FEASIBILITY STUDY WORK PLAN – DRAFT FINAL
WEST VAN BUREN WQARF SITE
PHOENIX, ARIZONA

by

Haley & Aldrich, Inc.
Phoenix, Arizona

for

The West Van Buren WQARF Site Working Group

REGISTERED GEOLOGIST
CERTIFICATE NO.
46379
ERIC
MICHAEL
PIGATI
Date Signed 03/01/13
ARIZONA, U.S.A.
Expires 6/30/13

File No. 37503-100
March 2013

HALEY & ALDRICH

Haley & Aldrich, Inc.
One Arizona Center
400 E. Van Buren St., Suite 545
Phoenix, AZ 85004

HALEY & ALDRICH

Tel: 602.760.2450
Fax: 602.238.9585
HaleyAldrich.com

01 March 2013
File No. 37503-100

West Van Buren WQARF Site Working Group

Ms. Gail Clement
G.M. Clement & Associates, Inc.
301 Baron Drive
Sedona, Arizona 86336

Mr. Bruce Travers
Geosyntec Consultants
11811 N. Tatum Blvd., Suite P129
Phoenix, Arizona 85028

Mr. Christopher D. Thomas
Squires, Sanders & Dempsey LLP
1 E. Washington Street, Suite 2700
Phoenix, Arizona 85004

Mr. Joseph A. Drazek
Quarles & Brady LLP
Two N. Central
Phoenix, Arizona 85004

Subject: Feasibility Study Work Plan – Draft Final
West Van Buren WQARF Site
Phoenix, Arizona

Ladies and Gentlemen:

In accordance with our agreement, please find enclosed the Feasibility Study Work Plan for the subject site for your review. If you have any questions, do not hesitate to contact Scott Zachary.

Sincerely yours,
HALEY & ALDRICH, INC.

Eric M. Pigati, R.G.
Senior Hydrogeologist
Arizona Registered Geologist #46379

REGISTERED GEOLOGIST
CERTIFICATE NO. 46379
ERIC MICHAEL PIGATI
Date Signed 03/01/13
ARIZONA, U.S.A.
Expires 6/30/13

Scott P. Zachary
Vice President

Enclosures

G:\37503_West_Van_Buren\100_Work Plan\020813 DRAFT FINAL VERSION\2013_0301_HAI_FS Work Plan_DRAFT FINAL_F.docx

TABLE OF CONTENTS

REGISTERED GEOLOGIST
CERTIFICATE NO. 46379
ERIC MICHAEL PIGATI
Date Signed 03/01/13
ARIZONA, U.S.A.
Expires 6/30/13

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Haley & Aldrich, Inc. prepared this "Feasibility Study Work Plan" (FS Work Plan) for the West Van Buren Water Quality Assurance Revolving Fund (WQARF) Site on behalf of the West Van Buren WQARF Site Working Group (Working Group), pursuant to Arizona Administrative Code R18-16-407. The Working Group is an unincorporated association of parties that either had or have operating facilities within the West Van Buren Area (WVBA), and key regional stakeholders, including: Air Liquide America Specialty Gases, LP; Arizona Public Service Company (APS); the City of Phoenix (COP); Dolphin, Incorporated (Dolphin); Freescale Semiconductor; HTM Sport GmbH/HEAD USA/HEAD Penn Racquet Sports; Holsum Bakery, Inc.; Honeywell International, Inc.; ITT Corporation; Laundry & Cleaners Supply, Inc.; Maricopa Land and Cattle Co.; Milum Textile Services Co.; Prudential Overall Supply, Inc. (Prudential); Salt River Project Agricultural Improvement and Power District (SRP); Schuff Steel Company; and Univar USA Inc. (Univar).

In 1985, volatile organic compounds (VOCs) were first detected in groundwater in the WVBA during a groundwater investigation conducted by Chevron USA Inc. at their facility located south of Van Buren Street between 51st Avenue and 55th Avenue (Dames & Moore, 1985). A November 1987 Decision Record created the Van Buren Tank Farm WQARF Area; a December 1987 amended Decision Record changed the name to the West Van Buren Area (Arizona Department of Environmental Quality [ADEQ], 2010b). The WVBA was placed on the State of Arizona WQARF registry in 1998 (ADEQ, 1998).

The WVBA is located in the western portion of the COP, approximately bounded by W. McDowell Road to the north, 7th Avenue to the east, W. Buckeye Road to the south, and 75th Avenue to the west. The approximate boundary of the WVBA is presented on Figures 1, 2, and 3; the approximate boundaries of the Motorola 52nd Street Superfund site ([M52]; immediately east of 7th Avenue) and the West Central Phoenix, West Osborn Complex (WOC) WQARF site (north of the central portion of the WVBA) are also shown on Figures 1 and 2.

This FS Work Plan is intended to specify the process that will identify the proposed remedy for the WVBA pursuant to regulatory and community approval. The following sections present the purpose, objectives, and approach of the Feasibility Study (FS) for the WVBA.

1.1 Feasibility Study Purpose

An FS is performed using the results of the Remedial Investigation (RI) to identify alternative remedies capable of achieving the Remedial Objectives (ROs) and to choose a proposed remedy that:

- Assures the protection of public health, welfare, and the environment;
- Provides for the control, management, or cleanup of hazardous substance as practicable to allow for the maximum beneficial use of the waters of the state;
- Is reasonable, necessary, cost-effective, and technically feasible; and
- Addresses any well that either now or in the reasonably foreseeable future supplies water for municipal, domestic, industrial, irrigation, or agricultural uses or is part of a public water system and would not be fit for its end use without treatment. (Arizona Administrative Register, Volume 8, Issue 13, p.1503)

1.2 Feasibility Study Work Plan Objective

The objective of this FS Work Plan is to demonstrate that the FS will meet the requirements of R18-16-407 and will include:

- A reference remedy and at least two alternative remedies [R18-16-407(E) and (F)] capable of achieving the ROs. These remedial measures will consider the needs of well owners and water providers affected by the release or threatened release of a hazardous substance [R18-16-407(G)];
- A comparative analysis of the reference remedy and the alternate remedies according to the prescribed comparison criteria, including practicability and reliability, risk, cost, and benefit or value [R18-16-407(H)];
- A proposed remedy based on the evaluation and comparison of the remedial alternatives [R18-16-407(I)]; and
- Community involvement in accordance with R-18-16-404.

1.3 Feasibility Study Process

The identified remedies will be evaluated according to the prescribed comparison criteria, including practicability and reliability, risk, cost, and benefit or value [R18-16-407(H)(3)]. The proposed remedy will be evaluated to ensure it can achieve the ROs and is consistent with the water management plans of affected water providers and the general land use plans of local governments with land use jurisdictions in the WVBA [R18-16-407(H)(1) and (2)].

1.4 Overall Feasibility Study Technical Approach

The FS process will build upon the data and information provided in the Final Remedial Investigation Report ([Final RI Report]; Terranext, 2012a). Additional steps taken in the preparation of the FS will include:

- An update of the Site Conceptual Model, as necessary, based on a review of the geology, hydrogeology, facility-specific remedial actions performed to date, the nature and extent of VOC-impacted groundwater, VOC concentration trends in groundwater, and potential impacts from adjacent Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund") and WQARF sites;
- The identification of WVBA facilities that may be potential continuing VOC source(s) to WVBA groundwater, if any, primarily through a review of the type of chlorinated solvents used during historical operations, how chlorinated solvents were used (for example bulk storage, vapor degreasing, hand cleaning, etc.), the time period of chlorinated solvent use, historical VOC concentrations in WVBA soil and soil gas, a review of soil and/or groundwater remediation performed to date, and an evaluation of VOC concentration trends in groundwater on and in the vicinity of WVBA facilities;
- An evaluation of chromium in soil and groundwater originating from the source at the ChemResearch facility and potential impacts that could result from this source on a regional groundwater remedy;

- The preparation of a groundwater flow model to better understand current groundwater flow conditions within the WVBA, to better understand groundwater flow conditions under reasonably foreseeable future groundwater use scenarios, and to simulate groundwater remedial alternatives that involve groundwater extraction; and
- An evaluation of risk under reasonably foreseeable use scenarios, including fate and transport of contaminants during the time period of the remedial action; current and future land and resource use; exposure pathways, duration of exposure, and changes in risk over the life of the remediation; protection of public health and aquatic and terrestrial biota during and after remedial action; and residual risk in the aquifer at the end of remediation.

Given the size of the WVBA and the fact that many WVBA facilities have either completed or are in the process of completing facility-specific remedial actions under the guidance of ADEQ (ADEQ, 2009; Terranext, 2012a), the focus of the FS process will be regional. The FS process will identify a reference remedy and alternative remedies capable of achieving the ROs in those areas of the WVBA not already addressed by ADEQ via facility-specific Consent Orders. The overall technical approach for the FS will therefore be to:

1. Evaluate the influence of facility-specific source area remedial actions on VOC concentration trends in the vicinity of WVBA facilities and in regional, site-wide WVBA groundwater;
2. Evaluate regional multi-facility areas within the WVBA that contain elevated VOC concentrations in groundwater for potential focused-treatment/remedy;
3. Identify WVBA facilities that may still be acting as a continuing VOC source impacting groundwater within the WVBA, if any;
4. Evaluate the VOC mass flux into the WVBA from adjacent sites such as the M52 site and the WOC WQARF site and the effect that remedial actions within these adjacent sites have or will have on VOC mass flux into the WVBA over time;
5. Assess the influence of groundwater pumping (currently predominantly used for irrigation at a rate of approximately 75,000 acre-feet per year [AFY] within the WVBA) under potential future groundwater pumping scenarios within and adjacent to the WVBA;
6. Evaluate (or screen) appropriate technologies that could be applied to remediate contaminants in soil, soil vapor[1], and groundwater; and
7. Evaluate any additional remedial measures necessary to address any well that either supplies water or is part of a public supply system if the well would now or in the reasonably foreseeable future produce water that would be unfit for its end use without treatment due to its impairment by the hazardous substances.

This overall FS technical approach will guide the development of a reference remedy and at least two alternative remedies capable of achieving the ROs for the WVBA. The FS may make recommendations for additional data collection prior to implementation of certain remedies in order to achieve a more successful and cost-effective result.

[1] Soil and soil vapor remedies will be evaluated primarily as part of a remedy for VOC source control to eliminate or mitigate a potential continuing source of groundwater contamination.

1.5 Feasibility Study Work Plan Organization

This FS Work Plan includes the following sections:

- Section 1 – Introduction;
- Section 2 – Background;
- Section 3 – WVBA Facilities and Adjacent Sites;
- Section 4 – Overview of Nature and Extent of Contamination;
- Section 5 – Remedial Objectives;
- Section 6 – Identification and Screening of Remedial Alternatives;
- Section 7 – Evaluation of Reference Remedy and Alternative Remedies;
- Section 8 – Feasibility Study Report;
- Section 9 – Community Involvement; and
- Section 10 – Feasibility Study Schedule.

Each section below discusses how the FS will be prepared for the WVBA pursuant to Arizona requirements under R18-16-407.

2. BACKGROUND

In 1985, VOCs were first detected in WVBA groundwater during a groundwater investigation conducted by Chevron USA Inc. at their facility located south of Van Buren Street between 51st Avenue and 55th Avenue (Dames & Moore, 1985). A November 1987 Decision Record created the Van Buren Tank Farm WQARF area; a December 1987 amended Decision Record changed the name to the WVBA.

Beginning in 1988, several facilities within the WVBA conducted investigations and remedial actions under the guidance of ADEQ (Terranext, 2012a). In 1998, the WVBA was placed on the WQARF registry (ADEQ, 1998) and a community advisory board was formed in 1999 (ADEQ, 2010b).

Terranext prepared a "Land and Water Use Report" in 2007 and a "Draft RI Report" for the WVBA in 2008 on behalf of ADEQ. In October 2009 and February 2010, the Roosevelt Irrigation District (RID) submitted an Early Response Action (ERA) Work Plan to ADEQ (Montgomery & Associates, 2009a; 2009b; and 2010) while ADEQ was developing the WVBA ROs. The RID ERA was conditionally approved by ADEQ on 24 June 2010. The ADEQ conditional approval letter includes the specific conditions, tasks, and outcomes that must be achieved by RID before the conditional approval becomes final (ADEQ, 2010d). A Final Remedial Investigation Report, which includes the Final Land and Water Use Report, was prepared in August 2012 (Terranext, 2012a). The Final RI Report also includes the Remedial Objectives Report prepared by ADEQ (ADEQ, 2012).

Based on the Land and Water Use Report and the Final RI Report (Terranext, 2012b and 2012a, respectively), ADEQ issued final ROs for the WVBA on 08 August 2012. The responsiveness summary attached to the final ROs stated that there is no human health risk associated with the current water uses.

2.1 Location

The WVBA is located in the western portion of the COP and is approximately bounded by W. McDowell Road to the north, 7th Avenue to the east, W. Buckeye Road to the south, and 75th Avenue to the west. The approximate boundary of the WVBA is presented on Figures 1, 2, and 3.

2.2 West Van Buren Area Facilities, Adjacent Sites, and Water Providers

Facilities within the WVBA and identified in the Final RI Report as having conducted detailed site investigations and/or remediation activities (Figure 3) are listed in Table I and include the following:

- Air Liquide America Specialty Gases, LP;
- American Linen Supply;
- ChemResearch Co, Inc.;
- Department of Energy;
- Dolphin, Incorporated;
- Maricopa County Materials Management (MCMM);
- Prudential Overall Supply;
- Reynolds Metals Co.; and

- Van Waters & Rogers (now Univar).

ADEQ has indicated that its Potentially Responsible Party (PRP) search for the WVBA is ongoing and PRPs will not be identified until ADEQ issues the Proposed Remedial Action Plan.

WQARF and CERLCA sites adjacent to the WVBA include:

- Motorola 52nd Street CERCLA site; and
- West Osborn Complex WQARF site.

Water providers within and adjacent to the WVBA include:

- City of Phoenix;
- City of Tolleson;
- Roosevelt Irrigation District; and
- Salt River Project.

WVBA facilities identified in the Final RI Report and in adjacent CERCLA and WQARF sites are discussed in Section 3. Water providers within or adjacent to the WVBA are further discussed in Section 5.

2.3 Geology

The WVBA is located within the east-central portion of the West Salt River Valley (WSRV), a sediment-filled structural basin typical of the Basin and Range physiographic region. The basin fill deposits are late Tertiary- to Quaternary-aged alluvial/fluvial sediments consisting of interbedded sequences of cobbles, gravels, sand, silt, clay, evaporites, and volcanics. The thickness of basin fill deposits ranges from less than 100 feet along the basin margins and near bedrock pediments, to approximately 11,000 feet thick in the vicinity of the Luke Sink, northwest of the WVBA (Brown and Pool, 1989).

Early to middle stages of basin development were characterized by a closed basin environment, with deposition of alluvial fan and playa deposits. In general, these closed-basin deposits are generally coarse-grained near the edges of the basin, with more fine-grained deposits and evaporites near the center of the basin. The later stages of basin formation were dominated by fluvial and alluvial sediments deposited by through-flowing streams within the WSRV. Fine- and coarse-grained sequences deposited during this period were influenced by the location of stream channels, surface water drainage direction, stream meandering, and basin subsidence.

The WSRV basin fill deposits are divided into three units, described in descending order below:

Upper Alluvial Unit: The Upper Alluvial Unit (UAU) consists of unconsolidated Quaternary-aged sands and gravels with interbedded fine-grained silts and clays deposited in fluvial channel, terrace, and floodplain environments by through-flowing streams during the later stages of basin development. The UAU is dominated by sand and gravels in the vicinity of the Salt, Gila, and Agua Fria Rivers, with an increase in finer-grained material away from the rivers. The lateral extent and thickness of coarse-grained streambed deposits, along with associated finer-grained terrace and floodplain deposits are the result of drainage direction and stream meandering of through-flowing streams within the basin.

Based on distinctions in the UAU lithology, the UAU has been divided into the UAU1 and UAU2 (Weston, 2000; Terranext, 2012a). The UAU1 consists of surface soils that grade downward into interbedded sand and gravel. When present, clay layers are generally thin and described as clayey sands. The UAU1 ranges in thickness from approximately 170 to 310 feet below ground surface (bgs) in the WVBA (Terranext, 2012a). The UAU1 appears to become more fine-grained west of 75th Avenue and to the north, particularly in the northwest portion of the WVBA. The UAU2 is generally associated with an increase in clay layers within the more coarse-grained UAU deposits (Terranext, 2012a). The UAU2 is immediately below the UAU1 and ranges from about 30 to 260 feet thick. Groundwater is typically under unconfined (water table) conditions in the UAU. The saturated thickness of the UAU is on the order of 200 feet.

Middle Alluvial Unit: The contact between the UAU2 and Middle Alluvial Unit (MAU) is identified by a clay layer at least 40 feet thick, often described as a hard brown clay or sticky brown clay (Terranext, 2012a). The MAU is increasingly coarse-grained near the basin margins, where the distinction between the UAU and MAU is less obvious, and grades to fine-grained playa and evaporite deposits near the basin center (Brown and Pool, 1989). The lower MAU is generally comprised of silts and clays with interbedded sand and gravel layers and lenses. As the closed basin matured and through-flowing streams developed, coarser-grained alluvial fan and fluvial sediments were deposited in the upper MAU.

The top of the MAU is encountered at depths ranging from approximately 250 to 500 feet bgs in the WVBA. The total thickness of the MAU varies within the WVBA. The base of the MAU was encountered at approximately 650 feet bgs near 45th Avenue and West Van Buren Street, while monitoring well AVB10-02 (near 67th Avenue between Van Buren and Lower Buckeye) was drilled to 850 feet bgs and was still considered to be in the MAU[2]. Within the Salt River Basin, the MAU thickness can range up to 1,600 feet (Terranext, 2012a). Groundwater in the MAU is under confined to semi-confined conditions.

Lower Alluvial Unit: The Lower Alluvial Unit (LAU) represents the early stages of basin formation and generally consists of conglomerate and semi-consolidated gravels along the basin edges, grading into finer-grained playa and evaporite deposits towards the center of the basin; interbedded volcanics are also present within the LAU. The thickness of the LAU ranges up to 10,000 feet near the Luke Sink. Based on driller's logs, the total basin fill thickness within the WVBA is at least 2,000 feet. Groundwater in the LAU is under confined to semi-confined conditions (Terranext, 2012a).

2.4 Hydrogeology

The UAU is the most productive of the three basin fill units within the WVBA, predominantly within the unconsolidated sand and gravel units. As noted above, groundwater within the UAU is under unconfined (water table) conditions. Based on pumping tests performed within the WVBA, aquifer transmissivity values in the vicinity of WVBA ranged from 4,000 to 160,000 gallons per day per foot; hydraulic conductivities ranged from 5 to 700 feet per day for the UAU (Terranext, 2012a). Large scale hydraulic conductivities of the UAU are estimated to range from 150 feet per day up to 1,500 feet per day in sand and gravel zones (Brown and Pool, 1989). The prolific nature of production wells within the WVBA suggests that the hydraulic conductivity of the UAU sand and gravel units is likely at

---

[2] Approximately 500 feet of the MAU was penetrated at AVB10-02 before drilling was terminated at a total depth of 850 feet.

the mid- to high-end of this range.

Most of the water production within the MAU comes from thin sand and gravel zones/lenses interbedded within the finer-grained deposits. Based on aquifer tests described in the Final RI Report (Terranext, 2012a), hydraulic conductivities ranged from 7 to 30 feet per day for the MAU (Terranext, 2012a). These are consistent with large scale hydraulic conductivities ranging from 4 to 60 feet per day estimated by Brown and Pool, although hydraulic conductivities may be up to two orders of magnitude less in zones consisting primarily of silt and clay. Groundwater in the MAU is under confined to semi-confined conditions.

Because the consolidated nature of LAU deposits reduces primary porosity and permeability, groundwater production from the LAU is likely derived from secondary porosity/permeability via joints and fractures. Groundwater in the LAU is under confined to semi-confined conditions.

2.4.1 Water Levels

Groundwater levels and hydraulic gradients within the WVBA are influenced by: (1) recharge along the Salt River from storm flows, releases from upstream reservoirs, and reclaimed water; (2) recharge from canal leakage; (3) recharge from excess irrigation; and (4) irrigation pumping. These influences result in both seasonal and multi-year trends in groundwater levels within the WVBA.

