MODIFIED EARLY RESPONSE ACTION WORK PLAN

OCTOBER 2012

WEST VAN BUREN WQARF REGISTRY SITE
PHOENIX, ARIZONA

Prepared by: **Synergy Environmental, LLC**

On Behalf of: **Roosevelt Irrigation District**

Prepared for: **Arizona Department of Environmental Quality**

SYNERGY ENVIRONMENTAL, LLC

EXECUTIVE SUMMARY

As contemplated by Arizona Administrative Code (AAC) R18-16-405 and as discussed with the Arizona Department of Environmental Quality (ADEQ), this Modified Early Response Action Work Plan is submitted on behalf of the Roosevelt Irrigation District (RID) to ADEQ to modify the original Early Response Action (ERA) Work Plan, dated February 3, 2010 and approved by ADEQ on June 24, 2010. Consistent with recent discussions with ADEQ, this modification to the original ERA Work Plan is proposed in order to provide a more cost effective approach to protect the RID water supply by accomplishing the objectives of the RID ERA remedial action.

The objectives of the RID ERA remedial action are:

- To protect and provide a water supply from the most highly contaminated RID wells in the West Van Buren Area (WVBA) Water Quality Assurance Revolving Fund (WQARF) Site (the WVBA Site) that is protective of all RID current and reasonably foreseeable municipal, agricultural, and industrial end uses; and,
- To address current and future risks to public health, welfare and the environment from exposures to contaminants in the groundwater that are known to volatilize into the air when pumped from the most highly contaminated RID wells.

This Modified ERA Work Plan provides a more cost effective and efficient approach to address these objectives and incorporates information and insights gained from the investigations prescribed by ADEQ in the original ERA Work Plan approval letter (Tasks 1 through 4) and from the ongoing pilot testing under the RID-95 Wellhead Pilot Treatment System Proposal, dated August 18, 2011, whose implementation was agreed to by ADEQ by letter dated September 2, 2011.

Based on detailed consideration and analysis of this new information, RID proposes the following modifications to the original ERA Work Plan:

- Utilize wellhead treatment systems (liquid-phase granular activated carbon) in lieu of the central water treatment facility;
- Eliminate the north-south lateral pipelines between the southern tier wells and the Salt Canal;
- Eliminate the gravity pipeline between the end of the Salt Canal and the RID Maintenance Yard (central water treatment facility location); and,

- Utilize a combination of treatment and blending to effectively reduce the concentration of volatile organic compounds (VOCs) from several additional wells with lower contaminant concentrations, resulting in a lower volume of contaminated water being directly treated while providing a higher total volume of contaminated well water that meets applicable maximum contaminant levels (MCLs) to ensure protection of all RID current and reasonably foreseeable end uses.

These modifications also provide additional ancillary benefits. These additional ancillary benefits are neither presented nor intended as a basis for ADEQ evaluation and consideration in the process of its review and approval of this Modified ERA Work Plan; however, it is believed that implementation of these modifications will result in the following performance improvements compared to the original ERA Work Plan:

- Reduces capital costs by approximately 50%, from approximately $34 million (MM) to approximately $18MM;
- Reduces operation and maintenance (O&M) costs by approximately 50%, from approximately $3-$4MM per year to approximately $1.5-$2MM per year;
- Enables blending of treated water with untreated water from wells having lower contaminant concentrations along the Salt Canal, thereby increasing the total volume of contaminated well water that will meet applicable MCLs by approximately 50%;
- Significantly reduces the time required to implement the early response pump and treatment action due to the simplified and modular nature of the wellhead treatment systems (compared to a central water treatment facility) and the elimination of the complex and disruptive construction of north-south lateral pipelines;
- Reduces the scope and cost of the selected groundwater remedy by reducing the number of impacted RID wells that will need to be addressed through supplemental remedial actions developed during the WVBA Site Feasibility Study and by providing effective mass contaminant removal and treatment by the earlier implementation of the wellhead treatment and blend systems that will remediate up to approximately 2,300 pounds per year of VOC contamination in the regional groundwater; and,
- Reduces the scope and cost of the groundwater remedy at the West Osborn Complex WQARF Site by addressing the groundwater contamination that is migrating into the WVBA Site and impacting and threatening to impact RID's wells

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1.0 INTRODUCTION

This Modified Early Response Action Work Plan is submitted on behalf of the Roosevelt Irrigation District (RID) to the Arizona Department of Environmental Quality (ADEQ) as a modification to the original Early Response Action (ERA) Work Plan (Montgomery & Associates [M&A], 2010a) dated February 3, 2010 and approved by ADEQ with conditions in ADEQ's letter dated June 24, 2010 (ADEQ, 2010). As requested by ADEQ, this Modified ERA Work Plan incorporates applicable content from the original ERA Work Plan (M&A, 2010a) and from the Modified ERA Proposal recently submitted by Synergy Environmental (Synergy Environmental [Synergy], 2012d). As recently discussed with ADEQ, this Modified ERA Work Plan provides a more efficient and cost-effective approach to accomplish the objectives of the ERA remedial action voluntarily initiated by RID pursuant to Arizona Administrative Code (AAC) R18-16-405 and the Agreement to Conduct Work between ADEQ and RID, signed and dated October 8, 2009.

This Modified ERA Work Plan provides the rationale for and outlines the tasks associated with the following objectives of the RID ERA:

- To protect and provide a water supply from the most highly contaminated RID wells in the West Van Buren Area (WVBA) Water Quality Assurance Revolving Fund (WQARF) Site (the WVBA Site) that is protective of all RID current and reasonably foreseeable municipal, agricultural, and industrial end uses; and,
- To address current and future risks to public health, welfare and the environment from exposures to contaminants in the groundwater that are known to volatilize into the air when pumped from the most highly contaminated RID wells.

This Modified ERA Work Plan will achieve other important ancillary benefits as well, including reducing the scope and cost of the selected groundwater remedy and maximizing the beneficial use of groundwater. While this Modified ERA Work Plan is not presented nor intended to be reviewed by ADEQ on the basis of these and other ancillary benefits, RID believes that these additional ancillary benefits should be considered by ADEQ during the separate WQARF Feasibility Study process for the development and selection of the groundwater remedy at the WVBA Site.

This Modified ERA Work Plan was prepared in accordance with the provisions specified in AAC R18-16-405. Although not relevant for ADEQ review and approval, this Modified ERA Work Plan is also consistent with the goals established for the federal Superfund program under the federal National Contingency Plan (NCP)[1] to use treatment to address the

[1] See 40 CFR, Chapter 1, § 300.430

principal threats posed by the site, wherever practicable; protect human health and the environment; maintain protection over time; and minimize untreated waste.

According to AAC R18-16-405.I and ADEQ's approval of the ERA, the RID ERA is deemed legally "necessary" because "[i]n considering whether an early response action is necessary to protect or provide a supply of water because a well is threatened by contamination, a well located in the area within ¼ mile upgradient, ½ mile cross-gradient and 1 mile downgradient of the areal extent of contamination at the site shall be presumed to be threatened by the contamination." RID's contaminated and threatened wells in the WVBA Site meet the "necessary" condition in AAC R18-16-405.I, which authorizes the RID ERA under AAC R18-16-405.A and Arizona Revised Statutes (ARS) § 49-282.06.A.

This Modified ERA Work Plan has been subdivided into the following sections:

- Early Response Action Rationale (Section 2.0)
- Summary of Site Conditions (Section 3.0)
- Description of Modified Early Response Action Work Plan (Section 4.0)
- Modified Early Response Action Work Plan Tasks (Section 5.0)
- Schedule (Section 6.0)
- References Cited (Section 7.0)

1.1 Purpose

The purpose of this Modified ERA Work Plan is to provide ADEQ with a revised plan for accomplishing the objectives of the ERA. The ERA was designed and approved by ADEQ to achieve the following necessary remedial action objectives described in AAC R18-16-405.A:

1. Protect and provide a water supply from the most highly contaminated RID wells in the WVBA Site that is protective of all RID current and reasonably foreseeable uses; and,

2. Address current and future risks to public health, welfare and the environment from potential exposures to contaminants in the groundwater that are known to volatilize when pumped from the most highly contaminated RID wells.

1.2 Scope

The approach outlined in this Modified ERA Work Plan is intended to refine the conceptual treatment design provided in the original ERA Work Plan approved by ADEQ on June 24,

2010 (ADEQ, 2010). This Modified ERA Work Plan recommends a number of cost effective and efficient changes to the original ERA Work Plan approach. As a modification to the original ERA Work Plan, this Modified ERA Work Plan follows the section numbering of that approved work plan and incorporates all relevant and applicable information from that plan into this single consolidated document.

Figure 1 depicts the approximate boundaries of, relevant features within, and the composite extent of groundwater contamination in the WVBA Site. Groundwater within the WVBA Site is impacted by volatile organic compounds (VOCs) and inorganic compounds as a result of historical releases from numerous industrial facilities located in the WVBA Site, the Motorola 52nd Street Superfund Site (52nd Street Site), and the West Central Phoenix WQARF Site (WCP Site), see **Figure 2**. The primary contaminants of concern (COCs) in groundwater in the WVBA Site are VOCs. The primary VOCs of concern are tetrachloroethene (PCE), trichloroethene (TCE) and 1,1-dichloroethene (1,1-DCE) because these compounds are detected in groundwater at concentrations exceeding Arizona Aquifer Water Quality Standards (AWQSs)[2]. Chromium also is considered a COC in the WVBA Site. Methyl tertiary butyl ether (MTBE) also is detected in groundwater in the WVBA Site[3].

RID has 32 wells within or in close proximity to the WVBA Site that have the permitted[4] capacity to pump in excess of 120,000 gallons per minute (gpm). Groundwater pumped by RID is conveyed to its service area west of the Agua Fria River (**Figure 2**). The groundwater contamination in the WVBA Site has contaminated or threatens to contaminate all of the RID water supply wells located within the WVBA Site boundary. In September 2012, sampling data indicate 23 of the 26 RID wells that were sampled were impacted by the groundwater contamination in the WVBA Site (**Table 1**). There are 9 other RID wells in the WVBA Site that are threatened by groundwater contamination, including 3 RID wells that do not presently have detectable VOC concentrations and 6 RID wells that have not been sampled recently.

The scope of the RID ERA is to address the contaminated RID wells with the highest COC concentrations and, through a combination of treatment and blending, reduce the concentrations in RID's water supply to achieve applicable water quality standards for all RID current and reasonably foreseeable end uses.

[2] In Arizona, all groundwater aquifers are classified for drinking water protected use. Accordingly, the "maximum contaminant levels" (MCLs) established by the federal Safe Drinking Water Act as enforceable drinking water quality standards have been adopted in Arizona as drinking water aquifer quality standards by rule. ARS § 49-223 and 224.

[3] Other hazardous substances and contaminants detected in groundwater in the WVBA Site, 52nd Street Site, and WCP Site include benzene, toluene, ethylbenzene, xylenes, nitrate, vinyl chloride, 1,4-dioxane, 1,1,1-trichloroethane, 1,1-dichloroethane, cis-1,2-dichloroethene, and chloroform.

[4] Arizona Department of Water Resources 55-Series database

2.0 EARLY RESPONSE ACTION RATIONALE

This section provides the rationale for the ERA that was developed and approved by ADEQ in accordance with Subsection C of AAC R18-16-405. As requested by ADEQ, this Modified ERA Work Plan incorporates applicable content from the original ERA Work Plan (M&A, 2010a) into a single consolidated document. In particular, this section identifies the information used to develop the ERA, explains why the ERA is necessary and appropriate, how the ERA will attain the applicable remedial objectives that are specified in the administrative code and referenced in the final RI Report (Terranext, 2012) for the WVBA Site, and how the ERA is consistent with ARS § 49-282.06, as evidenced by ADEQ's approval of the ERA on June 24, 2010 (ADEQ, 2010). Subsequent sections of this Modified ERA Work Plan provide a detailed description of the modified approach to accomplishing the ERA objectives.

2.1 Overview of Early Response Action

This subsection includes a conceptual overview of the modified approach to the ERA to provide the basis of and context for the rationale behind the Modified ERA Work Plan.
The modified approach to the ERA includes three conceptual components: 1) construction of new wellhead or distributed treatment facilities to reliably remove VOCs and reduce their concentrations at the most highly contaminated RID wells to meet water quality standards applicable for all RID current and reasonably foreseeable end uses; 2) implementation of physical improvements to selected RID wells and canals to reduce contaminant transfer of VOCs from water to air and to reduce exposure to VOCs; and; 3) discharge of treated water to the RID Main Canal or to a new pipeline for multiple end uses.

The modified approach to the ERA will predominantly use existing RID wells and well sites, pipelines and canals. The 8 most highly contaminated wells will be treated using wellhead or distributed treatment systems and the treated water discharged into existing RID laterals and canals. The new treatment facilities will remove thousands of pounds of VOCs annually from the well water pumped from the most highly contaminated RID wells and discharge water of sufficient quality for all RID current and reasonably foreseeable end uses. Under state law[5], no remedial or response action can reduce the quantity of RID's water supply or restrict the quality of RID's water supply from its maximum beneficial and/or for all RID current and reasonably foreseeable end uses.

Since its inception in 1927, RID has withdrawn groundwater from the WVBA Site for beneficial use and will continue this operation to implement the ERA into the future. The RID ERA is focused on restoring the quality of RID's water supply while maintaining the quantity of water produced by RID's most highly contaminated wells. Consequently, the

[5] See ARS § 49-282.06.A.2 and B.4(b)

RID ERA will not result in a net change in annual groundwater pumping volumes by RID in the WVBA Site and future groundwater levels will be unaffected by the ERA.

The RID ERA is necessary to protect and provide a water supply from the most highly contaminated RID wells that is protective of all RID current and reasonably foreseeable end uses and to address current and future risks to public health, welfare and the environment from exposure to contaminants present in the groundwater that are known to volatilize when pumped from the most highly contaminated RID wells. As discussed before, the RID ERA is deemed legally "necessary" under AAC R18-16-405.I and ADEQ's approval of the RID ERA on June 24, 2010 (ADEQ, 2010). Under WQARF statutes and rules, RID is legally entitled to the mitigation of all adverse impacts from the groundwater contamination on its wells, operations, and water supply, and the cost of such mitigation is the responsibility of the parties that contributed to or threaten to contribute to the groundwater contamination that has impacted or threatens to impact RID wells and water supply[6].

The remedial approach and degree of treatment in the RID ERA and Modified ERA Work Plan are conceptually similar to regional remedial actions adopted by ADEQ and EPA at federal Superfund Sites in the Phoenix area including the Phoenix-Goodyear Airport (PGA-N), North Indian Bend Wash (NIBW), and 52nd Street sites. Similar to the extraction and treatment of contaminated groundwater at the PGA-N, NIBW, and 52nd Street Superfund Sites to less than the MCLs under the federal Safe Drinking Water Act, groundwater pumped by the most highly contaminated RID wells in the WVBA Site will be treated consistent with state law to allow "maximum beneficial use of the waters of the state" and to achieve applicable water quality standards (*i.e.,* Maximum Contaminant Levels [MCLs]) necessary to protect all RID current and reasonably foreseeable municipal, agricultural and industrial end uses[7].

The RID ERA is designed to address the most highly contaminated portion of RID's impacted water supply and is not considered the selected groundwater remedy for the WVBA Site. The ERA is not a groundwater remedy. The groundwater remedy for the WVBA Site will be developed by ADEQ in accordance with the process outlined in WQARF statutes and rules. This WQARF process is underway, with public participation from the community and interested stakeholders, and ADEQ recently issued the final Remedial Investigation (RI) Report (Terranext, 2012) which included final remedial objectives (ROs) for the WVBA Site. However, because the RID ERA uses a United States Environmental Protection Agency (EPA) presumptive response strategy that is economical, efficient and consistent with similar groundwater remedies adopted by ADEQ and EPA at other Superfund and WQARF sites, and because it is consistent with ADEQ policy prohibiting the transfer of pollutants from groundwater to other environmental media, RID believes it is reasonable to consider that

[6] See AAC, Title 18, Chapter 16; ARS, Title 49; and 40 CFR, Chapter 1, §300.430.
[7] See ARS § 49-282.06.A and B.4.b.

the RID ERA infrastructure and operation may be integrated as part of the selected groundwater remedy for the WVBA Site.

Nevertheless, the RID ERA is not subject to the same degree of analysis or agency approval as the subsequent selected groundwater remedy[8]. The development and approval processes for ERAs were intentionally streamlined to facilitate rapid implementation of response actions to mitigate impacts or threatened impacts on potentially affected parties within or near WQARF sites. In this case, the RID ERA is necessary to protect and provide RID a water supply from the most highly contaminated RID wells that is protective of all RID current and reasonably foreseeable end uses and to address current and future risks to public health, welfare and the environment from exposures to contaminants in the groundwater that volatize when pumped from the most highly contaminated RID wells.

2.2 Attainment of Administrative Code Objectives

Subsection A of AAC R18-16-405 authorizes an ERA if the ERA is necessary to address any one of the following objectives:

- Objective A1: Address current risk to public health, welfare, and the environment
- Objective A2: Protect or provide a supply of water

With respect to RID's operations, the ERA is necessary to provide a water supply from the most highly contaminated RID wells that is protective of all RID current and reasonably foreseeable end uses and to address current and future risks to public health, welfare and the environment from exposures to VOCs in the groundwater that volatilize when pumped from the most highly contaminated RID wells, which are directly authorized under Objectives A1 and A2. In fact, RID's impacted wells in the WVBA Site meet the "necessary" condition in AAC R18-16-405.I, which authorizes the RID ERA under AAC R18-16-405.A and ARS § 49-282.06.A and B.4.b.

The following sections summarize how the RID ERA achieves the objectives in A1 and/or A2 and therefore is authorized under AAC R18-16-405.A.

Objective A1: Address current risk to public health, welfare, and the environment

The RID ERA will accomplish this objective by initiating remedial actions in the WVBA Site. Specifically, the ERA will pump contaminated well water from the most highly contaminated RID wells, treat it to remove and control the hazardous VOCs that are known to volatilize into the air when pumped from the most highly contaminated RID wells, and discharge the

[8] See AAC R18-16-405.C.

treated water at below drinking water quality standards that will be protective of all RID current and reasonably foreseeable end uses. In addition, the ERA includes physical improvements to selected RID wells and conversion of open sections of RID canals to below-grade pipeline in order to control and, thereby, mitigate public access and exposure to contaminants and volatilization of VOCs at the most highly contaminated RID wells. Implementation of the ERA also has the immediate benefit of eliminating the uncontrolled emissions of thousands of pounds of VOCs from groundwater to air that would otherwise occur every year[9].

