

APPENDIX H
GROUNDWATER REMEDIAL OBJECTIVES REPORT
(INCLUDING RESPONSIVENESS SUMMARY)
REMEDIAL INVESTIGATION REPORT
GROUNDWATER OPERABLE UNIT
Arizona Department of Environmental Quality
Broadway-Pantano Water Quality Assurance Revolving Fund Site
June 1, 2012

FINAL GROUNDWATER REMEDIAL OBJECTIVES REPORT

**Broadway-Pantano WQARF Site
Tucson, Arizona**



June 1, 2012

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1.0 INTRODUCTION

The Arizona Department of Environmental Quality (ADEQ) has prepared this Final Groundwater Remedial Objectives (GROs) Report for the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site (Site) in Tucson, Arizona. This Report is based upon the Broadway-Pantano Water Use Study and the written GRO proposals and comments from the public.

The GROs for the Site were developed as required by R18-16-406 of the Remedy Selection rules of the Arizona Administrative Code (A.A.C.). These rules require that GROs be established for the current and reasonably foreseeable uses of the waters of the state that have been or are threatened to be affected by release of a hazardous substance. The reasonably foreseeable uses of water are those likely to occur within 100 years, unless a longer time period is appropriate (R18-16-406 [D]). Reasonably foreseeable uses are those likely to occur, based on information provided by water providers, well owners, and others.

GROs selected for the Site are to consider community opinion and to be generally consistent with the water providers' management plans in the immediate area. Not every use identified in the Water Use Study will have a corresponding GRO. Uses identified in the Water Use Study may or may not be addressed based on information gathered during the public involvement process, the statutory authority of WQARF, and whether the use is reasonably foreseeable.

The GROs for this Site are based on the Broadway-Pantano Water Use Study [Appendix A] and the written public proposals and comments regarding the GROs [Appendices C and D]. The Water Use Study was available for public comment from April 4, 2007 to May 29, 2007. A public meeting to obtain community and stakeholder input on the Water Use Study and proposed GROs was held by ADEQ on May 23, 2007, at City of Tucson's Eastside City Hall. The Proposed GROs Report was issued for public comment on November 25, 2008, with the 30-day public comment period ending on December 24, 2008. ADEQ has prepared a responsiveness summary for the GROs public input and comments [Appendix B]. Pursuant to A.C.C. R18-16-406(J), this GROs Report has been included as an appendix in the Final Groundwater Remedial Investigation Report.

DEFINITIONS

Remedial Strategy: One or a combination of the six general strategies identified in Paragraph B.4 of Arizona Revised Statute. § 49-282.06 and further defined in rules promulgated in accordance with this statute. In general, these strategies are as follows: plume remediation, physical containment, controlled migration, source control, monitoring, and no action.

Remedial Measure: A specific action taken in conjunction with remedial strategies as part of the remedy to achieve one or more of the remedial objectives. For example, remedial measures may include well replacement, well modification, water treatment, provision of replacement water supplies, and engineering controls.

Reference Remedy: A combination of remedial strategies and remedial measures which, as a whole, is capable of achieving remedial objectives. The reference remedy is compared with the alternative remedies for purposes of selecting a proposed remedy at the conclusion of the Feasibility Study.

Alternative Remedy: A combination of remedial strategies and remedial measures different from the reference remedy that is capable of achieving remedial objectives. The alternative remedies are compared with the reference remedy for purposes of selecting a proposed remedy at the conclusion of the Feasibility Study.

Following issuance of the Final Groundwater Remedial Investigation Report, ADEQ will conduct the groundwater feasibility study. The groundwater feasibility study will evaluate specific remedial measures and strategies required to meet the GROs and will propose a reference remedy and at least two alternative remedies which are capable of meeting the GROs.

The GRO for each listed groundwater use are to be expressed in the following terms: (1) protecting against the loss or impairment of each listed use that is threatened to be lost or impaired as a result of a release of a hazardous substance; (2) restoring, replacing, or otherwise providing for each listed use to the extent that it has been or could be lost or impaired as a result of a release of a hazardous substance; (3) time frames when action is needed to protect against or provide for the impairment or loss of the use; and (4) the projected duration of the action needed to protect or provide for the use.

2.0 REMEDIAL OBJECTIVES FOR WATER USE

The regional aquifer [also known as the Central Well Field (CWF)] at the Site is contaminated with the volatile organic compounds (VOCs) tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride at levels exceeding federal Maximum Contaminant Levels and Arizona Aquifer Water Quality Standards. The groundwater operable unit (GOU) at the Site is defined by the extent of PCE contamination exceeding the Arizona Aquifer Water Quality Standard since the lateral and vertical extent of PCE contamination of groundwater at the Site far exceeds that of the other VOCs. The data collected as of 2008 indicate that there are no perched aquifers and the depth to the regional aquifer ranges between approximately 315 feet to 370 feet below ground surface, depending on the location within the Site. Groundwater flows naturally to the west/northwest at the Site, and the groundwater contamination extends approximately two miles to the west/northwest from the Broadway North and South Landfills.

The main user of the CWF is Tucson Water (TW), which is the City of Tucson (COT) water department and the primary municipal water provider for the area. Over the past twenty-five years, TW has had to shut down four wells at the Site because of PCE contamination. Also, wellhead treatment had to be installed on the St. Joseph's Hospital water supply well in 1997 because of PCE contamination from the Site.

Based on an Arizona Department of Water Resources (ADWR) well inventory and field verification or verbal verification with well owners, 91 registered groundwater wells were confirmed to be approximately within a mile downgradient of or a half-mile cross-gradient of the GOU. These 90 wells either have been impacted or are potentially threatened by the Site groundwater contamination. For this Report, these will be referred to as being "in the vicinity of the GOU."

ADEQ obtained information from ADWR and well owners concerning current and future use of these wells and determined that, as of 2008, of the 91 wells, 66 wells are used for monitoring or remediation, four are inactive and 21 are currently used for water supply. This information is presented in the attached Broadway-Pantano Water Use Study [Appendix A]. The responses from the owners of the active wells were that the wells would continue being used in the future, and the responses from the owners of most of the inactive wells were that they did not plan to use those wells in the future.

GROs were submitted by the public during the May 23, 2007 GRI/GRO public meeting and during the GRI public comment period. Proposed GROs were submitted by the Broadway-Pantano Community Advisory Board, the City of Tucson, Pima County, and Fred Brinker.

Recommendations from the public included the following: reduce of the mass and concentration of contaminants near suspected sources, prevent exposure to contaminated groundwater above acceptable risk levels, fully contain the plume within five years to prevent further degradation of the aquifer and to allow full use of nearby water supply wells, fully remediate the plume, and ensure treated groundwater is put to beneficial use instead of reinjection. These proposed GROs (which, in some cases, are mixed in with GRI comments) are included in Appendix B.

2.1 POTABLE WATER USE

2.1.1 MUNICIPAL POTABLE WATER USE

The vast majority of residences and businesses in the Site vicinity receive their potable water from TW. TW has 10 non-exempt active water supply wells in the vicinity of the Site which could be threatened by the Site groundwater contamination—C-020B, C-025B, C-046B, C-048B, C-049B, C-051B, C-056B, C-058B, C-114A and D-018A—and six of these wells are operated as restricted use (“last-on/first-off” or LOFO) wells—C-020B, C-025B, C-056B, C-058B, C-114A, and D-018A—because of their proximity to the Site [Appendix A—Tables 1 and 5; and Figure 2]. (“Non-exempt” is an ADWR designation for wells with pumps having >35 gallons-per-minute capacity.) TW has had to shut down four of its water supply wells because of Site contamination (C-021A, C-026B, D-021A, and D-022A) [Appendix A—Tables 8, 9, and 11; and Figure 1]. TW's C-022A well was also impacted by the Site contamination, but TW discontinued using this well in the mid-1970s because of problems with the well—not because of contamination [Appendix A—Table 8]. The historical annual water production for each of these wells, the year the well was shut down or designated as LOFO, and the maximum annual pumpage for each well during the five years prior to shutdown or LOFO designation are shown in Appendix A—Table 12.

According to TW, the CWF has historically been and will remain an essential component of TW's water supply infrastructure. Current TW plans include increased potable use of recharged and recovered Central Arizona Project (CAP) water that will further reduce its reliance on groundwater pumping in the CWF during most of each year. However, TW has indicated that TW will continue to need the CWF, and in particular the six LOFO wells near the GOU and the four downgradient wells to the west of Craycroft Road in the near term (i.e., within a decade), mid term (i.e., one to two decades), and long term (i.e. the future beyond two decades) for the following reasons:

- To help meet peak water demand during the hottest months;

- To meet projected annual potable demand when it exceeds the COT's current annual CAP allocation—anticipated to occur within the next few years;
- To provide backup supply during lengthy planned maintenance activities;
- To provide emergency backup supply should there be a disruption in CAP supply due to problems with the CAP infrastructure or due to supply disruptions caused by system outages on TW's own system;
- To provide potentially long-term backup potable supply should there be a disruption to CAP supply due to infrastructure failure of CAP's delivery system or should a shortage be declared on the Colorado River that could be in place for an indeterminate period of time.

Therefore, TW places a high priority on maintaining its operational use of the CWF, as well as other available supply sources. The current and future uses of the regional aquifer groundwater by TW are considered reasonably foreseeable.

Catalina Village Apartments (CVA) has a non-exempt municipal water supply well in the vicinity of the GOU which provides water to its apartment residents and for five acres of landscaping [Appendix A—Tables 1 and 5; and Figure 2]. CVA's annual well water usage was 19.8, 17.4, and 21.2 acre-feet in 2005, 2006, and 2007, respectively. CVA has indicated that it does not plan to increase its water usage. The current and future uses of the regional aquifer groundwater by CVA are considered reasonably foreseeable.