During the past 80 years, overall water levels have declined a total of about 100 to 150 feet within the WVBA (SRP, 2009; United States Geological Survey [USGS], 2010). Current depth to water in the UAU is on the order of 100 to 150 feet bgs (Terranext, 2012a). Groundwater levels declined during the mid-1950's over much of the WSRV due to increased pumping for irrigated agriculture, primarily cotton. Water levels declined until the mid-1960's, when heavy precipitation resulted in large storm flows along the Salt River, providing recharge and reducing the need for irrigation pumping. In general, water levels rose from the mid-1960's until about 1970, when water levels gradually began declining again. Large precipitation events in 1972, 1978, 1979, 1983, 1984, 1992, and 1993, with corresponding large flows in the Salt River, provided increased recharge and reduced the need for irrigation pumping. The retirement of agricultural land for development and the 1980 Groundwater Management Act, which placed certain restrictions on pumping and drilling new irrigation supply wells, also reduced the amount of irrigation pumping within the WSRV. As a result, regional water levels rose about 40 to 60 feet from the 1960's to the early 1990's (USGS, 2010). However, since about 1993, water levels within the WVBA have declined approximately 2.3 feet per year (about 35 feet overall) due to drought conditions and pumping within the WVBA (Terranext, 2012a).

Superimposed over these multi-year water level trends are seasonal fluctuations in water levels within the UAU, likely resulting primarily from RID pumping 32 irrigation wells located within and adjacent to the WVBA (Figure 3). These wells are used primarily during the irrigation season from March to September and pump a total of approximately 75,000 AFY. Seasonal water levels are also influenced by recharge along the Salt River from storm flows, releases from upstream reservoirs, and reclaimed water. Groundwater levels in UAU monitoring wells can fluctuate between approximately 10 to 40 feet during the year, depending on the timing and rate of RID irrigation pumping, with lower water levels during the summer months and higher water levels during the winter months.

For example, from 2003 to 2008, the water level fluctuations observed at monitoring wells AVB69-01 and AVB69-02, which are in the vicinity of irrigation well RID-104, ranged from 20 to 45 feet between winter and summer months. These seasonal water level changes, likely resulting primarily from irrigation pumping, cause an overall lowering of the water table and flattening of the hydraulic gradient within the WVBA during the summer months. Pumping RID irrigation wells also influences local groundwater gradients and flow directions within the area of influence of the pumping wells.

2.4.2 Groundwater Flow Directions

Historically, groundwater in the WSRV primarily flowed west towards the basin outlet between the Sierra Estrella and White Tanks mountain ranges (USGS, 2010). Since the 1960's, groundwater flow has been towards either the basin outlet or to the northwest towards the Luke Sink, where extensive groundwater pumping for irrigation since the 1950's has resulted in an extensive, regional groundwater depression that controls groundwater gradients over much of the central and northern portions of the WSRV, including the WVBA. As discussed above, groundwater gradients and flow directions within the WVBA are also controlled by recharge along the Salt River, recharge from excess irrigation, and irrigation pumping.

Winter Months

During the winter months, the overall groundwater flow direction is to the west, with a northwesterly flow component along the south-southeastern portion of the WVBA. Within the eastern portion of the WVBA, the overall groundwater flow direction in the UAU is to the west, with a hydraulic gradient of about 10 feet per mile (Terranext, 2012a). The hydraulic gradient flattens within the central and western portions of the WVBA, with a hydraulic gradient of about 4 to 5 feet per mile.

Summer Months

During the summer months, the overall water table is lowered, likely primarily by irrigation pumping, and a hydraulic trough appears to develop within the WVBA, with groundwater flow directions to the west, southwest, and northwest towards the central portion of the WVBA. Within the eastern portion of the WVBA, the overall groundwater flow direction in the UAU is to the west-southwest, with a hydraulic gradient of about 20 feet per mile (as compared to 10 feet per mile during the winter months; Terranext, 2012a). As with the winter months, the hydraulic gradient flattens within the central and western portions of the WVBA, with a hydraulic gradient of about 4 to 5 feet per mile. However, due to the lowering of the water table, the area with a relatively flat hydraulic gradient encompasses a larger portion of the WVBA during the summer months. As discussed above, pumping RID irrigation wells also influences local groundwater gradients and flow directions within the area of influence of the pumping wells.

2.5 Surface Water

The surface water features within and adjacent to the WVBA include the Salt River, the SRP Canals, and the RID Canals.

Salt River: The Salt River is located south of the WVBA and runs westward along its length (Figure 2). In the vicinity of the WVBA, the Salt River is dry except for upstream dam releases, local storm water runoff, and discharge of treated effluent from the COP 23rd Avenue wastewater treatment facility. When significant surface flows occur, the Salt River acts as a linear source of groundwater recharge in the vicinity of the WVBA (Terranext, 2012a).

SRP Canal System: The SRP operates the Grand Canal and a system of laterals in the vicinity of the WVBA. The Grand Canal is lined for most of its length, oriented east to west, and is approximately 1-¾ miles north of the WVBA boundary at its closest point. The laterals run north to south and are located from 19th Avenue westward beyond 83rd Avenue at approximately ½-mile intervals. Water within the laterals is used for agricultural purposes (Terranext, 2012a).

RID Canal System: The RID operates the Salt Canal and the Main Canal and its laterals in the vicinity of the WVBA (Figures 2 and 3); water within the RID canal system is pumped from RID production wells and is used for agricultural purposes. The Main Canal is open, lined, and oriented towards the northwest beginning at 19th Avenue and extending beyond the WVBA boundary in western Phoenix. Six laterals connect to the Main Canal between 19th Avenue and 51st Avenue. The laterals are underground gravity flow pipelines except for one 400-foot segment along 43rd Avenue (Salmon, Lewis & Weldon, 2010). The COP 23rd Avenue wastewater treatment facility discharges about 30,000 acre-feet of treated wastewater into the Main Canal each year.

The east to west Salt Canal runs from 23th Avenue along Van Buren Street until it connects with the RID Main Canal at 83rd Avenue. The Salt Canal has been converted to an underground gravity pipeline, except for two segments (300 feet and 1,100 feet long) between 75th Avenue and 83rd Avenue. RID indicated that these two open segments would be piped during 2010 (Salmon, Lewis & Weldon, 2010).

3. WVBA FACILITIES AND ADJACENT SITES

The WVBA FS will consider impacts from facilities located within the WVBA as well as adjacent sites. The following sections describe these facilities and adjacent sites.

3.1 WVBA Facilities

The Final RI Report (Terranext, 2012a) contains detailed descriptions of record reviews, facility histories, investigations, remedial activities, and regulatory histories for facilities within the WVBA; this information is incorporated into this FS Work Plan primarily by reference. As noted above, ADEQ has indicated that its PRP search for the WVBA is ongoing and the preliminary PRP list will be issued with the Proposed Remedial Action Plan.

Several of the WVBA facilities identified in the Final RI Report (Terranext, 2012a) have either completed or nearly completed their respective site investigations under the guidance of ADEQ (Terranext, 2012a). In addition, American Linen Supply Company (ALSCo), Dolphin, MCMM, Reynolds Metals, and Univar have completed remediation work for soil and, based on the results of the remedial actions, have either obtained No Further Action (NFA) determinations from ADEQ, ADEQ has terminated their respective Consent Orders, and/or the remedial system was shut down with approval by ADEQ after meeting soil remediation levels (SRLs). In addition to completing soil remediation, Univar conducted extensive groundwater monitoring in the UAU1 and UAU2 and received approval from ADEQ to discontinue site-specific groundwater monitoring. Dolphin and ALSCo also performed groundwater remediation via air sparging and/or groundwater extraction. Air Liquide completed source control and two years of groundwater monitoring as required under a Consent Order with ADEQ; the Consent Order was recently re-negotiated and now includes soil investigation in addition to groundwater monitoring. Prudential has not yet completed remediation but has negotiated an amended Consent Order with ADEQ to address remedial actions (ADEQ, 2009; see Table I). To date, complete source remediation of VOC- and chromium-impacted soil and/or groundwater has not been performed at ChemResearch, although some excavation of chromium contaminated soil has been conducted.

Brief site histories are provided below for WVBA facilities identified in the Final RI Report that conducted site investigations and/or remediation activities (Table I).

3.1.1 Air Liquide America Specialty Gases, LP

Air Liquide America Specialty Gases, LP is an international industrial group specializing in industrial and medical gases. The 9.9-acre facility is located at 301 South 45th Avenue and contains three primary buildings: the fill plant; the acetylene plant; and the former air separator unit (ASU). Industrial operations at the site began in 1963 when Dye Oxygen Company began industrial gas manufacturing. In 1973, Liquid Air Corporation bought the stock of Dye Oxygen Company; the facility has operated under the name Air Liquide since 1994. 1,1,1-trichloroethane (TCA) was reportedly used at the former ASU to clean compressors, valves, and other equipment for oxygen service from 1973 to 1996. TCA was also reportedly used as a degreaser for oxygen equipment during Dye Oxygen Company operations. Freon-11 was also reportedly used as part of a vapor degreasing system in the early 1980's, and methylene chloride was reportedly used from 1973 to 1974 to clean compressors, valves, and other equipment (Terranext, 2012a). Air Liquide began site investigations in 1998.

In 2007, Air Liquide entered into a Consent Order with ADEQ. Air Liquide has completed source control (excavation of the west grease trap and south grease trap, and surrounding soils, to depths ranging from 3 to 5.75 feet) and two years of groundwater monitoring as required under a Consent Order with ADEQ; the 2007 Consent Order was recently re-negotiated and now includes soil investigation in addition to groundwater monitoring.

3.1.2 American Linen Supply Company

ALSCo was a commercial dry cleaner located at 720 W. Buchanan Street; the 1.5-acre site included a 31,000 square foot laundry processing facility. The site operated as Maroney's Cleaners & Laundry, Inc. from approximately 1969 to 1979, when ALSCo purchased the property. The facility used PCE during operations from 1956 to 1984; ALSCo ceased dry cleaning operations in 1995. Site investigations began in 1992.

ALSCo settled with ADEQ in 1997 and ADEQ performed an Early Response Action (ERA) at the ALSCo site in 1999. The ERA consisted of groundwater extraction, SVE, and air sparging. The remedial action objectives (RAOs) were to reduce VOC concentrations in groundwater to be consistent with upgradient concentrations; RAOs for trichloroethene (TCE) and PCE in soil vapor were 20 and 14 micrograms per liter (μg/L), respectively.

The SVE system ceased operation in 2002 and the groundwater extraction system shut down in 2003. One year of groundwater rebound sampling was performed following groundwater extraction system shutdown. The rebound sampling results indicated that additional groundwater extraction was not necessary. Both groundwater and soil vapor data indicated the RAOs were achieved and, in 2008, ADEQ granted a No Further Action determination for soil.

3.1.3 ChemResearch Co., Inc.

ChemResearch Co., Inc. (CRC) is an electroplating, metal finishing, and metal parts painting company located at 1122 West Hilton Avenue. The site once consisted of four separate properties at 1122 West Hilton Avenue (Plating Shop), 1130 West Hilton Avenue (Warehouse/Laboratory), 1101 West Hilton Avenue (Administration/Grinding Shop), and 1120 West Watkins Street (Painting Shop). PCE was reportedly used in degreasers at the plating shop and painting shop (Terranext, 2012a). The plating site was first developed in 1953, when Francis Plating Company began hard chrome plating operations. CRC conducted chrome plating operations since 1959 and purchased the site in 1989. Historical operations included PCE vapor degreasing and the use of chromic acid. CRC leased the property at 1120 West Watkins Street from 1979 through 1992; a portion of this property was used by CRC for painting operations, which included the use of several paint booths and PCE degreasers. PCE was also either stored or used during historical operations at 1130 West Hilton Avenue (Warehouse/Laboratory) and 1101 West Hilton Avenue (Administration/Grinding Shop; Terranext, 2012a).

Site investigations began in 1990. In 1994, CRC entered into a Consent Order with the Resource Conservation and Recovery Act (RCRA) division of ADEQ to address on-site contamination, and CRC has an ADEQ-approved remedial action plan to conduct additional soils investigation and remediation[3] (Terranext, 2012a).

In 1995, soil in the chrome plating east bay area was excavated to a depth of approximately 10.5 feet bgs and transported off-site for disposal. Chromium concentrations in confirmation soil samples exceeded the residential and nonresidential SRLs and the groundwater protection level (GPL) for chromium, but logistics and the coarse-grained nature of the soils prevented further excavation. To date, remediation of VOC-impacted groundwater has not been performed at CRC.

3.1.4 Department of Energy

Department of Energy (DOE) owns two parcels of land located at 615 South 43rd Avenue, totaling approximately 33 acres. One parcel is a substation currently used to supply power to the DOE Western Area Power Administration (WAPA) Phoenix Area office; the other parcel contains the WAPA operations and maintenance complex. DOE has operated the substation since its construction in 1941. Several buildings are located on the DOE property to support activities such as administration, maintenance, storage, and vehicle fueling area. Chlorinated solvents were reportedly used during historical operations (Terranext, 2012a). Site investigations began in 1992.

DOE currently has an ADEQ-approved soil sampling plan related to five disposal structures, the installation of additional monitoring wells, and continued monitoring (Terranext, 2012a). To date, DOE has not performed soil remediation, although it is unclear whether remedial actions at DOE are required by ADEQ.

3.1.5 Dolphin, Incorporated

Dolphin is a precision metal casting facility located at 740 South 59th Avenue. The 50-acre facility produces precision aviation components and custom golf club heads. The property was first developed in 1968 by Rueter, Inc. as a casting facility; Dolphin purchased the property in 1972 and continued casting operations. Manufacturing operations included wax pattern preparation, silica shell preparation, casting, and cleaning and finishing. PCE and TCA were reportedly used during operations. PCE was dispensed from drums for use in vapor degreasing and wipe cleaning; PCE and TCA were used to degrease casting molds. Dolphin began transitioning to citrus-based solvents during 1990 and 1991; PCE use was discontinued in 1994. Site investigations began in 1988 and a RCRA Consent Order was issued by ADEQ in 2000.

A SVE pilot test was performed by Dolphin in 1996. Two SVE systems were installed in the vicinity of the former PCE degreaser and former drum storage areas near the Dolphin I building. A third SVE system was installed near the closed sewer interceptor at the Dolphin III building. An air sparge system was installed adjacent to the SVE systems at the Dolphin I building. The SVE/air sparge systems operated from 1998 to late 2001/early 2002 and were shut down due to asymptotic conditions. During SVE system decommissioning, soil vapor samples indicated that soil concentrations were reduced to less than the residential SRLs and GPLs. In addition, groundwater monitoring at the site indicated that VOC concentrations in

[3] The Final RI Report does not indicate whether the remedial action plan is related to chromium or VOC contamination, or both.

UAU1 groundwater were reduced to at or below upgradient concentrations. Dolphin completed rebound testing in 2004 and received ADEQ's authorization to shut down the SVE/air sparging systems. In 2006, Dolphin received closure of the RCRA Consent Order issued by ADEQ in 2000.

3.1.6 Maricopa County Materials Management

MCMM is the owner of the 4-acre property located at 320 West Lincoln. The property was formerly owned by Union Pacific Railroad until MCMM purchased the property in 1974. The property was divided into multiple lots prior to purchase by MCMM; previous occupants include Southern Pacific Transportation Company (succeeded by Union Pacific Railroad), Linde Air Product Company, Arizona Public Service Company (APS), and Southwest Solvents.

Southwest Solvents operated a solvent recycling operation along the northwest corner of the property from 1964 to 1974. Reclaimed solvents reportedly included PCE, TCE, TCA, and Freon. MCMM purchased the property in 1974 and built a warehouse that housed a printing operation; multi-graphic blankwash cleaning solutions and SafetyKleen cleaning solution, both reportedly containing PCE, were used during printing operations. APS operations were limited to use of office space located on the property. Site investigations were initiated by ADEQ in 1992.

A SVE pilot test was performed in 1995 in the vicinity of the former Southwest Solvent facility. In 1997, MCMM performed SVE in this area and was shut down later that year with ADEQ concurrence due to asymptotic extraction rates. Subsequent soil vapor sampling indicated that TCE and PCE concentrations in soil vapor had been reduced to below SRLs. In 2001, Maricopa County and Union Pacific Railroad settled with ADEQ to cover response and oversight costs.

3.1.7 Prudential Overall Supply

Prudential is an industrial laundry and dry cleaning operation located at 5102 West Roosevelt Street; the property is approximately 3.9 acres. Prudential purchased the property in 1980 and began operations in 1982. PCE was used during dry cleaning operations from 1982 to 1991. PCE was contained in a 750-gallon internal tank housed in the dry cleaning machine and was recycled in the machine to minimize waste PCE generation. Site investigations began in 2004.

Prudential entered into a Consent Order with ADEQ in May 2008 to further investigate soil and groundwater contamination. The activities associated with the Consent Order included the investigation and characterization of soil, soil vapor, and groundwater at the facility. Soil and soil gas samples were collected, soil vapor extraction wells were installed and tested, and 3 groundwater monitor wells were drilled, installed, and tested. The three monitor wells have been monitored monthly for water level elevation data and sampled quarterly for VOC analysis. 45-Day Status Reports and quarterly monitoring and sampling reports have been submitted to ADEQ.

In June 2010 Prudential entered into an Amended Consent Order with ADEQ. Per that Amended Consent Order, Prudential has revised the groundwater elevation monitoring to quarterly and groundwater sampling to semiannually. A Remedial Action Plan (RAP) was submitted to ADEQ and has been approved. Prudential is moving forward with the installation and operation of a SVE system at the facility to remediate soil impacts. Prudential is also submitting quarterly groundwater monitoring and sampling reports and 90-day Status Reports to ADEQ.

3.1.8 Reynolds Metals Co.

Reynolds Metals Co. was a former aluminum extrusion facility located between 35th and 43rd Avenues, and between Van Buren and the Union Pacific Railroad tracks. The 320-acre facility was constructed prior to 1946 under authority of the U.S. Government's Defense Plant Corporation. Aluminum Corporation of America (ALCOA) operated the plant from the time of construction to 1946, at which time Reynolds Metals Co. took over operations. In 1983, all production ceased. Two degreasing processes were used during operations. Stoddard solvent was used until the early 1970's when it was replaced by a vapor recovery degreasing unit. TCA was used in the vapor degreaser until the facility closed in 1983. Site investigations began in 1988.

Reynolds Metals Co. operated a SVE system from 1989 to 1991 to remove VOC mass from soil and the system was shut down after asymptotic conditions were reached. Reynolds also excavated and removed approximately 3,100 tons of contaminated soil (primarily soil impacted with petroleum hydrocarbons). In 2000, ADEQ granted a NFA determination for soil at fourteen target areas at the site. In 2002, Reynolds entered into a Consent Decree with ADEQ regarding liability and settled with ADEQ later that same year. Reynolds completed operations as outlined in Section VIII of the Consent Decree and in January 2006 received a letter of satisfaction of monitoring requirements.

3.1.9 Van Waters & Rogers (Univar USA Inc.)

Van Waters & Rogers (VW&R) is a chemical distribution facility located at 50 South 45th Avenue. The 9-acre site, now owned by Univar, is an industrial chemical warehousing, distribution, repackaging, and transport facility. The site was acquired in 1969 and the office and warehouse were built in 1971. Areas of operation included a wastewater pretreatment system, a RCRA Interim Status Storage unit, a sewer interceptor, and a bulk solvent tank farm. Site investigations began in 1989.

In 1990, VW&R entered into a Consent Order with ADEQ related to Part A Hazardous Waste Permit operations. In 1992, VW&R installed a SVE system to remove VOC mass from soil; the system operated until 1998. In 1996, VW&R and ADEQ signed a Consent Order for additional site investigations, closed the RCRA Interim Status Storage unit, and continued operation of the SVE system. Based on the results of confirmation soil samples following SVE shutdown in 1998, ADEQ granted a NFA determination for soil in 2002 and the 1996 Consent Order was terminated. In addition to completing soil remediation, Univar conducted extensive groundwater monitoring in the UAU1 and UAU2 and received approval from ADEQ to discontinue site-specific groundwater monitoring in 2002.

3.1.10 Other Facilities Identified in the Final RI Report

The following facilities within the WVBA were identified in the Final RI Report as having conducted site investigation work, but whose investigations do not appear to have been closed by ADEQ (Terranext, 2012a). These facilities may represent sources of VOCs in the WVBA.