Objective A2: Protect or provide a supply of water

The RID ERA (1) provides and protects RID's water supply by restoring the water pumped from the most highly contaminated RID wells through treatment to a quality protective of all RID current and reasonably foreseeable uses and (2) maintains the current annual rate of groundwater pumping by RID in the WVBA Site to eliminate the potential for groundwater level decline resulting from the ERA.

2.3 Consistency With Statute

The RID ERA is consistent with the following remedial action criteria set forth in ARS §§ 49-282-06(A) and (B)(4)(b):

1. Assure the protection of public health and welfare and the environment;
2. To the extent practicable, provide for the control, management or cleanup of the hazardous substances in order to allow the maximum beneficial use of the waters of the state;
3. Be reasonable, necessary, cost-effective and technically feasible; and,
4. For remediation of waters of the state, the selected remedial action shall address, at a minimum, any well that at the time of selection of the remedial action either supplies water for municipal, domestic, industrial, irrigation or agricultural uses or is part of a public water system 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 uses without treatment due to the release of hazardous substances. The specific measures to address any such well shall not reduce the supply of water available to the owner of the well.

[9] At other Phoenix Superfund Sites, EPA, ADEQ, and Maricopa County have clearly articulated that VOC contaminants should be removed from the environment and treated or disposed of properly rather than transferred from one media (contaminated groundwater) to another media (air).

The RID ERA is consistent with remedial action criteria 1 for the reasons cited under Objective A1. The ERA protects public health, welfare and the environment through water treatment and infrastructure improvements to reduce public access and exposure to contaminants and volatilization of VOCs at the most highly contaminated RID wells and elsewhere in the RID system.

The ERA is consistent with remedial action criteria 2 for the reasons cited under Objective A2. The ERA treats the contaminated water pumped from the most highly contaminated RID wells to below MCLs that will be protective of all RID current and reasonably foreseeable end uses and allow maximum beneficial use as a municipal water supply.

The ERA is consistent with remedial action criteria 3 for the reasons cited below. The ERA is reasonable because it implements an early response action that is expressly authorized by AAC R18-16-405.A to protect or provide a supply of water and to address current risks to public health, welfare and the environment and is authorized by the Agreement to Conduct Work between ADEQ and RID, dated October 8, 2009, to prepare and implement an early response action; it is necessary as a matter of state law because RID wells have been threatened and impacted as defined in AAC R18-16-405.I; it is cost-effective because it predominantly uses existing RID wells, conveyances, and easements; and, it is technically feasible because it uses presumptive remedial technologies that have been demonstrated to be effective at numerous similar contamination sites and the necessary professional expertise is available locally to design, construct and operate this remedial action. Furthermore, under the Modified ERA Work Plan, the ERA will implement an even more cost-effective and efficient approach to the original ERA Work Plan that ADEQ approved as satisfying all the applicable remedial action criteria in ARS § 49-282.06.

2.4 Information Used to Develop ERA

The RID ERA was developed from extensive geologic, hydrogeologic and engineering experience and judgment in accordance with the associated standards of practice for each of these disciplines. The available data on the hydrogeologic conditions and nature and extent of contamination in the WVBA Site were reviewed during development of the ERA. The RID technical project team; including RID, Synergy, Spinnaker, M&A and EUSI, has broad-based experience in providing strategic direction and decision making on water contamination projects, developing and managing regional groundwater remedial actions, conducting contaminated groundwater assessments, and characterizing hydrogeologic conditions.

To support the original ERA conceptual design development effort, HDR Engineering, Inc. (HDR), a locally and nationally recognized leader in water resource engineering, was contracted to conduct conceptual engineering design work for the ERA. While the design

concept has been modified from the earlier conceptual stage, the information provided in the HDR ERA Conceptual Design Technical Memo (see Attachment A of the original ERA Work Plan) is still relevant and valid in that it provides the basis for cost comparison of the wellhead/distributed approach provided in this Modified ERA Work Plan. To support the Modified ERA design development effort, Taylor Rymar Corporation (TRC), a local and regional engineering design and construction administration firm, was contracted to conduct detailed engineering design work for the first phase of ERA development. The key team members from Synergy, Spinnaker, M&A, HDR and TRC are registered professional geologists or engineers in Arizona.

The original approach to the ERA (M&A, 2010a) was developed based on the following specific information: (1) the Draft RI Report for the WVBA Site (Terranext, 2008a), (2) the Land and Water Use Report (Terranext, 2007), (3) Article 4 of Title 18, Chapter 16 of the AAC that addresses remedial action evaluation and selection, (4) the goals of the federal NCP and associated applicable federal guidance documents on conducting feasibility studies and presumptive groundwater remediation technologies developed by the EPA for the federal Superfund Program (EPA, 1988 and 1996), and (5) information provided by RID regarding their wells, conveyances and current water operations.

In addition to the information listed above, several sources of recent information have been considered in development of this Modified ERA Work Plan. Much of this recent information was obtained through completion of work under the following tasks that were stipulated by ADEQ in its approval letter for the original ERA Work Plan (ADEQ, 2010):

- ERA Task 1 - Public Health Exposure Assessment and Mitigation Work Plan (Synergy, 2011a)
- ERA Task 2 - Well Investigations Work Plan (M&A, 2010b)
- ERA Task 3 - Groundwater Modeling Work Plan (M&A, 2011)
- ERA Task 4 - Engineering Design Study

Most recently, ADEQ issued the final RI Report (Terranext, 2012) that provided updated information including the final ROs. The final ROs are provided in the Final RO Report included in the final RI Report as Appendix AA in Volume II. The final ROs provide clear guidance with respect to the objectives of remedial actions in the WVBA Site. The objectives upon which this Modified ERA Work Plan is predicated are consistent with the remedial objectives set forth in the Final RO Report.

3.0 SUMMARY OF SITE CONDITIONS

Extensive regional groundwater contamination exists in the City of Phoenix (COP) from approximately 52nd Street to beyond 75th Avenue between Lower Buckeye Road and Campbell Avenue (**Figure 2**). The groundwater in this area is impacted primarily by VOCs resulting from historical and current releases and threatened releases to the subsurface at or from numerous industrial facilities. The EPA under the federal Superfund program is managing impacted groundwater east of 7th Avenue within the 52nd Street Site. The 52nd Street Site is subdivided into three operable units (OUs) (**Figure 2**).

Interim groundwater pump and treat systems are currently operating in OU1 and OU2 to address impacted groundwater within these OUs. To date, an OU-wide groundwater remedy has not been implemented in OU3; therefore, impacted groundwater continues to migrate from OU3 to the WVBA Site. Numerous industrial facilities have been identified in OU1, OU2 and OU3 where historical and current releases, threatened releases, and documented subsurface contamination are suspected to represent past and ongoing sources of groundwater contamination in the 52nd Street Site OUs and downgradient in the WVBA Site (ADEQ, 2008a).

Impacted groundwater north of McDowell Road between 27th and 51st Avenues is associated with the WCP Site and is being managed by ADEQ. The WCP Site is subdivided into 5 OUs: 1) East Grand Avenue, 2) West Grand Avenue, 3) North Plume, 4) North Canal Plume, and 5) West Osborn Complex. Impacted groundwater in the West Osborn Complex exists immediately north and nominally upgradient of the WVBA Site. Numerous industrial facilities have been identified in the WCP Site where historical and current releases, threatened releases, and documented subsurface contamination are suspected to represent past and ongoing sources of groundwater contamination in the WCP Site and downgradient in the WVBA Site (ADEQ, 2012)[10]. To date, a site-wide remedy to mitigate the impacted groundwater in the WCP Site has not been implemented.

The WVBA Site is located immediately west of the 52nd Street Site and south of the WCP Site (**Figure 2**). The groundwater contaminant plume that extends west from the Motorola 52nd Street facility to beyond 75th Avenue is one of the largest plumes in the United States.

[10] ADEQ reported at its January 18, 2008 WQARF Board meeting that the West Osborn Complex is currently in the FS stage and that impacted groundwater from this operable unit was more extensive than originally thought and probably has migrated to and merged with the WVBA Site. Also, the results of the Final RI for the WVBA Site indicated that volatile organic compounds appear to be migrating from the WCP Site to the WVBA Site (Terranext, 2012).

3.1 West Van Buren Area Site

The WVBA Site was informally established in 1987 and then formally registered as a WQARF site in 1998 (ADEQ, 2008b). The WVBA Site is approximately 8.5 miles long and approximately 1.5 miles wide in most areas. The Site comprises approximately 25 square miles within the western portion of the COP. The extent of groundwater contamination associated with the WVBA Site is generally bounded on the north by Interstate 10, on the east by 7th Avenue, on the south by Buckeye Road, and on the west beyond 75th Avenue. The City of Tolleson is located immediately west of the WVBA Site.

The Draft RI Report was published by ADEQ in October 2008 (Terranext, 2008a). The Draft RI Report included summaries of the following information:

- Methodologies and scope of groundwater investigations conducted in the WVBA Site from 1987 through 2008;
- Results of approximately 50 facility-specific soil and/or groundwater investigations, and remedial actions at some sites, conducted by owners and operators at suspected source areas within the WVBA Site;
- Surface water, geologic, hydrogeologic and ecologic conditions;
- Nature and extent of contamination;
- Impacts to RID's wells and fate and transport of COCs in their conveyance system; and,
- COC fate and transport in groundwater.

The final RI Report (Terranext, 2012) was recently issued by ADEQ; however, there were no significant revisions to the information listed above, as provided in the Draft RI Report (Terranext, 2008a). With the exception of Appendix Z, Responsiveness Summary, and Appendix AA, Final RO Report, the substance of the final RI Report is consistent with the Draft RI Report.

A summary of the physical setting, hydrogeologic conditions, groundwater conditions, sources of contamination and impact on RID wells and operations are provided in the following sections based on the results of the RI.

3.2 Physical Setting

The relevant aspects of the physical setting in the WVBA Site include current and future land and water uses and surface water conditions.

3.2.1 Land Uses

The WVBA Site is located in the western portion of the COP. The area within the WVBA Site is largely urbanized. The urban density currently is highest in the east near the city center and lowest in the west where active and retired agricultural lands exist. New industrial and commercial complexes are being developed in the western portion of the WVBA Site. The primary current land uses in the WVBA Site identified in the Land and Water Use Report include agricultural/vacant, industrial, warehouse, transportation, residential, and mixed commercial/public (Terranext, 2012). The population in the WVBA Site is expected to increase in the future with the largest increases occurring in the west; therefore, residential land use is expected to increase proportionately compared to the other land uses. The land uses reported by the respondents to the land use questionnaires, who were largely industrial in nature, are not expected to change significantly in the future.

3.2.2 Water Uses

As noted in Section 2.2.2.1 of the final RI Report (Terranext, 2012), water uses for production wells located in the WVBA include domestic, industrial, irrigation, utility, commercial, stock, test and municipal. RID, COP and the Salt River Project (SRP) all have wells within or proximal to the WVBA. RID and SRP wells have historically been used for irrigation; however, all three entities have indicated plans or intentions to develop this groundwater for use as a drinking water supply, as indicated in the latest Land and Water Use Study Questionnaires.

3.2.3 Canal/Surface Water

RID operates its primary canal, designated as the "RID Main Canal", in the southern portion of the WVBA Site to convey water pumped from its wells in the WVBA Site and adjacent areas to its service area west of the Agua Fria River (**Figure 2**). The RID Main Canal extends from approximately 19th Avenue and Interstate 17, through the cities of Phoenix, Tolleson, Avondale and Goodyear to its terminus west of Buckeye (approximately 32 miles west of the WVBA Site). The RID Main Canal conveys a mixture of treated wastewater from the COP 23rd Avenue WWTP, the Litchfield Park Service Company WWTP, remediated water from the PGA-N Superfund site and groundwater pumped from the WVBA Site and adjacent areas to its service area in Goodyear and Buckeye. Although water uses by RID may vary year to year, historically the RID Main Canal typically receives around 80,000 acre-feet per year (AFY) of withdrawn groundwater from wells in the WVBA vicinity including over 50,000 AFY of impacted groundwater from RID wells within the WVBA Site and approximately 30,000 AFY of groundwater from RID wells within the WVBA Site that are currently not impacted by the groundwater contamination. The majority of this groundwater pumping occurs during the peak irrigation demand season that extends from early March through

the end of September. The RID also receives a nominally continuous flow of treated wastewater that provides approximately 20,000 to over 30,000 AFY of additional water supply to the RID Main Canal.

A substantial portion of the impacted groundwater conveyed to the RID Main Canal is pumped from RID wells along Van Buren Street during the peak irrigation season. This impacted groundwater is conveyed to the RID Main Canal in the RID "Salt Canal" (**Figure 1**). The Salt Canal extends from approximately Interstate 17 to 83rd Avenue. The Salt Canal is predominantly a below-grade pipe with a few short sections of open canal that exist adjacent to Van Buren Street. Flow from the Salt Canal discharges to the RID Main Canal near 83rd Avenue between Van Buren Street and Washington Street. RID also operates several smaller pipelines and open canals within the WVBA Site to convey groundwater from RID wells to the RID Main Canal.

SRP also operates water conveyance systems in the WVBA Site. North-south oriented lateral canals transport water from SRP's Grand Canal southward, under gravity flow, for irrigation use in the WVBA Site and surrounding area. The lateral canals also are supplied by a number of SRP production wells located in areas surrounding the WVBA Site. SRP does not operate wells within the WVBA Site.

The Salt River is a surface water feature located south of the WVBA Site. Localized flow occurs in the Salt River south of the WVBA Site as a result of treated wastewater releases from the COP's 23rd Avenue Waste Water Treatment Plant (WWTP). More extensive flow in the Salt River in the area south of the WVBA Site can occur periodically as a result of runoff from heavy precipitation events and releases from upstream reservoirs on the Salt and Verde River systems. A portion of this flow in the Salt River recharges the groundwater in the area south of the WVBA Site. This recharge can affect groundwater levels, hydraulic gradients, and groundwater flow directions in the WVBA Site.

3.3 Hydrological Conditions

The WVBA Site is located within the West Salt River Valley (SRV). The SRV is an alluvial basin consisting of unconsolidated to semi-consolidated sediments typical of basin and range physiography. These sediments are up to several thousand feet thick in the center of the basin, ranging in size from clay to cobbles, with some evaporite deposits (Terranext, 2012). In general, the SRV is subdivided into three hydrogeologic units from shallowest to deepest: 1) Upper Alluvial Unit (UAU), 2) Middle Alluvial Unit (MAU), and 3) Lower Alluvial Unit (LAU) (**Figure 3**). The units of primary interest in the WVBA Site are the UAU and MAU. It is reported in the Final RI Report that the LAU does not currently appear to be impacted in the WVBA Site, although limited data exist to characterize the LAU (Terranext, 2012). The LAU is not discussed in detail in this report.

An analysis of lithologic logs from approximately 200 monitor wells and other types of wells was conducted by ADEQ for the WVBA Site during the RI (Terranext, 2012). Based on this analysis, the UAU within the WVBA Site was further divided into two subunits designated as the UAU1 and UAU2. The UAU1 is generally composed of loose surface soil grading downward into interfingered sand, gravel, and thin clayey sand lenses. The UAU1 ranges in thickness from approximately 170 to 310 feet. In general, the UAU1 exhibits higher percentages of fine-grained sediments west of 75th Avenue and in the northern portion of the WVBA Site.

The UAU2 is generally composed of fine-grained sediments with large percentages of clay. The top of the UAU2 is encountered at depths ranging from approximately 170 to 310 feet below land surface (bls). The UAU2 ranges in thickness from approximately 30 to 260 feet, with the thickest portion existing in the western portion of the WVBA Site. In general, the UAU2 is more fine-grained west of 67th Avenue and in the southern portion of the WVBA Site.

The MAU is identified below the UAU2 based on a lithologic sequence characterized by at least approximately 40 feet of hard brown clay or sticky brown clay. Below this sequence, the MAU is composed predominantly of fine-grained sediments. The MAU is encountered at depths ranging from approximately 260 to 500 feet bls. The total thickness of the MAU was not reported in the Draft RI Report.

The LAU consists mainly of conglomerate and gravel grading into finer-grained mudstones toward the center of the basin. The LAU reaches thicknesses of up to 10,000 feet in the center of the basin. There are no monitor wells completed in the LAU and only three RID production wells are completed in the upper portion of the LAU. Consequently, there is little information regarding the LAU hydrogeologic conditions at the WVBA Site.

3.4 Groundwater Conditions

Groundwater conditions in the WVBA Site have been monitored periodically since 1993 as part of the RI. Groundwater within the WVBA Site generally occurs under unconfined conditions in the UAU and under semi-confined to confined conditions in the MAU. Groundwater levels in the UAU have declined approximately 35 feet in the monitor wells within the WVBA Site based on groundwater monitoring conducted during the RI from 1993 to the present. The water level decline was estimated to be approximately 3 feet per year and corresponds to drier than normal precipitation conditions that have prevailed throughout much of the period since 1995. On an annual basis, groundwater levels in the WVBA Site vary seasonally with the highest water levels observed in the winter and lowest water levels observed in the summer. These fluctuations are due primarily to seasonal variations in groundwater pumping from the RID wells and are most prevalent in the central

and western portions of the WVBA Site. There are also periodic fluctuations due to flowing water events in the Salt River.

The prevailing lateral groundwater flow direction in UAU1, UAU2, and MAU is generally to the west, although groundwater flow directions can vary locally and seasonally due to recharge and groundwater pumping from the RID wells. The largest deviations from the prevailing westerly groundwater flow direction are observed in the central and western portions of the WVBA Site in close proximity to the RID wells. In general, groundwater flow is dominantly horizontal, but vertical flow is known to occur between UAU and MAU monitored intervals. Where consistently observed, vertical flow is attributed to partially confined aquifer conditions at deeper monitored intervals and may be either upward or downward depending on location and time of year. Few wells penetrate the LAU, but, recent investigations of fluid flow in well RID-95 an upward movement of groundwater from the Lower Alluvial Unit to the UAU occurs under non-pumping conditions at this location in the winter season (M&A, 2012).