2.1.2 COMMERCIAL POTABLE WATER USE

Carondelet Health Network (CHN) owns two wells at its St. Joseph's Hospital complex at its 350 North Wilmot Street property—one non-exempt well used for potable/irrigation/heating/cooling water supply and the other well not used because it is dry [Appendix A—Tables 6 and 10; and Figures 1 and 2]. St. Joseph's Hospital pumps water from its active well under the groundwater usage right owned by CHN which allows a maximum pumpage of 205 acre-feet per year [Appendix A—Table 2]. The water supply well has been receiving granular activated carbon wellhead treatment since 1997 to remove PCE and other Site contaminants from the groundwater. The facilities director indicated that CHN has expanded its St. Joseph's Hospital medical facility (in 2008 increasing its hospital bed capacity from 309 to 494—a 60% increase) and more expansion is planned. Therefore, the facilities director expects that the complex will be using its ADWR-permitted annual 205 acre-feet allotment of groundwater within the next five to ten years. In 2007, they pumped only 91.5 acre-feet from this well; however, the facilities

director indicated that the well has been down periodically because of well pump problems and they are in the process of replacing the pump. The facilities director also indicated that they may want to use the dry well in the future (presumably by deepening it). This well is unable to be tested but is located within the GOU. The current and future uses of the regional aquifer groundwater by CHN are considered reasonably foreseeable.

Pima Alamo Heights, L.L.C. owns an exempt well at its 6074 East Pima Street property that is used for both commercial irrigation and private residential potable water supply [Appendix A—Table 6 and Figure 2]. (An “exempt well” is a well equipped with a pump with a maximum capacity of 35 gallons per minute or less and from which water is withdrawn for a use other than irrigation of two or more acres and, in general, the well owner is not required to measure and report the water withdrawals to ADWR.) The lessees, the McPheeters, have indicated that even though their Catalina Heights Nursery (previously operated at the property) has closed, another nursery, Nate’s Plant Farm, is operating in its place, and the water use for the property will remain potable and irrigation. Pima Alamo Heights, L.L.C. has indicated that the property may be converted to a park or multi-family housing in the future, but how these potential developments might change the water usage is unknown at this time. The current and future uses of the regional aquifer groundwater by the lessees are considered reasonably foreseeable.

2.1.3 RESIDENTIAL POTABLE WATER USE

There are six private residences within one-half (cross-gradient) to one (downgradient) mile of the Site plume (Figure 1 in Appendix A) with exempt domestic wells, but only five of these wells are active. Four of the five residences with active domestic wells use their wells for potable and/or irrigation use and plan to do so for the foreseeable future [Appendix A—Table 7]. ADEQ thus far has been unable to communicate with the fifth residence with a private well, but ADWR records indicate this well was installed recently and the fifth residence’s neighbor indicated that the fifth residence has an on-site well. The sixth registered exempt domestic well was drilled to a depth of 20 feet in 2005 and then capped; the owners indicated in 2008 that they do not know when they will finish drilling the well [Appendix A—Table 10]. The current and future uses of the regional aquifer groundwater by these five private residences are considered reasonably foreseeable.

2.1.4 REMEDIAL OBJECTIVE FOR POTABLE WATER

The GRO will be to restore, replace or otherwise provide for the current and future potable use of the regional aquifer threatened or impacted by PCE, TCE, and vinyl chloride contamination emanating from the WQARF Site. [“Potable” is defined

here as water which meets state and federal primary drinking water standards (a.k.a. Maximum Contaminant Levels) and Arizona Aquifer Water Quality Standards.] This action is needed for as long as the level of contamination in the groundwater resource prohibits its use as a potable water supply.

2.2 NON-POTABLE WATER USE

2.2.1 COMMERCIAL NON-POTABLE WATER USE

Wash Depot XII, Inc. owns a non-exempt well at its Simoniz Car Wash facility at its 6042 East Speedway Boulevard property [Appendix A—Table 6]. It pumps water from this well under its own groundwater usage right which allows a maximum pumpage of 10 acre-feet per year [Appendix A—Table 2]. The Simoniz Car Wash well water contains nitrate above the federal drinking water standard and thus is used solely for car washing and the facility receives its potable water from TW. The annual well water usage was reported to be 10 acre-feet in 2005, 2006, and 2007. Wash Depot XII, Inc. does not plan to change its water usage at this facility in the future. The current and future uses of the regional aquifer groundwater by Wash Depot XII, Inc. are considered reasonably foreseeable.

HSL Dorado Place Office, L.L.C. owns the property 1181 North El Dorado Place which has a well which is used solely for landscape irrigation and filling a pond [Appendix A—Table 6]. Water is pumped from this well under a groundwater usage right (owned by Omar Mireles) which allows a maximum pumpage of three acre-feet per year [Appendix A—Table 2]. The well water is used solely for irrigation. The annual well water usage was reported to be three acre-feet in 2005, 2006, and 2007. No changes in water usage are expected in the future.

Dorado C.C., Inc. owns two non-exempt wells at its El Dorado Golf Course at 6601 East Speedway Boulevard [Appendix A—Table 6]. The groundwater usage right (owned by Humberto Lopez) under which water is removed from these wells allows a maximum pumpage of 300 acre-feet per year [Appendix A—Table 2]. One well is located at the northern part of the golf course and is considered unlikely to be impacted by the Site because of its distance from the GOU and the localized groundwater flow direction in the vicinity of the well. However, the annual well water usage was reported to be 222, 232, and 255 acre-feet in 2005, 2006, and 2007, respectively. The second well is located at the southern part of the golf course which is in the GOU vicinity but it is dry and capped and the owner does not plan to use it in the future; therefore, no GRO is needed for this well [Appendix A—Table 10]. Likewise, 4-D Properties owns a well at its 1031 North Wilmot property which is capped and the owner does not plan to use it in the future; therefore no GRO is needed for this well [Appendix A—Table 10].

2.2.2 REMEDIAL OBJECTIVE FOR NON-POTABLE WATER USE

The GRO will be to protect for the future non-potable use of the regional aquifer threatened by PCE, TCE, and vinyl chloride contamination emanating from the WQARF Site. [“Non-potable” is defined here as water which is not required to meet state and federal primary drinking water standards (a.k.a. Maximum Contaminant Levels) and Arizona Aquifer Water Quality Standards.] This action is needed for the present time and for as long as the level of contamination in the groundwater resource threatens its use as a non-potable water supply.

APPENDIX A

Water Use Study

Water Use Study Report

Broadway-Pantano WQARF Site Tucson, Arizona



June 1, 2012

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ACRONYMS AND ABBREVIATIONS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AWQS	Arizona Aquifer Water Quality Standard
BNL	Broadway North Landfill
BSL	Broadway South Landfill
COC	Contaminants of concern
COT	City of Tucson
CWF	central well field
GAC	granular activated carbon
GOU	groundwater operable unit
PCE	tetrachloroethene or tetrachloroethylene
GRI	groundwater remedial investigation
GRO	groundwater remedial objective
LOFO	last-on/first-off or restricted-use
Site	Broadway-Pantano WQARF Site
TCE	trichloroethene or trichloroethylene
TW	Tucson Water (City of Tucson Water Department)
VOC	volatile organic compound
WQARF	Water Quality Assurance Revolving Fund

EXECUTIVE SUMMARY

This Water Use Study report has been prepared for the Broadway-Pantano Water Quality Assurance Revolving Fund Registry Site (Site) to meet the requirements established under Arizona Administrative Code R18-16-406 (D).

The purpose of the report is to gather information regarding current and foreseeable uses of waters that have been or are threatened to be impacted by the contaminant release to groundwater at the Site. This report will be used by the Arizona Department of Environmental Quality to determine the groundwater Remedial Objectives (cleanup goals).

The Site includes the Broadway North and South Landfills and the associated releases of tetrachloroethene, trichloroethene, and other volatile organic compounds to groundwater.

This Site is located within the City of Tucson's central well field. Within the vicinity of the Site, there are five water supply wells which already have been contaminated, and 21 active water supply wells which are threatened by the contamination. Of the 21 threatened active wells, ten are used for large municipal potable water supply, one is used for small municipal potable water supply, five are used for commercial potable/irrigation/industrial water supply, and five are used for private single-family home/irrigation water supply.

Of all of the groundwater users at the Site, Tucson Water (the City of Tucson's water department) is the largest water provider and groundwater user in the Site vicinity. In the Site vicinity, Tucson Water has had to shut down four wells contaminated by the Site and restrict the pumping of six wells immediately bordering the plumes. Tucson Water also has four wells downgradient of the Site which could be impacted by the Site. Tucson Water has indicated that the central well field will continue to be an integral part of its water resource base, even with increased utilization of recharged Central Arizona Project water. St. Joseph's Hospital's water supply well also has been impacted by the Site contamination and groundwater from this well is receiving wellhead treatment which removes the contaminants of concern. The hospital has indicated that its groundwater usage will need to expand in the future.

1.0 INTRODUCTION

This Water Use Study report has been prepared for the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Registry Site (Site) for the Arizona Department of Environmental Quality (ADEQ) to meet the requirements established under Arizona Administrative Code (A.A.C.) R18-16-406(D). The purpose of the report is to gather information regarding current and foreseeable uses of waters that have been or are threatened to be impacted by a contaminant release from the Site. This report, mainly based on information collected through 2008, has been revised in response to public comments.

1.1 Process Overview

The process to complete the groundwater remedial investigation (GRI) and select groundwater remedial objectives (GROs) begins with the completion of the draft GRI report, which includes the Water Use Study report. The issuance of the draft GRI report is followed by a public comment period for the draft GRI report and a public meeting to solicit proposed GROs (cleanup goals) for the Site. The GRO public meeting must be held within 45 days to 90 days following the issuance of the draft GRI report. Following the GRO public meeting, ADEQ prepares the draft GROs report. The draft GRO report shall list the current and reasonably foreseeable beneficial uses of waters of the state. These uses shall be identified based upon information provided during the public meeting and any other information received by ADEQ. The draft GRO report shall state the GROs for each listed water use (e.g., potable, irrigation, etc.). The public will be provided an opportunity to comment on the draft GRO report. If there is significant public interest or additional information has been discovered, a second public meeting to discuss the GROs may be held. The final GROs report is then prepared and included in the final GRI report, along with responsiveness summaries to address public comments on the draft GRI and proposed GRO reports.

1.2 Water Use Study Report

The purpose of the report is to gather information regarding current and "foreseeable" uses of waters that have been or are threatened to be impacted by a contaminant release, and to project time frames for future changes in those uses. Information gathered from discussions with water providers and well owners are included in the report.

