plume B is a single plume emanating from the AANG source area.

AANG Comment 6: The cursory risk assessment conducted in 1996 (six years ago) does not use current data. A more site-specific and relevant health risk assessment using current data needs to be performed to determine if an unacceptable risk is present.

TIAA Superfund Site, Area A & B Groundwater OU - Record of Decision Amendment

Response: Comment noted. See ROD Amendment, Decision Summary, Section F for a site specific explanation of risk. In December 1996, EPA issued the *TIAA Site Baseline Risk Assessment* (1996 Risk Assessment). The 1996 Risk Assessment examined the risk associated with ingestion of, inhalation of, or dermal contact with TIAA Site COCs. The 1996 Risk Assessment was based on the "Conceptual Site Model" for the TIAA Site.

Because the COCs are essentially the same throughout the Site, and exposure pathways (i.e. ingestion, inhalation, dermal contact) are the same for these Project Areas as for other areas of the Site, the ROD Amendment relies in part on the 1996 Risk Assessment for conclusions regarding risk from exposure to Site contaminants. The remedy selected in the ROD Amendment is based on recent Project Area-specific data, the 1996 Risk Assessment, and new risk calculations for the West Cap and West Plume B Project Areas. The ROD Amendment, Decision Summary, Section G, Summary of Site Risks, provides additional detail regarding the 1996 Risk Assessment.

AANG Comment 7: The TCE contamination that comprises West Plume B appears to be migrating toward the TARP extraction system. TCE concentrations extracted by the TARP system are much greater than those detected in the West Plume B Project Area. An alternative should be investigated that considers the use of the TARP system to hydraulically capture any contamination that might migrate from the West Plume B Project Area. This alternative would not require any additional extraction within the West Plume B project Area, and therefore would be economically prudent. In addition, use of the existing TARP system would provide no additional disruption to local residents.

Response: Alternative 3e described in the FS evaluates use of the TARP system as a treatment facility. However allowing TARP to function as the extraction system as well, was screened out early in the evaluation process. Using TARP as the extraction system is analogous to the No Action or MNA alternatives and was therefore rejected for many of the same reasons. See response to ADEQ comment number 2.