Recharge in the WVBA Site occurs from infiltration of excess irrigation water from agricultural land, leakage from irrigation canals, and infiltration of treated wastewater and surface water runoff in the Salt River.

Groundwater pumping by RID represents the primary discharge from the WVBA Site (Terranext, 2012). RID currently operates approximately 50 large capacity wells east of the Agua Fria River. Thirty-two of these wells are located within the WVBA Site. The RID wells located within the WVBA Site are variably screened in the UAU, MAU and LAU. On average, RID pumps approximately 75,000 AFY of groundwater from wells located in the WVBA Site. Based on the reported hydrogeologic conditions in the WVBA Site in the final RI Report, the RID wells probably derive most of their water from the UAU. While groundwater levels declined approximately 35 feet in the last 16 years, coinciding with the onset of drought conditions in the mid 1990s and the lack of Salt River flow events and storm water releases, significant mining of groundwater has not occurred in the WVBA Site as a result of the long-term RID pumping. Other potential and current groundwater users in or near the WVBA Site include Arizona Public Service, SRP, COP, and the City of Tolleson (Terranext, 2007).

3.5 Nature and Extent of Groundwater Contamination

Groundwater contamination in the WVBA Site was first discovered in 1984 during routine groundwater sampling at the Phoenix Fuel Terminal (PFT; also known as the Van Buren Tank Farm) (Terranext, 2012). Since that time, a substantial effort has been undertaken to characterize the nature and extent of groundwater contamination, as well as identifying potential contamination sources. Based on the RI and other supplemental characterization work, the primary COCs detected at concentrations above regulatory standards in the

groundwater within the WVBA Site are VOCs. Specifically, the primary VOCs detected are PCE, TCE, and 1,1-dichloroethene[11]. To a lesser extent, chromium is also considered a COC. MTBE also has been detected in the WVBA Site groundwater in the vicinity of the PFT (Terranext, 2008b and c).

The final RI Report (Terranext, 2012) includes a detailed narrative, as well as tabular and graphical summaries, of the areal extent and temporal changes in COC concentrations in the UAU1, UAU2, and MAU over the period 1993 to 2008. PCE and TCE concentrations in groundwater as high as 95,000 micrograms per liter (µg/L) and 1,800 µg/L, respectively, have been reported in the UAU1 (Terranext, 2012). As reported in the final RI Report, the LAU does not appear to be impacted in the WVBA Site, although limited data are available to characterize the LAU water quality (Terranext, 2012).

Figures 4 through 12 depict the extent and spatial variation in PCE, TCE and 1,1-DCE concentrations in the UAU1, UAU2 and MAU, respectively, and the concentrations of these compounds detected in the RID wells during the first quarter 2008. These maps were prepared based on first quarter 2008 water quality data included in Table 4-5 of both the Draft RI Report (Terranext, 2008a) and final RI Report (Terranext, 2012),

As depicted on the figures, the most extensive groundwater contamination exists in the UAU1 and UAU2, with a substantially smaller area of impact existing in the MAU. Based on the similarity between PCE and TCE concentrations in the RID and monitor wells, it appears that the RID wells derive most of their water from the UAU. The water quality data collected during the RI indicate elevated VOC concentrations in the north-central and eastern portion of the WVBA Site, which indicate that VOC-impacted groundwater is currently migrating into the WVBA Site from the WCP and 52nd Street Sites. These observations are consistent with information reported in the final RI Report (Terranext, 2012). Specifically, ADEQ reported that water quality data developed during the RI indicated that VOCs were migrating from the 52nd Street and WCP Sites to the WVBA Site.

While there have been additional data collected on groundwater quality in many of the RID and monitor wells, **Figures 4** through **12** in this Modified ERA Work Plan that depict the extent and spatial variation of the COCs are still representative of the general Site conditions. **Figure 13** depicts the concentration of TCE, PCE and 1,1-DCE in RID production wells in the WVBA and that figure has been updated with the most recent water quality data. This recent RID well water quality data is also provided in **Table 1,** Summary of Water Quality Data, of this Modified ERA Work Plan.

[11] Other hazardous substances detected in groundwater in the WVBA Site, WCP Site, and 52nd Street Site include benzene, toluene, ethylbenzene, xylenes, nitrate, vinyl chloride, 1,1,1-trichloroethane, cis-1,2-dichloroethene, 1,1-dichloroethane and chloroform.

3.6 Sources of Contamination

A substantial effort was undertaken by ADEQ during the RI to identify potential sources that may have contributed to the groundwater contamination within the WVBA Site (Terranext, 2012). Over 60 potential sources have been identified in the WVBA Site based on information included in the final RI Report and other available records. Vadose zone investigations were conducted at approximately 50 of these potential sources areas and groundwater investigations were conducted at 11 of these potential sources areas (Terranext, 2012). Over 25 potential sources have been identified in the 52nd Street Site (Terranext, 2012; ADEQ, 2008a). Over 20 potential sources have been identified in the WCP Site (ADEQ, 2008c). The search for potential sources within the 52nd Street, WCP, and WVBA Sites has not been completed and, therefore, additional potential sources may be identified in the future.

3.7 Impact of Groundwater Contamination on RID Wells and Operations

Thirty-two RID production wells are located within the WVBA Site (**Figure 13**). In September 2012, 23 of the 26 RID wells that were sampled had detectable concentrations of VOCs and 14 RID wells were impacted by at least one VOC at a concentration exceeding AWQSs and MCLs[12] (Terranext, 2008c). The COCs detected above AWQSs and MCLs in September 2012 included PCE, TCE and 1,1-DCE. Of these COCs, PCE and TCE were the most prevalent and TCE was detected at the highest concentration of 64 µg/L in RID well 92. The AWQS and MCL for both PCE and TCE is 5 µg/L. In September 2008, RID wells 107 and 108 also contained MTBE at concentrations of 20 and 45 µg/L, respectively (Terranext, 2008a and c). These two RID wells are located near the PFT. An AWQS has not been established for MTBE. Groundwater pumped from RID wells 102 and 105 in 2008 also contained total chromium at concentrations of 21 and 12 µg/L, respectively. These concentrations are less than the AWQS and MCL for total chromium of 100 µg/L.

Over 110,000 AFY (over 70,000 gpm) of annual pumping capacity exists in the currently impacted RID wells within the WVBA Site. The impacted groundwater pumped from the RID wells, along with wastewater and groundwater pumped from unimpacted RID wells, is currently conveyed to the RID Main Canal and then to RID's service area west of the Agua Fria River. Groundwater pumping from the RID wells comprises the primary groundwater discharge from the WVBA Site (Terranext, 2012). Historical operation of RID wells appears to have limited the downgradient migration of contaminated groundwater within the WVBA Site.

[12] MCLs are enforceable "maximum contaminant levels" established under the federal Safe Drinking Water Act as drinking water quality standards. In Arizona, all groundwater aquifers are classified for drinking water protected use. Accordingly, the MCLs have been adopted as drinking water aquifer quality standards by rule. ARS §§ 49-223 and 49-224.

The contaminated groundwater in the WVBA Site has impacted and threatens to impact multiple RID wells, which impairs these wells and RID's operations, restricts the use of this water supply, and represents an ongoing liability to RID, as previously stated in RID's comment letter on the Draft RI Report submitted to ADEQ on December 23, 2008 (RID, 2008). A comprehensive groundwater remedy conducted under state and federal authority in the WVBA Site is required to eliminate the water supply impairment and associated liability to RID. Nevertheless, until a groundwater remedy is developed and implemented, RID has decided to pursue a voluntary early response action, pursuant to state law, to ensure the water supply from the most highly contaminated RID wells is protective of all RID current and reasonably foreseeable end uses, and to address the current and future risks to public health, welfare and the environment from exposures to VOC contaminants in the groundwater that volatize when pumped from the most highly contaminated RID wells.

3.8 Summary of Site Status

A substantial effort was undertaken by ADEQ and other parties over the past 25 years to characterize the hydrogeologic conditions, nature and extent of groundwater contamination, and potential sources of contamination of the groundwater in the WVBA Site. Based on those historical efforts, the following are key findings and milestones for the WVBA Site:

- The final RI Report was published by ADEQ in August 2012. The final RI Report summarizes the regional groundwater and contaminant assessment conducted by ADEQ and other private parties at facilities within the WVBA Site.
- The Land and Water Use Study has been completed. This study identified RID as the largest current groundwater user in the WVBA Site.
- Impacted groundwater exists over a large area and to depths greater than 300 feet bls.
- Numerous potential sources located in the WVBA, WCP and 52nd Street Sites have contributed, are suspected to have contributed, or threaten to contribute to the groundwater contamination in the WVBA Site.
- The community has been routinely informed on the WVBA project status and has actively participated in the administrative process.
- RID operates 32 production wells in the WVBA Site and 23 of these wells are currently impacted by the groundwater contamination and the remaining RID wells are threatened.

There have also been a number of significant efforts currently underway or recently completed in the WVBA Site since the original ERA Work Plan was approved in June 2010. Based on these recent efforts, the following are additional sources of information for the WVBA Site:

- Proposed ROs were developed and issued on May 16, 2011 by ADEQ (ADEQ, 2011a) and the Final RO Report was issued as Appendix AA of the final RI Report in August 2012 (Terranext, 2012);
- Task 1 work, detailed in the Public Health Exposure Assessment and Mitigation Work Plan (Synergy, 2011a), was completed and results were submitted to ADEQ on September 16, 2011, in a Summary Report (Synergy, 2011b);
- Task 2 work, detailed in the Well Investigation Work Plan (M&A, 2010b), was completed at RID-95 and reported to ADEQ in the RID-95 Well Investigation Technical Memorandum (M&A, 2012); well investigations were recently conducted at RID-111R and at RID-92;
- Task 3 work, detailed in the Groundwater Modeling Work Plan (M&A, 2011), is currently underway;
- Engineering pilot studies, detailed in the RID-95 Wellhead Pilot Treatment System Proposal (Synergy, 2011c), with implementation agreed to by ADEQ by letter dated September 2, 2011 (ADEQ, 2011b), were completed and treatment systems installed at four (4) RID wells [RID-89, RID-92, RID-95 and RID-114] (all currently in operation); and,
- In conjunction with RID, water quality sampling was conducted by ADEQ at many of the contaminated RID wells in June 2010, April 2011, September 2011 and September 2012.

In addition to the WVBA technical efforts listed above, the Final FS Report for the West Osborn Complex (WOC) WQARF Site, immediately north of and adjacent to the WVBA Site, was recently issued by GeoTrans, Inc. (GeoTrans, 2012). Key ADEQ findings and conclusions in the WOC Final FS Report that are equally applicable, relevant or appropriate for the WVBA Site include:

1. ROs for groundwater use are based on the current and reasonably foreseeable uses of water at the site for drinking water purposes based on the needs of the impacted water providers in the site;
2. Proposed treatment technologies must achieve drinking water standards for COCs;
3. Liquid-phase granular activated carbon (LGAC) was the selected treatment technology to cost-effectively ensure reliable and fail-safe removal of COCs; and,

4. ADEQ requires all remediation technology to provide vapor capture/control to prevent pollutant transfer from one environmental media to another and to provide a high degree of public protection against potential exposure to VOCs in the air.

The Final WOC FS Report also confirmed ADEQ's findings in the 2008 Draft RI Report for the WVBA Site that the WOC groundwater contamination plume is continuing to migrate in a southwesterly direction and into the WVBA Site and, therefore, is impacting or threatening to impact RID wells in the WVBA Site. The result is the continued transfer of groundwater contamination from the WOC WQARF Site to the RID well field in the WVBA Site, leaving the environmental impacts and costs to address much of the WOC groundwater contaminants to fall on RID.

Section 3.8 of the original ERA Work Plan also states that, of the 32 RID wells within the WVBA, 18 of these wells were contaminated. However, current data show that 23 of the 26 RID wells that were sampled in September 2012 are contaminated with 14 of these wells impacted by VOC concentrations that exceed EPA MCLs.

4.0 DESCRIPTION OF ERA AND MODIFIED ERA WORK PLAN

The modified approach to the ERA is depicted on **Figure 14** and summarized in **Table 2**. Consistent with the prior analysis contained in the ERA Work Plan approved by ADEQ, the Modified ERA Work Plan was developed based on an evaluation of Site conditions, the documented impact and threatened impact on RID wells and operations, a preliminary analysis of potential response actions, and the extensive experience of RID's technical consultants on similar groundwater contamination sites. Likewise, consistent with the ERA Work Plan approved by ADEQ, the Modified ERA Work Plan includes actions and technologies that are proven, reliable and effective. The conceptual design and phased implementation of the Modified ERA Work Plan are summarized below.

4.1 Modified ERA Work Plan Conceptual Design

Consistent with the prior analysis contained in the ERA Work Plan approved by ADEQ, the remedial actions described in this Modified ERA Work Plan were selected using best available Site information, best available scientific information concerning remedial methods and technologies, and best engineering judgment. This Modified ERA Work Plan, however, is further refined by information and data obtained from recent activities conducted in accordance with the supplemental Tasks set forth in the ADEQ's June 24, 2010 approval letter (ADEQ, 2010) for the original ERA Work Plan and in the RID-95 Wellhead Pilot Treatment System Proposal. Through consideration of this information and application of best engineering judgment, the potential remedial alternatives identified in the ERA were re-evaluated as discussed in the following sections.

4.1.1 Potential Remedial Alternatives

The following potential remedial alternatives were considered to achieve the ERA objectives:

- Drilling of new extraction wells outside of the WVBA Site to replace the impacted RID water supply;
- Modifying existing impacted RID wells to exclude contaminated zones;
- Modifying existing impacted RID wells to only pump from contaminated zones;
- Acquiring a surface water supply and abandoning existing impacted RID wells;
- Implementing wellhead treatment using air stripping (AS);
- Implementing centralized treatment using AS;

- Implementing centralized treatment using LGAC; and,
- Implementing wellhead treatment using LGAC.

4.1.2 Alternatives Evaluation

These alternatives were conceptually evaluated for effectiveness in contaminant removal and control, practicability and ease of near-term implementation, regulatory acceptance, capital cost, and ongoing operation and maintenance (O&M) costs. The findings from this conceptual evaluation are as follows:

Three alternatives were conceptually evaluated that propose replacing the impacted RID water supply by:

- Acquiring replacement water resources;
- Drilling new extraction wells outside of the WVBA Site; or,
- Modifying existing impacted wells to exclude contaminated zone.

These alternatives were eliminated from further consideration for two fundamental reasons. First, all three replacement water alternatives pose large, if not insurmountable, implementation issues in terms of acquiring or developing the water supplies which would be needed to replace the approximately 70,000 gpm peak pumping capacity in the 23 impacted RID production wells. Acquiring replacement water sources for even a portion of the impacted RID water supply, if feasible, would be difficult, costly, and entail protracted efforts to develop the necessary infrastructure or water rights. The second overriding issue of concern would result from RID cessation of pumping should replacement water supplies become available. Ceasing pumping of impacted RID wells would result in expansion of the WVBA plume and potential impacts to additional wells owned by RID and other water providers that are not presently contaminated.

The alternative to modify existing impacted wells to only pump from contaminated zone has some potential to increase the effectiveness of contaminant removal and control for the groundwater remedy but does not meet the objective of the ERA which is to restore and protect the quality and quantity of the water supply from the most highly contaminated RID wells. However, modification of RID wells may limit the quantity of water available to and needed by RID. Consequently, further consideration of this alternative will be addressed in the FS for the WVBA Site.

The remaining alternatives evaluate treatment as the means to restore the quality of the water supply from the most highly contaminated RID wells using AS or LGAC treatment technology applied at either the wellhead or a centralized treatment plant.

Wellhead treatment using Air Stripping: This alternative would be problematic from both an operational and a regulatory acceptance standpoint. Recent discussions with ADEQ confirm the agency position that single-stage AS is not a suitable treatment technology for any future remedial actions that has a reasonably foreseeable drinking water end use because failure of the AS treatment system could result in a direct discharge of untreated groundwater into a public water supply. Pursuant to AAC R18-16-411(C), any water treatment facilities must "assure protection of public health against such failure." The selection of AS for any future remedial actions leading to a reasonably foreseeable drinking water end use would require secondary treatment or blending within the potable system. Secondary treatment using a second pass through an AS tower would result in significant maintenance issues due to scale formation in the tower packing. This problem is persistent even in single-pass AS systems operated in the Phoenix area due to the high level of hardness in groundwater and would be substantially more problematic if a two-pass AS configuration were employed. Additionally, AS would require subsequent air treatment by vapor-phase GAC that would substantially add to capital and O&M costs. For these reasons, this alternative is not considered a practical or cost effective approach to meet the ERA objectives.

Centralized treatment using AS: This alternative would be problematic from both an operational and a regulatory acceptance standpoint, for the same reasons stated above. For these reasons, this alternative is not considered a practical or cost effective approach to meet the ERA objectives.

Centralized treatment using LGAC: Although a centralized LGAC treatment was identified in the original ERA Work Plan as the most practicable alternative to meet the ERA goals, it has become apparent, based on information and data obtained from recent activities conducted in accordance with the supplemental Tasks set forth in the ADEQ's June 24, 2010 approval letter (ADEQ, 2010) for the original ERA Work Plan and in the RID-95 Wellhead Pilot Treatment System Proposal, that centralized LGAC treatment is a more costly and complicated approach compared to wellhead treatment, requiring installation of additional pipelines (as discussed in Section 4.2.4), and new pump stations and ancillary process equipment (as discussed in Section 4.2.1). In addition, the centralized treatment alternative provides significantly less flexibility in terms of blending opportunities and the ability to implement changes as Site conditions evolve into the future. For these reasons, this alternative is not considered to be a cost effective approach to achieve the ERA objectives.

Wellhead treatment using GAC: Based on the experience obtained from the RID-95 Wellhead Pilot Treatment System program, this alternative is both technically feasible and

cost effective. Information and performance data obtained from the installation and operation of the four wellhead pilot treatment systems, installed and operated in near-continuous mode, demonstrate that wellhead treatment using LGAC is feasible and less expensive than a centralized treatment facility. Where land access is restricted at several target RID well sites, reconnaissance surveys and preliminary contacts with adjacent land owners, conducted after the original ERA Work Plan was approved, indicate that it is feasible to acquire sufficient land to construct the necessary wellhead treatment systems identified in this Modified ERA Work Plan.