1.3 Site Background

In January 1983, an active City of Tucson (COT) Water Department (Tucson Water or TW) groundwater production well D-022A in the TW's main potable water supply well field (called the central well field, or CWF) was found by ADEQ to be contaminated with the volatile organic compound (VOC) fluorotrichloromethane, also known as Freon 11. This well is located immediately adjacent to and downgradient of the Broadway North Landfill (BNL). Between 1987 and 1991, TW took this well and two others, C-021A and D-021A, out of service due to detectable concentrations of tetrachloroethene (PCE) in samples of groundwater collected from the wells. Well C-021A (now abandoned) formerly was located approximately one mile downgradient of the BNL. Well D-021A is located approximately

one-half mile downgradient of the BNL and one mile downgradient of the Broadway South Landfill (BSL). In 1997, a wellhead granular activated carbon (GAC) treatment system was placed on the St. Joseph's Hospital water supply well, which also contained PCE from the Site; the GAC treatment removes PCE to non-detectable levels. The last water supply well to be impacted by the contamination was the TW C-026B well which was disconnected from the public water supply distribution network in 1998. In 1998, the Broadway-Pantano Site was placed on the WQARF Registry. These wells are listed in Tables 8, 9, and 11 and shown in Figure 1.

The Site has been divided into two operable units: (1) Landfill Operable Unit, which includes the closed 100+ acre BNL, the closed BSL, and the vadose zone directly beneath and in close proximity to the BNL and BSL; and (2) Groundwater Operable Unit (GOU), which includes the volume of the saturated zone containing VOC concentrations exceeding the State of Arizona Aquifer Water Quality Standards (AWQSs). The main contaminant of concern (COC) in groundwater is PCE. [The COCs in the GOU are those contaminants which have been detected with some consistency in Site groundwater above the AWQS.]

1.4 Regional Aquifer Characteristics

The five COCs in the GOU are the VOCs PCE, TCE, cis-1,2-dichloroethene, vinyl chloride, and methylene chloride; however, the extent of the GOU is defined solely by PCE since the four other VOCs have not exceeded the AWQS beyond a distance of one-third mile downgradient of the BNL. The lateral extent has been sufficiently defined by recent RI groundwater sampling events. Figure 1 depicts the areal extent of the GOU groundwater contamination interpreted from the results from 2004 through 2006 groundwater sampling events at the Site. All of the COCs have been present in shallow groundwater to depths less than 50 feet below the water table, but only two COCs (i.e., PCE and TCE) have been detected at concentrations above their respective ADEQ AWQSs at depths greater than 50 feet below the water table.

Groundwater within the GOU (with several exceptions) flows toward the west at a hydraulic gradient of approximately 0.003 feet/foot [Figure 1]. The notable exceptions are in the vicinities of the BSL (where groundwater flows to the northwest) and Western Containment System (where localized perturbations are caused by sustained pumpage of the two Western Containment System extraction wells and continual reinjection of treated water into two WCS injection wells). The regional aquifer is unconfined and the depth to groundwater in the vicinity of the Site ranges from approximately 315 to 370 feet below ground surface. The regional aquifer materials are relatively homogeneous consisting of primarily thick sequences of well-graded to poorly graded sands with discontinuous lenses of clayey sands, silty sands, and gravels.

2.0 USE EVALUATION

The following sections outline current and foreseeable water uses for the Site and the surrounding area. Reasonably foreseeable uses of water are those likely to occur within 100 years unless a longer time period is shown to be reasonable based on site-specific circumstances [A.A.C. R18-16-406 (D)].

2.1 Groundwater Uses

The Site lies within the Tucson Active Management Area created by the Arizona Groundwater Management Code passed in 1980. All groundwater legally withdrawn from any Active Management Area must occur under a groundwater right or permit, unless groundwater is being withdrawn from an exempt well. An "exempt well" is defined as a well equipped with a pump having a maximum capacity of 35 gallons per minute from which water is withdrawn for a use other than irrigation of two or more acres. All exempt wells must be registered with the Arizona Department of Water Resources (ADWR). Non-exempt wells have a discharge capacity greater than 35 gallons per minute. Owners of non-exempt wells located within Active Management Areas must report their annual groundwater withdrawals to ADWR whereas owners of exempt wells do not need to report withdrawals. Non-exempt wells are associated with one of the following types of rights or permits which require annual reporting of water withdrawals (ADWR, 2008):

- Grandfathered rights – Grandfathered rights are derived from past individual water use. There are three types of grandfathered rights: [1] Irrigation grandfathered rights, [2] Type 1 non-irrigation grandfathered rights (attached to the land), and [3] Type 2 non-irrigation grandfathered rights (not attached to the land);
- Service area right – Service area rights allow cities, towns, private water companies and irrigation districts to withdraw groundwater to serve their customers; or
- Withdrawal permits – Withdrawal permits allow new withdrawals of groundwater for non-irrigation uses within Active Management Areas. There are eight types of withdrawal permits covering various groundwater uses that are subject to different requirements. Examples of withdrawal permits include general industrial use permits, dewatering permits, and poor-quality groundwater-withdrawal permits.

Tables 1 through 3 summarize information concerning groundwater rights and permits in the Site area. Table 4 summarizes surface water filings in the Site area. Tables 5 through 11 list ADWR inventory groundwater wells located in the vicinity of the Site.

The following sections summarize the information received by ADEQ from well owners regarding specific current and future uses of groundwater wells in or near the Site that either have been impacted by a contaminant release or are threatened to be impacted by a contaminant release. Groundwater wells located within the GOU, located within approximately one-half mile cross gradient of the GOU (Figure 1), or located within approximately one mile downgradient of the GOU were evaluated and these wells are identified in the text below as being "in the GOU vicinity." This information was solicited by

ADEQ based on the groundwater flow direction in the regional aquifer, as well as proximity to the contaminant plumes in the regional aquifer.

Based on an ADWR well inventory conducted in 2005 and a review of ADWR on-line documents, 96 registered groundwater wells were identified within the vicinity of the Site. This universe of wells includes the following:

- 11 municipal water supply,
- five commercial potable/irrigation/cooling/etc. water supply,
- five private single-family home water supply,
- four groundwater remediation,
- 62 groundwater monitor,
- four not being used [three are dry, and one only partly constructed],
- five not existing [three were abandoned per ADWR regulations by the owners and two were not locatable by ADWR staff and said by the owners not to exist].

These wells are listed in Tables 5 through 11 and shown in Figure 1. Figure 2 shows only the active water supply wells. The correspondence and record of telephone conversations between ADEQ and the owners of groundwater rights and wells for the Water Use Study are contained in Attachment 1.

2.1.1 Municipal Water Supply—City of Tucson Water Department (Tucson Water)

TW is the water supplier for all of the residences and businesses in the vicinity of the GOU with just the few exceptions indicated in this Water Use Study report. TW currently relies on water supply production from five well fields within the Tucson Basin and Avra Valley to meet current municipal demand (TW, 2004). The most significant renewable source of potable supply is the Central Avra Valley Storage and Recovery Project (CAVSARP) Well Field located in Avra Valley, while the CWF is TW's largest groundwater supply source (TW, 2004). The CWF is located in the Tucson Basin and encompasses much of the urbanized footprint of the COT. The GOU is situated near the center of the CWF (TW, 2007).

TW has numerous water supply wells in the vicinity of the GOU (Figure 5). Four wells (C-021A, C-026B, D-021A, and D-022A) have been removed from operation since the late 1980s and early 1990s due to the presence of VOCs. A fifth well, C-022A, was contaminated after it was removed from service in the mid-1970s because of water supply problems. In addition, four active water supply wells currently have restricted-use operational status ("last-on/first-off" or LOFO) because of their proximity to the GOU. LOFO wells are among the last wells to be brought into service and the first wells to be taken out of service when a period of increased water supply need arises. Since August 1999, TW voluntarily has designated two other wells (wells C-025B and D-018A), both situated immediately south of the GOU, as having LOFO status to limit the potential for the GOU groundwater contamination to migrate toward these wells and to ensure the availability of these wells for supply should a need arise. All of these six LOFO wells were pumped in 2006 to assess the viability of the well infrastructure to meet system demand. TW is continuing to maintain and sample these wells so that they will be available to meet system demand as may be required. Table 12 provides a summary of annual production (in millions of gallons) of CWF water supply wells located

within the vicinity of the GOU. The table presents full production data for 1957 through 2007 (TW, 2007).

TW currently has a policy to take wells out of service that have VOC concentrations that exceed half of the potable drinking water standards for any regulated compound [i.e., EPA Maximum Contaminant Levels (MCLs) or ADEQ AWQSSs]. The six LOFO wells in the immediate vicinity of the GOU are being monitored for VOCs at least semiannually, and at least monthly during those times when the wells are brought into service for more than seven days. This policy ensures the quality of potable water supplies drawn from this area (TW, 2007).

According to TW, the CWF has historically been, and will remain, an essential component of TW's water supply infrastructure. Current TW plans include continuing the recharge and recovery of Central Arizona Project (CAP) water at CAVSARP, an operating storage and recovery facility in the Avra Valley. Potable use of the recovered blend of CAP water and Avra Valley groundwater began in May 2001 and continues to the present. TW has expanded the recharge capacity of CAVSARP up to 80,000 acre-feet per year and has plans to expand its recovery capacity in the near term. TW is currently in the process of developing a project similar to CAVSARP several miles to the south; this facility is called the Southern Avra Valley Storage and Recovery Project (SAVSARP), and it will provide an additional source of renewable supply. The SAVSARP facility, which is permitted to recharge up to 60,000 acre-feet per year, became operational in October 2008; the recovery component of the project is expected to become operational in late 2012 (TW, 2007; Prior, 2012).

TW anticipates that use of both CAVSARP and SAVSARP facilities will further reduce its reliance on groundwater pumping in the CWF during most of each year; however TW will continue to need the CWF and particularly the six LOFO wells in the near-term (5-10 years), mid-term (approximately 1 to 2 decades), and long-term (indefinitely) for the following reasons:

- To help meet peak water demand during the hottest months;
- To meet projected annual potable demand when it exceeds the TW's current annual CAP allocation—anticipated to occur within the next few years;
- To meet demand during partial system outages associated with lengthy planned maintenance activities;
- To provide emergency backup supply should there be a disruption in CAP supply due to problems with the CAP infrastructure or due to supply disruptions caused by system outages on TW's own system; and
- To provide potentially long-term backup potable supply should a shortage be declared on the Colorado River—the Secretary of Interior may make such a declaration within the next five years and it could be in place for an indeterminate period of time.