- BC Assemblage, 333 N. Black Canyon Highway – During a preliminary site assessment, soils were sampled and analyzed for pesticides, herbicides, polychlorinated biphenyls (PCBs), and petroleum hydrocarbons; ADEQ requested copies of the report. WVBA constituents of concern (COCs) were not sampled. No letter was issued by ADEQ.
- Chevron, U.S.A., Inc., 3050 S. 19th Avenue – TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- CoStar Corp/Data Packaging Corp, 425 S. 67th Avenue – A soil release was investigated at an oil/water separator and at a drywell and contaminated soil was excavated to 25 feet bgs. Soil remediation was confirmed but groundwater monitoring wells requested by ADEQ (in a letter dated 9 September 1993) was not completed.
- Grow Group, Inc., 4940 W. Jefferson Street - During a preliminary site assessment, soils were sampled and analyzed for pesticides, herbicides, PCBs, and petroleum hydrocarbons; ADEQ requested copies of the report. WVBA COCs were not sampled.
- Hi-Tech Plating, Inc., 4313 W. Van Buren Street – PCE and TCE were detected in drywell. The drywell area was investigated but VOCs were not found in soil or groundwater. No letter was issued by ADEQ.
- Jacquay's Equipment Co., 1219 S. 19th Avenue – Testing was recommended in a Phase I report but there is no record of testing in the file. No letter was issued by ADEQ.
- Joe's Diesel Repair, 6316 W. Van Buren Street - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- LaSalle Draperies, 710 W. Buchanan Street – PCE and TCE detected in soil gas but not soil samples. An ADEQ telephone record dated 30 July 1992 indicated that additional sampling could result in issuing a no action letter.
- Maricopa By-Products, Inc., 3602 W. Elwood Street - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Petco, Inc., west side of 67th Avenue, north of railroad - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Phoenix Vegetable Distribution, south side of Buckeye Road, east of 83rd Avenue - TCE was detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Ray & Bob's Truck Salvage, 101 S. 35th Avenue – TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Research Chemicals, 8220 W. Harrison Street, Tolleson – TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples. According to a facility permit, the facility was investigated/operated under RCRA.

- Roadway Express, 2021 S. 51st Avenue – TCE was detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Salesco Systems/Turken Industrial Properties, 5736 W. Jefferson Street – COCs were detected in drywell sludge. In a letter dated 19 February 1992, ADEQ requested that the full extent of drywell contaminated be investigated; there is no information in the file indicating that the investigation was completed.
- Santa Fe Railroad Yard, W. of 19th Avenue between McDowell Road and Fillmore Street - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Schuff Steel, 4420 S. 19th Avenue - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Smithey Recycling Co., 3640 S. 35th Avenue - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Southwest Feed & Seed, 350 S. 75th Avenue - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Sta-Rite Industries, Inc. 1146 W. Hilton Street – PCE was released at the facility and PCE-contaminated soil was excavated. A groundwater investigation was not performed. No response was provided by ADEQ.
- Transco Lines, 3839 W. Buckeye Road - TCA and TCE were detected at concentrations slightly greater than detection limits in a soil sample collected during a Phase I investigation but less than concentrations detected in background samples.
- Tritech Manufacturing, Inc./Tri-Star Quality Metal Finishing, Inc., 5144 W. McKinley Street – Soil sampling around a drywell indicated that COCs were not present in the subsurface. An upgradient monitoring well installed by ADEQ contained higher VOC concentrations compared to downgradient monitoring wells.
- Unocal, 10 S. 51st Avenue – PCE was detected in soil samples collected from a property leased from Santa Fe Pacific Pipeline Partners, L.P. Soil data collected by Brown and Caldwell and Levine Fricke, and groundwater data collected from groundwater monitor wells upgradient and downgradient of the area indicate that COC concentrations are similar.

3.2 Adjacent Sites

The M52 site and the WOC WQARF site are immediately adjacent to the WVBA (Figure 2). Information from these adjacent sites will be considered during the preparation of the WVBA FS to the extent that they may influence the groundwater remedial alternatives identified and ultimately the groundwater remedy selected.

3.2.1 Motorola 52nd Street Superfund Site

The M52 site is located immediately adjacent to the eastern boundary of the WVBA (east of 7th Avenue) as shown on Figure 2. The M52 site is a CERCLA site, was placed on the National Priority List in 1989, and is divided into three operable units (OUs). Although the M52 site is a federal CERCLA site, the United States Environmental Protection Agency (EPA) designated ADEQ as the lead agency for activities in OU1 and OU2; Region 9 EPA is the lead agency for OU3.

The COCs in M52 site groundwater include TCE, PCE, 1,1,1-trichloroethane (1,1,1-TCA) and their breakdown products (USEPA, 2010). As noted in the Region 9 EPA M52 site overview "*The groundwater contamination* [within the M52 site] *has spread westerly for several miles. The portion of the VOC plume that extends west of 7th Avenue is being addressed by the Arizona Department of Environmental Quality (ADEQ) Water Quality Assurance Revolving Fund (WQARF).*" The Final RI Report (Terranext, 2012a) also states "*WVBA groundwater data indicate that TCE and 1,1-DCE (and to a lesser extent, PCE) groundwater contamination originates from the* [M52] *OU3 area east of Seventh Avenue and flows into the WVBA WQARF site from the east* ."(Terranext, 2012a).

Operable Unit 1: The former M52 site is a 90-acre semiconductor manufacturing plant located at 52nd Street and McDowell Road (Figure 2; ADEQ, 2011a; USEPA, 2010); ON Semiconductor currently operates the facility, although Freescale Semiconductor (a spin-off company from Motorola) is responsible for addressing contamination within OU1. In 1992, an interim measure groundwater extraction system began operation at the boundary of OU1 and OU2 along 44th Street. Extracted groundwater is treated via air stripping and activated carbon. While treated groundwater is being used in the manufacturing process, use of treated groundwater for facility operations will cease in the near term and the future beneficial use of the treated groundwater is being evaluated. Current work at OU1 includes continued operation of the groundwater extraction system and evaluation of VOC source area reduction in bedrock beneath the former M52 site.

Operable Unit 2: The approximate extent of OU2 is shown on Figure 2 (ADEQ, 2011a; USEPA, 2010). In 2001, a groundwater extraction system consisting of three extraction wells began operation at the boundary of OU2 and OU3 along 20th Street. Extracted groundwater is pumped to the treatment system at 20th Street, treated with activated carbon, and discharged to the SRP's Grand Canal at 35th Street. Approximately 3 million gallons of groundwater are extracted and treated each day (USEPA, 2010), equivalent to about 2,000 gallons per minute. Current work at OU2 includes facility-specific RI/FS's and the continued operation and maintenance of the groundwater extraction system.

Operable Unit 3: OU3 extends from 20th Street to 7th Avenue (Figure 2; ADEQ, 2011a; USEPA, 2010). Region 9 EPA is working with parties within OU3 to complete facility-specific investigation work. In addition, in 2009, Honeywell and APS entered into an Administrative Order on Consent with EPA to voluntarily complete the RI/FS work for OU3 (USEPA, 2010).

3.2.2 West Central Phoenix, West Osborn Complex WQARF Site

The West Central Phoenix (WCP) WQARF site was divided into five separate WQARF sites in 1998. The West Osborn Complex (WOC) was originally a 15-acre parcel located near 35th

Avenue and Osborn Road used to manufacture electronic components from the late 1950s to the mid-1970s. TCE and other chemicals were reportedly used during historical operations (ADEQ, 2010c).

The WVBA Final RI Report (Terranext, 2012a) identifies the WOC WQARF plume as the southern-most plume in WCP and hence the closest to the WVBA. The approximate boundary of the WOC groundwater plume, as provided by ADEQ, is shown on Figure 3. While the WOC WQARF plume outline shown on Figure 3 is separate from the WVBA, the WVBA Final RI Report (Terranext, 2012a) states "*TCE and other VOCs appear to be entering the central portion of the WVBA from the north*." and "*The current COCs in groundwater at the WOC include TCE, 1,1-DCE, and PCE. TCE presents the highest contaminant concentration in the WOC.*"

Available information indicates the WOC site is currently in the FS phase of the WQARF process (ADEQ, 2010c).

4. OVERVIEW OF NATURE AND EXTENT OF CONTAMINATION

4.1 Soil and Soil Vapor

As discussed in Section 3.1, ALSCo, Dolphin, MCMM, Reynolds Metals, and Univar have completed remediation work for soil, and based on the results of the remedial actions, have either obtained NFA determinations from ADEQ, ADEQ has terminated their respective Consent Orders, and/or the remedial system was shut down with approval by ADEQ after meeting SRLs. Because these facilities successfully completed soil remediation under the guidance of ADEQ, they will not be included in the discussion below regarding pre-remedial soil and soil vapor impacts within the WVBA. Note that Air Liquide completed source control via excavation of its west grease trap and south grease trap in the former Air Separation Unit – South Room; however, Air Liquide's re-negotiated Consent Order with ADEQ includes additional soil investigation, indicating that an NFA determination for soils has not yet been obtained at the Air Liquide site.

To date, DOE has not performed soil remediation related to VOC impacts, although it is unclear whether remedial actions at DOE are required by ADEQ. ChemResearch conducted soil excavation as part of remedial activities. The following information regarding ChemResearch, DOE, and Prudential was obtained from the 2012 Final RI Report (Terranext, 2012a).

ChemResearch: In 1992, soil gas samples were collected from 5 feet bgs (with an additional 15 foot sample at some locations) at approximately 44 locations at the ChemResearch property, adjacent properties, and along Hilton Avenue. PCE was detected in soil gas samples collected at the ChemResearch property at concentrations ranging from 66 μg/L (location CR-01) to 1,100 μg/L (location CR-05, in the vicinity of the former PCE underground storage tank). PCE was detected at 34 of 36 soil gas sample locations from adjacent properties and along Hilton Avenue at concentrations ranging from 2.9 μg/L to 770 μg/L. During a 1996 soil investigation of the ChemResearch west bay, soil samples were collected at six locations at depths of approximately 5 and 9.5 feet bgs; PCE was detected in all of the soil samples at concentrations ranging from 0.09 milligrams per kilogram (mg/kg) to 3,500 mg/kg (5.5-foot sample from location SS-20). TCE was not detected in the soil samples, with reporting limits ranging from 0.025 mg/kg to 100 mg/kg.

DOE: In 1993, eleven soil samples were collected from four locations at depths ranging from 13 to 28 feet bgs; PCE was detected in the 18- and 28-foot samples from location SB14 at concentrations of 0.23 mg/kg and an estimated 0.049 mg/kg, respectively. No other COCs were detected in the other soil samples, with a reporting limit of 0.012 mg/kg. In 2003, sediments in drywells DW-1 (southern drywell) and DW-2 (northern drywell) were sampled. VOCs were not detected from the DW-2 sediment sample; 1,1-Dichloroethene (1,1-DCE) was detected in the sediment sample from DW-1 at a concentration of 0.32 mg/kg. In 2005, a soil vapor survey was performed in the operations area of the DOE complex. Approximately 103 soil gas samples were collected from six investigation areas with the potential for historical VOC use. One or more COCs were detected in approximately 5 of the 103 soil gas sample locations. Detected PCE concentrations ranged up to 0.72 μg/L, while detected TCE concentrations ranged up to 1.6 μg/L (Area 4, Location 8 at northeast corner of Craneway building).

Prudential Overall Supply: Prudential performed site investigations related to an underground storage tank and within laundry areas. In 2004, soil gas samples were collected from nine locations within the Prudential site at depths of 10 to 15 feet bgs. PCE was detected in all nine samples at concentrations up to 140,000 parts per billion by volume (SG-8, adjacent to the wastewater flume and wastewater discharge line); TCE was detected in three samples at concentrations up to 1,200 parts per billion by volume (SG-6, near the former PCE sludge/lint drum area). During the 2004 investigation, soil samples were also collected at six locations at depths up to 8 feet bgs; PCE and TCE were not detected with reporting limits of approximately 0.05 mg/kg. In 2006, soil samples were collected from two boring locations (SB-1 and SB-2, near the highest soil vapor concentrations observed during the 2004 investigation) at depths ranging from 15 to 105 feet bgs. PCE concentrations ranged from non-detect (reporting limits of approximately 0.05 mg/kg) up to 1.9 mg/kg (85-foot sample from SB-2). TCE was not detected in the soil samples collected in 2006. PCE was detected in soil gas samples collected from SB-1 and SB-2 at concentrations up to 2,900 μg/L (85-foot sample at SB-2) and 2,985 μg/L (105-foot sample at SB-1). The highest detected TCE concentration in soil gas samples was 27.4 μg/L (105-foot sample from SB-1).

4.2 Groundwater

Groundwater within the WVBA is impacted with VOCs presumably released during historical operations at certain industrial sites and other facilities within the WVBA. WVBA groundwater also appears to be impacted with VOCs originating from upgradient VOC sources within the M52 site (USEPA, 2010; Terranext, 2012a) and the WOC WQARF site (ADEQ, 2008; ADEQ, 2010c; Terranext, 2012a). The approximate lateral extent of VOC-impacted groundwater at M52, WVBA, and WCP, as provided by ADEQ, is shown on Figure 2 (ADEQ, 2006b; 2010a; 2011a).

The COCs in WVBA groundwater are (ADEQ, 2010b; Terranext, 2012a):

- TCE;
- PCE;
- TCA;
- cis-1,2-Dichloroethlyene (cis-1,2-DCE);
- 1,1-Dichloroethane (1,1-DCA);
- 1,1-Dichloroethene (1,1-DCE); and
- Chromium[4].

COCs used during historical operations within the WVBA include TCE, PCE, TCA, and chromium. Cis-1,2-DCE is a breakdown product of TCE; 1,1-DCA is a breakdown product of TCA; and 1,1-DCE is a breakdown product of TCA, PCE, and/or TCE (Fetter, 1993).

VOC-impacted groundwater within the WVBA is reportedly limited to the UAU1 and, to a lesser extent, the UAU2. Localized, relatively low VOC concentrations have also been observed in monitoring wells within the uppermost MAU (Terranext, 2012a). Based on first quarter 2008

[4] According to the Final RI Report, hexavalent chromium is present in groundwater beneath the ChemResearch facility and is considered a COC at this location. Regarding other total chromium detects in groundwater above the AWQS, the Final RI Report states "With the exception of the southeast corner of the site, these wells [with total chromium above the AWQS] are spread across the entire WVBA without a distinct pattern to identify a manmade source. Therefore, data interpretation suggests that the chromium in the wells not located in the southeast corner of the WVBA is possibly from deterioration of stainless steel well casing, or naturally occurring within native soils." (Terranext, 2012a).

groundwater sampling results, the COCs currently detected above the Arizona Water Quality Standards (AWQS) in WVBA groundwater are primarily TCE and PCE; 1,1,1-TCA and 1,1-DCE were detected above the AWQS in limited, localized areas within the WVBA. As a result of this COC distribution, the FS will focus on groundwater within the UAU.

The Final RI Report (Terranext, 2012a) included TCE and PCE concentration maps for WVBA groundwater in the UAU1 and UAU2 based on water quality data collected during the first quarter 2008 (Figures 4, 5, 6, and 7). TCE and PCE water quality data were also available for the M52 OU3 during the first quarter 2008 (Shaw Environmental, 2008).

During first quarter 2008, the greatest TCE concentrations were detected in UAU1 groundwater within the eastern and central portion of the WVBA, generally ranging from 50 to 150 μg/L (Figures 4 and 5). As discussed in the Final RI Report (Terranext, 2012a), TCE-impacted groundwater in this portion of the WVBA appears to primarily originate from the M52 site, where TCE concentrations in M52 OU3 monitoring wells ranged up to 220 μg/L during the first quarter 2008 (USEPA, 2010; Shaw Environmental, 2008; Terranext, 2012a). Elevated TCE concentrations (up to 60 μg/L) were also detected in the north-central portion of the WVBA, along the southern edge of the WOC WQARF site (ADEQ, 2008; ADEQ, 2010c, Terranext, 2012a; Figure 4). As shown on Figure 5, the extent of TCE-impacted groundwater within the UAU2 is smaller as compared with the UAU1, with a similar concentration range as the UAU1 (non-detect up to 160 μg/L).

During first quarter 2008, the greatest PCE concentrations (generally between 25 and 100 μg/L) detected in UAU groundwater were observed in localized areas in the vicinity of WVBA facilities with known historical PCE releases (Terranext, 2012a); detected PCE concentrations within more regional, site-wide WVBA groundwater were generally below 15 μg/L (Figure 6). During first quarter 2008, PCE was also detected in M52 OU3 groundwater, generally at concentrations at or below 5 μg/L (Shaw Environmental, 2008). As shown on Figure 7, the extent of PCE-impacted groundwater within the UAU2 is smaller and with lower PCE concentrations (non-detect up to 37 μg/L in UAU2 monitoring wells) as compared with the UAU1.

Over the past 10 years or so, in general, the lateral extent of the WVBA plume has either remained stable or decreased in size. Concentrations of both TCE and PCE in UAU groundwater have also declined, in some cases by orders of magnitude, in particular in the vicinity of sites that have performed either soil and/or groundwater remediation. In addition, since the 2001 startup of the groundwater extraction system at the boundary of the M52 OU2 and OU3, TCE and PCE concentrations have declined in M52 OU3 monitoring wells, thereby reducing the VOC mass flux along the boundary of M52 OU3 and the WVBA. The FS report will include a detailed evaluation of VOC concentration trends and plume stability; it will also include updated TCE and PCE plume maps and water quality cross sections to evaluate whether the overall lateral extent of the regional VOC plume is currently either stable or in decline and whether reduction in the VOC mass flux across the M52 OU3 and WVBA boundary is continuing.

<u>Inorganic Constituents in Groundwater</u>: Due to significant agricultural land use within and in the vicinity of the WVBA over the past 100 years, groundwater within the WVBA is degraded by inorganic constituents, in particular total dissolved solids (TDS) and nitrate. Excess irrigation water, in some cases already high in TDS, leaches salts within the soil and underlying alluvial sediments as it percolates downward to the water table, resulting in elevated TDS concentrations in groundwater. Excess irrigation water also leaches nitrates from fertilizer, resulting in elevated nitrate concentrations in groundwater (USGS, 2010).

The 2010 USGS Professional Paper 1781, "Conceptual Understanding and Groundwater Quality of Selected Basin-Fill Aquifers in the Southwestern United States," indicates that TDS concentrations in groundwater are in the 1,000 to 3,000 milligrams per liter (mg/L) range in the vicinity of the WVBA, which is consistent with TDS concentrations in groundwater samples collected within the WVBA.

Groundwater samples collected from RID production wells in the late 1980s contained elevated TDS and nitrate concentrations. TDS concentrations ranged from about 800 to 1,500 mg/L. While there is no primary Maximum Contaminant Level (MCL) for TDS, the secondary MCL for aesthetic considerations is 500 mg/L. TDS above 1,000 mg/L generally requires treatment before providing as a public water source (COP, 2005). From 1985 to 1989, nitrate concentrations in groundwater samples collected from RID production wells ranged from 2 to 64 mg/L; 114 of the 140 groundwater samples collected during this time period were above the AWQS of 10 mg/L. Post-1989 inorganic water quality data from RID production wells are not available.

TDS concentrations from groundwater samples collected at the VW&R (Univar) site from 1991 to 1993 ranged from 1,260 to 1,350 mg/L; detected nitrate concentrations ranged up to 8.8 mg/L.

5. REMEDIAL OBJECTIVES

ROs are goals to be achieved by the selected remedy as part of an approved remedial action. Therefore, the reference remedy and the alternative remedies evaluated as part of the FS must be capable of achieving the ROs.

ADEQ establishes ROs for impacted or threatened land and water in terms of current and reasonably foreseeable land use and current and reasonably foreseeable beneficial uses of the waters of the state [(R18-16-406(D) and (I)]. Reasonably foreseeable land use is that likely to occur at the site; reasonably foreseeable water use is that likely to occur within 100 years, unless a longer time period is shown to be reasonable based on site-specific information.

Pursuant to R18-16-406(D), the Land and Water Use Report (Terranext, 2012b) contains detailed descriptions of current and reasonably foreseeable land and water use for the COP and current and reasonably foreseeable use of water for RID, SRP, the City of Tolleson, and private wells. ADEQ subsequently prepared a "Remedial Objectives Report" (ADEQ, 2012), which provides ROs for land, groundwater, and surface water for the WVBA.

Sections 5.1 and 5.2 include a brief summary of current and reasonably foreseeable land and water use in the WVBA, referenced from the Land and Water Use Report (Terranext, 2012b) and the 2005 update to the COP's Water Resources Plan (COP, 2005). The ROs for land, groundwater, and surface water are presented and discussed in Section 5.3.

5.1 Current and Future Land Use

The WVBA is located within the COP and abuts the City of Tolleson's eastern boundary (75th Avenue between Van Buren and the RID Main Canal). Current and future land use is provided in the COP's General Plan amended in 2004 and includes the goals, policies, and recommendations for land use development during the next 10 to 20+ years.