LGAC treatment is known to be reliable, fail-safe and readily accepted by the regulatory agencies as a Best Available Demonstrated Control Technology (BADCT); therefore, LGAC treatment is compliant with AAC R18-16-411(C). Under state law, treated water from the ERA must, to the extent practicable, be treated to a degree applicable for "maximum beneficial use" and for all "current and reasonably foreseeable end uses" by RID[13]. GAC treatment can achieve this requirement. For these reasons, this alternative is considered to be the most practicable and cost effective alternative to meet the ERA objectives.

4.2 Modified ERA Work Plan Conceptual Design Elements

The primary conceptual design elements of the original ERA approach, as detailed in the ADEQ-approved ERA Work Plan, included: (1) a centralized groundwater treatment facility (CGTF); (2) physical improvements to existing pipelines and canals; (3) modifications to existing extraction wells; and (4) new pipelines. This Modified ERA Work Plan modifies this original design approach in several areas. The following sections briefly recap the Modified ERA Work Plan design elements and describe the proposed modifications, where applicable, to enable consideration of the enhancements and improvements to the original ERA conceptual design approach.

4.2.1 Treatment Facilities

The original ERA Work Plan included a CGTF designed to treat 20,000 gpm of water from ten of the most highly contaminated RID wells using LGAC. The CGTF was to include the following major system components: wet wells, pump stations, prefilters, LGAC contactors, flush and backwash support systems, and instrumentation and controls.

This Modified ERA Work Plan will consist of wellhead LGAC treatment systems, in lieu of the CGTF, at eight of the most highly contaminated RID wells. Based on information and performance data obtained from the pilot wellhead treatment systems installed and operated at RID-89, RID-92, RID-95, and RID-114, it has been demonstrated that wellhead

[13] See ARS § 49-282.06.A.2 and B.4.b.

treatment is not only feasible and satisfies the ERA objectives, but also provides the following additional ancillary benefits:

- Reduces capital costs by approximately 50%, from approximately $34 million (MM) to approximately $18MM;
- Reduces operation and maintenance (O&M) costs by approximately 50%, from approximately $3-$4MM per year to approximately $1.5-$2MM per year;
- Enables blending of treated water with untreated water from wells having lower contaminant concentration along the Salt Canal, thereby increasing the total volume of contaminated well water that will meet applicable MCLs by approximately 50%;
- Significantly reduces the time required to implement the early response pump and treatment action due to the simplified and modular nature of the wellhead treatment systems (compared to a central water treatment facility) and the elimination of the complex and disruptive construction of north-south lateral pipelines;
- Reduces the scope and cost of the selected groundwater remedy by reducing the number of impacted RID wells that will need to be addressed through supplemental remedial actions developed during the WVBA Site Feasibility Study and by providing effective mass contaminant removal and treatment by the earlier implementation of the wellhead treatment and blend systems that will remediate up to approximately 2,300 pounds per year of VOC contamination in the regional groundwater; and,
- Reduces the scope and cost of the selected remedy at the West Osborn Complex WQARF Site by addressing the groundwater contamination that is migrating into the WVBA Site and impacting and threatening to impact RID's wells.

The concept of blending treated and untreated wells along the Salt Canal is a new element introduced in this Modified ERA Work Plan. Combining the treated groundwater from wells RID-106, RID-112, RID-113, and RID-114 with untreated groundwater from lower contaminant concentration wells RID-105, RID-107, RID-108, RID-109, RID-110 and RID-111R, will achieve a blended water quality that meets or exceeds applicable MCLs at the point of discharge of the Salt Canal into the Main Canal.

The Salt Canal is primarily an enclosed pipeline except for two remaining open sections to be enclosed under this Modified ERA Work Plan as described in Section 4.2.2 below. Once fully enclosed, the point of discharge to RID Main Canal will be the first point of reasonable potential for public exposure and will serve as the point of compliance to achieve applicable MCLs for the VOCs. This blending approach is summarized in **Table 3**, which provides the

mathematical projection of water quality from blending treated wells with untreated wells and shows the worst-case, blended VOC concentrations at this point of compliance.

4.2.2 Salt Canal Improvements

The RID Salt Canal, which runs from 23rd to 83rd Avenues along the south side of West Van Buren Street, will serve as a major conveyance of both treated and untreated well water to the RID Main Canal at 83rd Avenue. The Salt Canal is a gravity conveyance that consists primarily of reinforced concrete or vitrified clay pipe ranging in diameter from 21 inches to 48 inches, with the diameter increasing in the direction of flow (east to west).

Improvements to the Salt Canal will include replacing open sections of canal with below-grade pipe to prevent volatilization of VOCs from untreated water to the atmosphere and restrict public access to contaminated water. There are currently only two remaining open reaches on the Salt Canal: (1) approximately 220 feet of open canal east of 77th Avenue, and (2) approximately 1,150 feet of open canal west of 79th Avenue. The third reach included in the original ERA Work Plan, approximately 220 feet near 68th Avenue, has been converted to below-grade piping as part of a recent COP street improvement project.

4.2.3 Well Modifications

Well modifications are primarily intended to enable remote operation and monitoring of the extraction wells that are connected to treatment systems and to minimize point source release of VOCs from well discharge structures.

Each RID well equipped with treatment systems will be modified to provide instrumentation and controls to enable remote operation and to collect and transmit data to a central point of operation. At a minimum, the operating status and flow rate will be provided through instruments at the well and transmitted to the operations center. Currently, these wells are controlled manually at the wellhead and flow rates are estimated based on electric use information and periodic flow measurement.

Each of the RID wells to be equipped with treatment systems has unique discharge structure and piping and will require individual modifications to implement volatilization controls. Conceptually, the existing air gap present at each well will be enclosed to eliminate VOC volatilization to the atmosphere. A passive GAC filter will be installed to vent this sealed enclosure to accommodate pressure differentials, allowing the enclosure to breath as discharge and atmospheric conditions change while preventing release of VOCs from the enclosure head-space to the atmosphere.

A secondary aspect of the Well Modifications section of the original ERA Work Plan was to determine whether the bottom portion of deeper RID wells, those penetrating through the MAU and into the LAU, needed to be sealed off from the UAU to isolate pumping to the upper, contaminated groundwater zones and prevent migration of contaminants from the UAU into the underlying MAU and LAU through conduit flow. The results of well investigations at RID-95 demonstrated that there is an upward gradient under non-pumping conditions, preventing the downward movement of contaminants and any vertical cross-contamination of alluvial units. These additional well modifications may be contemplated and addressed in the FS.

4.2.4 New Pipelines

A number of new pipelines were planned in the original ERA Work Plan (M&A, 2010a) including eight individual segments extending over 25,000 linear feet, consisting of:

- A new 48-inch gravity flow pipeline connecting the terminus of the Salt Canal at 83rd Avenue to the CGTF located at 84th Avenue;
- Four new pressurized pipelines, ranging in size from 10- to 20-inches in diameter, to convey water from the highly contaminated southern-tier wells (RID-89, RID-92, RID-95, and RID-100) north to the Salt Canal; and,
- Three new pressurized pipelines, ranging in size from 12- to 16-inches in diameter, to convey water from the lower concentration contaminated wells located on the Salt Canal (RID-105, RID-109, and RID-110) south to existing laterals and, from there, to the Main Canal by gravity flow.

These new pipelines are no longer necessary under the Modified ERA Work Plan. Elimination of these new pipelines significantly reduces the ERA capital costs (by approximately $7 million), reduces O&M costs associated with pumping and pipeline maintenance, reduces implementation impacts to the local public (e.g. street excavation, traffic restrictions and congestion), and substantially reduces the time to achieve full ERA implementation by eliminating the lengthy task of pipeline design, permitting and construction.

4.3 Modified ERA Work Plan Implementation

Implementation of this Modified ERA Work Plan is based on treatment of "target VOCs", those VOCs that exceed MCLs, to achieve treatment to levels that are below these corresponding MCLs. Several of the VOCs present in the contaminated well water are below MCLs and are substantially more difficult to remove through the LGAC process than the target VOCs. Consequently, allowing these "deminimis" VOCs, those VOCs that are

already present at concentrations below MCLs, to pass through the LGAC vessels will result in a significant reduction in O&M costs while achieving MCLs for all VOCs. This approach will enable much longer LGAC bed life compared to GAC replacement at the first detection of these deminimis VOCs in the treatment system effluent.

Table 2 has been revised to include mass removal estimates that include only target VOCs. The VOC concentrations in **Table 2** have also been updated to include the latest ADEQ sampling results and the reduced flow rates due to treatment system head losses.

The Modified ERA Work Plan will be implemented in a two-phase approach as described in the following sections.

4.3.1 Phase 1

Phase 1 of the Modified ERA Work Plan consists of installation and operation of the four wellhead treatment systems included in the RID-95 Wellhead Pilot Treatment System Proposal (Synergy, 2011c). These four wells are among the most highly contaminated wells, and treatment of these wells has resulted in restoring the quality of the water supply from these wells to concentrations protective of all RID current and reasonably foreseeable end uses. One of these wells, RID-114, is located at the eastern end of the Salt Canal at 23rd Avenue and West Van Buren Street (**Figure 14**). The remaining three wells, the "southern-tier wells" (RID-89, RID-92 and RID-95), are all located approximately ¾ mile south of the Salt Canal that runs parallel to West Van Buren Street along the southern alignment. RID-89, -92 and -95 are located on 51st, 43rd and 35th Avenues, respectively.

Phase 1 design and construction has been completed and wellhead treatment at all four wells is currently underway. The most recent information regarding volumes of water treated and VOC mass removed from these Phase 1 wells is available in the August 2012 Monthly Progress Report - RID-95 Wellhead Pilot Treatment Systems (Synergy, 2012a).

Based on current VOC concentrations in the Phase 1 RID wells, the estimated total annual VOC mass removal during Phase 1 would be up to approximately 1,900 pounds, which would be more than the total pounds of VOCs removed in FY2011 at all other WQARF sites. (**Table 2**). System performance monitoring is being conducted to assess well operations and treatment effectiveness. The treated water from Phase 1 will be used for its highest beneficial use, which in addition to irrigation could include industrial supply and/or potable supply, in the reasonably foreseeable future.

Production capacity of these four wells decreased as a result of the additional head losses through the treatment systems. Reductions in pump output have been observed in each well with average losses of approximately 10%. Well RID-92 has the highest production

capacity loss of approximately 18%. RID intends to recover this lost capacity at each of these wells as part of this ERA through well equipment replacement and installation of an additional treatment skid at RID-92. Additional engineering assessment is needed to determine the most appropriate means of restoring the lost water production capacity that resulted from the wellhead treatment, and this assessment will occur as part of the Modified ERA Work Plan.

4.3.2 Phase 2

Phase 2 of the Modified ERA Work Plan consists of equipping four additional RID wells with high VOC concentrations with wellhead treatment. These additional wells (anticipated as RID-100, RID-106, RID-112, and RID-113) will be equipped with wellhead treatment systems similar to those constructed at the pilot treatment system sites, as illustrated in **Figure 14**. The objective is the restoration of the quality of the water supply from these additional contaminated RID wells to concentrations protective of all RID current and reasonably foreseeable end uses. Three of the Phase 2 wells are located along the Salt Canal that runs parallel to West Van Buren Street along the southern alignment. RID-106, -112 and -113 are located just east of 67th, at 32nd and just east of 28th Avenues, respectively. The remaining Phase 2 well, RID-100, is an additional southern-tier well located at 27th Avenue approximately ¾ mile south of Van Buren Street.

Phase 2 wellhead treatment systems installation is anticipated to begin in late 2013, upon availability of project funds. These installations will be designed consistent with the Phase 1 treatment systems as detailed in the RID-95 Wellhead Pilot Treatment System Proposal, dated August 18, 2011, whose implementation was agreed to by ADEQ by letter dated September 2, 2011.

Phase 2 implementation may require access to, or acquisition of, additional land for siting of wellhead treatment units at the targeted RID well sites. Information obtained during Phase 2 planning and design concerning land availability, site access, and well and water quality conditions will dictate final decisions concerning treatment system installation and/or may necessitate alternative siting for wellhead treatment, particularly associated with RID wells on the Salt Canal.

Based on current VOC concentrations in the Phase 2 wells, the estimated total annual contaminant VOC mass removal following implementation of Phase 2 would be approximately 440 pounds (**Table 2**). The treated water from Phase 2 would be used for its highest beneficial use, which in addition to irrigation could include industrial supply and/or potable supply in the reasonably foreseeable future.

The total annual volume of water pumped during the ERA would be nominally equivalent to the current annual volume pumped by RID from this area and future groundwater levels will be unaffected by the ERA.

As discussed in Phase 1, the production capacity of these Phase 2 wells will also be reduced due to head losses through the treatment systems. RID intends to recover this lost capacity at each well as part of this ERA and installation of an additional treatment skid at RID-106.

5.0 MODIFIED ERA WORK PLAN TASKS

The following tasks comprise the ERA:

- Task 1 – Meetings
- Task 2 – Community Involvement
- Task 3 – Data Collection and Analysis
- Task 4 – Permits and Property Access
- Task 5 – Design
- Task 6 – Construction
- Task 7 – System Testing and Start-up
- Task 8 – Operation and Maintenance Plan

Brief summaries of the activities anticipated for each task are provided below in the following sections.

5.1 Task 1 - Meetings

Meetings will be scheduled with interested and affected stakeholders such as local municipalities, local residents and the business community that may be impacted by Site activities to coordinate and obtain feedback and input on significant aspects of the ERA. Coordination meetings will be held with ADEQ throughout the entire ERA.

5.2 Task 2 - Community Involvement

Community involvement has been facilitated during the planning and implementation of the original ERA in accordance with AAC R18-16-404 and the existing Community Involvement Plan developed by ADEQ for the WVBA Site. Consistent with the ERA Work Plan approved by ADEQ, periodic public meetings will continue to be held to communicate progress on the ERA and obtain feedback from the community. In order to broaden communication outreach and enhance transparency, RID will continue to deliver messages and information through the various communications channels and platforms developed for the ERA. These channels and platforms may include one-on-one briefings, group presentations, electronic and print media, and web-based communications.

5.3 Task 3 - Data Collection and Analysis

Additional groundwater quality data will be obtained during the ERA to the extent required for ERA design and implementation. Groundwater samples were collected and analyzed for VOCs and chromium from 24 RID wells in September 2008 (Terranext, 2008c). These data have been reviewed, and serve as the basis for **Figure 4** through **Figure 12**, inclusive. Terranext conducted additional sampling of RID wells and canals, with oversight by Synergy, in June 2010, September 2011 and September 2012. The most recent water quality data for RID wells in the WVBA is provided in **Table 1**. Supplementary sampling may be conducted to fill data gaps if needed and may include sampling from selected RID wells, ADEQ monitor wells and RID canals. All samples will be analyzed for COCs. All water quality analytical work will be conducted at an Arizona-certified laboratory.

To the extent possible, the field activities, sampling methods, laboratory analyses and quality assurance procedures will adhere to protocols developed by ADEQ in the WVBA Field Sampling and Analysis Plan (FSAP) and Quality Assurance Project Plan (QAPP) issued by BE&K/Terranext (BE&K/Terranext, 2000a and b). Field activities will also adhere to the Site-Specific Health and Safety Plan (HASP) issued by Synergy (Synergy, 2011d) which was an addendum to the 1999 BE&K/Terranext HASP (BE&K/Terranext, 1999). RID will coordinate with ADEQ to define any exceptions or other modifications to these plans prior to the initiation of field work and formally adopt the approved plans to guide future data acquisition. RID will provide ADEQ with advance notice of sampling or data collection activities and the results of these activities.

After startup of the wellhead pilot treatment systems, RID began conducting sampling of select RID wells and at various points within the wellhead treatment systems, as specified in the RID-95 Wellhead Pilot Treatment System Proposal (Synergy, 2011c), and in the ERA Operation and Maintenance Plan (Synergy, 2012c), in general accordance with the adopted FSAP, QAPP and HASP.

5.4 Task 4 – Permits and Property Access

Under the Modified ERA Work Plan, all of the construction work associated with the ERA will take place on existing RID property or in RID easements, except at those well sites where additional land must be acquired in order to support placement of the wellhead treatment systems. However, it is anticipated that some new permits, property access agreements and/or easements may be required to construct the ERA components, which will include converting the open sections of the Salt Canal to below-grade pipeline, constructing the treatment facilities and improving well sites. It is also anticipated that additional land will need to be procured from adjacent property owners at well sites RID-

100, RID-106, RID-112, and RID-113 due to the limited size of the well sites and location of the existing wells within those sites.

RID, as a governmental agency, is exempt from many of the permitting requirements normally associated with this type of construction project. However, the following permits may be required in conducting the work described in this Modified ERA Work Plan. Additional permits and agreements may be required as the project progresses. The anticipated permits or approvals/agreements are listed below:

COP - Transportation Department:	Right-of-Way Permits Traffic Control Permits
Maricopa County Air Quality Department:	Dust Control

5.5 Task 5 – Design

Under the approach outlined in this Modified ERA Work Plan, detailed engineering design will be greatly simplified and streamlined due to the previous detailed engineering design efforts completed as part of the RID-95 Wellhead Pilot Treatment System initiative, whose implementation was agreed to by ADEQ by letter dated September 2, 2011. The basic design of each wellhead treatment system is essentially identical with the only differences being the orientation of the treatment skid(s) and configuration of interconnecting piping. These unique aspects of each wellhead treatment system will be influenced by the individual site conditions such as available space and constraints imposed by existing infrastructure.

The basic design of these wellhead treatment systems has been demonstrated to be reliable and effective in removing the target VOCs as well as to be protective of public health by providing redundancy and fail-safe operational controls, as demonstrated in the 1-Month Technology/Design Demonstration Report - RID-95 Pilot System (Synergy, 2012b). Consequently, RID proposes to provide ADEQ with only the final detailed engineering design documents for each of the wellhead treatment systems, and Salt Canal improvements, for review and approval by ADEQ in accordance with the provisions of AAC R18-16-411 prior to commencement of construction.