Therefore, TW places a high priority on maintaining its operational use of all CWF wells, including LOFO wells, as well as other available supply sources (TW, 2007; Marra, 2008).

According to TW pumpage data for the six LOFO wells for 2006 (Table 12), the pumpage rates (in millions of gallons) ranged from 4.1 (for well D-018A) to 25.5 (for well C-114A) and

totaled 90.7 for all six wells. By contrast, during 1992, these same six wells were pumped at rates (in millions of gallons) ranging from 128.9 (for well D-018A) to 221.8 (for well C-056B), and the total pumpage was 1022.8 (or approximately 1 billion gallons). According to TW, although TW has been able to temporarily reduce reliance on CWF wells in recent years, the AVRA Valley 26-inch main break in November 2006 resulted in the need to turn on CWF wells and the LOFO wells for two months, and emphasized the need to contain the western migration of the Broadway-Pantano plume (TW, 2007).

2.1.2 Municipal Water Supply Well—Catalina Village

Catalina Village at 5324 East 1st Street is an assisted living/retirement housing community. This small municipal provider has a non-exempt well supplying water to 107 apartments and 5 acres of landscaping/lawn [Tables 1 and 5]. Catalina Village has indicated that there are no plans for increasing water usage at the facility. According to ADWR records, Catalina Village's well water usage was 19.844, 17.362, and 21.161 acre-feet in 2005, 2006, and 2007, respectively.

2.1.3 Commercial Wells

There are four non-exempt wells and one exempt well in the GOU vicinity which are used for commercial potable, irrigation, or industrial water supply, or a combination of these uses.

The St. Joseph's Hospital (350 North Wilmot Road) and property is owned by Carondelet Health Network (CHN). The St. Joseph's Hospital complex has a well which provides water for steam production, building heating and cooling, landscape irrigation and potable use [Table 6]. According to ADWR records, this well supplied 47.87, 67.39, and 91.47 acre-feet of water in 2005, 2006, and 2007, respectively. CHN has a Type 2 grandfathered groundwater usage right to pump 205 acre-feet of groundwater annually [Table 2]. The hospital's facilities director has indicated that the complex has been expanding over the past few years (e.g., from 309 hospital beds to 494 hospital beds) and is continuing to expand; therefore, he expects that they will be withdrawing the entire 205 acre-foot annual allotment within the next five to ten years.

Granular activated carbon (GAC) wellhead treatment was installed on the hospital water supply well in 1997 because of PCE contamination from the Site. The GAC removes PCE and other VOCs to non-detectable levels. The hospital is also hooked up to the TW system and receives water from TW when its own well is off-line for maintenance or repairs.

St. Joseph's Hospital also has a second groundwater well, but this well is inactive because it is dry [Table 10]. The depth of this well is reported to be 350' below ground surface and the closest monitor well in the vicinity of this second well indicates the water table to be approximately 360' below ground surface. However, the hospital facilities director does not plan to abandon this well in order to keep open the option of using it in the future. The water table in this part of the CWF has risen several feet with TW's reduction in regular pumping from the CWF since the early 2000s, but most likely the hospital would need to deepen this well to make it usable.

Wash Depot XII, Inc. owns the Simoniz Car Wash at 6042 East Speedway Boulevard which has a well supplying water solely for the washing cars [Table 6]. Simoniz's well water at this location contains nitrate above the federal drinking water standard and is not used for potable use. Wash Depot XXII, Inc. withdraws water from this well under its Type 2 grandfathered groundwater usage right which allows an annual withdrawal of 10 acre-feet [Table 2]. According to ADWR records, this car wash withdrew 10 acre-feet of water from its well in 2005, 2006, and 2007. Wash Depot XII, Inc. has indicated that they do not foresee any changes in their water usage in the future.

HSL Dorado Place Office, L.L.C. owns the property 1181 North El Dorado Place which has a well which is used solely for landscape irrigation and filling a pond [Table 6]. (Humberto Lopez owns the Type 2 grandfathered groundwater usage right which allows an annual withdrawal of 300 acre-feet from this well [Table 2]). According to ADWR records, the annual well water usage was reported to be three acre-feet in 2005, 2006, and 2007. No changes in water usage are expected in the future.

Dorado C.C., Inc. has two non-exempt wells at its El Dorado Golf Course at 6601 East Speedway Boulevard. [Table 6]. (Omar Mireles owns the Type 2 grandfathered groundwater usage right which allows a combined annual withdrawal of 3 acre-feet [Table 2] from these two wells.) One well is located at the northern part of the golf course is used for irrigation. This well is considered unlikely to be impacted by the Site because of its distance from the GOU and the localized groundwater direction in the vicinity of the well (Figure 2). However, according to ADWR records, the annual well water usage was reported to be 222, 232, and 255 acre-feet in 2005, 2006, and 2007, respectively. The second well is located at the southern part of the golf course which is in the GOU vicinity but it is dry and capped and the owner does not plan to use it in the future.

Pima Alamo Heights LLC owns the property at 6074 East Pima Street which has an exempt well [Table 6]. This well water is used for nursery irrigation and potable water supply. The nursery at the property will be closing down in the latter part of 2008. After closure, the well will continue to be used for potable and watering the on-site vegetation. The owner indicated that in the future the land use may change to either a park or multi-family housing, with the well possibly continuing to be the on-site water source.

2.1.4 Private Residential Wells

There are five residences in the GOU vicinity that have exempt wells used for potable water supply, irrigation water supply, or both potable and irrigation water supply [Table 7]. Four of these wells were installed within the last five years. Owners of four of the wells indicated they plan to continue to use their well water and one well owner could not be reached.

2.1.5 Monitor and Remediation Wells

Presently there are 62 wells in the GOU vicinity being used by ADEQ for groundwater monitoring [Table 8]. ADEQ have no plans at this time to change this usage for these wells.

Four wells in the Site vicinity are being used by ADEQ as part of the remedial Western Containment System [Table 9]. This system includes two extraction wells and two injection wells which operate under an ADWR withdrawal permit [Table 3]. These wells are located at

the western end of the Site. The Western Containment System extracts, treats, and injects (back into the same aquifer) approximately 800 gallons of groundwater per minute.

2.1.6 Inactive Wells

Four wells in the GOU vicinity are not being used because they are dry [Table 10]. Three wells have gone dry because the water table in the CWF has dropped significantly since these wells were first installed. Two of these three well owners, 4-D Properties and Dorado C.C., Inc. have indicated that they have no plans to use the dry wells, and the third well owner, CHN, has indicated that it doesn't want to rule out using this well in the future (though deepening of the well would be needed). The fourth well, a residential exempt well, was constructed only to 20 feet below ground surface in 2005, and the owners indicated that they are uncertain as to when they will be able to complete construction on the well.

2.1.7 Non-Extant Wells

ADWR records indicate well registration for five wells in the GOU vicinity that no longer exist [Table 11]. Three of these wells have been abandoned pursuant to ADWR regulations. There also are two wells in the ADWR database which either were never installed, never installed at the properties indicated, or covered by a building, hardscape, or landscape in the distant past. The present property owners deny the existence of any wells on their properties and ADWR searched the properties and could not find any wells.

2.2 Surface Water Uses

Ronald Ray Tankersley

Mr. Tankersley filed a statement of claim for the use of public waters from the Pantano Wash in June of 1979 [Table 4]. The water was first used beneficially on June 11, 1919 for irrigation, domestic and recreational use. ADEQ attempted to contact the permit holder but the permit holder was not locatable.

3.0 SUMMARY OF USES

The water uses described in Section 2.0 that are most likely to be relevant to discussion of GROs are presented below.

3.1 Groundwater Uses

Current and future groundwater uses within the Site area include the following:

- TW will continue to use the CWF within the regional aquifer along with supplemental blended CAP water from the Avra Valley facility.

- Private domestic and commercial water users will continue to use their regional aquifer wells for drinking water and irrigation.
- ADEQ will continue to operate the Western Containment System and inject treated water back into the aquifer from which it was extracted as needed.

3.2 Surface Water Uses

There are no anticipated future surface water uses within the Site area.

4.0 REFERENCES

- Arizona Department of Water Resources, 2008. Overview of Arizona's Groundwater Management Code. <http://www.evwf.org/EVWF-ADWRgmasummary.pdf>
- Arizona Department of Water Resources, On-Line Imaged Records of Annual Withdrawal and Use Report—Groundwater Summary, years 2005, 2006, and 2007.
- Arizona Department of Water Resources, On-Line Imaged Records.
- Marra, R.P. 2008. Emailed communication from Ralph Marra, Tucson Water, Planning and Engineering Division, Water Resources Section. July 22.
- Prior, B, 2012. Personal communication with Bruce Prior, Tucson Water, Planning and Engineering Division, Water Resources Section. January 23.
- Tucson Water (City of Tucson, Water Department). 2004. Water Plan: 2000-2050 (Final Draft). November 22.
- Tucson Water (City of Tucson, Water Department). 2007. Transmittal of Tucson Water's Comments Regarding SECOR's Draft Remedial Investigation Report—Groundwater Operable Unit and Other Potential Source Areas. May 29.
- Tucson Water (City of Tucson, Water Department) 2008. Update to *Water Plan: 2000-2050*.
- URS Corporation, 2002. Remedial Investigation Report – Broadway- Pantano WQARF Site Groundwater Operable Unit for mid 1980's through 2000. June 30.

TABLES

Table 1	Service Area Rights (56- Numbers)
Table 2	Grandfather Rights (58- Numbers)
Table 3	Withdrawal Permits (59- Numbers)
Table 4	Surface Water Filings (36- Numbers)
Table 5	Municipal Wells (55- Numbers)
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Table 10	Inactive Wells (55- Numbers)
Table 11	Non-Extant Wells (55- Numbers)
Table 12	Tucson Water Wells in the Vicinity of the Broadway-Pantano Groundwater Operable Unit—Annual Production

NOTES: All existing wells are listed by reference number in Tables 5-11 and are shown in Figure 1.
All existing active wells are listed by reference number in Tables 5-7 and are shown in Figure 2.
The main sources for the information found in the tables are the Arizona Department of Water Resources and the well owners.