The COP is made up of 15 "urban villages"; the Central City and Estrella urban villages are located within the WVBA. The COP has identified Estrella as a targeted growth area due to the amount of agricultural land available for development and is expected to experience significant increases in both employment and residential growth.

In 2000, the highest percentages of land use for Central City, Estrella, and City of Tolleson were:

- Central City - transportation/airport (28%); industrial (16%); small lot residential (11%); and commercial/vacant/public space.
- Estrella - agriculture (49%); industrial (18%); public (8%); and parks/open space/vacant/developing residential.
- Tolleson - agriculture (46%); industrial/warehouse (24%); residential (14%); and parks/open space/vacant/developing residential (25%). Land use in eastern Tolleson, adjacent to the WVBA, is primarily agriculture and industrial.

By 2030, Central City and Estrella are projected to grow to the following numbers:

- Central City – Employment (116,000; 6% increase); population (164,000; 20% increase); and households (66,000; 12% increase).
- Estrella - Employment (148,000; 215% increase); population (146,000; 240% increase); and households (40,000; 300% increase).

As part of the land and water use study, 57 standardized questionnaires were mailed to stakeholders within the WVBA.

5.2 Current and Reasonably Foreseeable Water Use

Reasonably foreseeable water use is that likely to occur within 100 years unless a longer time period is shown to be reasonable based on site-specific information. The following information on current and reasonably foreseeable water use within the WVBA is based on the Land and Water Use Report (Terranext, 2012b) and completed questionnaires, as well as the 2005 update to the COP's Water Resources Plan (COP, 2005). Note that the 2005 update to the COP's Water Resources Plan was prepared using growth rates and water use projections that were made prior to the economic downturn and housing slump in the Phoenix metropolitan area beginning in 2008; to the extent new plans are finalized, this information will be incorporated into the FS. In addition, contingency strategies and measures will be included in the FS to address reasonably foreseeable uses of groundwater with uncertain time frames. These contingencies may include a trigger resulting in implementation of a pre-selected strategy or measure, or possibly a focused remedy selection process in which the water provider and stakeholders select the strategy or measure at that time.

5.2.1 Current Water Use

Groundwater within the WVBA is used for agricultural purposes and some industrial use, but is not used as a municipal drinking water supply. COP and SRP do not have production wells located within the WVBA (COP, 2005; SRP, 2011). During the irrigation season (approximately March to September), RID produces approximately 75,000 AFY of groundwater within the WVBA from 32 irrigation wells located within or adjacent to the WVBA. There are also a few domestic water wells within the WVBA, as discussed below.

City of Phoenix – The COP Water Resources Plan (2005) provides guidance for water acquisition, water management, and infrastructure to ensure a sustainable water supply for current customers and anticipated growth over the next 50 years. In a normal supply year, the COP water demand of approximately 500,000 AFY is met with the following sources:

- SRP (54 percent);
- Central Arizona Project ([CAP]; 36 percent);
- Reclaimed Water (7 percent); and
- Groundwater (3 percent).

In years with surface water shortfalls, a portion of the COP supply may consist of groundwater pumped from SRP wells. The COP also maintains a number of groundwater production wells for operational flexibility and use when CAP and/or SRP supplies are reduced (COP, 2005). As noted above, there are no COP or SRP production wells within the WVBA (COP, 2005; SRP, 2011).

The COP has approximately 30 groundwater production wells that can generate 67 million gallons of water per day (75,000 AFY); these wells are located one mile or more from the WVBA, mostly in the north-central portion of the COP. The actual number of available production wells varies at any given time. Based on the current COP production well capacity and a 65 percent duty cycle, the COP can produce approximately 44,000 AFY (COP, 2005). The current projected groundwater use for normal supply years and general Plan-based growth is 15,000 AFY.

Historically, the COP has developed or acquired more than 200 production wells. A majority of these wells were removed from service due to age, decreased efficiency, and/or degraded groundwater quality. From 1981 to 2000, the total loss of the COP well production due to degraded groundwater quality exceeded 90,000 AFY. While some COP production wells have been impacted by VOCs, many COP wells have been closed due to groundwater degradation from inorganic constituents such as chromium, arsenic, and nitrate (COP, 2005).

Salt River Project: The SRP is responsible for managing surface water and groundwater rights within the Salt River Reservoir District (SRRD) geographic region. Groundwater within the WVBA underlies the SRRD. SRP has approximately eight groundwater production wells located in the vicinity of the WVBA that feed the SRP canal laterals discussed in Section 2.5; however, no SRP wells are located within the WVBA. To date, SRP's use of these wells has not been impacted by the WVBA (SRP, 2011). These wells are used to supplement surface water supply on an as-needed basis. Therefore, the annual use of groundwater fluctuates depending upon the availability of surface water (SRP, 1996).

Roosevelt Irrigation District: RID pumps the largest amount of groundwater within the WVBA and provides irrigation water to members in its service area west of the Agua Fria River (outside of the WVBA). In the late 1910's, waterlogged land, resulting from regional hydrogeologic conditions and irrigation return flows, threatened local farming operations within the WVBA. In 1920, SRP entered into an agreement with the Carrick and Mangham Agua Fria Lands and Irrigation Company, RID's predecessors, to withdraw a certain amount of groundwater to help alleviate the waterlogged conditions. According to SRP, the 1920 agreement and subsequent supplemental agreements for water production with Carrick-Mangham and RID will expire in 2026 (SRP, 2009).

RID operates approximately 50 wells within the SRRD during the peak irrigation season, generally from March to September (Terranext, 2012a); 32 of these wells are located within or adjacent to the WVBA (Figure 3). The total depth of RID wells within and adjacent to the WVBA range from 284 feet to 1,800 feet deep; most of the RID wells are screened across the UAU1, UAU2, and into the upper MAU, with some of the deeper wells screened across the UAU1, UAU2, MAU, and into the LAU. Approximately 135,000 AFY are extracted during RID operations (SRP, 2009) and conveyed to the RID irrigation service area west of the Agua Fria River via a conveyance system of canals and pipelines. About 75,000 AFY are pumped from 32 RID wells within and adjacent to the WVBA[5] and 60,000 AFY are pumped from the remaining 18 RID wells. During 2008 and 2009, the average pumping rate of RID wells within the WVBA ranged from approximately 1,500 to 4,800 gallons per minute (Montgomery & Associates, 2009a).

[5] Approximately 16 RID wells contain COCs above the AWQS; these wells pump about 37,000 AFY.

The COP 23rd Avenue wastewater treatment plant also discharges approximately 30,000 AFY to the RID Main Canal on a year-round basis as part of a “3-way exchange” between the COP, RID, and SRP in which: (1) the COP delivers 30,000 AFY of reclaimed water to RID for irrigation use within RID’s service area; (2) RID leases SRP wells to provide a like amount of water to the SRP canal system; and (3) SRP then delivers 20,000 AFY to COP water treatment plants and 10,000 AFY to the Salt River Pima-Maricopa Indian Community (COP, 2005). This arrangement with RID provides the COP access to SRP supplies and generates groundwater pumping credits through “in-lieu” recharge, which allows the COP to accrue credits for groundwater that would have otherwise been pumped if not for the water provided to RID.

City of Tolleson: The COP supplies Tolleson with municipal water through an Inter-Governmental Agreement. Tolleson also has four production wells located west of the WVBA that are mainly used in the summer months as a backup supply (City of Tolleson, 2005).

Private Water Wells: Outreach letters were sent to 48 possible domestic well owners in 1995. Of the 18 responses received, three reported operational private domestic wells, 12 reported a municipal water supply, and three reported private wells not used for consumptive purposes. A follow-up telephone call was made to the 18 respondents; 17 were contacted and nine allowed access to sample their well (Terranext, 2012b). On 31 March 1995, groundwater samples were collected from each of the 10 domestic wells on the nine properties. Groundwater samples from two of the wells contained detectable concentrations of TCE and PCE. A well registered to Southwest Trail Boss (345 S. 83rd Avenue) contained TCE and PCE at concentrations below the MCLs; according to the completed questionnaire, this well was not used for drinking water. A well registered to Greenwood Memory Lawn (2300 West Van Buren) contained TCE (6.9 μg/L) and PCE (below MCL). The remainder of the domestic wells sampled did not contain TCE or PCE above their respective MCLs. Completed ADEQ Land and Water Use questionnaires also indicated the following private wells are located in the WVBA (Terranext, 2012b):

- Straight Arrow Enterprises (one well for domestic and landscaping use);
- 7300 W. Van Buren (domestic and livestock watering uses);
- 5727 W. Van Buren (domestic use for two residences);
- 6510 W. Buckeye (unidentified use);
- U.S. Department of Energy (one irrigation well); and
- APS (seven wells for industrial use).

No private well owners responded to the solicitation for ROs (ADEQ, 2012).

5.2.2 Reasonably Foreseeable Water Use

As discussed above, groundwater within the WVBA is used for agricultural purposes and some industrial use, but is not used as a municipal drinking water supply. It is anticipated that RID’s groundwater pumping (approximately 75,000 AFY) of 32 irrigation wells located within or adjacent to the WVBA for delivery of irrigation water to their service area located outside of the WVBA will continue until the year 2026. Because land use within the WVBA is transitioning from irrigated lands for agricultural purposes to more urbanized, municipal uses, the associated groundwater uses will also transition in the reasonably foreseeable future. These groundwater uses may include use of eight SRP groundwater production wells in the vicinity of the WVBA for municipal drinking water supply, with a total pumping rate of approximately 16,000 AFY (SRP, 2011). As noted above, these wells are outside of the WVBA and are not impacted by the WVBA.

Note that there is considerable uncertainty regarding the exact timing of groundwater needs within the WVBA in the reasonably foreseeable future, primarily due to the uncertain affects of ongoing drought conditions and the impact of the recent economic downturn and associated slow down in development. The 2005 update to the COP's Water Resources Plan was prepared using growth rates and water use projections that were made prior to the economic downturn and housing slump in the Phoenix metropolitan area beginning in 2008; to the extent new plans are finalized, this information will be incorporated into the FS. In addition, contingency strategies and measures will be included in the FS to address reasonably foreseeable uses of groundwater with uncertain time frames. These contingencies may include a trigger resulting in implementation of a pre-selected strategy or measure, or possibly a focused remedy selection process in which the water provider and stakeholders select the strategy or measure at that time.

City of Phoenix: The COP has identified additional water sources to prepare for projected growth and the possibility of potentially severe surface water shortfalls (COP, 2005). These water sources include:

- Increasing the COP's groundwater production capacity and supplementing aquifer recharge;
- Importing groundwater from the COP's McMullen Valley water farm;
- Increasing reclaimed water use through an expansion of the distribution system and via recharge and recovery;
- Acquiring additional Colorado River supplies;
- Partnering with other water suppliers; and
- Managing demand.

The COP's local production well network could be expanded to reduce drought impacts, meet peaking needs, and provide operational flexibility. From 2005 to 2055, the projected groundwater use for normal supply years and general Plan-based growth is 15,000 AFY. Based on a preliminary analysis of potential shortfalls under moderate drought conditions, the COP estimates that between 20,000 AFY and 28,000 AFY of additional groundwater may be needed to address these shortfalls (COP, 2005). The analysis concluded that the central and north-central portions of the COP service area would be the most appropriate locations for additional well capacity. A more detailed analysis could result in an increase in additional well capacity; however, the need for additional capacity could decrease should other non-well options be used (COP, 2005). The north-central part of the COP service area is outside of the WVBA.

Opportunities for expansion of the COP production well network include:

Rehabilitate or drill new COP wells: The COP has access to several production wells that were closed due to aging equipment and/or degraded water quality. These wells could be re-drilled or rehabilitated and brought back into use. An ADEQ-approved blending program could also be considered to reduce the need for wellhead treatment due to elevated nitrate, TDS, and/or arsenic.

The COP has plans to drill and construct up to four new production wells located along the Salt River between 35th Avenue and 68th Avenue (outside of the WVBA; COP, 2011); these new production wells would be screened in the LAU and are anticipated to provide a total of 12,000 AFY of additional COP groundwater production.

Partner with SRP to rehabilitate or drill new SRP wells to connect to the COP system: SRP has started a groundwater restoration program to rebuild well capacity lost due to urbanization of "on-project" lands (i.e. lands within SRP boundaries). This program seeks to drill or rehabilitate over 100 wells over a 12-year period and SRP has requested that the COP consider directly connecting "stranded" wells to the COP distribution system, provided water quality and access is suitable, or that the COP pursue other partnership opportunities with SRP.

Rehabilitate or drill new wells for discharge to SRP or CAP canals: The COP could partner with SRP or other entities to increase supplies available to canals during surface water shortages. Through its groundwater restoration program, SRP is seeking to increase capacity along its main canal system. Regarding CAP canals, it is anticipated that groundwater production wells outside of the Phoenix service area would provide Arizona Water Banking Authority (AWBA) backup of CAP supplies, providing the COP and AWBA opportunities to create recovery capacity.

Salt River Project: SRP has eight groundwater production wells near the WVBA (none of the eight wells are within the WVBA). To date, SRP's use of these wells has not been impacted by the WVBA. As a result of changing land use in the area, SRP anticipates that these eight wells will be used for drinking water purposes in the reasonably foreseeable future, either by directly connecting the wells to municipal distribution systems within the SRRD, or piping to municipal water treatment plants located on the SRP canal system as a drought supply (SRP, 2011). SRP projects that average annual pumpage from SRP wells in the vicinity of the WVBA in the reasonably foreseeable future will be on the order of 16,000 AFY (SRP, 2011).

Roosevelt Irrigation District: Under agreements with the SRP, RID operates approximately 50 wells within the SRRD during the peak irrigation season, generally from March to September (Terranext, 2012b); 32 of these wells are located within or adjacent to the WVBA. Approximately 135,000 AFY are extracted during RID operations (SRP, 2009) and conveyed to the RID irrigation service area outside the WVBA and west of the Agua Fria River via a system of canals and pipelines. According to SRP, the 1920 agreement and subsequent supplemental agreements with Carrick-Mangham and RID will expire in 2026 (SRP, 2009).

The Land and Water Use Report (Terranext, 2007) questionnaire completed by RID stated that RID's current water use is *"used for nonpotable purposes within the District's boundaries"* and RID's future water use of wells, canals, and laterals for the foreseeable future *"will continue to be used much as they are today"*; the RID questionnaire also stated the future use (up to 100 years) for any RID well impacted by the WVBA would be *"Same as today."* However, RID submitted to ADEQ a revised questionnaire dated 12 January 2010; this revised questionnaire stated that *"Currently, the wells in the WVB site provide water supply for irrigation but the wells will transition to drinking water supply as residential and commercial development continues in the District"*. ADWR has expressed concern about RID's authority to move groundwater from within the boundaries of a water provider that has obtained a Designation of Assured Water Supply (in this case the City of Phoenix) and the potential to negatively affect that Designation (ADWR, 2010). Others have raised additional concerns regarding RID's authority to move groundwater from within the WVBA in the future (SRP, 2011; West Van Buren Working Group, 2011). These questions have not been resolved.

The COP 23rd Avenue wastewater treatment plant also discharges approximately 30,000 AFY to the RID Main Canal on a year-round basis as part of a the COP/RID/SRP "3-way exchange". However, the 2005 update to the COP Water Resources Plan states, with regard to reclaimed water use, *"An additional factor to consider involves the diminishment of the "three way" exchange and the RID GSF* [groundwater storage facility] *over time due to urbanization of agricultural lands."* and that, in the future, excess reclaimed water from the COP 23rd Avenue wastewater treatment plant may be stored at the Agua Fria Linear Recharge Project (COP, 2005). The water supply and demand modeling assumptions in the COP Water Resources Plan assumes that the COP/RID/SRP "3-way exchange" phases out in 2025 (COP, 2005).

Private Water Wells: Based on the completed ADEQ Land and Water Use questionnaires, there are no planned changes to the limited number of private water wells within the WVBA (Terranext, 2012b). Those uses include irrigation, industrial, livestock watering, and household domestic uses.

Current and future water uses described above will be used in the groundwater model to simulate possible future groundwater conditions in order to develop a better understanding of potential future groundwater hydraulic conditions, which will be a key component of evaluating various remedial alternatives.

5.3 Remedial Objectives

Pursuant to R18-16-406(I), ADEQ established ROs for current and reasonably foreseeable land and water use based on the Land and Water Use Report (Terranext, 2012b) and public comments (ADEQ, 2012). The FS will evaluate remedial measures capable of achieving the final ROs, which are established for each listed use to:

- Protect against loss or impairment of each listed use that is threatened to be lost or impaired as a result of a release of a hazardous substance;
- Restore, replace, or otherwise provide for each listed use to the extent that it has been or will be lost or impacted as a result of a release of a hazardous substance;
- Provide time frames when action is needed to protect against or provide for the impairment or loss of the use; and
- Provide the projected duration of the action needed to protect or provide for the use.

As stated in the Arizona Administrative Register's March 2002 Notice of Exempt Rulemaking, Title 18 (Environmental Quality), Chapter 16 (WQARF Program), "*Remedial objectives described in this rule* [R18-16-406] *are based on uses determined by the community and are defined by the Department with significant community involvement. The objectives are designed to protect and provide for uses of land and water. This does not mean that the aquifer will always be cleaned up to drinking water standards or to a level suitable for the use. Instead, the rule requires different uses to be identified and a remedy is selected which will protect and provide for the uses.*"

The following sections discuss the specific WVBA RO categories that will be included in the FS.

5.3.1 Remedial Objectives for Land Use

The ROs for land use in the WVBA are (ADEQ, 2012):

1. Protect against possible exposure to hazardous substances in surface and subsurface soils that could occur during development of property based upon applicable zoning regulations.
2. Protect against possible leaching of hazardous substances in surface and subsurface soils to the groundwater.
3. Protect against the loss or impairment of current and all reasonably foreseeable future uses of land as provided in zoning regulations and the Land and Water Use report as a result of hazardous substances in surface and subsurface soils. Appropriate remedial actions will be implemented as an Early Response Action (ERA) or after the record of decision (ROD) is finalized which ever is warranted and continued until hazardous substances causing the impairment or restriction to the land use are remediated.

The Working Group suggested changes to the Land Use ROs in its 30 June 2011 comment letter (Appendix A). The FS will incorporate the final ROs as determined by ADEQ.

5.3.2 Remedial Objectives for Groundwater Use

ADEQ's RO Report included ROs for municipal, agricultural, and private uses of groundwater.

<u>Municipal Groundwater Use</u>: The ROs for current and reasonably foreseeable future municipal groundwater use in and near the WVBA are (ADEQ, 2012):

1. To protect, restore, replace or otherwise provide a water supply for municipal use by currently and reasonably foreseeable future municipal well owners within the WVBA WQARF site if the current and reasonably foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.
2. To protect, restore, replace or otherwise provide a water supply for municipal groundwater use by currently and reasonably foreseeable future municipal well owners outside the current plume boundaries of the WVBA WQARF site if the current and reasonably foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.

Agricultural Groundwater Use: The ROs for current and reasonably foreseeable future agricultural groundwater use in and near the WVBA are (ADEQ, 2012):

1. To protect, restore, replace or otherwise provide for the current and reasonably foreseeable future supply of groundwater for agricultural/irrigation use and for the associated recharge capacity that is threatened by or lost due to contamination associated with the WVBA WQARF site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.

Private Groundwater Use: The ROs for current and reasonably foreseeable future private groundwater use in and near the WVBA are (ADEQ, 2012):

1. To protect, restore, replace or otherwise provide a water supply for potable or non-potable use by currently impacted commercial, industrial, and domestic well owners within the WVBA WQARF site if the current and reasonably foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.
2. To protect, restore, replace or otherwise provide a water supply for potable or non-potable use by commercial, industrial, and domestic well owners outside the current plume boundaries of the WVBA WQARF site if the current and reasonably foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.

5.3.3 Remedial Objectives for Canal Water Use

The ROs for RID's current and reasonably foreseeable future canal water use in and near the WVBA are (ADEQ, 2012):

1. To protect, restore, replace or otherwise provide a water supply for potable or non-potable use by currently impacted RID wells within the WVBA WQARF site if the current and reasonably foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.

2. To protect, restore, replace or otherwise provide a water supply for potable or non-potable use by RID wells outside the current plume boundaries of the WVBA WQARF site if the current and reasonably foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.