5.6 Task 6 - Construction

Construction will commence on each of the discrete system elements described previously upon completion of detailed design documents, receipt of required approvals, receipt of necessary funding and acquisition of all required permits and access agreements.

5.7 Task 7 - System Testing and Start-Up

Start-up and commissioning of each of the discrete system elements will be conducted following completion of construction and prior to final acceptance of the facilities. The individual wellhead treatment systems, including the interconnected RID wells, will be operated to verify proper function of all controls and alarms and to document conformance with all significant design specifications.

During start-up operations, the treated water will be discharged to the RID Main Canal. The treated water will be sampled and analyzed in accordance with the O&M Plan and discharge permit, if required, to verify proper system operation and to ensure compliance with water discharge quality standards.

5.8 Task 8 - Operation and Maintenance

An O&M plan has been prepared in accordance with AAC R18-16-411. The existing Early Response Action Operation and Maintenance Plan - Wellhead Treatment Systems (Synergy, 2012c), addressing O&M of the existing four wellhead treatment systems, will be updated, and provided to ADEQ for review and approval, during implementation of this Modified ERA Work Plan to address the O&M of these additional four wellhead treatment systems. The WVBA Site Community Advisory Board will be provided the opportunity to comment on the O&M Plan before it is considered final.

Discharge of treated water to waters of the United States is not anticipated for the ERA; therefore, an Arizona Pollutant Discharge Elimination System permit will not be required. The RID Main Canal is not designated as waters of the United States.

6.0 SCHEDULE

Due to the uncertainty in the time to obtain approval of this Modified ERA Work Plan and to secure project funding, the schedule for implementation is defined by approximate task frequency (for recurring tasks) and estimated task duration (for non-recurring tasks). This revised schedule is summarized below.

Task 1 - Meetings

Meetings with ADEQ will be held on a quarterly basis or more frequently as needed based on project activity.

Task 2 - Community Involvement

Meetings with the community will be scheduled and coordinated by ADEQ.

Task 3 - Data Collection and Analysis

Data is being collected and analyzed on an ongoing basis and will be reported to ADEQ as required.

Task 4 - Permits and Property Access

Permits required for construction activities will be obtained as part of those efforts, and included in the Task 6 - Construction schedule.

Acquisition of additional property adjacent to the existing well sites is anticipated to take six to twelve months from approval of the Modified ERA Work Plan and availability of project funding.

Task 5 - Design

Design of the modifications to the Salt Canal is anticipated to take three to six months following approval of the Modified ERA Work Plan and availability of project funding.

Design of individual wellhead treatment systems is anticipated to take approximately four months from acquisition of additional property, where required, or from approval of the Modified ERA Work Plan and availability of project funding, where additional property is not required.

Task 6 - Construction

Construction of the modifications to the Salt Canal is anticipated to take approximately six months from completion and approval of the associated design documents.

Construction of the wellhead treatment systems is anticipated to take twelve to sixteen months from completion and approval of the associated design documents.

Task 7 - System Testing and Start-Up

Testing and start-up of the wellhead treatment systems is anticipated to take two months following completion of construction of each of the systems.

Task 8 - O&M Plan

Revision of the existing O&M Plan, covering the wellhead treatment systems currently in operation, is anticipated to take one month from completion of the final design documents.

7.0 REFERENCES CITED

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TABLES

TABLE 1
SUMMARY OF WATER QUALITY DATA
ROOSEVELT IRRIGATION DISTRICT WELLS
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

WELL IDENTIFIER			RID-83	RID-84	RID-85	RID-86	RID-89	RID-91	RID-92
DATE SAMPLED			09/14/11	09/17/12	06/07/10	09/17/12	09/17/12	09/17/12	09/17/12
	Units	MCL							
1,1,1-Trichloroethane (TCA)	ug/l	200	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	ug/l	--	<0.50	<0.50	<0.50	<0.50	**3.2**	<0.50	**3.3**
1,1-Dichloroethane (1,1-DCA)	ug/l	--	<0.50	<0.50	<0.50	<0.50	**0.8**	<0.50	**1.8**
1,1-Dichloroethene (1,1-DCE)	ug/l	7	<0.50	**0.98**	<0.50	<0.50	**2.4**	**0.58**	**4.7**
1,2-Dichloroethane	ug/l	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethene	ug/l	70	<0.50	<0.50	<0.50	<0.50	**2.8**	**0.57**	**7.0**
trans-1,2-Dichloroethene	ug/l	100	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	ug/l	5	<0.50	**7.3**	<0.50	<0.50	**8.0**	<0.50	**13**
Trichloroethene (TCE)	ug/l	5	<0.50	**1.2**	<0.50	<0.50	**26**	**2.6**	**64**
Total VOCs:	ug/l	--	<0.50	**9.5**	<0.50	<0.50	**44**	**3.8**	**93**
Total Target VOCs:	ug/l	--	--	**7.3**	--	--	**34**	--	**76**

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TABLE 1
SUMMARY OF WATER QUALITY DATA
ROOSEVELT IRRIGATION DISTRICT WELLS
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

WELL IDENTIFIER			RID-93	RID-94	RID-95	RID-99	RID-100	RID-101	RID-102
DATE SAMPLED			09/17/12	09/17/12	09/17/12	09/17/12	09/17/12	09/04/08	06/08/10
	Units	MCL							
1,1,1-Trichloroethane (TCA)	ug/l	200	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	ug/l	--	**0.52**	<0.50	**0.51**	<0.50	<0.50	<0.50	**0.73**
1,1-Dichloroethane (1,1-DCA)	ug/l	--	<0.50	<0.50	**4.3**	<0.50	**2.4**	<1.0	<0.50
1,1-Dichloroethene (1,1-DCE)	ug/l	7	**0.57**	<0.50	**7.3**	<0.50	**3.3**	**2.0**	<0.50
1,2-Dichloroethane	ug/l	5	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50
cis-1,2-Dichloroethene	ug/l	70	**0.52**	<0.50	**11**	<0.50	**4.9**	<0.50	**0.81**
trans-1,2-Dichloroethene	ug/l	100	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	ug/l	5	**0.53**	**1.2**	**4.1**	**3.8**	**4.1**	<0.50	**17**
Trichloroethene (TCE)	ug/l	5	**1.9**	<0.50	**60**	<0.50	**16**	<0.50	**0.72**
Total VOCs:	ug/l	--	**4.0**	**1.2**	**88**	**3.8**	**30**	**2.0**	**19**
Total Target VOCs:	ug/l	--	--	--	**68**	**3.8**	**16**	--	**17**

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TABLE 1
SUMMARY OF WATER QUALITY DATA
ROOSEVELT IRRIGATION DISTRICT WELLS
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

WELL IDENTIFIER			RID-103	RID-104	RID-105	RID-106	RID-107	RID-108	RID-109
DATE SAMPLED			06/08/10	09/20/12	09/20/12	09/17/12	09/17/12	09/17/12	09/17/12
	Units	MCL							
1,1,1-Trichloroethane (TCA)	ug/l	200	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	ug/l	--	<0.50	**1.1**	<0.50	**1.0**	**0.57**	<0.50	**2.1**
1,1-Dichloroethane (1,1-DCA)	ug/l	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene (1,1-DCE)	ug/l	7	**1.4**	<0.50	**0.68**	**3.8**	**1.3**	<0.50	**2.1**
1,2-Dichloroethane	ug/l	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethene	ug/l	70	<0.50	<0.50	<0.50	**1.0**	<0.50	<0.50	<0.50
trans-1,2-Dichloroethene	ug/l	100	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	ug/l	5	<0.50	**3.1**	**2.6**	**21**	**5.4**	**5.2**	**4.9**
Trichloroethene (TCE)	ug/l	5	<0.50	<0.50	**0.56**	**7.7**	**6.3**	**2.9**	**6.6**
Total VOCs:	ug/l	--	**1.4**	**4.2**	**3.9**	**35**	**14**	**8.1**	**16**
Total Target VOCs:	ug/l	--	--	--	--	**29**	**12**	**5.2**	**6.6**

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TABLE 1
SUMMARY OF WATER QUALITY DATA
ROOSEVELT IRRIGATION DISTRICT WELLS
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

WELL IDENTIFIER			RID-110	RID-111R	RID-112	RID-113	RID-114
DATE SAMPLED			09/17/12	09/20/12	09/20/12	09/20/12	09/17/12
	Units	MCL					
1,1,1-Trichloroethane (TCA)	ug/l	200	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	ug/l	--	**2.8**	**4.0**	**3.2**	**3.0**	**1.6**
1,1-Dichloroethane (1,1-DCA)	ug/l	--	<0.50	<0.50	<0.50	<0.50	**2.1**
1,1-Dichloroethene (1,1-DCE)	ug/l	7	<0.50	<0.50	<0.50	<0.50	**1.7**
1,2-Dichloroethane	ug/l	5	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethene	ug/l	70	<0.50	<0.50	**0.85**	**0.77**	**7.9**
trans-1,2-Dichloroethene	ug/l	100	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	ug/l	5	**6.4**	**0.97**	**1.8**	**1.8**	**2.6**
Trichloroethene (TCE)	ug/l	5	**0.80**	<0.50	**6.3**	**5.3**	**44**
Total VOCs:	ug/l	--	**10**	**4.9**	**12**	**11**	**60**
Total Target VOCs:	ug/l	--	**6.4**	**--**	**6.3**	**5.3**	**44**

EXPLANATION:

ug/l = micrograms per liter
MCL = Maximum Contaminant Level
VOCs = Volatile Organic Compounds
Target VOCs = Compounds at or above respective MCLs.
Shading indicates VOC concentration equals or exceeds respective MCL.
Analytical results are the most recently available from ADEQ.

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TABLE 2
MODIFIED ERA WELL FLOW RATES AND CONTAMINANT DATA
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

PHASE DESCRIPTION	WELL NAME	PUMPING RATE (gpm)[1]	TOTAL VOCs (ug/l)[2]	TOTAL TARGET VOCs (ug/l)[3]	ESTIMATED MASS OF TOTAL TARGET VOCs CAPTURED (pounds per year)[4]
PHASE 1 - PILOT WELLHEAD TREATMENT SYSTEMS INITIATIVE	RID-89	3,100	44	34	468
	RID-92	1,300	93	76	436
	RID-95	1,700	88	68	504
	RID-114	2,500	60	44	484
	TOTAL:	**8,600**	--	--	**1,892**
PHASE 2 - ADDITIONAL WELLHEAD TREATMENT SYSTEMS	RID-100	2,100	30	16	146
	RID-106	1,500	35	29	189
	RID-112	1,700	12	6.3	47
	RID-113	2,300	11	5.3	54
	TOTAL:	**7,600**	--	--	**436**
COMBINED PHASE 1 AND PHASE 2 MASS CAPTURED:					**2,328**

EXPLANATION:

RID = Roosevelt Irrigation District
gpm = gallons per minute
VOCs = Volatile Organic Compounds
ug/l = micrograms per liter
MCL = Maximum Contaminant Level
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene

[1] Phase 1 pumping rates are based on actual data obtained from wells in treatment mode. Phase 2 pumping rates are based on RID production data with an estimated 10% derating for future treatment system head losses. Pumping rate loss based on empirical data obtained during Phase 1 work.

[2] Sum of concentrations for all VOCs, including those VOCs currently below MCLs (see Table 1).

[3] Sum of concentrations for TCE, PCE and 1,1-DCE (where 1,1-DCE exceeds the MCL) (see Table 1).

[4] Mass removal assumes 100% duty for Phase 1 and Phase 2 wells.

TABLE 3
WELL BLENDING SUMMARY
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

RID WELL #	FLOW RATE[1]	TARGET VOCs[2]		SALT CANAL BLENDING SUMMARY		
		TCE	PCE	%	TCE	PCE
	(gpm)	(ug/l)	(ug/l)	Removal	Presented as ug/l	
105	1900	0.56	2.6	0	0.56	2.6
106	1500	7.7	21	100	0	0
107	2100	6.3	5.4	0	6.3	5.4
108	1900	2.9	5.2	0	2.9	5.2
109	2400	6.6	4.9	0	6.6	4.9
110	2900	0.80	6.4	0	0.80	6.4
111R	2900	<0.50	0.97	0	0	0.97
112	1700	6.3	1.8	100	0	0
113	2300	5.3	1.8	100	0	0
114	2500	44	2.6	100	0	0
RESULTING CONCENTRATIONS @ DISCHARGE TO MAIN CANAL:					**1.7**	**2.7**

EXPLANATION:

TCE = Trichloroethene
PCE = Tetrachloroethene
ug/l = micrograms per liter

[1] Flow rate for RID-114 is based on actual data. Other flow rates are based on RID production data with an estimated 10% derating to account for expected head losses.

[2] Analytical results are the most recently available from ADEQ.

[3] Water quality data for RID-111R estimated based on nearest upgradient well, RID-112.

7.7 Concentration is at or greater than Maximum Contaminant Level (MCL).

106 RID well equipped with wellhead treatment. Treatment will result in removal of TCE and PCE to non-detectable levels, which are assumed to be zero in this model.

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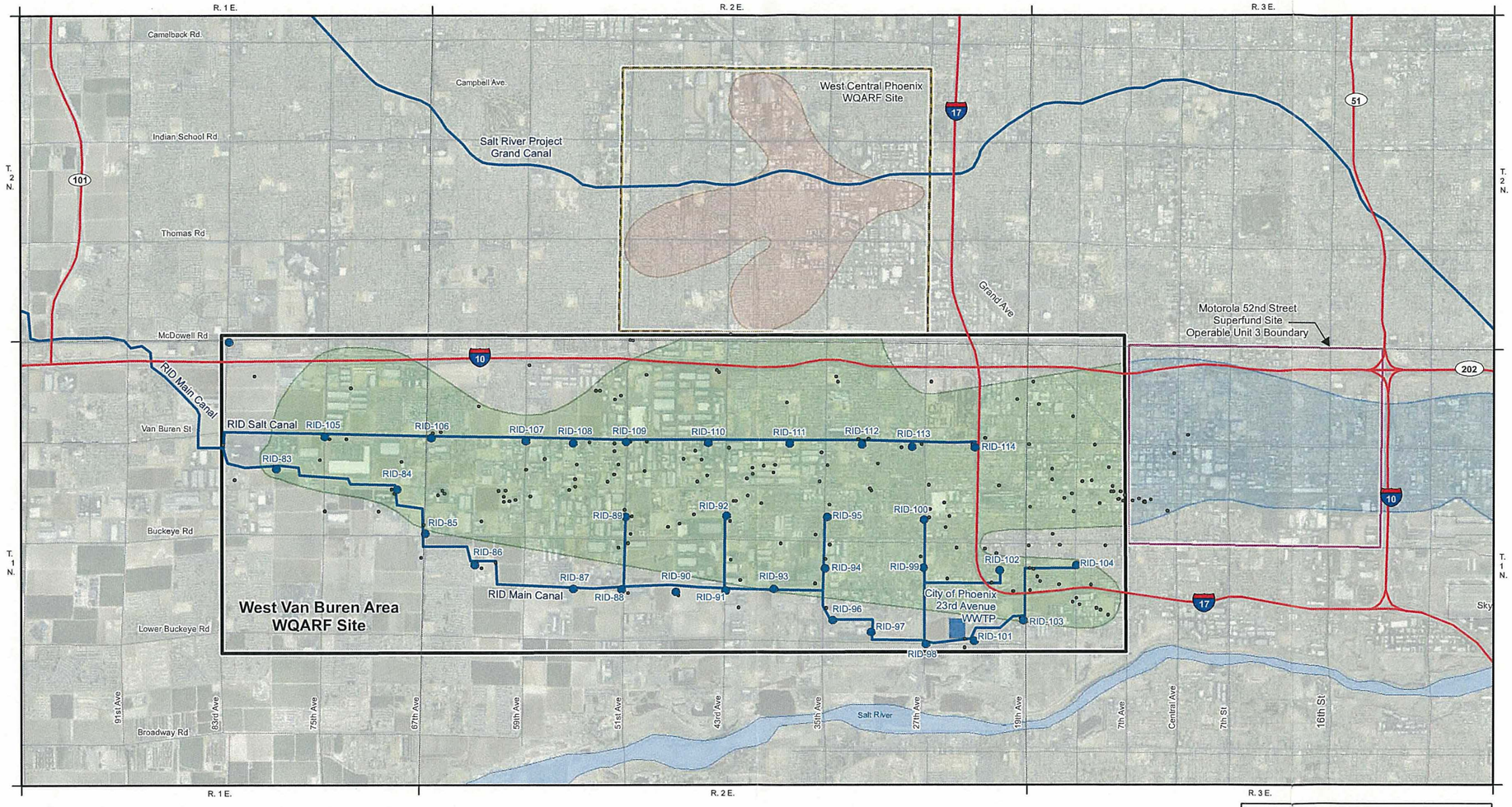
ILLUSTRATIONS



EXPLANATION

- Roosevelt Irrigation District Well
- Monitor Well
- Existing Canal or Pipeline
- Interstates
- Local Streets
- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site

Abbreviations

WVBA - West Van Buren Area
WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District