TABLE 1

SERVICE AREA RIGHTS (56- NUMBERS)

Service Area Rights (56-'s): ADWR Explanation: Most Arizonans receive domestic water through service area rights. Service area rights allow cities, towns, private water companies and irrigation districts to withdraw groundwater to serve their customers.

Permit Number	Owner Name--Contact	Owner Address	Permit Use	Cadastral Location
56-000001	CITY OF TUCSON, WATER DEPT Ralph Marra	P.O. Box 27210, Tucson, Arizona 85726	WELLS - MULTIPLE WELLS	MULTIPLE WELLS
56-000151	CATALINA VILLAGE Ann Liska, Management Office	5324 East 1st Street, Tucson, Arizona 85711	WELL - 55-611851	D-14-0-14-0-11

Source: Arizona Department of Water Resources

TABLE 2

GRANDFATHERED RIGHTS (58- NUMBERS)

Grandfathered Rights (58-'s): ADWR Explanation: These rights are comprised of [1] Irrigation grandfather rights [2] type 1 non-irrigation grandfathered rights (attached to the land) and [3] type 2 non-irrigation grandfathered rights (not attached to the land/well).

Water Right #- Permit Type-- Annual Pumpage Under Permit	Owner Name/Contact Name	Well Location	Well Number/Use	Cadastral Location
58-114521 Type 2 10 acre-feet/year	WASH DEPOT XII, Inc. Harry Andersen 14 Summer Street, Suite 302 Malden, MA 02148	Simoniz Car Wash 6042 East Speedway Tucson, AZ	WELL 55-801196 Commercial	D-14-0-14-0-12ABA
58-108946 Type 2 300 acre-feet/year	HUMBERTO LOPEZ (+ two other individuals) CONTACT--Max Geffer HSL Properties, Inc. 3901 East Broadway Boulevard Tucson, AZ 85711 [NOTE: Land owner is Dorado C.C., Inc. at same address.]	Dorado Golf Course 6601 East Speedway Tucson, AZ 85710	WELL 55-612397 + [WELL 55-612396 (but this well is dry)] Irrigation	D-14-0-15-0-06
58-100441 Type 2 3 acre-feet/year	OMAR MIRELES 3901 East Broadway Boulevard Tucson, AZ 85711 [NOTE--Land Owner is HSL Dorado Place Office, L.L.C. at same address.]	1181 North El Dorado Place Tucson, AZ 85715	WELL 55-602755 Irrigation	D-14-0-15-0-06
58-104143 Type 2 205 acre-feet/year	CARONDELET HEALTH NETWORK Kevin Nelson St. Joseph's Hospital 350 North Wilmot Road Tucson, AZ 85712	same as owner	WELL 55-603227 Commercial	D-14-0-15-0-07

Sources: Arizona Department of Water Resources and well owners

TABLE 3

WITHDRAWAL PERMITS (59- NUMBERS)

Withdrawal Permits (59-'s): ADWR Explanation: Withdrawal permits allow new withdrawals of groundwater for non-irrigation uses such as dewatering, mineral extraction and metallurgical processing, general industrial use, and poor quality groundwater withdrawal.

Permit Number	Owner Name/Contact	Owner Address	Permit Use	Cadastral Location
59-586193	AZ DEPT OF ENV QUALITY Gretchen Wagenseller	400 West Congress, Suite 433, Tucson, Arizona 85701	INJECTION WELL - (55-587017)	D-14-0-14-0-12
59-586193	AZ DEPT OF ENV QUALITY Gretchen Wagenseller	400 West Congress, Suite 433, Tucson, Arizona 85701	INJECTION WELL - (55-587018)	D-14-0-14-0-12
59-586193	AZ DEPT OF ENV QUALITY Gretchen Wagenseller	400 West Congress, Suite 433, Tucson, Arizona 85701	EXTRACTION WELL - (55-587019)	D-14-0-15-0-7
59-586193	AZ DEPT OF ENV QUALITY Gretchen Wagenseller	400 West Congress, Suite 433, Tucson, Arizona 85701	EXTRACTION WELL - (55-620028)	D-14-0-14-0-12

Sources: Arizona Department of Water Resources and well owners

TABLE 4

SURFACE WATER FILINGS (36- NUMBERS)

Surface waters, according to ADWR: appropriate, or public, waters include: A) the waters of all natural sources, flowing in streams, canyons, ravines or other natural channels, whether perennial or intermittent, flood, waste, or surplus water, and of lakes.

Permit Number	Owner Name/Contact	Owner Address	Permit Use	Cadastral Location
36-24369	TANKERSLEY, RONALD R	8350 East Tanque Verde Road, Tucson, Arizona 85749	Domestic, Irrigation, Recreation	D-14-0-15-0-08
36-46641	ST JOSEPHS HOSPITAL	350 North Wilmot Road, Tucson, Arizona 85711	Domestic, Irrigation-- Wells	D-14-0-15-0-07
36-46643	ST JOSEPHS HOSPITAL	350 North Wilmot Road, Tucson, Arizona 85711	Domestic, Irrigation-- Wells	D-14-0-15-0-07

Source: Arizona Department of Water Resources

**TABLE 5
MUNICIPAL WELLS [active]**

Figures 1 & 2 Reference #	ADWR Registry ID #	WELL NAME	PERMIT TYPE	WELL USE	WATER USE	WELL DEPTH	CASING DIAMETER	OWNER
1	55-620021	C-020B	Non-Exempt	Water Production	Large Municipal Provider	500'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
2	55-620026	C-025B	Non-Exempt	Water Production	Large Municipal Provider	0 - 375' 375' - 585'	16" 12"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
3	55-619980	C-046B	Non-Exempt	Water Production	Large Municipal Provider	644'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
4	55-619983	C-048B	Non-Exempt	Water Production	Large Municipal Provider	520'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
5	55-619985	C-049B	Non-Exempt	Water Production	Large Municipal Provider	520'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
6	55-619989	C-051B	Non-Exempt	Water Production	Large Municipal Provider	780'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
7	55-619993	C-056B	Non-Exempt	Water Production	Large Municipal Provider	614'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
8	55-619995	C-058B	Non-Exempt	Water Production	Large Municipal Provider	664'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
9	55-619959	C-114A	Non-Exempt	Water Production	Large Municipal Provider	534'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
10	55-620057	D-018A	Non-Exempt	Water Production	Large Municipal Provider	0 - 328' 328' - 465' 465' - 700'	16" 12" 10"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726
11	55-611851	None	Non-Exempt	Water Production	Small Municipal Provider	455'	8"	CATALINA VILLAGE 5324 East 1st Street Tucson, AZ 85711

Sources: Arizona Department of Water Resources and well owners

**TABLE 6
COMMERCIAL WELLS [active]**

Figures 1 & 2 Reference #	ADWR Registry ID #	WELL NAME	PERMIT TYPE	WELL USE	WATER USE	WELL DEPTH	CASING DIAMETER	OWNER	WELL LOCATION
12	55-603227	411-P	Non-Exempt	Water Production	Commercial-RECEIVING WELLHEAD TREATMENT BECAUSE OF SITE CONTAMINATION	530'	12"	CARONDELET HEALTH NETWORK St. Joseph's Hospital 350 North Wilmot Road Tucson, AZ 85711	same as owner
13	55-801196	416-P	Non-Exempt	Water Production	Commercial	400'	8"	WASH DEPOT XII, Inc. 14 Summer Street, Suite 302 Malden, MA 02148	Simoniz 6042 East Speedway Boulevard Tucson, AZ 85712
14	55-602755	not applicable	Non-Exempt	Water Production	Irrigation	358'	8"	HSL DORADO PLACE OFFICE, L.L.C. 3901 East Broadway Tucson, AZ 85711	1181 North El Dorado Place Tucson, AZ 85715
15	55-610399	not applicable	Exempt	Water Production	Irrigation/Commercial	350'	8"	PIMA ALAMO HEIGHTS, L.L.C. 3333 East Speedway Boulevard Tucson, AZ 85716	Catalina Heights Nursery 6074 East Pima Street Tucson, AZ 85712
15A	55-612397	not applicable	Non-Exempt	Water Production	Irrigation	475'	16"	DORADO CC, INC. HSL Properties, Inc. 3901 East Broadway Boulevard Tucson, AZ 85711 Contact-Humberto Lopez	Dorado Golf Course 6601 East Speedway Tucson, AZ 85710

Sources: Arizona Department of Water Resources and well owners/users

**TABLE 7
PRIVATE RESIDENTIAL WELLS [active]**

Figures 1 & 2 Reference #	ADWR Registry ID #	WELL NAME	PERMIT TYPE	WELL USE	WATER USE	WELL DEPTH	CASING DIAMETER	OWNER	WELL LOCATION
16	55-206760	not applicable	Exempt	Water Production	Domestic	460'	7"	ALBERTS RESIDENCE 250 North Indian House Road Tucson, AZ 85711	same as owner
17	55-594986	not applicable	Exempt	Water Production	Domestic	460'	5"	MAYO RESIDENCE 5362 East 3rd Street Tucson, AZ 85711	same as owner
18	55-202261	not applicable	Exempt	Water Production	Domestic	470'	7"	NEWELL RESIDENCE 330 North Indian House Road Tucson, AZ 85711	same as owner
19	55-208987	not applicable	Exempt	Water Production	Domestic	460' (unconfirmed)	7"	REILLY RESIDENCE 365 North Indian House Road Tucson, AZ 85711	same as owner
20	55-210048	not applicable	Exempt	Water Production	Domestic	460'	9"	SWAIN RESIDENCE 431 North Indian House Road Tucson, AZ 85711	same as owner

Sources: Arizona Department of Water Resources and well owners/users

TABLE 8

MONITOR WELLS [AND FORMER WATER SUPPLY WELLS USED AS MONITOR WELLS]