5.3.4 Remedial Objectives for Surface Water Use

The ROs for SRP's current and reasonably foreseeable future surface water use in and near the WVBA are (ADEQ, 2012):

1. To protect, restore, replace or otherwise provide a water supply for potable or non-potable use by SRP wells outside the current plume boundaries of the WVBA WQARF site if the current and foreseeable future uses are impaired or lost due to contamination from the site. Remedial actions will be in place for as long as need for the water exists, the resource remains available and the contamination associated with the WVBA WQARF site prohibits or limits groundwater use. Remedial actions to meet ROs will be implemented upon issuance of the ROD. If there is an imminent risk to human health or the environment, then an ERA may be initiated prior to implementation of the ROD.

6. IDENTIFICATION AND SCREENING OF REMEDIAL ALTERNATIVES

A remedial alternative is the combination of a remedial strategy and applicable remedial measures that together are capable of achieving the ROs. Remedial strategies refer to plume-wide general approaches; the remedial measures refer to specific actions such as well replacement, well modification, well head treatment, etc. Remedial technologies, on the other hand, consist of the actual equipment, materials, and/or processes used to implement the remedial strategy and measures. The FS will identify the appropriate technologies that have the potential of achieving the ROs and then assemble the technologies into various remedial alternatives that employ different strategies and measures. The following sections discuss the process of identifying and screening remedial technologies and assembling the required remedial alternatives for evaluation.

6.1 Remedial Technologies

Appropriate remedial technologies will be identified and screened to address impacted WVBA soil, soil vapor[6], and groundwater according to the following criteria:

- Compatibility with current and reasonably foreseeable groundwater uses;
- Compatibility with current and reasonably foreseeable land use;
- COC treatment effectiveness;
- Regulatory requirements;
- Constructability;
- Operation and maintenance requirements;
- Hazardous materials and other health and safety considerations;
- Generation and management of waste products;
- Flexibility and expandability; and
- Cost.

Technologies that may be screened include, but may not be limited to, hydraulic control/mass removal, in-situ chemical oxidation, bio-augmentation, bio-stimulation, and aeration-based remedies such as in-well stripping, air sparging, and SVE.

The technologies that rank the highest after screening will be retained for development of the reference remedy and alternative remedies. The retained technologies will be compiled with selected remedial strategies and measures to develop the reference remedy and alternative remedies.

6.2 Reference Remedy and Alternative Remedies

Based on the retained technologies and the selected remedial strategies and measures, a minimum of three alternative remedies capable of reasonably achieving the ROs will be developed, including a reference remedy and at least two alternative remedies [R18-16-407(E)(1) and (3)]. At least one of the alternative remedies will employ a remedial strategy or combination of strategies that is more

[6] Soil and soil vapor remedies will be evaluated primarily as part of a remedy for VOC source control to eliminate or mitigate a potential continuing source of groundwater contamination.

aggressive than the reference remedy [R18-16-407(E)(3)] and at least one of the alternative remedies will employ a remedial strategy or combination of strategies that is less aggressive than the reference remedy [R18-16-407(E)(3)].

Each alternative remedy to be evaluated will consist of the remedial strategy and all remedial measures to be employed [R18-6-407(E)(1)]. A remedial strategy may incorporate more than one technology or methodology [R18-16-407(F)] and different remedial technologies or methodologies may also be applied to different portions of the aquifer. Remedial strategies are specifically identified in R18-16-407(F) and include:

1. Plume remediation to achieve water quality standards for COCs in waters of the state throughout the site, historically identified as aquifer restoration;
2. Physical containment to contain contaminants within definite boundaries;
3. Controlled migration to control the direction or rate of contaminant migration, but not necessarily to contain migration of contaminants;
4. Source control to eliminate or mitigate a continuing source of contamination;
5. Monitoring to observe and evaluate the contamination at the site through the collection of data; and
6. No action consists of performing no action at the Site.

Remedial measures necessary for each alternative remedy to achieve ROs or to satisfy the requirements of Arizona Revised Statutes (ARS) § 49-282.06(B)(4)(b) will be identified in consultation with and/or considering the needs of the water providers or known well owners whose water supplies are affected by the release or threatened release of hazardous substances [R18-16-407(G)]. In identifying remedial measures, the needs of the well owners and water providers and their customers, including the quantity and quality of water, water rights and other legal constraints on water supplies, and the reliability of water supplies and any operational implications will be considered [R18-16-407(G)]. Remedial measures may include, but are not limited to, well replacement, well modification, water treatment, provision of replacement of alternative supplies, or engineering controls [R18-16-407(G)].

The combination of the remedial strategy and the remedial measures for each alternative remedy will be able to achieve the ROs. Each remedy alternative to be evaluated will consist of a remedial strategy and all remedial measures to be employed [R18-16-407(E)]. Where appropriate, the reference remedy and alternative remedies may incorporate different remedial strategies for different aquifers or portions of aquifers [R18-16-407(E)(1)]. The reference remedy and any alternative remedies may include contingent remedial strategies or remedial measures to address reasonable uncertainties regarding the achievement of ROs or uncertain time frames in which ROs will be achieved [R18-16-407(E)(1)]. One of the alternative remedies may use the same strategy as the reference remedy, but with different viable technologies or a more intensive use of the same technology. Source control will be considered as an element of the reference remedy and all alternative remedies, except for the monitoring and no action alternatives [R18-16-407(F)]. Selected remedial strategies and measures will be combined with the retained technologies to develop the reference remedy and alternative remedies.

As noted in Section 5.2, contingency strategies and measures will be included in the reference remedy and alternative remedies to address reasonably foreseeable uses of groundwater with uncertain time frames. These contingencies may include a trigger resulting in implementation of a pre-selected strategy or measure, or possibly a focused remedy selection process in which the water provider and stakeholders select the strategy or measure at that time.

6.3 Reference Remedy

The reference remedy will be developed based on best professional judgment, considering the following [R18-16-407(E)(2)]:

1. RI information;
2. Best available scientific information concerning available remedial technologies; and
3. Preliminary analysis of the comparison criteria and the reference remedy to comply with ARS § 49-282.06.

6.4 More Aggressive Remedy

At least one of the alternative remedies will employ a remedial strategy or combination of strategies that is more aggressive than the reference remedy [R18-16-407(E)(3)]. A more aggressive strategy is one that requires fewer remedial measures to achieve ROs, a strategy that achieves ROs in a shorter period of time, or a strategy that is more certain in the long term and requires fewer contingencies[R18-16-407(E)(3)].

6.5 Less Aggressive Remedy

At least one of the alternative remedies will employ a remedial strategy or combination of strategies that is less aggressive than the reference remedy [R18-16-407(E)(3)]. A less aggressive strategy would achieve ROs in a longer period of time, may rely upon more natural chemical concentration reduction processes and/or may have a greater degree of effectiveness uncertainty requiring a greater number of contingencies.

7. EVALUATION OF REFERENCE REMEDY AND ALTERNATIVE REMEDIES

A comparative evaluation of the reference remedy and at least two alternative remedies will be conducted and discussed in the FS Report [R18-16-407(H)]. The evaluations will include:

1. A demonstration that the remedial alternative will achieve the ROs;
2. An analysis of consistency with the water management plans of the affected water providers and the general land use plans of local government with land use jurisdiction; and
3. An evaluation of the comparison criteria.

7.1 Evaluation of Comparison Criteria

Each alternative remedy will be evaluated according to the comparison criteria, which include practicability, risk, cost, and benefit or value [R18-16-407(H)(3)]. A discussion of the comparison criteria, evaluated in relation to each other, with the associated uncertainties, will be included in the FS Report [R18-16-407(H)(3)(e)]. The comparison criteria are described in the following sections.

7.1.1 Practicability

The practicability of the remedies, including their feasibility, short- and long-term effectiveness, and reliability will be evaluated [R18-16-407(H)(3)(a)]. The evaluation of practicability will consider site-specific conditions, characteristics of the contamination resulting from the release, performance capabilities of available technologies, and institutional considerations such as site access issues, easements and rights-of-way, and utilities.

7.1.2 Risk

Risk of the remedies will be evaluated, including their overall protectiveness of public health and aquatic and terrestrial biota under reasonably foreseeable land use scenarios and end uses of water [R18-16-407(H)(3)(b)]. The risk evaluation will include:

1. Fate and transport of contaminants and contaminant concentrations and toxicity over the life of the remediation;
2. Current and future land and resource use;
3. Exposure pathways, duration of exposure, and changes in risk over the lifetime of the remediation;
4. Protection of public health and aquatic and terrestrial biota while implementing the remedial action; and
5. Residual risk in the aquifer at the end of remediation.

7.1.3 Cost

Cost of the remedies will be evaluated, counting the expenses and losses, including capital, operating, maintenance, and life cycle costs [R18-16-407(H)(3)(c)]. The cost analysis may include the analysis of uncertainties that may impact the cost of the remedial alternatives, analysis of projected water uses and costs associated with use-based treatment, other use impairment costs of water not remediated to water quality standards, and the cost of alternative water supply or treatment [R18-16-407(H)(3)(c)]. Transactional costs necessary to implement the remedial alternatives, including the transactional costs of establishing long-term financial mechanisms, such as trust funds for funding of an alternative remedy, will be included in the cost evaluation [R18-16-407(H)(3)(c)]. Given the current and low projected capital interest rates and potential duration of the project, it is proposed that a low or no financial discount factor (less than three percent) be used in the life-cycle cost analysis.

7.1.4 Benefit or Value

An evaluation of the benefit or value of the remedies will be performed. The evaluation of benefit or value will include factors consistent with [R18-16-407(H)(3)(d)] and others such as:

1. Lowered risk to human, aquatic and terrestrial species;
2. Reduced concentration and reduced volume of contaminated water;
3. Decreased liability and acceptance by the public;
4. Aesthetics and preservation of existing uses;
5. Enhancement of future uses;
6. Improvements to local economies; and
7. Sustainability/Water Conservation.

7.2 Proposed Remedy

Based on evaluation and comparison of the reference remedy and other alternative remedies, a Proposed Remedy will be developed and described [R18-16-407(I)]. The Proposed Remedy may be the reference remedy, any of the alternative remedies evaluated in the FS, or a different combination of remedial strategies and remedial measures included in the alternative remedies evaluated in the FS [R18-16-407(I)]. The Proposed Remedy may also include contingency measures to be implemented if needed to meet ROs for a potential future use, as discussed in Section 6.2.

8. FEASIBILITY STUDY REPORT

The FS Report will be prepared to document the FS process and the development and description of the Proposed Remedy [R18-16-407(I)]. The reference remedy and alternative remedies will be developed and described in the FS Report in sufficient detail to allow evaluation using the comparison criteria, but construction level plans are not required [R18-16-407(E)(1)]. The FS Report will describe the reasons for selection of the Proposed Remedy including [R18-16-407(I)]:

1. How the Proposed Remedy will achieve the ROs;
2. How the comparison criteria were considered; and
3. How the Proposed Remedy meets ARS § 49-282.06.

A revised conceptual site model will be included in the FS Report to incorporate other information and data acquired since the RI was completed. A preliminary Draft FS Report that focuses on the selection and evaluation of the proposed remedy will be provided to ADEQ for their review. After ADEQ review, the Draft FS Report will be provided to the public for review and comment. A final FS Report will be prepared to respond to comments and will be submitted to ADEQ for review and final approval.

9. COMMUNITY INVOLVEMENT

Community involvement activities will be performed in compliance with R18-16-404 and in cooperation with ADEQ [R18-16-407(J)]. Community involvement activities will follow the requirements of the WVBA Community Involvement Plan. Specific community involvement activities may include the preparation and distribution of public notices describing the availability of the FS Work Plan and Draft FS Report for public comment and review. Community involvement will also include participation in public meetings scheduled to discuss the FS Work Plan and the Draft FS Report.

10. SCHEDULE

The Feasibility Study schedule is provided on Figure 8.

G:\37503_West_Van_Buren\100_Work Plan\020813 DRAFT FINAL VERSION\2013_0301_HAI_FS Work Plan_DRAFT FINAL_F.docx

REFERENCES

1. Arizona Administrative Code, 2002. *Title 18. Environmental Quality, Chapter 16. Department of Environmental Quality Water Quality Assurance Revolving Fund Program*. March 31, 2002.

2. Arizona Administrative Register, 2002. *Notice of Exempt Rulemaking, Title 18. Environmental Quality, Chapter 16. Department of Environmental Quality Water Quality Assurance Revolving Fund Program, Volume 8, Issue 13*. March 29, 2002.

3. Arizona Department of Environmental Quality, 1998. *West Van Buren Site Registry Report*. January 28, 1998.

4. Arizona Department of Environmental Quality, 2006a. *West Van Buren Water Quality Revolving Fund (WQARF) Site Fact Sheet*. February 2006.

5. Arizona Department of Environmental Quality, 2006b. *West Central Phoenix WQARF Sites Map*. November 2006.

6. Arizona Department of Environmental Quality, 2008. *Water Quality Assurance Revolving Fund Advisory Board Meeting Minutes*. January 18, 2008.

7. Arizona Department of Environmental Quality, 2009. *West Van Buren Water Quality Assurance Revolving Fund Site, Community Action Board Meeting Minutes*. December 10, 2009.

8. Arizona Department of Environmental Quality, 2010a. *West Van Buren WQARF Site Map*. January 2010.

9. Arizona Department of Environmental Quality, 2010b. *West Van Buren Water Quality Revolving Fund (WQARF) Site Summary*. March 2010.

10. Arizona Department of Environmental Quality, 2010c. *West Central Phoenix Water Quality Revolving Fund (WQARF) Site Summary*. March 2010.

11. Arizona Department of Environmental Quality, 2010d. *Conditional Approval of a Water Quality Assurance Revolving Fund (WQARF) Early Response Action (ERA) Work Plan for the West Van Buren Registry Site*. June 24, 2010.

12. Arizona Department of Environmental Quality, 2011a. *Motorola 52nd Street Superfund Site Map*. 2011.

13. Arizona Department of Environmental Quality, 2011b. *Proposed Remedial Objectives Report, West Van Buren Area WQARF Registry Site, Phoenix, Arizona*. May 16, 2011.

14. Arizona Department of Environmental Quality, 2012. *Remedial Objectives Report, West Van Buren Area WQARF Registry Site, Phoenix, Arizona*. August 8, 2012.

15. Arizona Department of Water Resources, 2010. *Letter from Herb Guenther to Stan Ashby*. May 7, 2010.

16. Arizona Revised Statutes. *Title 49 - The Environment. Section 49-282.06 - Remedial Action Criteria*.

17. Brown, J.G. and Pool, D.R., 1989. *Hydrogeology of the Western Part of the Salt River Valley, Maricopa County, Arizona: U.S. Geological Survey Water Resources Investigations Report 88-4202*.

18. City of Phoenix, 2004. *2004 General Plan*.

19. City of Phoenix, 2005. *Water Resources Plan, 2005 Update*.

20. City of Phoenix, 2011. *Email Communication from Manager of COP Environmental Programs*. June 6, 2011.

21. City of Tolleson, 2005. *2005 General Plan*.

22. Dames and Moore, 1985. *Final Report. Groundwater Monitoring Well Installation and Testing, Phoenix Terminal.*

23. Fetter, C.W., 1993. Contaminant Hydrogeology. MacMillan Publishing.

24. Montgomery & Associates, 2009a. *Roosevelt Irrigation District Groundwater Response Action, West Van Buren Water Quality Assurance Revolving Fund Site*. September 24, 2009.

25. Montgomery & Associates, 2009b. *Roosevelt Irrigation District Early Response Action, West Van Buren Water Quality Assurance Revolving Fund Site*. October 5, 2009.

26. Montgomery & Associates, 2010. *Roosevelt Irrigation District Revised Early Response Action, West Van Buren Water Quality Assurance Revolving Fund Site*. February 3, 2010.

27. Roosevelt Irrigation District. Water Quality Data, 1985 – 1989.

28. Roosevelt Irrigation District. *Revised Land and Water Use Questionnaire*. January 12, 2010.

29. Salmon, Lewis & Weldon, 2010. *Letter to ADEQ re: West Van Buren WQARF Site, Roosevelt Irrigation District Proposal for Early Response Action.* April 22, 2010.

30. Salt River Project, 1996. *Assured Water Supply Study for Salt River Project Member Lands*.

31. Salt River Project, 2009. *Letter to ADEQ re: West Van Buren WQARF Site, Roosevelt Irrigation District's Proposed Early Response Plan*. December 4, 2009.

32. Salt River Project, 2011. *Letter to ADEQ re: Arizona Department of Environmental Quality Notice of the Availability of the Proposed Remedial Objectives Report for the West Van Buren WQARF Registry Site in Phoenix, Arizona*. June 30, 2011.

33. Shaw Environmental, 2008. *Groundwater Monitoring Report for Motorola 52nd Street Superfund Site, Operable Unit 3 Study Area, Phoenix, Arizona*. March 2008.

34. Terranext, 2007. *Land and Water Use Report, West Van Buren Area WQARF Registry Site, Phoenix, Arizona*. December 2007.

35. Terranext, 2008. *Draft Remedial Investigation Report, West Van Buren Area WQARF Registry Site, Phoenix, Arizona*. October 2008.

36. Terranext, 2012a. *Remedial Investigation Report, West Van Buren Area WQARF Registry Site, Phoenix, Arizona*. August 2012.

37. Terranext, 2012b. *Land and Water Use Report, West Van Buren Area WQARF Registry Site, Phoenix, Arizona*. March 2012.

38. United States Environmental Protection Agency, Region 9. 2010. *Motorola, Inc. (52 Street Site) Superfund Site Fact Sheet*. July 27, 2010.

39. United States Geological Survey, 2010. *Conceptual Understanding and Groundwater Quality of Selected Basin-Fill Aquifers in the Southwestern United States, Professional Paper 1781*.

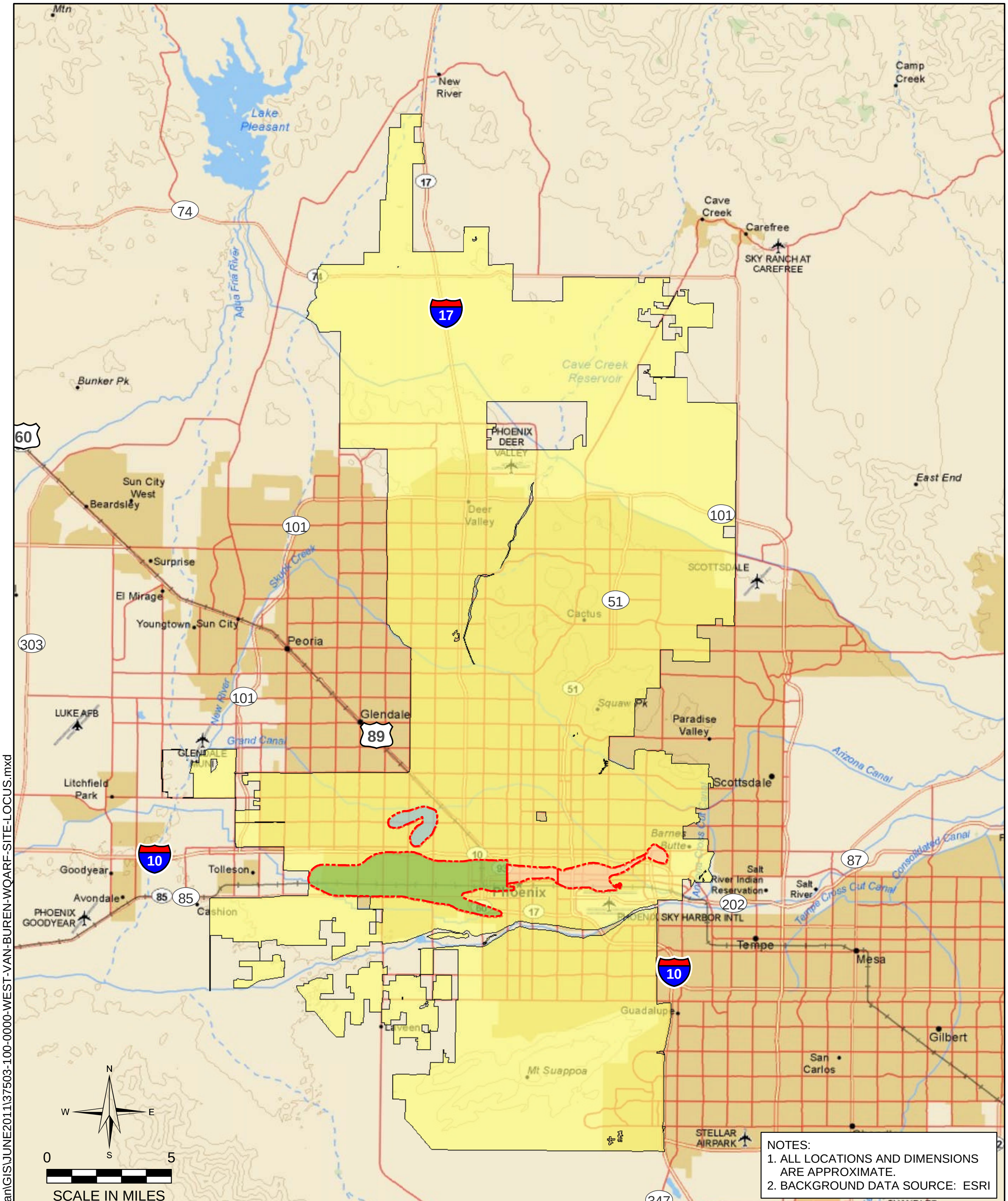
40. West Van Buren Working Group, 2011. *Letter to ADEQ re: Proposed Remedial Objectives Report for the West Van Buren WQARF Registry Site*. June 30, 2011.