N

0 5,000

Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

STUDY AREA

2010

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FIGURE 1

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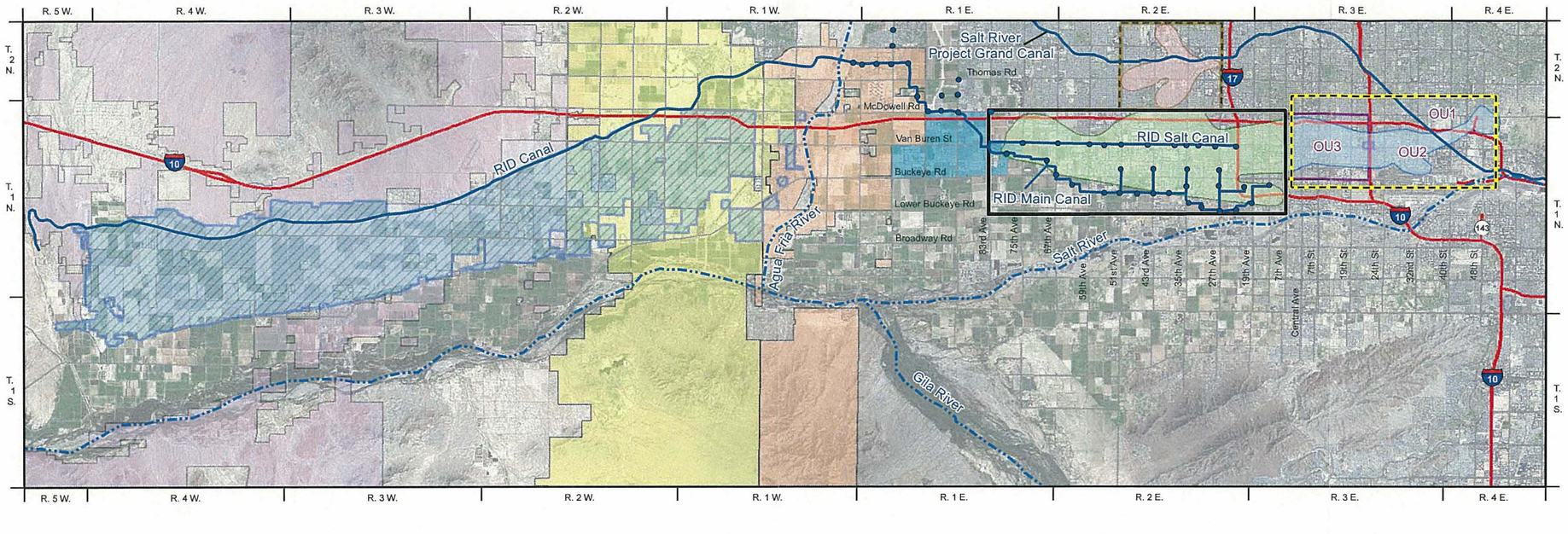

EXPLANATION

- Roosevelt Irrigation District
- City of Goodyear Boundary
- City of Avondale Boundary
- Town of Buckeye Boundary
- City of Tolleson Boundary
- Interstates
- Local Streets
- Roosevelt Irrigation District Well
- West Van Buren WQARF Site
- Motorola 52nd Street Superfund Site
- West Central Phoenix WQARF SIte
- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
OU - Operable Unit
RID - Roosevelt Irrigation District

N

0 3

Miles

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

REGIONAL CONDITIONS

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2010

FIGURE 2

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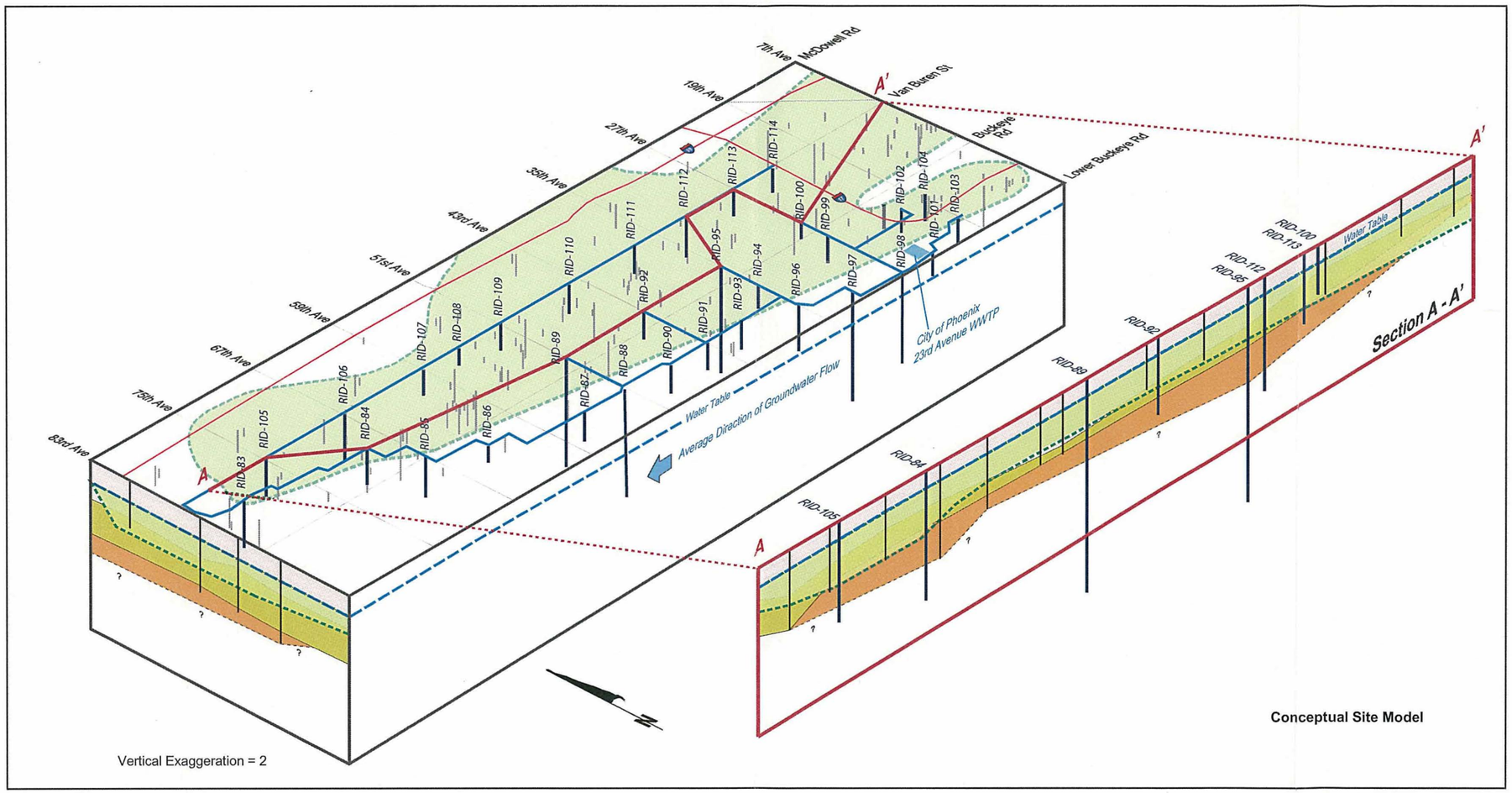

Conceptual Site Model

EXPLANATION

- Upper Alluvial Unit 1 (UAU1)
- Upper Alluvial Unit 2 (UAU2)
- Middle Alluvial Unit (MAU)
- Estimated Extent of Impacted Groundwater In WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)

- Existing Canal or Pipeline
- Interstates
- Local Streets
- Roosevelt Irrigation District Well
- Monitor Well

Abbreviations
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

CONCEPTUAL SITE MODEL

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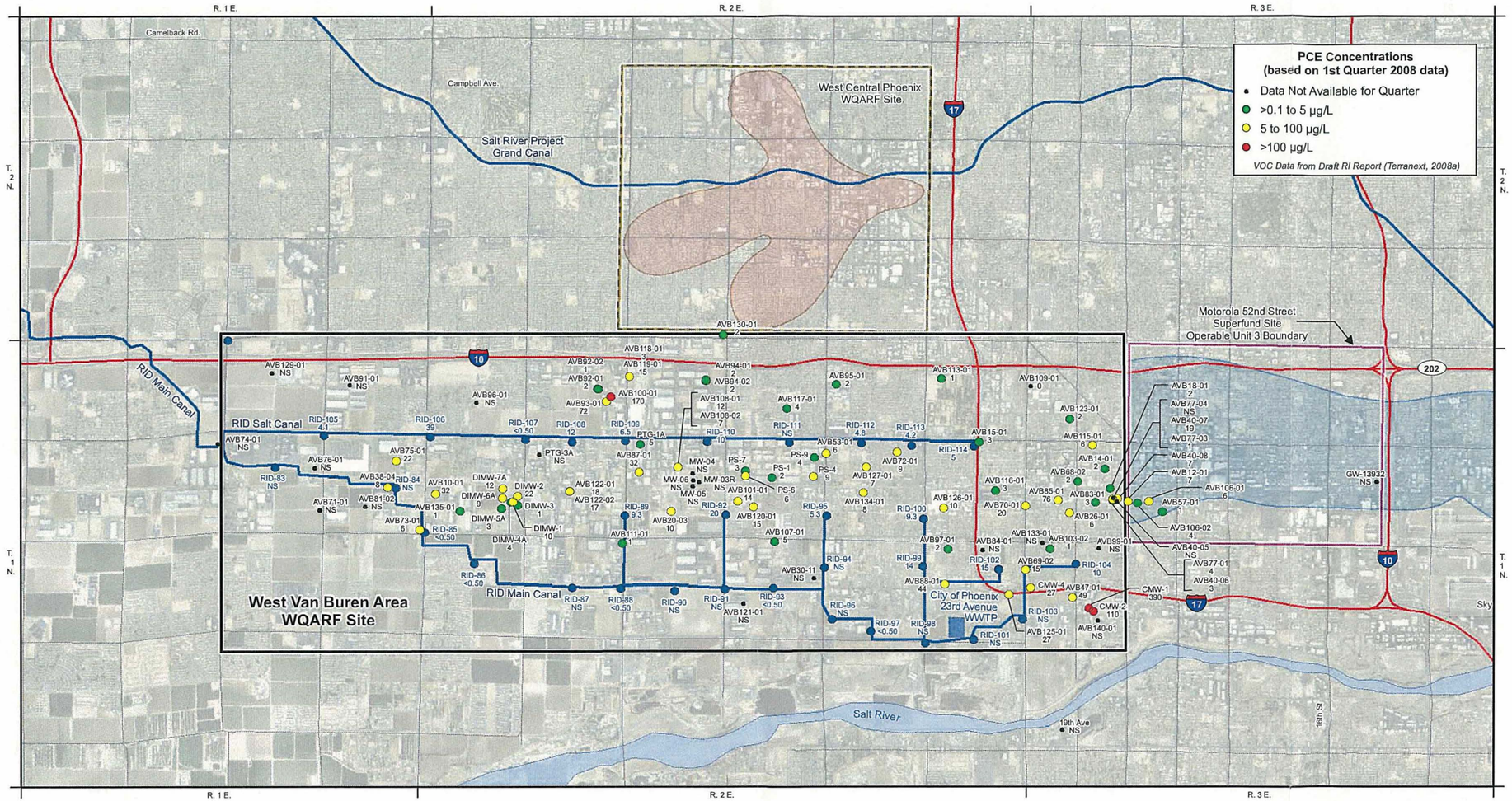
FIGURE 3



EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 9.3 - PCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-3 - Well ID
  - 1 - PCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
µg/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation
PCE - Tetrachloroethene

N

0 5,000 Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

TETRACHLOROETHENE CONCENTRATIONS UPPER ALLUVIAL UNIT 1 FIRST QUARTER 2008

2010

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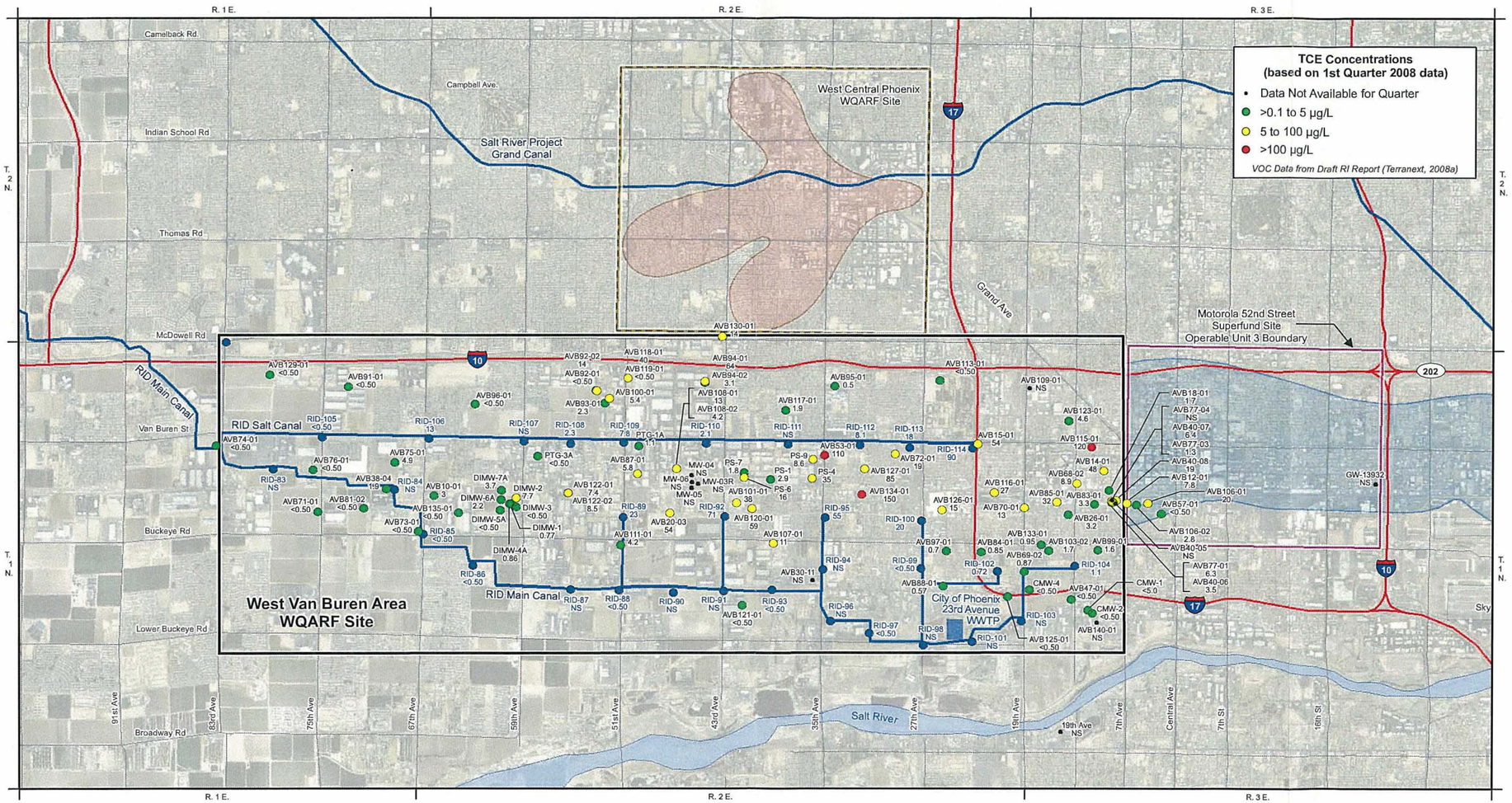
FIGURE 4

G:\GIS-Tuc\Projects\802\03\UAU1_PCE_Qrtr1_2008.mxd\29Jan2010



EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 23 - TCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-1 - Well ID
  - 0.77 - TCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
µg/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation
TCE - Trichloroethene

N

0 5,000
Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

TRICHLOROETHENE CONCENTRATIONS UPPER ALLUVIAL UNIT 1 FIRST QUARTER 2008

2010

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FIGURE 5

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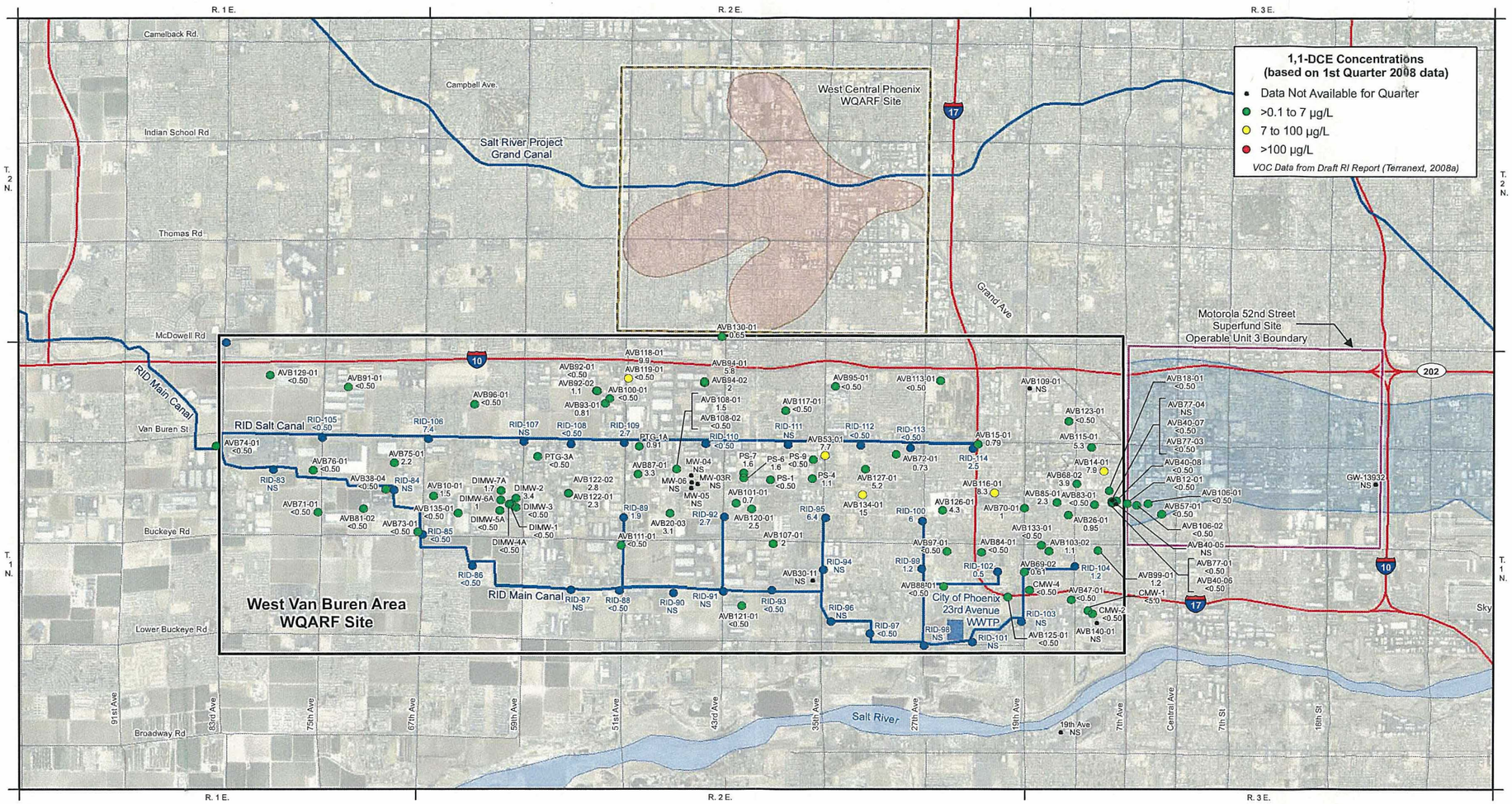