Figure 1 Reference #	ADWR Registry ID #	WELL NAME	WELL TYPE	WELL DEPTH	CASING DIAMETER	OWNER	
21	55-589345	BP-01	Monitor	456'	5"	ADEQ 400 West Congress Suite 433 Tucson, AZ 85701	
22	55-589349	BP-02	Monitor	460'	5"		
23	55-589348	BP-03	Monitor	450'	5"		
24	55-589347	BP-04	Monitor	455'	5"		
25	55-589346	BP-05	Monitor	475'	5"		
26	55-589343	BP-07	Monitor	476'	5"		
27	55-587095	BP-08	Monitor	492'	5"		
28	55-589342	BP-09	Monitor	476'	5"		
29	55-589341	BP-10	Monitor	480'	5"		
30	55-588207	BP-11	Monitor	500'	5"		
31	55-589338	BP-15	Monitor	489'	5"		
32	55-589337	BP-16	Monitor	490'	5"		
33	55-596237	BP-19	Monitor	445'	5"		
34	55-208705	BP-20	Monitor	468'	6"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726	
35	55-208704	BP-21	Monitor	468'	6"	ADEQ 400 West Congress Suite 433 Tucson, AZ 85701	
36	55-211472	BP-22	Monitor	438'	5"		
37	55-211653	BP-23	Monitor	440'	5"		
38	55-908056	BP-24A	Monitor	355'	5"		
39	55-908057	BP-24B	Monitor	405'	5"		
40	55-908058	BP-24C	Monitor	460'	5"		
41	55-908951	BP-25	Monitor	375'	5"		
42	55-620020	C-020A	Former Production Well	338'	8"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726	
43	55-620023	C-022A	Former Production Well	0 - 338'	12"		
44	55-620026	C-025A	Former Production Well	0 - 333'	16"		
45	55-620027	C-026A	Former Production Well	0 - 336'	12"		
46	55-619979	C-046A	Former Production Well	336' - 596'	10"		
47	55-619982	C-048A	Former Production Well	0-294'	12"		
48	55-619985	C-049A	Former Production Well	294' - 575'	10"		
49	55-619988	C-051A	Former Production Well	0 - 195'	12"		
50	55-619992	C-056A	Former Production Well	195' - 595'	10"		
51	55-619994	C-058A	Former Production Well	0 - 520'	16"		
52	55-620059	D-021A	Former Production Well--DISCONNECTED FROM MUNICIPAL WATER DISTRIBUTION SYSTEM BECAUSE IT WAS CONTAMINATED BY THE SITE	0 - 336'	12"		
53	55-620060	D-022A	Former Production Well--DISCONNECTED FROM MUNICIPAL WATER DISTRIBUTION SYSTEM BECAUSE IT WAS CONTAMINATED BY THE SITE	0 - 334'	12"		
54	55-620074	D-039A	Former Production Well	334' - 500'	10"		
55	55-620075	D-040A	Former Production Well	0 - 252'	16"		
56	55-620076	D-041A	Former Production Well	252' - 506'	12"		
57	55-578599	R-068A	Former Production Well--DISCONNECTED FROM MUNICIPAL WATER DISTRIBUTION SYSTEM BECAUSE IT WAS CONTAMINATED BY THE SITE	0 - 328'	16"		
58	55-578601	R-069B	Former Production Well--DISCONNECTED FROM MUNICIPAL WATER DISTRIBUTION SYSTEM BECAUSE IT WAS CONTAMINATED BY THE SITE	328' - 550'	12"		
59	55-204041	R-124A	Former Production Well	0 - 310'	12"		
60	55-204042	R-125A	Former Production Well	310' - 460'	10"		
61	55-568641	SE-001	Former Production Well	435'	12"		
62	55-568639	SJ-001	Former Production Well	0 - 402'	12"		
63	55-568640	SJ-002	Former Production Well	402' - 556'	10"		
64	55-522726	WR-155A	Former Production Well	0 - 335'	12"		
65	55-527410	WR-177A	Former Production Well	335' - 702'	10"		
66	55-527412	WR-178A	Former Production Well	370'	6"		
67	55-527409	WR-179A	Former Soil Vapor Extraction Well	380'	6"		
68	55-527411	WR-180A	Monitor	410'	5"		
69	55-527406	WR-181A	Monitor	395'	5"		
70	55-527407	WR-186A	Monitor	375'	5"		
71	55-592443	WR-207B	Monitor	395'	5"		
72	55-558356	WR-273A	Monitor	400'	5"		
73	55-558355	WR-274A	Monitor	615'	16"		
74	55-558354	WR-275A	Monitor	470'	6"		
75	55-575473	WR-352A	Monitor	460'	6"		
76	55-575474	WR-353A	Monitor	490'	6"		
77	55-576420	WR-354A	Monitor	465'	6"		
78	55-577633	WR-358A	Monitor	440'	6"		
79	55-581353	WR-367A	Monitor	410'	6"		
80	55-587406	WR-435A	Monitor	500'	16"		
81	55-205404	WR-458A	Monitor	347'	5"		
82	55-205405	WR-459A	Monitor	370'	5"		
				420'	6"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726	
				425'	6"		
				410'	6"		
							ADEQ 400 West Congress, Suite 433 Tucson, AZ 85701

Sources: Arizona Department of Water Resources and well owners/users

**TABLE 9
REMIEDIATION WELLS**

Figure 1 Reference #	ADWR Registry ID #	WELL NAME	PERMIT TYPE	WELL DEPTH	CASING DIAMETER	OWNER
83	55-587018	R-091A	Withdrawal Permit (but well is used for injection)	500'	12"	ADEQ 400 West Congress, Suite 433 Tucson, AZ 85701
84	55-587017	R-090A	Withdrawal Permit (but well is used for injection)	500'	12"	ADEQ 400 West Congress, Suite 433 Tucson, AZ 85701
85	55-587019	R-092A	Withdrawal Permit (well is used for extraction)	500'	16"	ADEQ 400 West Congress, Suite 433 Tucson, AZ 85701
86	55-620028	C-026B	Withdrawal Permit (well is used for extraction)--FORMER MUNICIPAL WATER SUPPLY WELL--DISCONNECTED FROM MUNICIPAL WATER DISTRIBUTION SYSTEM	544'	16"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726

Sources: Arizona Department of Water Resources and well owners/users

**TABLE 10
INACTIVE WELLS**

Figure 1 Reference #	ADWR Registry ID #	PERMIT TYPE	REASON FOR INACTIVITY	WELL DEPTH	CASING DIAMETER	OWNER	WELL LOCATION
87	55-700690	UNKNOWN	Well is capped.	220' (unconfirmed)	8"	4-D PROPERTIES 2525 East Broadway Boulevard Tucson, AZ 85716	Batteries Plus 1031 North Wilmot Tucson, AZ 85711
88	55-700682	Non-Exempt	Well is likely to be dry because depth to groundwater in the vicinity is 350'.	350' (unconfirmed)	16"	CARONDELET HEALTH NETWORK St. Joseph's Hospital 350 North Wilmot Road Tucson, AZ 85711	same as owner
89	55-210351	Exempt	Well constructed thus far only to 20' below ground surface and well owners indicate well construction may not be completed for some time.	20'	10"	RECKART RESIDENCE 410 North Sahuara Avenue Tucson, AZ 85711	same as owner
90	55-612396	Non-Exempt	Well is closed down and likely dry because depth to groundwater in the vicinity is 314'.	303'	12"	HUMBERTO LOPEZ [Dorado CC Inc.] HSL Properties, Inc. 3901 East Broadway Boulevard Tucson, AZ 85711	Dorado Golf Course 6601 East Speedway Tucson, AZ 85710

Sources: Arizona Department of Water Resources and well owners/users

**TABLE 11
NON-EXTANT WELLS**

Figure 1 Reference #	ADWR Registry ID #	WELL NAME	FORMER WATER USE STATUS	WELL DEPTH	CASING DIAMETER	OWNER	WELL LOCATION
91 ⁽¹⁾	55-620022	C-21A	Former Production Well--DISCONNECTED FROM MUNICIPAL WATER DISTRIBUTION SYSTEM BECAUSE OF SITE CONTAMINATION/ Former Monitor Well--ABANDONED	200' - 370' 357' - 505'	12" 10"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726	
not applicable	55-603226	not applicable	UNKNOWN--ABANDONED--Well was abandoned per ADWR regulations--spring 2008.	350'	12"	CARONDELET HEALTH NETWORK Kevin Nelson St. Joseph's Hospital 350 North Wilmot Road Tucson, AZ 85711	same as owner
not applicable	55-531208	WR-207A	Former monitor well (WR-207A)--ABANDONED.	450'	6"	CITY OF TUCSON PO Box 27210 Tucson, AZ 85726	
not applicable	55-640187	not applicable	UNKNOWN--Cannot verify that well ever existed since present property owner denies that there is a well on the property and ADWR staff searched for the well and could not find it.	No drillers report	No drillers report	BEAL RESIDENCE 310 North Indian House Road Tucson, AZ 85711	not applicable
not applicable	55-635545	not applicable	UNKNOWN--Cannot verify that well ever existed since present property owner denies that there is a well on the property and ADWR staff searched for the well and could not find it.	No drillers report	No drillers report	GRACE TO THE NATIONS 6180 East Pima Street Tucson, AZ 85712	not applicable

(1) This well is being shown on the figures because it was an active water supply well before it was impacted by the Site contamination and had to be shut down; thus, the Site Remedial Objectives will address the loss of this well water.