41. Weston, 2000. Central Phoenix Groundwater Model. Prepared for ADEQ.

TABLE I
WVBA FACILITY SUMMARY MATRIX
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

Facility	Historical Operations	Site Investigation Activities	Remedial Actions	Current Regulatory Status
Air Liquide America Specialty Gases, LLC	Industrial and medical gases - site operations began in 1963. TCA used to clean compressors, valves, and other equipment from 1973 to 1996.	Soil, soil gas, and groundwater investigations began in 1998. In 2007, facility entered into Consent Order with ADEQ for additional site investigations.	**SOIL** Source area work was performed in the former Air Separation Unit - South Room, consisting of excavation of the west grease trap, south grease trap, and surrounding soils to depths ranging from 3 to 5.75 feet.	The 2007 Consent Order was recently re-negotiated and now includes additional soil investigation along with groundwater monitoring.
American Linen Supply Company (ALSCo)	Dry cleaner - ceased operations in 1995. PCE used from 1956 to 1984.	Soil, soil gas, and groundwater investigations began in 1992. Settled with ADEQ in 1997.	1999: Early Response Action conducted by ADEQ. **SOIL** 1999 to 2003: SVE performed. 2002: SVE system shutdown and rebound monitoring performed. **GROUNDWATER** 1999 to 2003: Air sparging and groundwater extraction. 2002: Air sparging system shutdown. 2003: Groundwater extraction system shutdown.	2008: NFA for soil.
ChemResearch Co., Inc.	Electroplating, metal finishing and metal parts painting - site operations began in 1953. Chromium plating operations. PCE vapor degreasing during historical operations.	Soil, soil gas, and groundwater investigations began in 1990.	**SOIL** 1995: Excavated and removed chromium-impacted soil to 10.5 feet bgs in the chromium plating east bay area. To date, no VOC-impacted groundwater remediation has been conducted.	ADEQ-approved Remedial Action Plan to conduct additional soils investigation and remediation. Unknown whether the remediation is related to chromium or VOC impacts, or both.
Department of Energy	Electrical substation and operations and maintenance facility, including administration, maintenance, storage, and vehicle fueling areas - site constructed in 1941. Chlorinated solvents reportedly used during historical operations.	Soil, soil gas, and groundwater investigations began in 1992.	None to date – unclear whether remedial actions are required by ADEQ.	ADEQ-approved soil sampling plan related to five disposal structures, the installation of additional monitoring wells, and continued monitoring.
Dolphin, Inc.	Wax pattern preparation, silica shell preparation, casting, and cleaning and finishing - site operations began in 1968. PCE and TCA reportedly used during operations. PCE used in vapor degreasing; PCE use was discontinued in 1994.	Soil, soil gas, and groundwater investigations began in 1988. RCRA Consent Order was issued by ADEQ in 2000.	**SOIL** 1998 to 2002: SVE performed. 2002: SVE system shutdown and rebound sampling. **GROUNDWATER** 1998 to 2002: Air sparging performed.	2006: Termination of ADEQ Consent Order.
Maricopa County Materials Management (MCMM)	1964 - 1974: Southwest Solvents operated on property now owned by MCMM - solvent recycling operation; reclaimed solvents included PCE, TCE, TCA, and Freon. 1974: Printing operation by MCMM; use of multi-graphic blankwash cleaning solutions and SafetyKleen cleaning solution reportedly containing PCE.	Soil, soil gas, and groundwater investigations began in 1992.	**SOIL** 1995 to 1997: SVE. 1997: SVE system shut down due to asymptotic conditions; subsequent soil vapor samples were below Soil Remediation Levels (SRLs).	2001: Maricopa County and Union Pacific Railroad settled with ADEQ to cover response and oversight costs.
Prudential Overall Supply	Dry cleaner - began operations in 1982. PCE used from 1982 to 1991.	Soil and soil gas investigation activities began in 2004; three groundwater monitor wells have been installed and are monitored and sampled per ADEQ Consent Orders. Soil vapor extraction wells have been installed and tested.	**SOIL** A Remedial Action Plan was prepared and approved by ADEQ for remediation of Site soils. Installation and operation of a soil vapor extraction system to address soil impacts is in progress.	Working under the June 2010 amended Consent Order with ADEQ.
Reynolds Metals Co.	1946 to 1983: Aluminum extrusion facility. Stoddard solvent used until early 1970s; vapor degreasing with TCA used until facility closed in 1983.	Soil, soil gas, and groundwater investigations began in 1988.	**SOIL** 1989 to 1991: SVE. 1991: SVE system was shut down after asymptotic conditions were reached. Excavated and removed approximately 3,100 tons of contaminated soil (primarily impacted with petroleum hydrocarbons).	2000: ADEQ issued NFA for soil at 14 target areas.
Van Waters & Rogers (Univar USA Inc.)	Industrial chemical warehousing, distribution, repackaging, and transport facility - site acquired in 1968; office and warehouse built in 1971. Wastewater pre-treatment system, RCRA Interim Status Storage unit, sewer interceptor, and a bulk solvent tank farm.	Soil, soil gas, and groundwater investigations began in 1989. 1996: Consent Order with ADEQ related to additional site investigations.	**SOIL** 1992 to 1998: SVE. 1998: SVE system shut down.	2002: Termination of ADEQ Consent Order. 2002: NFA for soils.

NOTES:
1. AS = Air sparging
2. NFA = No further action
3. PCE = Tetrachloroethene
4. SVE = Soil vapor extraction
5. TCA = 1,1,1-Trichloroethane
6. TCE = Trichloroethene
7. VOCs = Volatile organic compounds



G:\37503 West Van Buren\100 Work Plan\GIS\JUNE2011\37503-100-0000-WEST-VAN-BUREN-WQARF-SITE-LOCUS.mxd

LEGEND

- Motorola 52nd Street Superfund Site
- West Van Buren Area WQARF Site
- West Osborn Complex (WOC) WQARF Site
- City of Phoenix Boundary

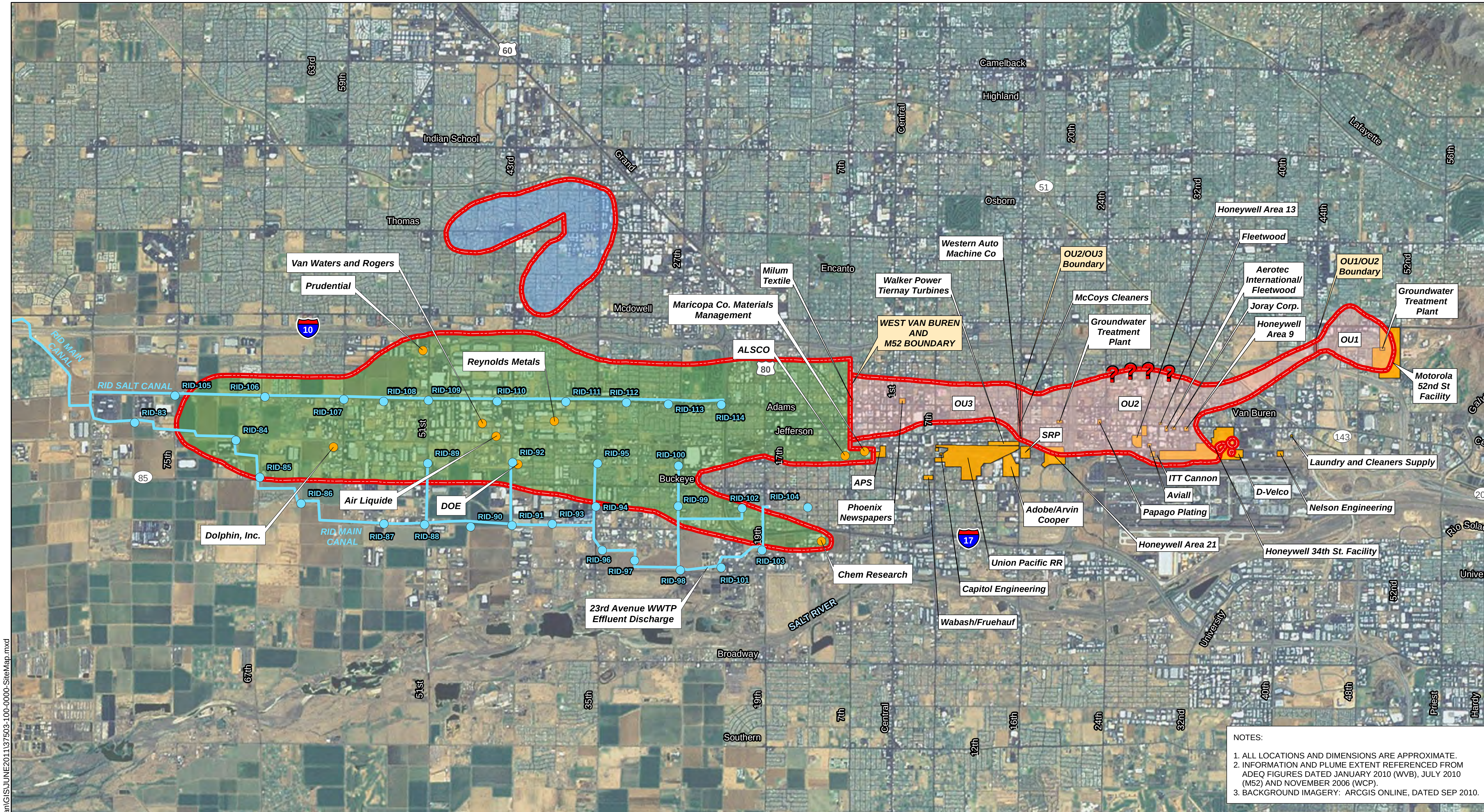
HALEY & ALDRICH

WEST VAN BUREN AREA
WQARF SITE
PHOENIX, AZ

SITE LOCUS

SCALE: AS SHOWN
MARCH 2013

FIGURE 1



NOTES:

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. INFORMATION AND PLUME EXTENT REFERENCED FROM ADEQ FIGURES DATED JANUARY 2010 (WVB), JULY 2010 (M52) AND NOVEMBER 2006 (WCP).
3. BACKGROUND IMAGERY: ARCGIS ONLINE, DATED SEP 2010.

LEGEND

- Roosevelt Irrigation District Well
- Contour represents estimated area of volatile organic compounds in groundwater that exceed the Aquifer Water Quality Standards.
- ? Insufficient Data
- OU Area Boundary
- Motorola 52nd Street Superfund Site
- West Van Buren Area WQARF Site
- West Osborn Complex (WOC) WQARF Site

N W E S

0 5000

SCALE IN FEET

HALEY & ALDRICH

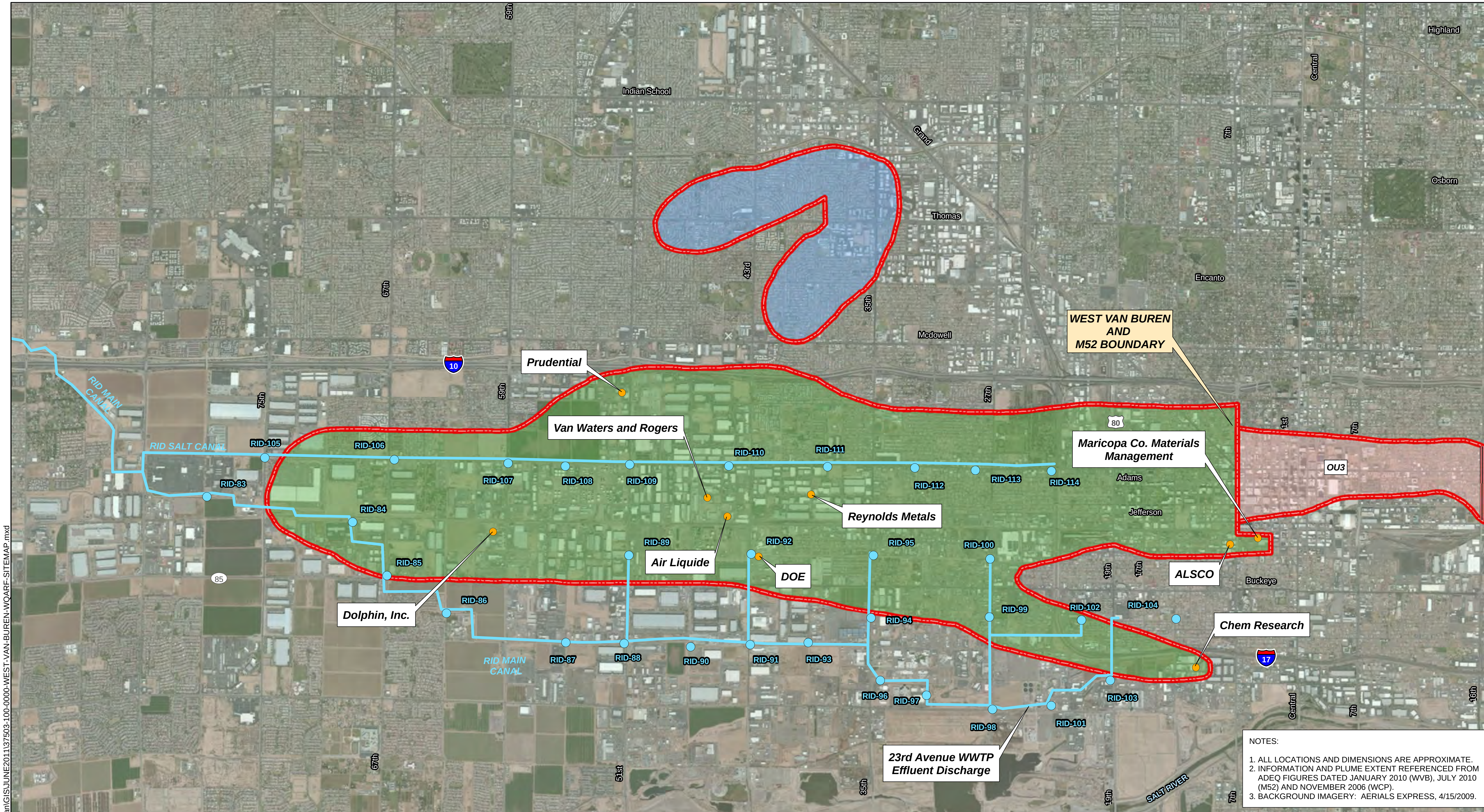
WEST VAN BUREN AREA
WQARF SITE
PHOENIX, AZ

WEST VAN BUREN AREA WQARF SITE AND ADJACENT SITES

SCALE: AS SHOWN
MARCH 2013

FIGURE 2

G:\37503_West_Van_Buren\100_Work Plan\GIS\JUNE2011\37503-100-0000-SiteMap.mxd



LEGEND

- Roosevelt Irrigation District Well
- Contour represents estimated area of volatile organic compounds in groundwater that exceed the Aquifer Water Quality Standards.
- Motorola 52nd Street Superfund Site Boundary
- West Van Buren Area WQARF Site Boundary
- West Osborn Complex (WOC) WQARF Site

N
W E
S

0 5000
SCALE IN FEET

HALEY & ALDRICH

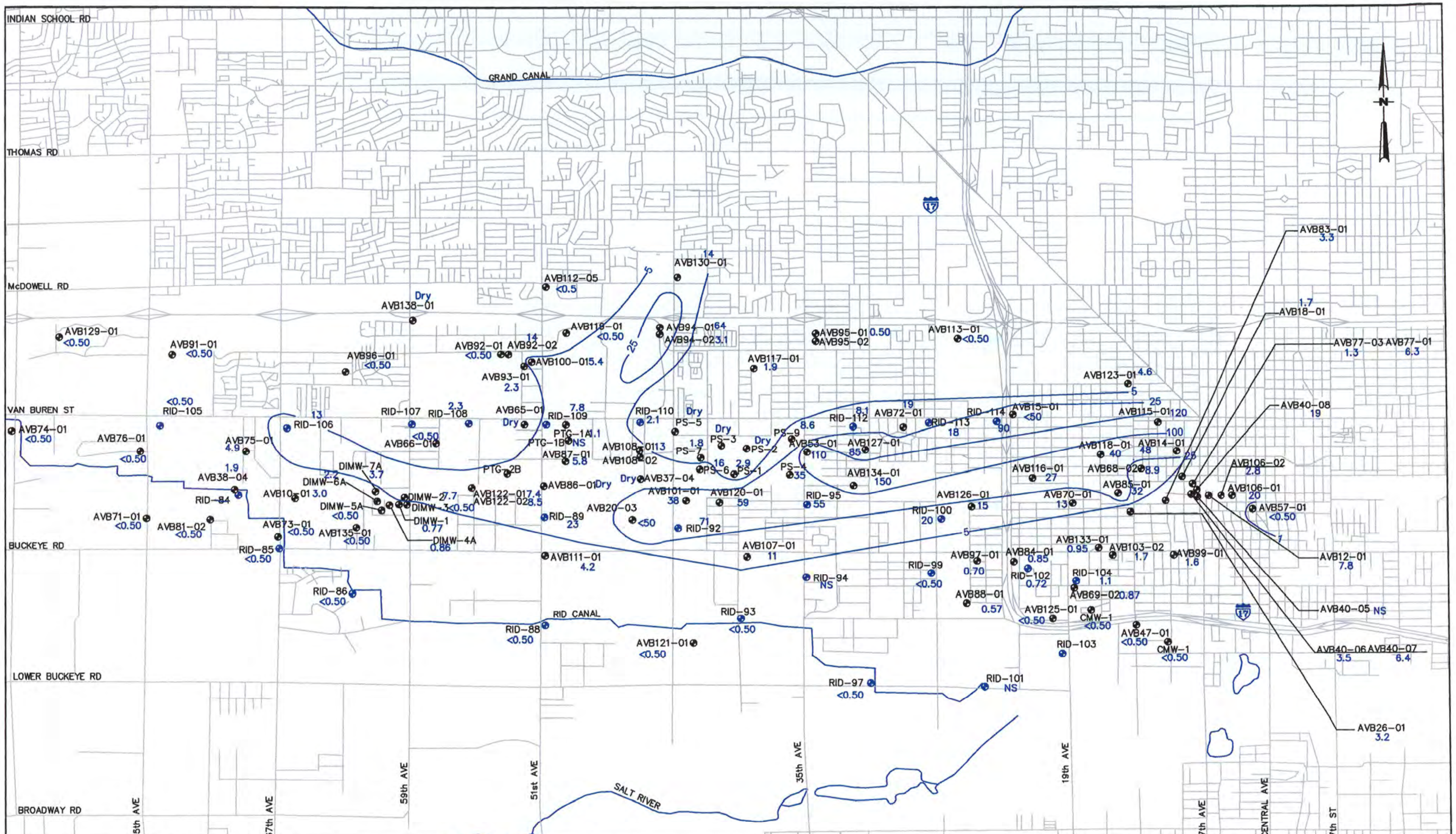
WEST VAN BUREN AREA
WQARF SITE
PHOENIX, AZ

WEST VAN BUREN AREA WQARF SITE MAP

SCALE: AS SHOWN
MARCH 2013

FIGURE 3

G:\37503_West_Van_Buren\100_Work Plan\GIS\JUNE2011\37503-100-0000-WEST-VAN-BUREN-WQARF-SITEMAP.mxd



LEGEND

AEW11-06 – WELL IDENTIFICATION NUMBER
11 – TRICHLOROETHENE (ug/l)
— – TCE CONCENTRATION CONTOUR (ug/l)
NS – NOT SAMPLED
⊗ – APPROXIMATE WELL LOCATION

NOTE
SOURCE DATA FOR BASEMAP FROM THE ARIZONA DEPARTMENT OF TRANSPORTATION DIGITAL ROAD MAP.