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 1.9 - 1,1- DCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-6A - Well ID
  - 1 - 1,1- DCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

- WQARF - Water Quality Assurance Revolving Fund
- WWTP - Waste Water Treatment Plant
- RID - Roosevelt Irrigation District
- µg/L - Micrograms Per Liter
- VOC - Volatile Organic Compound
- RI - Remedial Investigation
- 1,1-DCE - 1,1-Dichloroethene

N

0 5,000 Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

1,1- DICHLOROETHENE CONCENTRATIONS UPPER ALLUVIAL UNIT 1 FIRST QUARTER 2008

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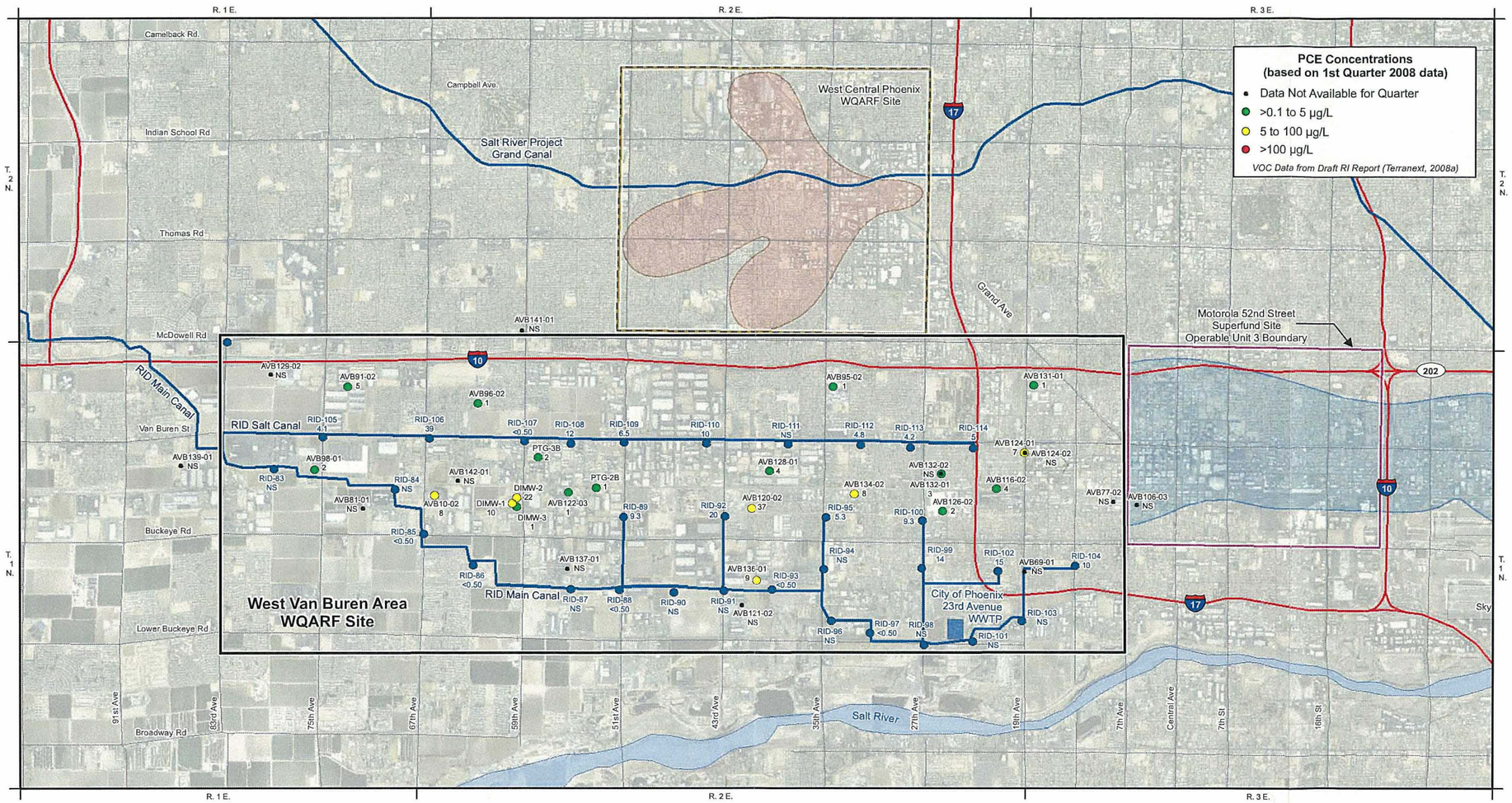
FIGURE 6



EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 9.3 - PCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-3 - Well ID
  - 1 - PCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
µg/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation
PCE - Tetrachloroethene

N

0 5,000
Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

TETRACHLOROETHENE CONCENTRATIONS UPPER ALLUVIAL UNIT 2 FIRST QUARTER 2008

2010

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FIGURE 7

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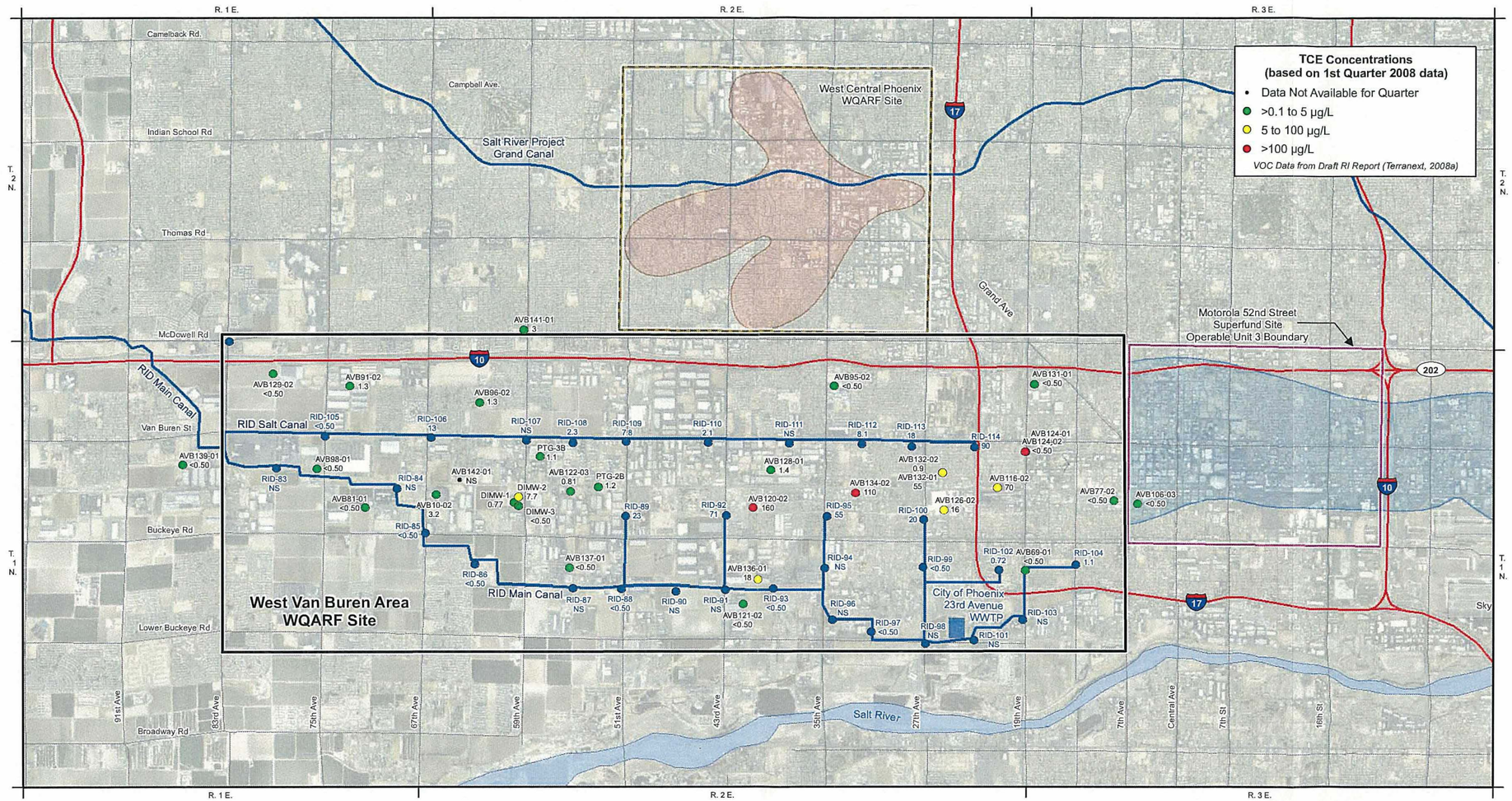

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 23 - TCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-1 - Well ID
  - 0.77 - TCE Concentration (µg/L) (NS = Not Sampled)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
µg/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation
TCE - Trichloroethene

N

0 5,000 Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

TRICHLOROETHENE CONCENTRATIONS UPPER ALLUVIAL UNIT 2 FIRST QUARTER 2008

2010

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FIGURE 8

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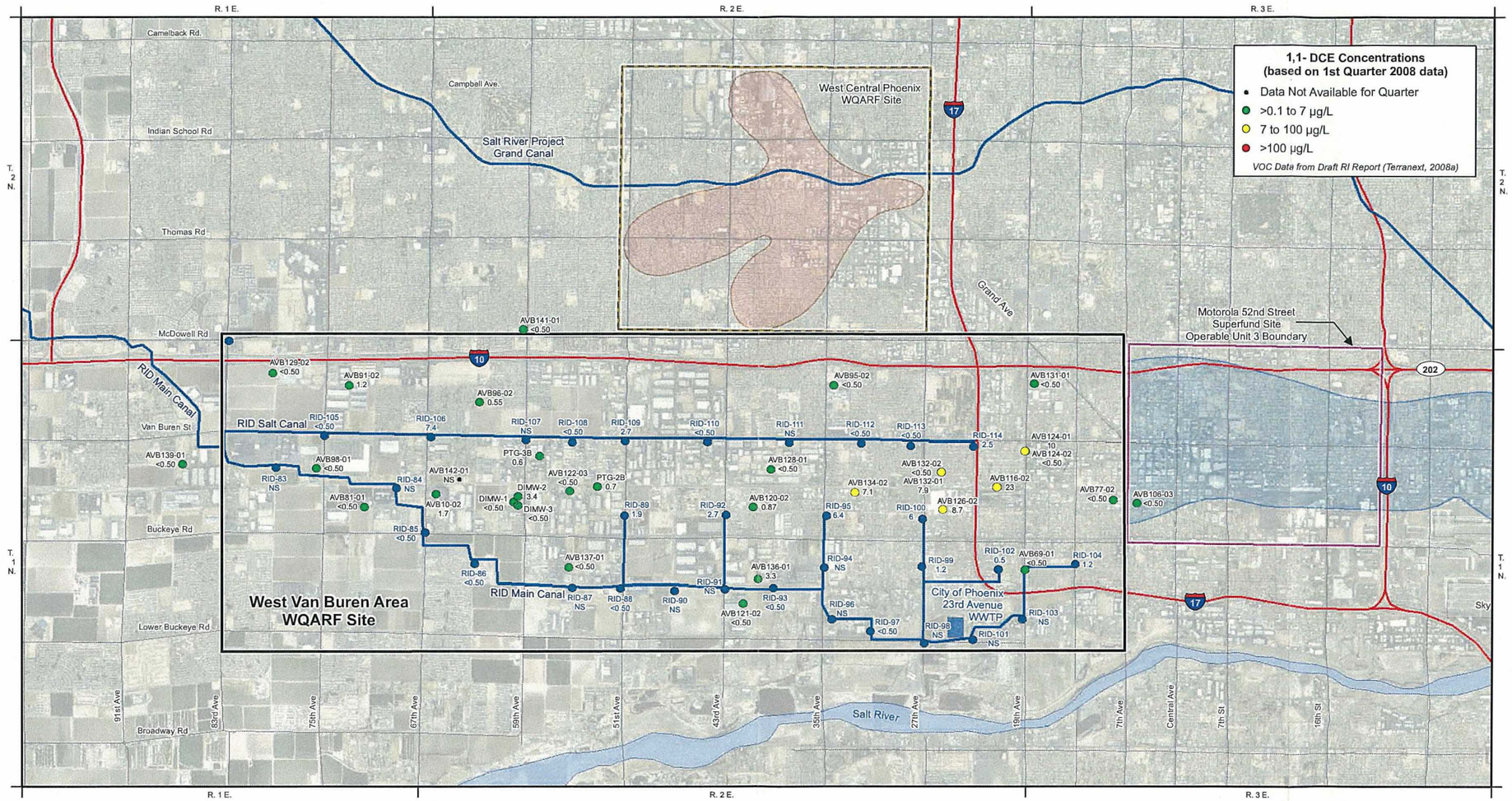

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 1.9 - 1,1- DCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-2 - Well ID
  - 3.4 - 1,1- DCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

- WQARF - Water Quality Assurance Revolving Fund
- WWTP - Waste Water Treatment Plant
- RID - Roosevelt Irrigation District
- µg/L - Micrograms Per Liter
- VOC - Volatile Organic Compound
- RI - Remedial Investigation
- 1,1-DCE - 1,1-Dichloroethene

N

0 5,000 Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

1,1- DICHLOROETHENE CONCENTRATIONS UPPER ALLUVIAL UNIT 2 FIRST QUARTER 2008

2010

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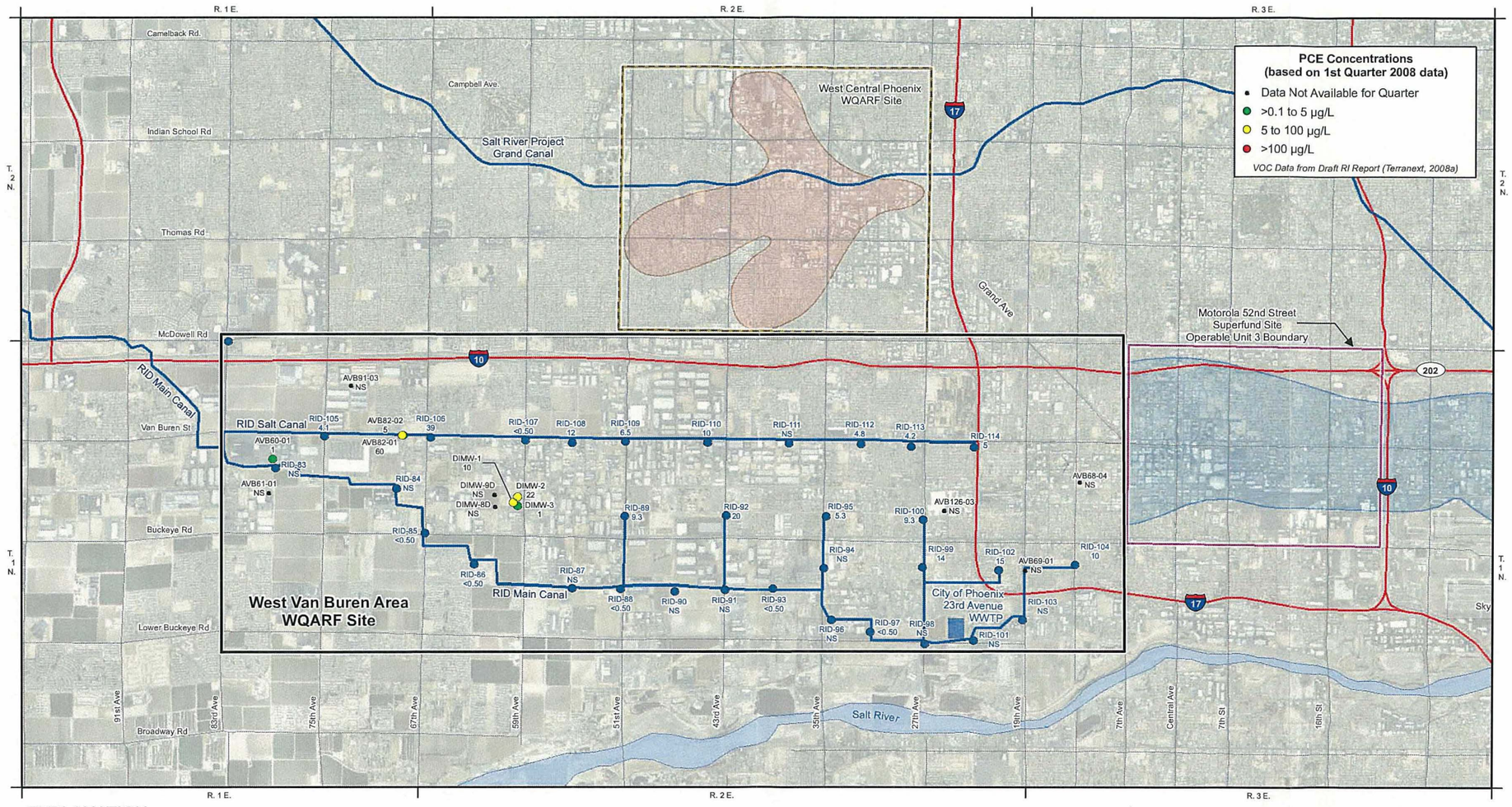
FIGURE 9



PCE Concentrations (based on 1st Quarter 2008 data)

- Data Not Available for Quarter
- >0.1 to 5 µg/L
- 5 to 100 µg/L
- >100 µg/L

VOC Data from Draft RI Report (Terranext, 2008a)

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 9.3 - PCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-3 - Well ID
  - 1 - PCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
µg/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation
PCE - Tetrachloroethene