Sources: Arizona Department of Water Resources and well owners/users

TABLE 12--Tucson Water Wells in the Vicinity of the Broadway-Pantano Groundwater Operable Unit--Annual Production (millions of gallons)

Year	C-020A	C-020B	C-021A	C-022A	C-025A	C-025B	C-026A	C-026B	C-046B	C-048B	C-049B	C-051B	C-056A	C-056B	C-058A	C-058B	C-114A	D-018A	D-021A	D-022A	D-039A	D-040A	D-041A	Total Pumpage (Million Gallons)
1957	12.9		25.9																					39
1958	13.7		27.3																					41
1959	17.4		34.8										4.0		3.5									60
1960	19.6		36.0	56.7	43.9		24.6						33.5	29.3	26.1									293
1961	13.6		65.3	41.5	39.5		82.7						42.2	42.2	26.1				101.8	20.2				470
1962	38.2		106.7	53.9	23.5		92.7						31.8	80.2	82.1				11.4	13.5				549
1963	20.0		18.9	65.5	13.5		58.8						10.7	32.8	32.8				101.6	11.4				501
1964	0.3		14.7	67.6	4.0		48.8						45.2	94.9	94.9				168.2	18.3				656
1965			8.3	74.1			2.6						29.6	122.9	122.9				138.5	17.5				519
1966			53.0	43.6			37.4						48.8	69.5	69.5				68.2	3.2				382
1967	9.7		57.3				8.6						64.7	63.7	63.7				102.6	46.1				522
1968			63.4	11.0		8.3	53.2						102.6	89.0	89.0				36.8	62.2				838
1969	100.4		46.0	52.5		46.5	86.8						104.0	104.0	104.0				47.5	42.0				1020
1970	93.6		57.1	60.7		80.2	84.5						57.9	107.3	107.3				58.1	44.2				1089
1971	111.3		33.9	52.9		105.5	50.9						241.5	73.7	73.7				56.0	39.8				1169
1972	109.5		40.1	55.4		117.0	54.0						272.3	130.7	130.7				70.8	28.2				1305
1973	143.7		76.5	52.5		155.7	54.4						263.8	63.0	63.0				85.2	31.2				1284
1974	145.3		94.6	50.1		175.2	18.2						257.5	92.2	77.8				94.1	72.3				1380
1975	125.6		77.7	45.6		158.3	106.1						189.2	99.0	91.6				102.1	109.0				1085
1976	131.5		64.7	0.6		124.3	84.0						205.0	39.8	51.6				88.5	98.9				1007
1977	72.2		57.4			113.1	108.9						113.8	50.7	39.7				1.2	105.5				816
1978	110.8		49.1			175.5							85.1	2.1					89.4	48.5				1375
1979	70.9		38.4			158.7							181.0						87.1	48.5				1375
1980	66.8		37.8			194.1							152.8						82.7	38.2				1827
1981						71.3							376.2						119.7	66.5				2429
1982						64.5							355.5						125.3	56.2				2784
1983						104.7							359.3						183.6	4.2				2959
1984						85.1							369.5						119.6	0.5				3279
1985						67.8							333.8						88.5	14.2				3201
1986						76.6							348.0						65.6	1.9				2963
1987						192.4							348.0						133.8	192.0				3377
1988						193.8							331.9						78.3	156.3				2925
1989						125.9							323.8						198.5					2825
1990						84.2							311.9						121.2	164.0				2693
1991						3.3							284.2						43.6					2453
1992						138.3							221.8						128.9					2268
1993						0.3							0.2						0.1					16
1994						170.1							62.8						35.2					1721
1995						262.0							22.7						86.9					1806
1996						256.2							1.2						62.6					1670
1997						220.2							0.0						79.4					1725
1998						172.1							6.8						107.3					1593
1999						42.9							0.9						0.0					1173
2000						76.6							0.2						38.1					940
2001						0.2							0.2						0.1					62
2002						0.0							0.0						0.1					135
2003						0.1							0.0						0.0					136
2004						0.0							0.0						0.0					43
2005						0.0							0.0						0.0					85
2006						9.3							16.9						25.5					391
2007						0.0							0.0						0.0					102

NOTES:

(1) Modified from Table 2-3 of URS (2002a). Data for calendar year 2007 added from electronic mail supplied to ADEQ by Bruce Prior of Tucson Water, delivered on January 19, 2012. All volumes are rounded to the nearest tenth of a MG. The supplied data includes the 6 last-on/first-off Tucson Water production wells that are within the Broadway-Pantano WQARF Site GOU plus C-048B, C-049B and C-051B located west of Craycroft Road.

(2) C-022A well was shut down in 1978 for groundwater supply reasons--not for Broadway-Pantano Site contamination reasons.

Purple highlighting indicates the year the well was put on restricted usage because of well's proximity to the Site groundwater contamination.

Yellow highlighting indicates the year the well was disconnected from the water distribution system because of contamination of the well by the Site.

Green highlighting indicates the first year of reduced pumping of the well because of Tucson Water's replacement of Central Well Field water with Central Arizona Project water.

Pink highlighting indicates the maximum annual pumpage during the five years prior to the first year of pumping restrictions OR shutdown because of the contamination OR pumping reduction because of introduction of CAP water.

The purpose of the color coding is to help determine what pumping capacity the well has or had prior to pumping restrictions. This information will be needed for the Remedial Objectives and Feasibility Study. The year 1993 was not counted because pumping of the well was down that year because of introduction of direct-serve CAP water.

FIGURES

- Figure 1** **Groundwater Well Locations, Broadway-Pantano Site**
Figure 2 **Active Private and Municipal Well Locations, Broadway-Pantano Site**

NOTE: Figure 1 shows all existing wells identified by a reference number. The name, owner, and other information for these wells are provided in Tables 5-11 by reference number. Figure 2 shows all existing active wells also identified by a reference number. The name, owner, and other information for these wells are provided in Tables 5-7.

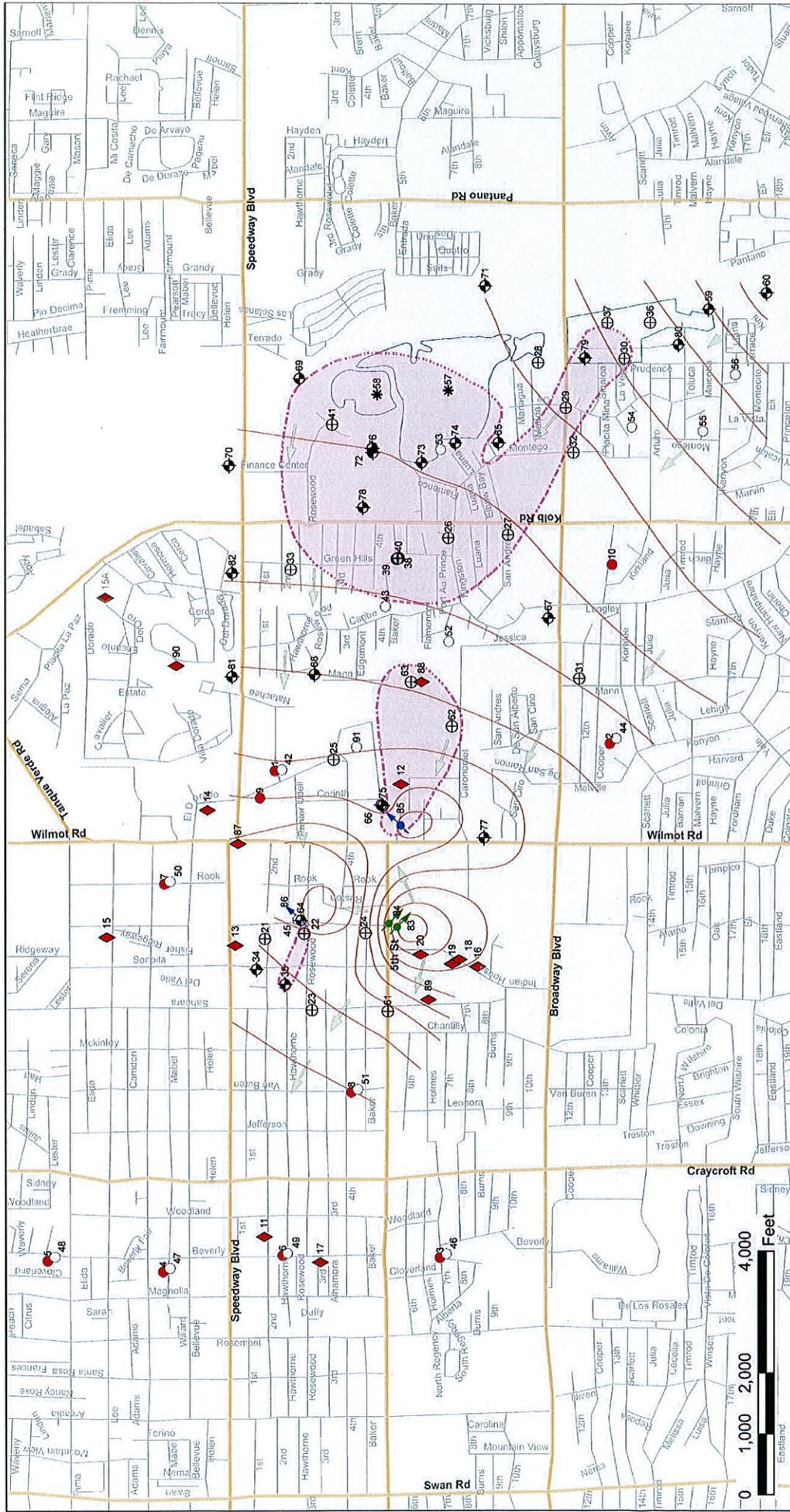


Figure 1
WELL LOCATIONS
BROADWAY - PANTANO SITE

PREPARED FOR:
 ARIZONA DEPARTMENT OF
 ENVIRONMENTAL QUALITY

PREPARED BY:

 8211 S. 48th Street
 Phoenix, Arizona 85044
 Phone: 602-435-2200 Fax: 602-431-9562

Drawn By: CMG
 Checked: TAK
 Approved: TAK
 Job No.: 180T.20401.09



- LEGEND**
-  COT Member
 -  ADEC Member
 -  COT Inactive
 -  COT Active
 -  Air Injection Monitor
 -  Extraction Well
 -  Injection Well
 -  Pit
 -  5-year PCE 2004-2005
 -  Nov 2005 GW Contours
 -  GW Flow Direction (Estimated)