PROJ. #:	03103154-18	DATE:	05/05/08
DRAWN BY:	DAG	SCALE:	1"=3600'
DESIGNED BY:	AJG		
APPROVED BY:	AJG		

TERRANEXT

FIGURE 4-10
UAU 1 TCE CONCENTRATIONS
FIRST QUARTER 2008
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

WPFILE/ PROJECTS/ 03103154/ Phase 18/ 1st qtr 08/Figure 4-10 UAU1 TCE Concentrations.dwg

HALEY & ALDRICH

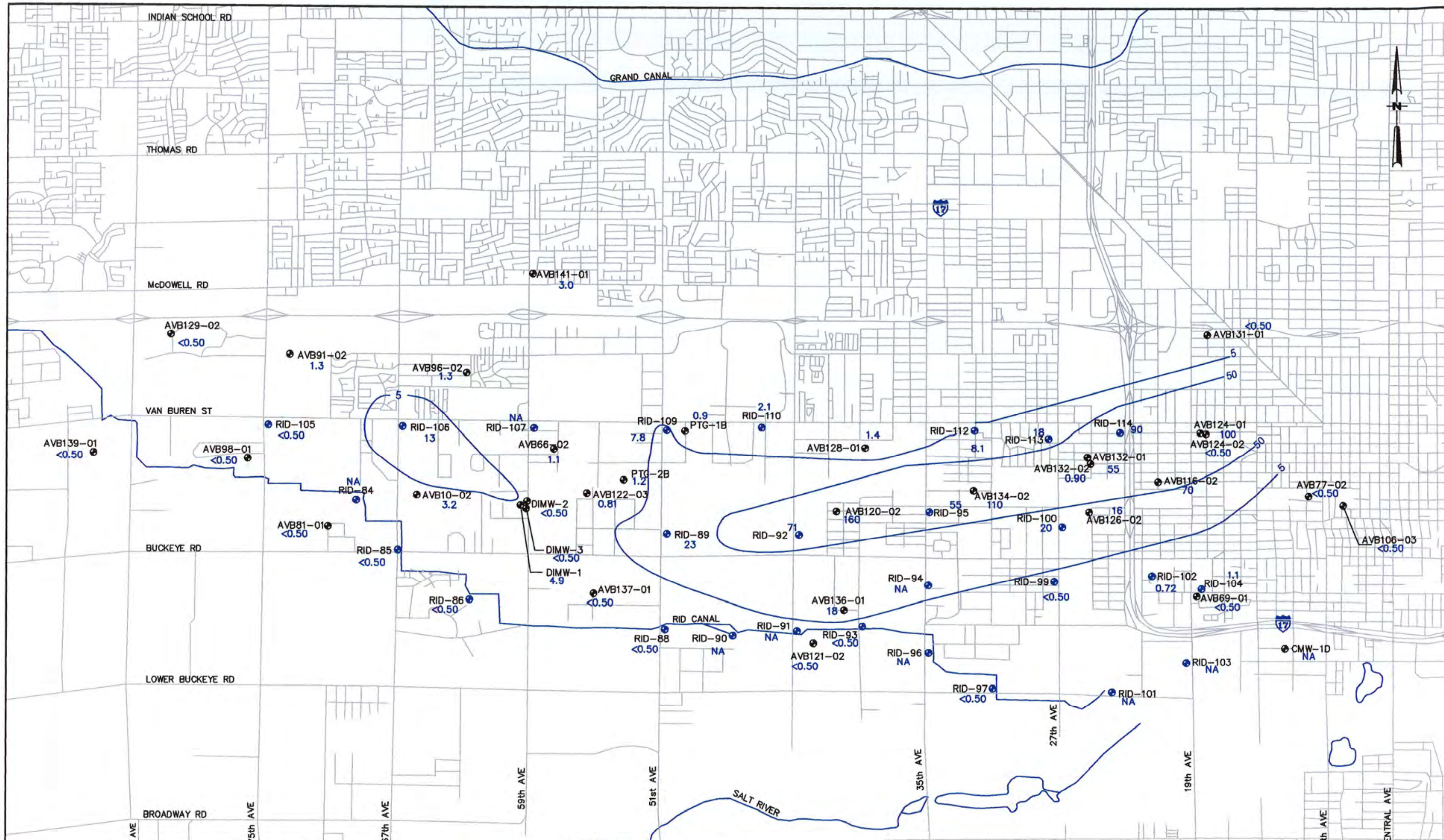
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

UAU1 TCE CONCENTRATIONS – FIRST QUARTER 2008 (FROM FINAL RI REPORT)

SCALE: NOT TO SCALE
MARCH 2013

FIGURE 4

G:\project_path\MXD file_name



LEGEND

AEW11-06 – WELL IDENTIFICATION NUMBER
11 – TRICHLOROETHENE (ug/l)
TCE CONCENTRATION CONTOUR (ug/l)
NA – NOT AVAILABLE
Ø – APPROXIMATE WELL LOCATION

U:/projects/03103154/Phase 18/1st qtr 08/UAU2 TCE CONCENTRATIONS FIGURE 4-23.dwg

NOTE
SOURCE DATA FOR BASEMAP FROM THE ARIZONA DEPARTMENT OF TRANSPORTATION DIGITAL ROAD MAP.

PROJ. #:	03103154-18	DATE:	05/05/08
DRAWN BY:	DAG	SCALE:	1"=3600'
DESIGNED BY:	AJG		
APPROVED BY:	AJG		

TERRANEXT

FIGURE 4-23
UAU 2 TCE CONCENTRATIONS
FIRST QUARTER 2008
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

HALEY & ALDRICH

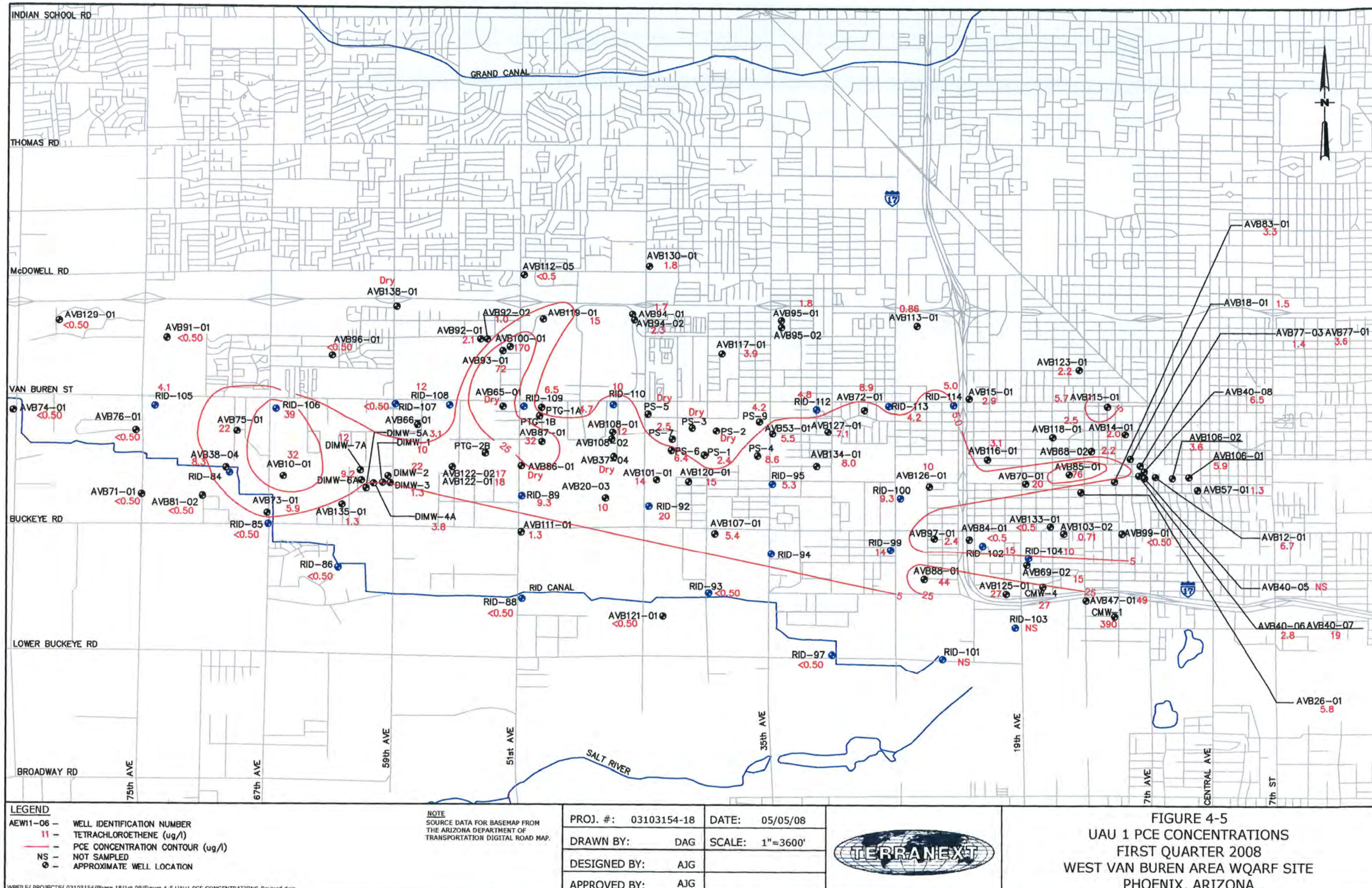
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

UAU2 TCE CONCENTRATIONS –
FIRST QUARTER 2008
(FROM FINAL RI REPORT)

SCALE: NOT TO SCALE
MARCH 2013

FIGURE 5

G:\project_path\MXD file_name



HALEY & ALDRICH

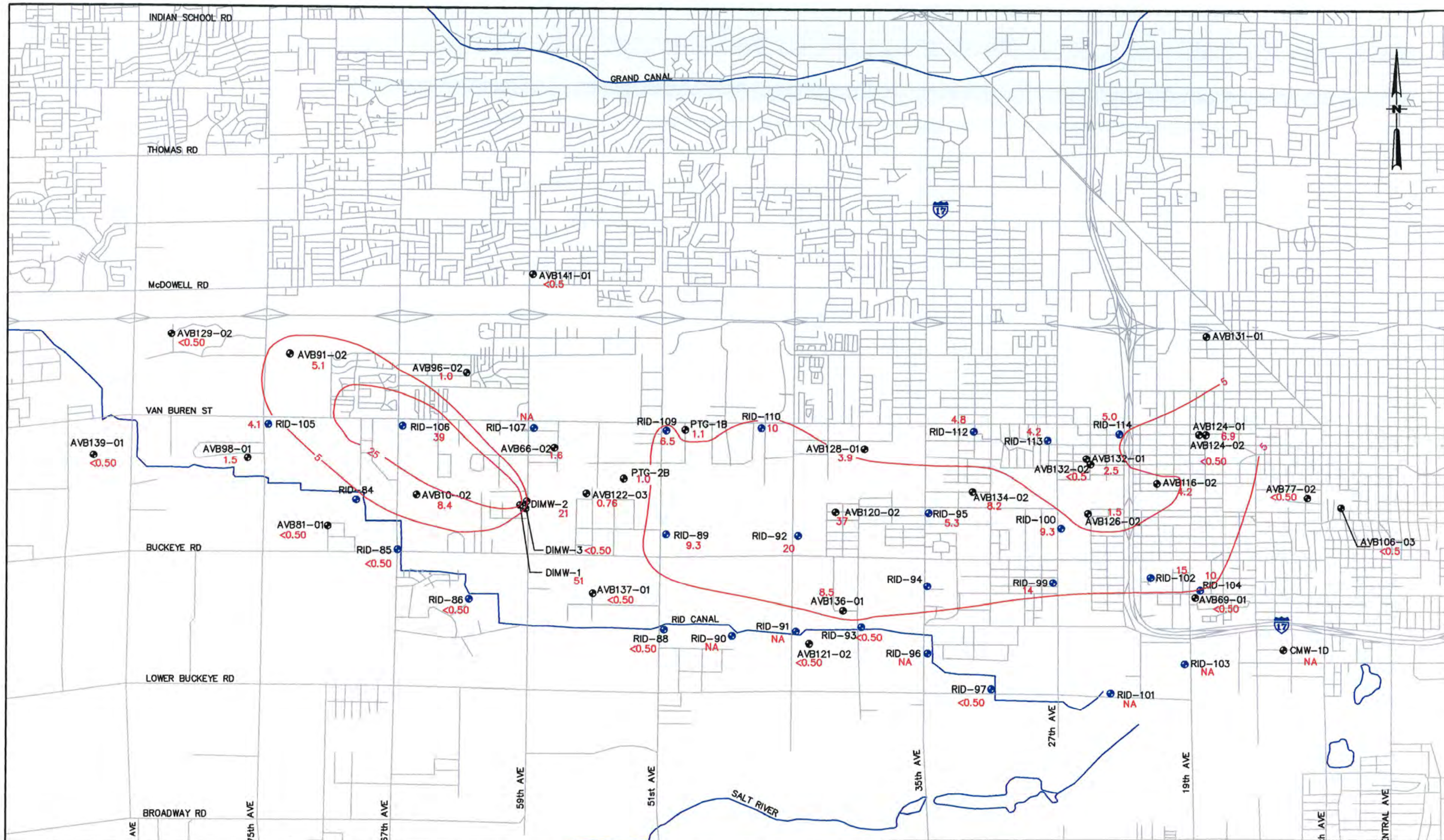
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

UAU1 PCE CONCENTRATIONS – FIRST QUARTER 2008 (FROM FINAL RI REPORT)

SCALE: NOT TO SCALE
MARCH 2013

FIGURE 6

G:\project_path\MXD file_name



LEGEND

AEW11-06 – WELL IDENTIFICATION NUMBER
11 – TETRACHLOROETHENE (ug/l)
—— PCE CONCENTRATION CONTOUR (ug/l)
NA – NOT AVAILABLE
⊘ – APPROXIMATE WELL LOCATION

U:/projects/03103154/Phase 18/1st qtr 08/UAU2 PCE CONCENTRATIONS FIGURE 4-22.dwg

NOTE
SOURCE DATA FOR BASEMAP FROM THE ARIZONA DEPARTMENT OF TRANSPORTATION DIGITAL ROAD MAP.

PROJ. #:	03103154-18	DATE:	05/05/08
DRAWN BY:	DAG	SCALE:	1"=3600'
DESIGNED BY:	AJG		
APPROVED BY:	AJG		

TERRANEXT

FIGURE 4-22
UAU 2 PCE CONCENTRATIONS
FIRST QUARTER 2008
WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

HALEY & ALDRICH

WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

UAU2 PCE CONCENTRATIONS –
FIRST QUARTER 2008
(FROM FINAL RI REPORT)

SCALE: NOT TO SCALE
MARCH 2013

FIGURE 7

G:\project_path\MXD file_name

ID	Task Name	Duration
1	ADEQ Approval of Group to Start FS	1 day
2	Feasibility Study Work Plan	**145 days**
3	Draft Feasibility Study Work Plan	42 days
4	Publish Agency Draft	1 day
5	Receipt of ADEQ Comments	30 days
6	ADEQ Notice of Draft FS WP Availability	14 days
7	Receipt of Public Comments on FS Work Plan	30 days
8	Submit Final Feasibility Study Work Plan	14 days
9	ADEQ Review & Approval of Final FS WP	14 days
10	Identification & Screening of Remedial Alternatives	**127 days**
11	Evaluation of Remedial Technologies	25 days
12	Prepare Reference Remedy & Alternative Remedies Proposal	26 days
13	Submit Remedies Proposal	1 day
14	Receipt of ADEQ Comments on Remedies Proposal	30 days
15	Revisions & ADEQ Approval of Remedies Proposal	45 days
16	Evaluation of Reference Remedy & Alternative Remedies	**31 days**
17	Comparative Evaluation of Remedies	30 days
18	Prepare Proposed Remedy	1 day
19	Draft Feasibility Study Report	**82 days**
20	Prepare Draft FS Report	51 days
21	Submit Draft FS Report	1 day
22	Receipt of ADEQ Comments on Draft FS Report	30 days
23	Community Involvement	**37 days**
24	Publish Draft FS Public Notice	0 days
25	Receipt of Public Comments on Draft FS Report	30 days
26	ADEQ Public Meeting	7 days
27	Final Feasibility Report	**61 days**
28	Prepare Final FS Report	30 days
29	Submit Final FS Report	1 day
30	ADEQ Review & Approval of Final FS Report	30 days

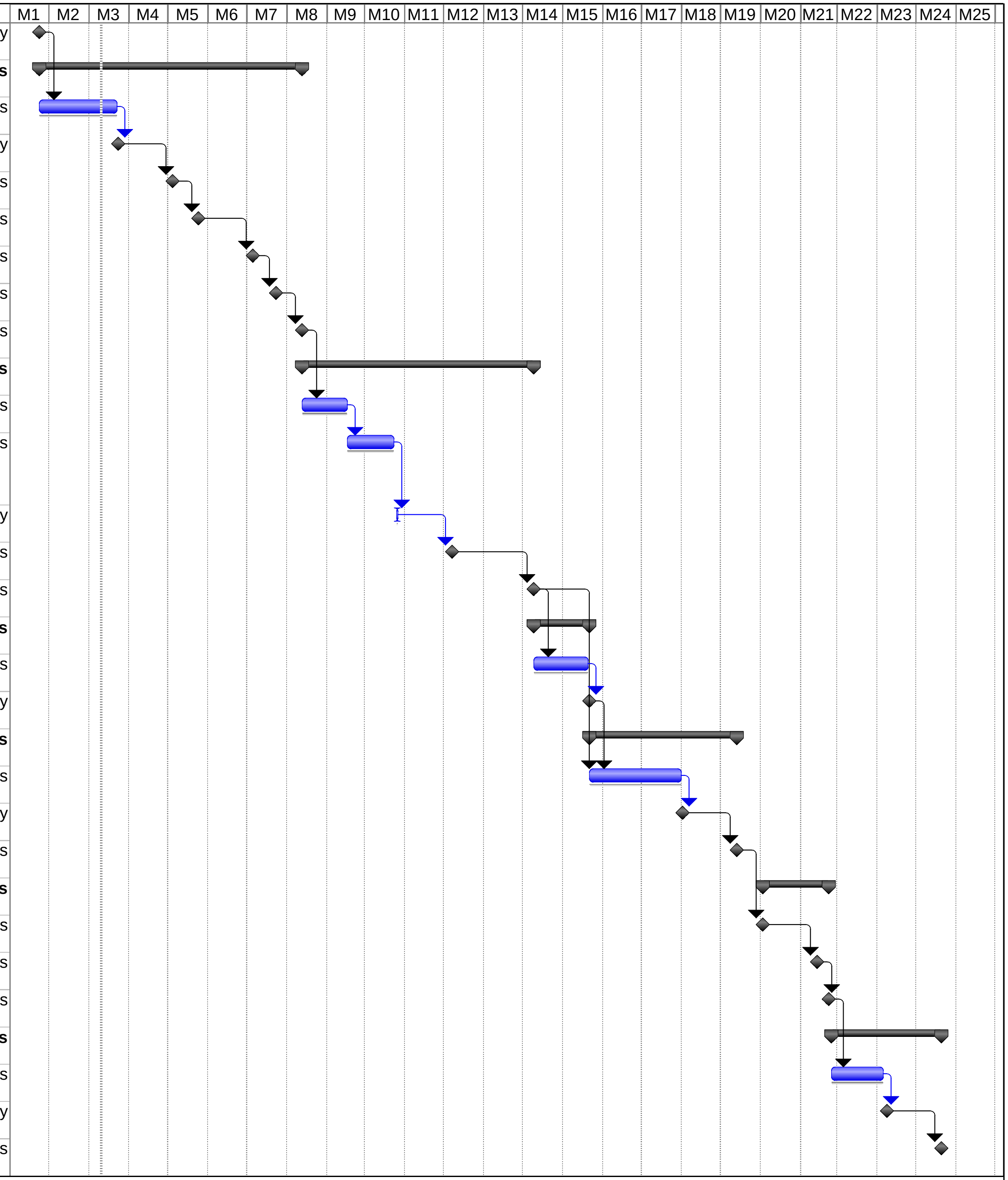


Figure 8 - Feasibility Study Schedule
West Van Buren Area WQARF Site

Task	Summary	Rolled Up Progress	Project Summary
Progress	Rolled Up Task	Split	Group By Summary
Milestone	Rolled Up Milestone	External Tasks	Deadline

APPENDIX A

Working Group’s RO Comment Letter Dated 30 June 2011

[illegible] 6/30/11 6:35

Arizona Public Service Company
City of Phoenix
Components, Incorporated
Cooper Industries, LLC
Dolphin, Inc.
Holsum Bakery, Inc.
Honeywell International Inc.
Laundry & Cleaners Supply, Inc.
Maricopa Land and Cattle Company
Meritor, Inc.
Milum Textile Services Co.
Penn Racquet Sports
Prudential Overall Supply
Schuff Steel
Univar USA, Inc.