N

0 5,000 Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

TETRACHLOROETHENE CONCENTRATIONS MIDDLE ALLUVIAL UNIT FIRST QUARTER 2008

2010

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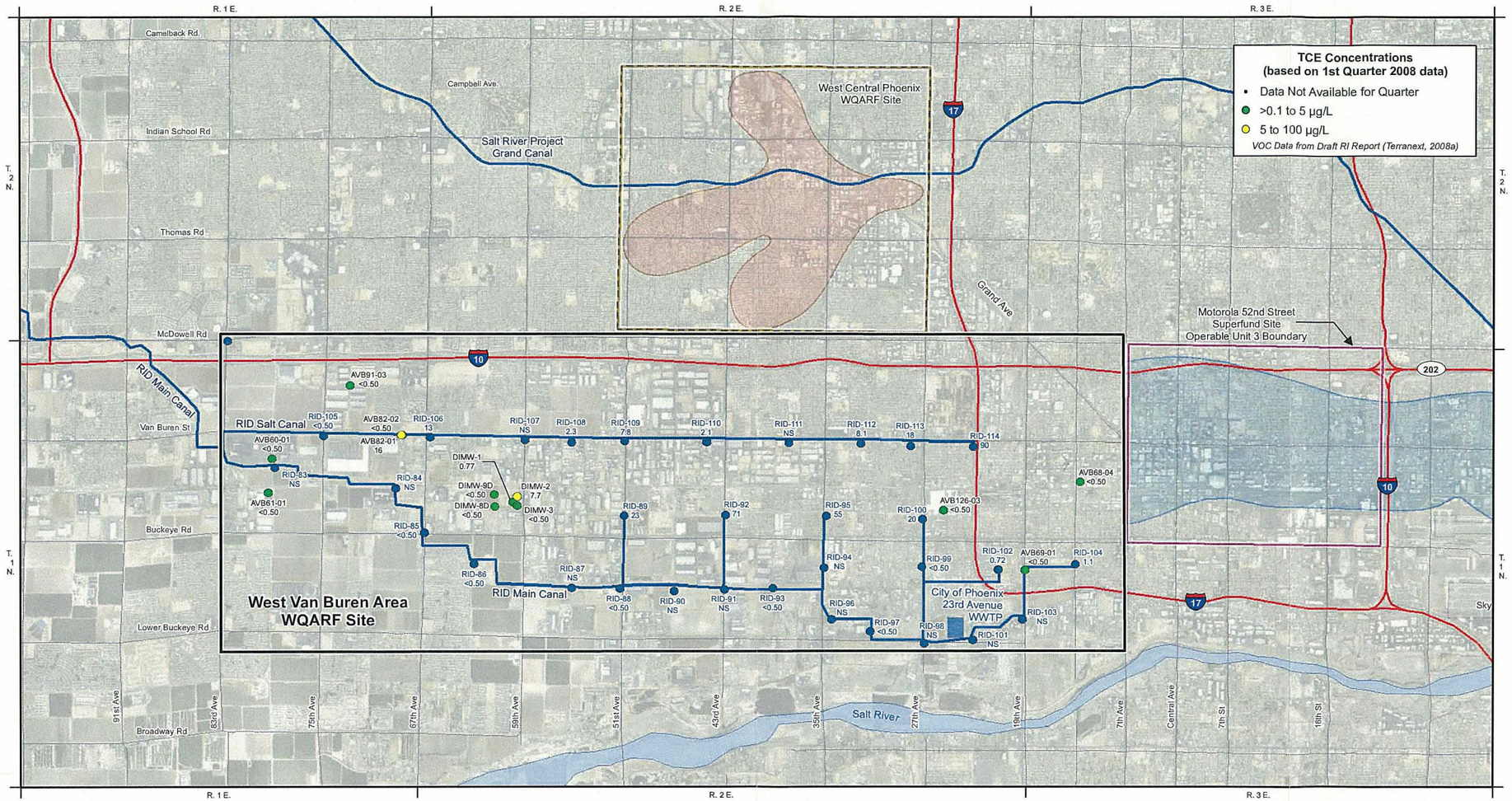
FIGURE 10



EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 23 - TCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-1 - Well ID
  - 0.77 - TCE Concentration (µg/L) (NS = Not Sampled)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
µg/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation
TCE - Trichloroethene

N

0 5,000 Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

TRICHLOROETHENE CONCENTRATIONS MIDDLE ALLUVIAL UNIT FIRST QUARTER 2008

2010

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FIGURE 11

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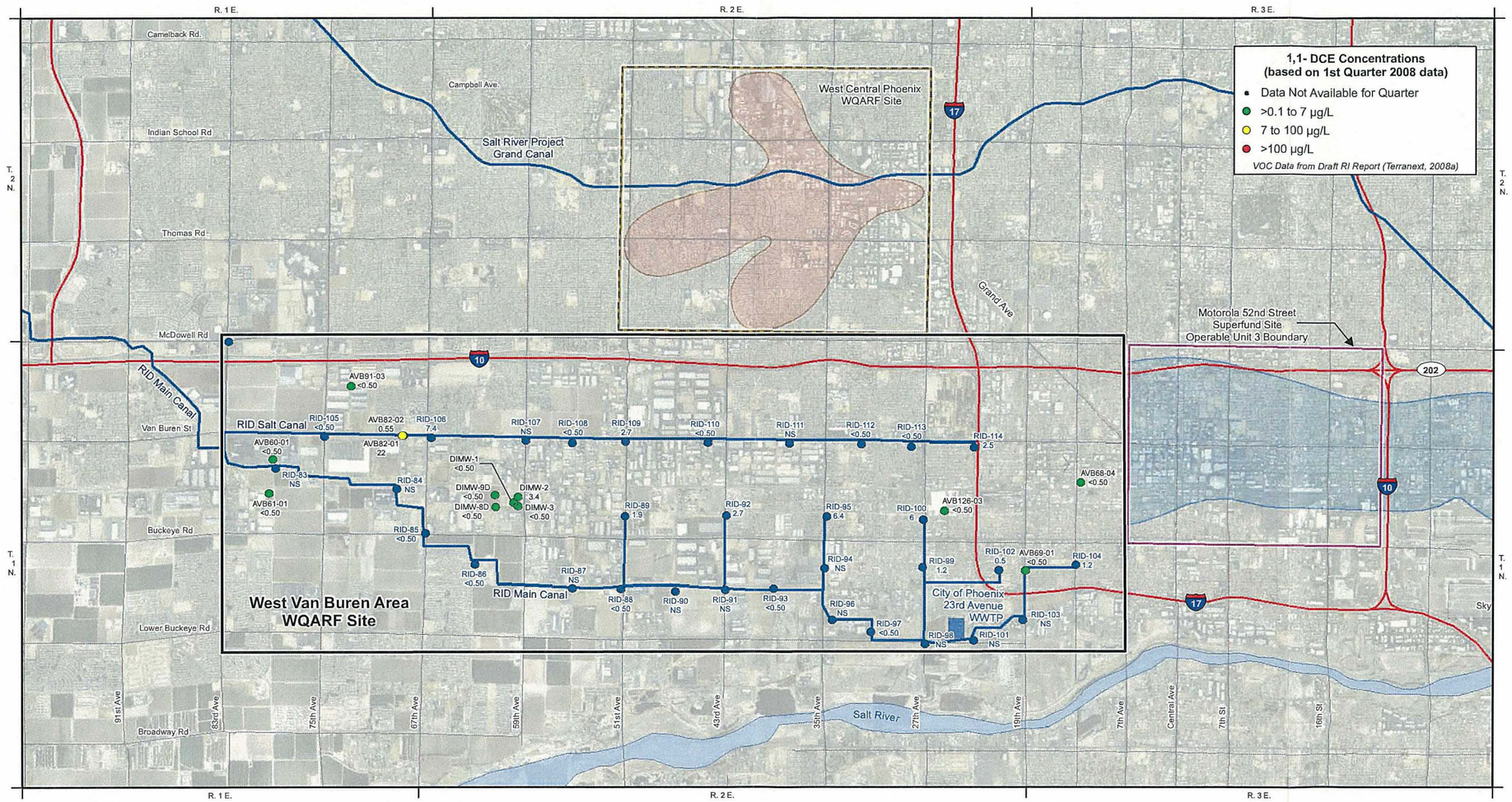

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 1.9 - 1,1- DCE Concentration (µg/L) (NS = Not Sampled)
- Monitor Well
  - DIMW-2 - Well ID
  - 3.4 - 1,1- DCE Concentration (µg/L) (NS = Not Sampled)

- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF -	Water Quality Assurance Revolving Fund
WWTP -	Waste Water Treatment Plant
RID -	Roosevelt Irrigation District
µg/L -	Micrograms Per Liter
VOC -	Volatile Organic Compound
RI -	Remedial Investigation
1,1-DCE	1,1-Dichloroethene

N

0 5,000 Feet

Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

1,1- DICHLOROETHENE CONCENTRATIONS MIDDLE ALLUVIAL UNIT FIRST QUARTER 2008

2010

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FIGURE 12

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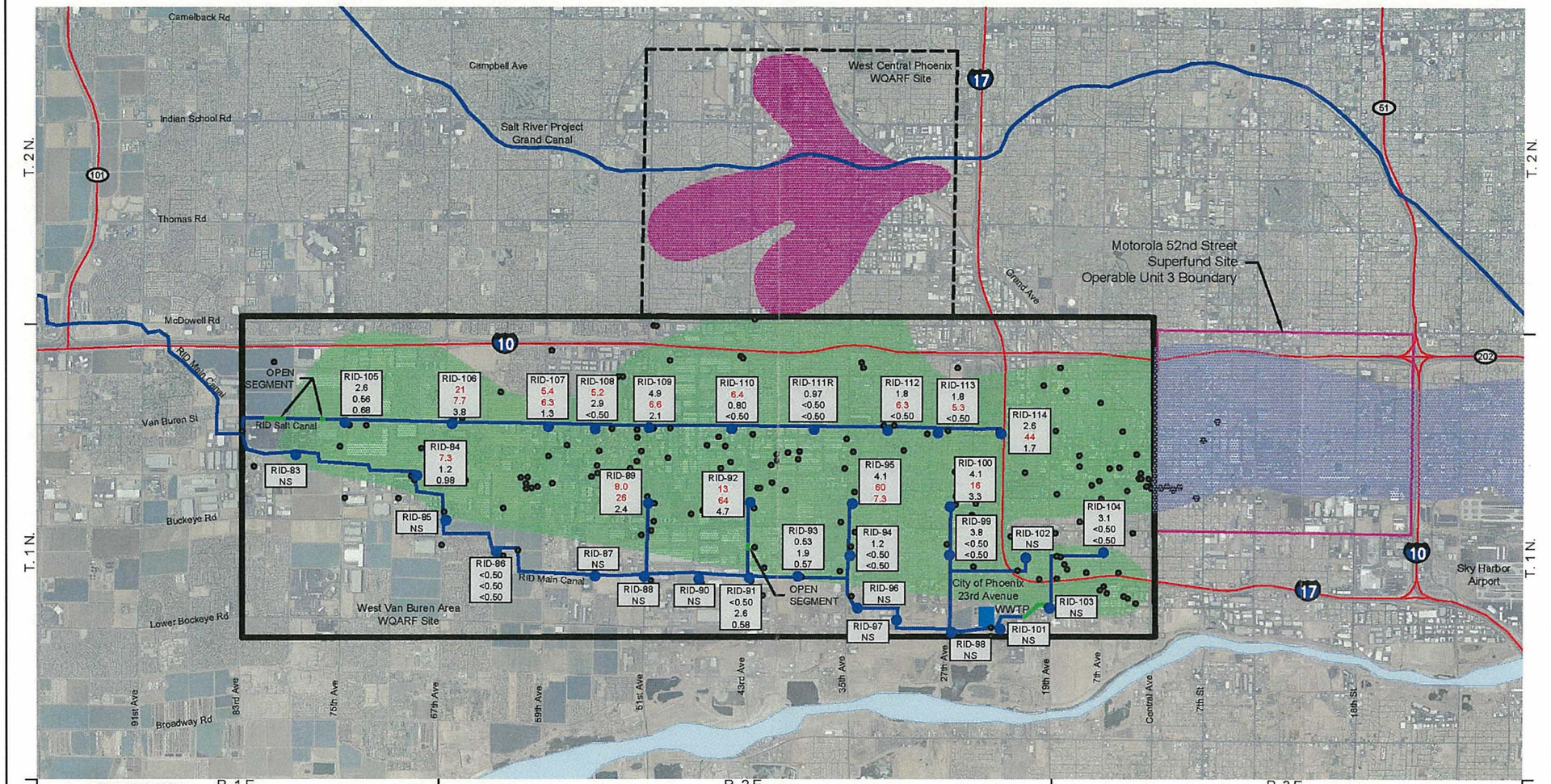


EXPLANATION

- Roosevelt Irrigation District Well
- RID-103 - Well ID
- <0.50 - Tetrachloroethene (µg/L)
- <0.50 - Trichloroethene (µg/L)
- 1.6 - 1,1-Dichloroethene (µg/L)
- (NS = Not Sampled
- (Values in Red Exceed
- Maximum Contaminant Level)
- Existing Canal or Pipeline
- Existing Canal Open Segment
- Interstates

- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Base on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Monitor Well

Abbreviations

WVBA	- West Van Buren Area
WQARF	- Water Quality Assurance Revolving Fund
WWTP	- Water Water Treatment Plant
RID	- Roosevelt Irrigation District
µg/L	- Micrograms Per Liter
PCE	- Tetrachloroethene
TCE	- Trichloroethene
1,1-DCE	- 1,1-Dichloroethene

N

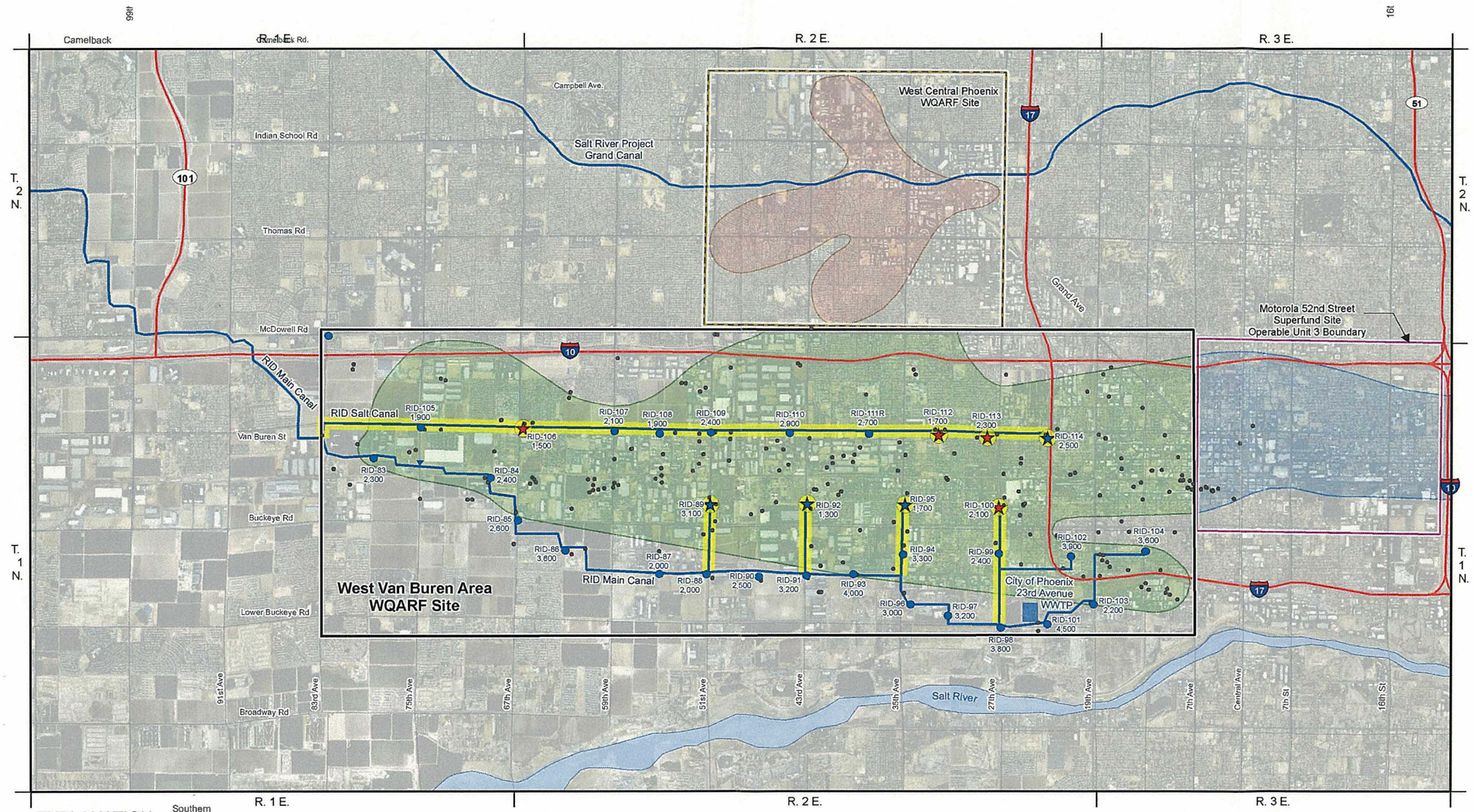
0 2,500 5,000

APPROXIMATE SCALE IN FEET

PCE, TCE, AND 1,1-DCE CONCENTRATIONS IN RID WELLS 2012

Roosevelt Irrigation District
West Van Buren Area
WQARF Site

By: LD	Date: 10/11/12	Project No.	802.40
SYNERGY Environmental, LLC	10645 N. Tatum Blvd. Suite 200-497 Phoenix, AZ 85028 602-430-2795	Figure	13



EXPLANATION

- Roosevelt Irrigation District Well
- RID-89 — Well ID
- 3,100 — Estimated Pumping Rate (gpm), [After Treatment Where Applicable]
- Monitor Well
- Phase 1 Early Response Actions
- Phase 2 Early Response Actions
- Existing Canal or Pipeline
- Interstates
- Local Streets

Southern

- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Early Response Action (see Table 2 for a summary of phased implementation)

Abbreviations

WVBA - West Van Buren Area
WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
gpm - Gallons Per Minute

N

0 5,000 Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

MODIFIED EARLY RESPONSE ACTION

2012

SYNERGY ENVIRONMENTAL, LLC

FIGURE 14