June 30, 2011

Mr. Kevin Snyder
Arizona Department of Environmental Quality
Project Manager, Remedial Projects Unit, Waste Programs Division
1110 West Washington Street, MC4415B-1
Phoenix, Arizona 85007

Re: Proposed Remedial Objectives Report for the West Van Buren WQARF Registry Site

Dear Mr. Snyder:

The undersigned parties appreciate the opportunity to comment on ADEQ's Draft Remedial Objectives Report for the West Van Buren WQARF Registry Site, dated May 16, 2011 (Draft Report). As a general matter, we support the Remedial Objectives as drafted. With some minor revisions as discussed within these comments, the Draft Report should serve as a helpful vehicle in moving the West Van Buren site forward in the process.

Although the groundwater use Remedial Objectives as a whole are sound, we suggest modifying the reasonably foreseeable listed uses in three respects. We propose two changes to the proposed Remedial Objectives for groundwater uses, and we propose to re-format the Remedial Objectives for land uses. First, RID's proposed future sale of the area water supply for drinking water use by third parties outside the area is not a reasonably foreseeable use that should be recognized as a Remedial Objective for West Van Buren. We do agree that accommodating future drinking water use in general is an appropriate Remedial Objective. Second, the listed "uses" and associated Remedial Objectives discussed within Section 4.1 are actually risks, not beneficial end uses. All risk pathways must, of course, be identified in the Remedial Investigation and Feasibility Study, and addressed by the selected remedy for the site. But only beneficial uses of water and land should be stated as Remedial Objectives in the WQARF rules. Finally, the proposed land use Remedial Objectives improperly confuse land uses with risks, and include some, but not all, of the risks that should be addressed in the RI/FS.

A. With Only Two Exceptions, ADEQ's Proposed Groundwater Remedial Objectives Properly Reflect Reasonably Foreseeable Uses within the WVB Area.

Overall we agree with the proposed groundwater Remedial Objectives as drafted. The Remedial Objectives associated with the three groundwater uses - municipal, agricultural, and private - recognize and account for the changing uses inherent in Arizona's groundwater environment. We appreciate the agency's recognition that land uses and their associated groundwater uses are transitioning from traditional irrigated lands for agricultural purposes to more urbanized, municipal uses. Although expected to continue within the next 100 years, the rate and timing of land and groundwater changes are unknown. As reflected in the agency's Draft Report and in the City of Phoenix water planning information shared with ADEQ, water providers anticipate this conversion and have attempted to plan for these changes, but the exact timing is of course uncertain. The uncertainty inherent in this prediction and planning effort was recognized even when the remedy selection rules were being developed. In the remedy selection rulemaking package, ADEQ stated "[i]n regard to estimating future population and water uses, the Department agrees that it is difficult to predict well into the future. That is one of the reasons the Department specifies water management plans as a tool in the information collection and Remedial Objective process."[1]

Although only a few years ago most of us would have predicted continued growth and associated changes in water use, today we have all observed and experienced the effects of the unprecedented economic environment and associated dramatic slow down in development. This historic economic environment adds to the already complex water planning and prediction effort.

It is reasonably foreseeable that over the next 100 years, land uses within the WVB area will continue to convert from agricultural to more urbanized uses and an attendant change in groundwater use from irrigation to municipal. It is critical for water providers in the greater Phoenix area to plan for this anticipated transition, and indeed they have. Anticipating an increased need for groundwater supplies, Phoenix has retained its currently inactive groundwater wells with plans to reactivate them along with minor modifications when groundwater needs increase. Phoenix's planning efforts also include maintaining its special pump rights with SRP and further direct connections to SRP wells.[2] These are just some of the examples of water providers anticipating and planning for the changing future needs of the lands they serve. On the other hand, what is not reasonably foreseeable, and what is discussed in more detail below, is exportation of the area's groundwater to other lands outside of the WVB area's boundaries.

B. The Draft Report's Inclusion of Future RID Drinking Water Supply Use is Not Reasonably Foreseeable and Should Be Removed from the Draft Report.

---

[1] 8 A.A.R. 1491, 1522 (March 29, 2002).
[2] Terranext, Land and Water Use Report West Van Buren Area WQARF Registry Site, 3-2 (December, 2007).

Only current and reasonably foreseeable uses of land and the current and reasonably foreseeable beneficial uses of waters of the state, supported by information provided during the public meeting and other information received by ADEQ, are to be listed within the Proposed Remedial Objectives Report.[3] Although ADEQ selects Remedial Objectives based upon public input, the agency must evaluate and refine the information to determine what uses are reasonably foreseeable.

As part of the Remedial Objectives development process, the agency solicits a variety of public input, including input from water providers and from members of the public. Inherent in the process is receipt of conflicting information and expressions of competing interests and uses, a phenomenon recognized during development of the remedy selection rules.[4] The agency evaluates all of this input to determine reasonably foreseeable uses. Those uses are then listed as the Remedial Objectives for the Site.[5]

Reasonably foreseeable uses for water are those likely to occur within 100 years (unless a longer time period is shown to be reasonable based on site-specific circumstances).[6] As indicated in the regulatory package associated with the remedy selection rule, reasonably foreseeable end uses are those that are *reasonably probable* to occur in the future, "not one simply within the realm of possibility."[7]

Within the Municipal Groundwater Use discussion of Section 3.1, the Draft Report lists, as a reasonably foreseeable use, RID's future drinking water supply for residential and commercial development within the RID water district. This description is somewhat misleading. RID does not propose to use this water for drinking water purposes directly. Rather, RID proposes to export this water from the West Van Buren Site for drinking water use by third parties. Major hurdles standing in the way of this use prevent export of groundwater by RID from meeting the reasonable foreseeability test.

1. RID's Groundwater Pumping Rights Are In Dispute.

ADEQ must consider whether RID's proposed sale is legally permitted. RID's right to continue its groundwater pumping within the Salt River Reservoir District and to transport that water to another area is a matter of dispute between RID and SRP, the other contractual party to RID's water right. RID's contractual right to pump water ends in or about 2026.[8] After that time, RID will not be legally permitted to transport groundwater out of the District to RID's service area or to others in the West Valley. In its December 4, 2009 comments to RID's ERA Proposal, SRP explained the uncertainty associated with RID's groundwater pumping rights and the legal restrictions on transporting pumped water out of the District.

---

[3] A.A.C. § R18-16-406(I)(4).
[4] *See* 8 A.A.R. at 1521-22.
[5] *See* 8 A.A.R. at 1503, 1519, 1521, 1522.
[6] A.A.C. § R18-16-406(D).
[7] 8 A.A.R. at 1519, 1521.
[8] W.R. Powell, SRP Manager, Risk Management and Environmental Services, *Letter to Julie Riemenschneider*, at 2 (December 4, 2009).

2. *RID's Brokerage of this Water Is Barred By State Water Law and Policy.*

As discussed within these comments, RID's brokerage of this water for use by the West Valley Cities is not reasonably foreseeable due to various practical reasons, but more importantly, for foundational water law and policy reasons. The Arizona Groundwater Management Act (GMA) grandfathered existing agricultural uses of groundwater. But one of the inherent premises of the Act is that upon urbanization of agricultural lands, groundwater that had been previously used for agricultural purposes would be available to municipal providers to serve those urbanized lands.[9] RID's proposal is to export this groundwater away from those lands. The municipal water providers that will serve these lands in the future have a right to expect to access that groundwater, and have a right to object to its loss.

RID's proposed brokerage of water would be inconsistent with Arizona Department of Water Resources (ADWR) policy regarding incentives for use of remediated water. In 1997, the Arizona Legislature passed legislation to provide incentives to encourage the beneficial use of groundwater withdrawn as part of an approved remediation project. ADWR subsequently published a policy statement explaining the factors it would use to determine whether a remediation project is entitled to these incentives.[10] RID's proposal is inconsistent with several of these factors. In particular, ADWR discourages the creation of new permanent end uses for remediated groundwater that would not have existed absent the statutory incentive.[11] RID seeks to create a new long-term end use by constructing a new potable water treatment and transmission system. In addition, ADWR encourages reinjection or recharge within the same aquifer or basin from which remediated water is withdrawn, or the replacement of existing groundwater uses in the basin with remediated groundwater.[12]

After meeting with RID to hear first-hand about RID's proposed future groundwater uses, the ADWR Director sent RID a letter expressing his serious concerns and detailing the numerous statutory restrictions and water policy principles prevent RID from exporting pumped groundwater outside the West Van Buren area for drinking water purposes.

As stated in ADWR's letter, RID's proposed use runs afoul of at least three primary water law policies. First, the plan conflicts with the foundational assumptions of the GMA. The GMA was based upon the basic principle of reducing dependency on groundwater pumping in Active Management Areas. Although some longstanding

---

[9] *See, e.g.,* A.R.S. § 45-469 (prohibition on converting irrigation grandfathered rights to Type 1 non-irrigation rights if land is within the exterior boundaries of the service area of a city, town, or private water company).
[10] ADWR, *Substantive Policy Statement: Remediated Groundwater Incentive for Conservation Requirement Accounting for the Second Management Plan* (June 14, 1999).
[11] *Id.*
[12] *Id.*

irrigation providers may withdraw and transport groundwater from outside their service areas for use within their service areas,[13] the GMA envisioned that future deliveries of groundwater for irrigation purposes would decline or be replaced by non-groundwater sources. As traditionally-agricultural lands urbanized, municipal providers who are subject to Assured Water Supply requirements would then provide potable water supplies and groundwater pumping would diminish. RID's proposed future use directly conflicts with these foundational assumptions of the GMA.

Second, uncertainties regarding the duration of RID's contractual groundwater pumping rights prevent use of this water for Assured Water Supply purposes. As previously reflected in SRP's comments to RID's Proposed ERA, there is a dispute between RID and SRP as to the duration of RID's contractual groundwater pumping rights. As pointed out by ADWR, such a dispute would impair the department's ability to issue a determination of assured water supply for this water, greatly reducing the desirability of RID's water supply to any municipal providers, RID's prospective future customers.

Finally, legal questions exist regarding the extent to which RID is legally authorized to supply groundwater for non-irrigation uses. As the regulatory agency in charge of overseeing water use in Arizona, ADWR has questioned RID's legal ability to supply groundwater for non-irrigation uses.

ADWR's recognition that RID's proposal is barred by state law for a variety of reasons demonstrates the improbability and thus unreasonableness associated with RID's proposed sale of this pumped groundwater outside the West Van Buren area for drinking water purposes.

3. RID Lacks Infrastructure and Financing to Broker and Export Groundwater.

Lack of necessary infrastructure and financing makes RID's sale of this water for potable purposes unlikely. Some details regarding RID's thoughts on its future drinking water use are revealed in its Early Response Action (ERA) proposal documents. RID's proposed ERA involves numerous costly repairs, upgrades, and additions to RID's current infrastructure to facilitate RID's entry into the drinking water business. Miles of pipelines and upgrades and improvements to numerous wells are just some of the capital investments required before RID could become a drinking water purveyor. Additionally, as ADEQ is aware, RID has previously asserted that it plans to finance its future drinking water business from third parties through litigation and settlement proceeds. Lack of firm financial resources or even a sound plan to obtain funding for the many infrastructure and other expenses associated with this new business make it improbable.

The proposed potable uses by West Valley Cities would not occur if the groundwater was not impacted by the WQARF contamination. The cost to construct the

---

[13] *See* A.R.S. § 45-494.

infrastructure needed to export the water would be prohibitive. Of course, RID cannot ask the WQARF program to fund a treatment and transportation system solely for the purpose of providing for a use that would otherwise be technically and financially impracticable.

RID claims that drinking water is a foreseeable end use of groundwater in the area. We agree. Drinking water is a foreseeable end use of groundwater in the West Van Buren Area for entities such as the City of Phoenix or Salt River Project and their customers. But use *by RID* of that groundwater for drinking water is not a foreseeable end use. RID is, and always has been, in the business of supplying irrigation water. As late as November 2007, RID reported that it only used groundwater for non-potable uses and that groundwater would continue to be used for those purposes in the future.[14] Specifically, RID indicated that it foresaw no significant changes in regard to its use of West Van Buren groundwater and that future uses (up to 100 years) for any impacted wells would be the "same as today."[15]

RID now seeks to convert itself into a municipal water broker. It asserts that West Valley Cities will purchase this water for potable use. But in determining whether potable use by West Valley Cities outside the West Van Buren Site is reasonably foreseeable, ADEQ must ask whether RID's project would be feasible if the aquifer were not impacted. RID's proposal involves transportation of treated water to the West Valley at enormous expense. If the project to sell water for drinking water use is actually made feasible only by the WQARF remedy, then the use is not reasonably foreseeable.

4. RID's Speculative Future Uses Are Not Reflected in Municipal Water Documents.

An examination of the publicly available planning documents for Buckeye and Goodyear do not reveal a firm plan to rely upon RID for their future drinking water needs.

As discussed above, RID's system is not currently constructed in a manner that would allow it to begin delivering drinking water. Arizona's WQARF laws and regulations are clear – a WQARF remedy cannot be required to cover the costs that a well owner or water provider would have incurred regardless of the contamination.[16] In other words, a party may not use the WQARF remedy process as a vehicle for improving its position. As explained in the agency's rulemaking package, WQARF remedy selection is intended to address:

> only the impacts of a release or a threatened release of a hazardous substance ...[and] will not cover remedial action costs that would have been incurred if the release had not impacted the property or well. For

---

[14] Stanley H. Ashby, Land and Waste Use Study Questionnaire, at 1-2 (November 12, 2007).

[15] *Id.* at 4.

[16] A.A.C. § R18-16-402(B).

> example, a well may have high levels of trichloroethylene, arsenic, and total dissolved solids. If only the trichloroethylene was released and the other contaminants were present before the release, the well owner cannot require WQARF to clean up the remainder of the contaminants or replace the well with a more productive well. Likewise, a property owner who owns a landfill cannot require WQARF to remove or completely clean up a landfill so the property can be used for other uses.[17]

RID's desire to convert its existing agricultural use to a drinking water use does not, by itself, establish that the use is reasonably foreseeable. Considering these additional factors – uncertain legal rights to water, inconsistency with Arizona law, ADWR's concerns, lack of infrastructure without adequate funding, and lack of customer commitments – leads to the conclusion that RID's future drinking water use is not reasonably probable and thus not reasonably foreseeable. For these reasons, RID's "drinking water use" should be deleted from the Draft Report.

C. The RID Canal Water Use and Associated ROs Are Duplicative and Should be Deleted from the Draft Report.

The purpose of ADEQ's discussion within Section 4.1 regarding RID Canal Water Use and the associated Remedial Objectives is unclear. First, the Remedial Objectives in Section 4.1 reference private wells and their contribution to RID's canals. Specifically, the first proposed RO is "[t]o protect, restore or otherwise provide a water supply for potable or non-potable use by currently impacted *private well owners* within the WVBA WQARF site…" It is unclear what ADEQ means with this reference to private wells. Of course all reasonably foreseeable uses must be listed as Remedial Objectives, without respect to whether the water is recovered from a private or public well. The Draft Report, however, already addresses uses associated with private groundwater wells within Section 3.3. The reference in Section 4.1 appears to be addressing the well itself. Wells, canals, and other physical infrastructure are not themselves beneficial uses. Wells are addressed separately in the remedy selection rules. Every final remedy must address "any well that either supplies water for …irrigation or agricultural uses …if the well would now or in the reasonably foreseeable future produce water that would not be fit for its current or reasonably foreseeable end use without treatment."[18] But the well itself is not a Remedial Objective. This reference to private well owners within the WVBA WQARF site is duplicative and unnecessary and should be removed from Section 4.1.

Second, the RID Canal water use discussion and proposed ROs are inconsistent with ADEQ's information collection effort as reflected in the Land and Water Use Report. In its Surface Water Use section, the Land and Water Use Report discusses RID's water delivery through its canal system and subsequent use outside of the WVBA

[17] 8 A.A.R at 1499 (emphasis added).

[18] 8 A.A.R. at 1503.

land area for agricultural purposes.[19] Agricultural groundwater uses and their associated ROs, including RID's use, are already discussed in Section 3.2 of the Draft Report. And although, as reflected in the comments above, we disagree with the specific listing of "RID's future drinking water use," municipal groundwater uses and associated ROs are also discussed in Section 3.1. The Draft Report's discussion of RID's canals is duplicative of the groundwater discussion within section 3.0 and the associated ROs.

As reflected in the information collected by the agency during its RI process, RID's canals serve merely as transport mechanisms similar to water pipelines. There are no legally-permitted beneficial end uses that occur within RID's canals. Their sole purpose is to transport groundwater blended with reclaimed water to RID's agricultural end users. Because RID's canals are not considered "waters of the U.S.," RID's canals are not surface waters.[20] There is no need to specifically address "canal use" within the Draft Report.

If the canal use section was intended to identify some risk associated with RID's canals, this is the wrong forum for such identification. Instead, risks are appropriately included within a Remedial Investigation report and considered in the Feasibility Study in developing a remedy.[21] In fact the rules spell out that the Feasibility Study must include both a demonstration that the Remedial Objectives will be met – that the reasonably foreseeable end uses will be protected, replaced, or provided for – and a separate evaluation of risks associated with those current and reasonably foreseeable uses.[22] All exposures associated with transportation of water to its point of use, including vapor inhalation, ingestion, and dermal contact, must be evaluated. The same is true of potential exposures associated with other media within the West Van Buren Site. Those exposures are not Remedial Objectives, themselves. And there is no basis for transforming just one exposure associated with one use into a Remedial Objective for the Site. We respectfully request that ADEQ delete Section 4.1 from the Draft Report.

D. The Land Use Remedial Objectives are in Improper Form.

Finally, we note that some revision of the land use Remedial Objectives in section 2.0 is necessary to bring them into proper form. The Draft Report currently provides:

> Based upon review of public comments, ADEQ proposes the following ROs for land use in the WVBA area:
>
> - Protect against possible exposure to hazardous substances in surface and subsurface soils that could occur during development of property based upon applicable zoning regulations.

---

[19] Land and Water Use Report at 13.
[20] *See* A.A.C. § R18-11-101(41)(defining surface waters); *see also* A.A.C. Title 18, Ch. 11, Appendix B (List of Surface Waters and Designated Uses).
[21] *See* A.A.C. § R18-16-406(F) (requiring the results of a risk evaluation to be included within a draft remedial investigation report).
[22] A.A.C. § R18-16-407(H).

- Protect against possible leaching of hazardous substances in surface and subsurface soils to the groundwater.
- Protect against possible land restrictions required by applicable zoning regulations because of hazardous substances in surface and subsurface soils.

We suggest that the proper land use Remedial Objectives are:

- Protect against the loss or impairment of current uses of land as a result of releases of hazardous substances.
- Protect against the loss or impairment of reasonably foreseeable future uses of land (as provided in zoning regulations and planning documents of local land use authorities) as a result of releases of hazardous substances.

Section 2.0 of the Draft Report seems to set a goal of protecting against exposures during development of property, but ignores other exposures (such as any under current uses). As we have previously stated, we agree that all exposures must be evaluated and addressed in the remedy selection process. Evaluation of all exposure pathways is part of the Remedial Investigation and Feasibility Study process as outlined in the WQARF rules.[23]

In summary, we support the Remedial Objectives as drafted within the report and suggest only three revisions: (1) delete the listed RID future drinking water supply use, (2) delete Section 4.1, "RID Canal Water Use", and (3) revise the proposed land use Remedial Objectives. We appreciate you considering our comments and look forward to your response.

Sincerely,

Karen Scrodie Gaylord

Karen S. Gaylord for

Arizona Public Service Company
City of Phoenix
Components, Incorporated
Cooper Industries, LLC
Dolphin, Inc.
Holsum Bakery, Inc.
Honeywell International Inc.
Laundry & Cleaners Supply, Inc.
Maricopa Land and Cattle Company
Meritor, Inc.
Milum Textile Services Co.
Penn Racquet Sports
Prudential Overall Supply
Schuff Steel
Univar USA, Inc.

---

[23] *Id.*