Data: UTM_ZONE_12_NAD83

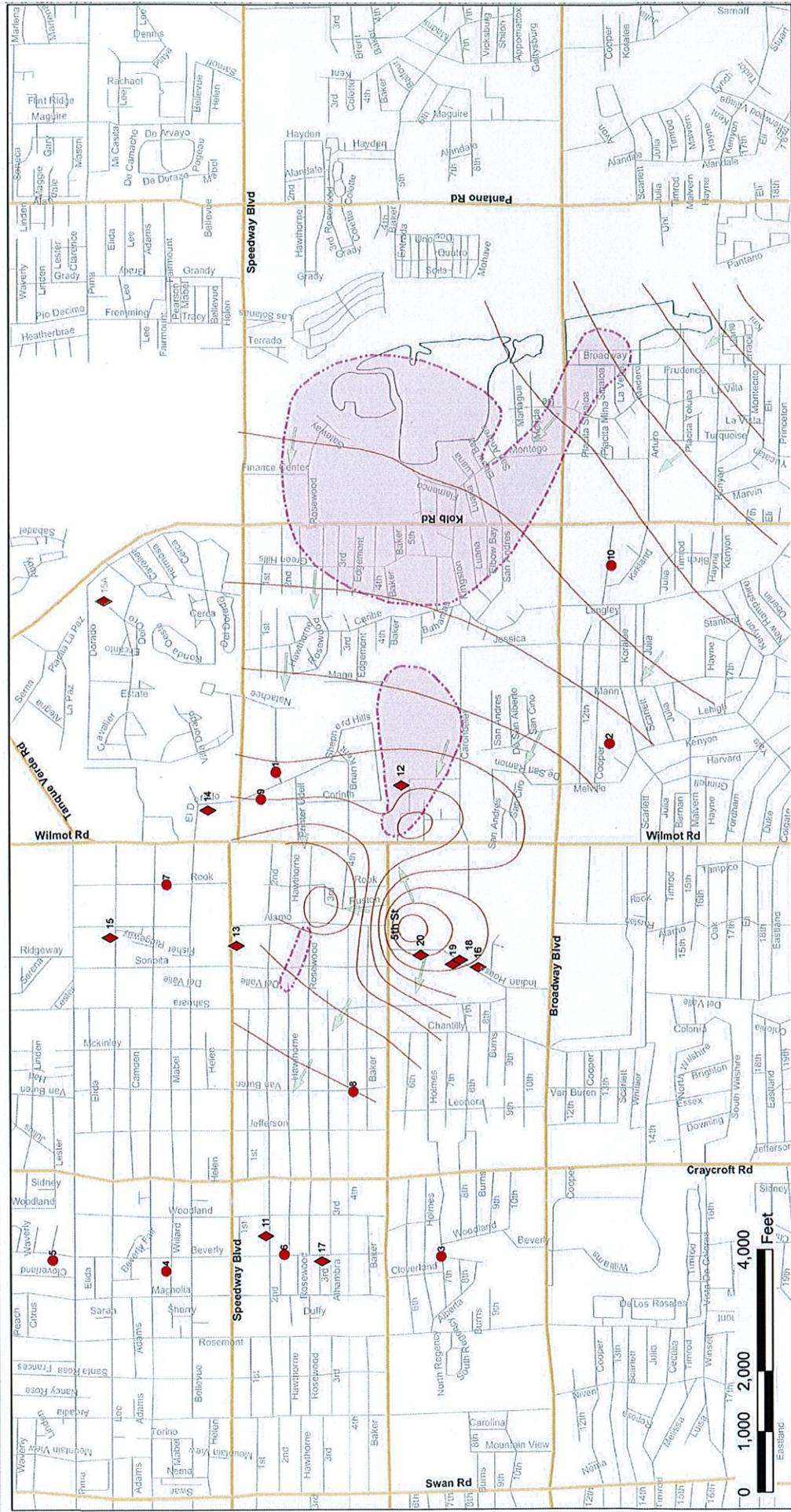


Figure 2
ACTIVE PRIVATE AND MUNICIPAL
WELL LOCATIONS
BROADWAY - PANTANO SITE

PREPARED FOR:
 ARIZONA DEPARTMENT OF
 ENVIRONMENTAL QUALITY

PREPARED BY:

 6211 S. 48th Street
 Phoenix, Arizona 85044
 Phone: 602-438-2200 Fax: 602-41-9582

Drawn By: CMG
 Checked: TAK
 Approved: TAK
 Job No.: 18OT.20401.09



LEGEND

-  COT Active
-  COT Inactive
-  ADEQ Monitor
-  Air Injection/Monitor
-  Injection Well
-  Private
-  Extraction Well
-  GW Flow Direction (Estimated)

5 ppb PCE 2004 - 2005
 Nov 2005 GW Contours
 Data: UTM ZONE 12, NAD83

ATTACHMENT 1

**Documentation of Communication
Between ADEQ and Well Owners, Well Users, and
Groundwater Rights Owners
Regarding Current and Future Groundwater Use**

Attachment 1

Broadway-Pantano Site Water Use Study Information Obtained from Groundwater Right Owners, Well Owners, and Well Users

Well Owner	Well Address	ADWR Well #55- + Groundwater Right #58-	Information Obtained from Telephone Conversation
4-D Properties	1031 North Wilmot	55-700690	On January 15, 2004, Terri Pearson, Property Manager, indicated that Batteries Plus is the lessee at the property and they have no intention of installing any wells. [ADWR field survey confirms existence of a capped well at the property--ADWR info also indicates the well is screened only to 220 feet (over 100 feet above the water table).] On June 25, 2008, Delores Cathy Welch-Mount, Property Manager, indicated that the tenants are on Tucson Water and they have no intention of bringing the well on line.
Alberts residence	250 North Indian House Road	55-206760	On November 16, 2006, Ms. Knox (property manager for Dave and Heather Alberts) confirmed that the well has been installed. On June 20, 2008, Heather Albert indicated that their well is used for irrigation and only Tucson Water is used for the potable water supply.
Any Travel, Inc.	1181 North El Dorado Place	55-602755 + 58-100441	On January 15, 2004, Arizona Department of Environmental Quality (ADEQ) sent a Water Use Study inquiry letter to Nina Dmetruk, contact for Any Travel, Inc., owner of the building/property at 1181 North El Dorado Place in Tucson, Arizona. ADEQ did not receive a response to this letter so ADEQ called Ms. Dmetruk on May 26, 2004; she indicated that they had no plans for changing the water usage at this property.
Any Travel, Inc.	1181 North El Dorado Place	55-602755 + 58-100441	On August 25, 2006, ADEQ spoke with David Bacon, Director of Facilities Management, Misys Health Care Systems (Misys), the lessee of the facility at 1181 North El Dorado Place in Tucson, via telephone to update information received in 2004 regarding Misys' present and future planned uses for groundwater at the property. This well is used for landscape irrigation and pond filling. He said that they use approximately 180,000-190,000 gallons/year and have no plans to change this usage. He also indicated that Misys may be moving their company to another building/property in two years.
Any Travel, Inc, then HSL Dorado Place Office	1181 North El Dorado Place	55-602755 + 58-100441	On February 28, 2007, David Bacon [speaking for the property owners] called ADEQ in response to an ADEQ telephone inquiry to Any Travel, Inc. regarding an update to the information they had provided previously regarding the groundwater well located at 1181 North El Dorado Place in Tucson, Arizona. The purpose of this telephone call was to confirm that the well water usage was still landscape irrigation. David Bacon, speaking on behalf of Nina Dmetruk of Any Travel, Inc. confirmed that the well water is still being used solely for landscape irrigation and filling of an on-site pond. David Bacon is the former Director of Facilities for Misys, which leased this property until recently.
Dorado CC, Inc. (HSL)	6601 East Speedway Boulevard	55-612396 and 55-612397 + 58-108946	On March 23, 2007, David Bacon left a phone message with ADEQ indicating that the well usage is determined by Any Travel, Inc. and Any Travel, Inc. will allow the new lessee to use the on-site well only for landscape irrigation and filling of the on-site pond. On June 16, 2008, Omar Mireles, HSL, confirmed that they had purchased the property and the well and the well's usage has not changed from previous.
Beal residence Carondelet Health Network	310 North Indian House Road 350 North Wilmot Road	55-640787 55-603227, 55-603226, 55-700682 + 58-104143	On June 25, 2008, Omar Mireles confirmed that the water right should have been put in the name of the property owner, which is HSL Dorado Place Office L.L.C. but mistakenly was put in his name. He indicated that they will be correcting this in the future. El Dorado County Club supervisor signed 2007 ADWR annual water use report indicating use of just the 55-352697 well. Used just the one well--the northern well. On June 20, 2008, Max Gelfer of HSL confirmed that they are using only one of the two wells and it is being used solely for irrigation. On June 26, 2008, Mr. Gelfer indicated they have no plans to use the 55-352696 well, which is capped (welded shut). On July 18, 2008--Mr. Gelfer indicated that they have no plans for increasing water usage [if anything, conserving--using less water]. On February 27, 2007, Mr. Beal indicated that they do not have an on-site well. On January 15, 2004, ADEQ sent a Water Use Study inquiry letter to Jackie Olson, Director of Property Management & Development, Carondelet Health Network, which owns the St. Joseph's Hospital at 350 North Wilmot, Tucson, Arizona. Ms. Olson referred ADEQ to Kevin Nelson, Director of Facilities, St. Joseph's Hospital. On May 18, 2004, Mr. Nelson indicated the following: They use approximately 31 million gallons/year and the well is 400 feet deep. Over the next five years, management is planning on making capital improvements that are likely to result in a 40% increase in water usage. There are no plans for installing a new well. On February 26, 2007, Mr. Nelson confirmed that the 55-603226 well was capped [in spring 2008, this well was abandoned per ADWR requirements]. On June 13, 2008, Mr. Nelson confirmed that the previously-indicated [in 2004] capital improvements have already been implemented and the hospital continues to rely on their well for its potable water supply. At this time there are no plans for installing additional wells. On June 25, 2008, Mr. Nelson indicated that even though there are no plans to use the 55-700682 well for potable water supply during the next 10 years, he did not want to close off the possibility of this well being used in the future. [NOTE: The bottom of this well's screening is reported (but not confirmed) to be approximately 15' above the present water table]. On July 17, 2008, Mr. Nelson indicated that they recently completed construction on a new medical office and a new 185-bed building, thus bringing St. Joseph's Hospital hospital bed capacity to over 485. He indicated that their well has been off line almost half of the year due to pump problems but they are getting it fixed [since it's costing them \$20,000/month to pay for City water]. He expects that the hospital will be pumping their ADWR-permitted maximum of 205 acre-feet in the next 5 years or so.
Catalina Village	5324 East 1st Street	55-611851	On July 17, 2008, Mr. Nelson indicated that they recently completed construction on a new medical office and a new 185-bed building, thus bringing St. Joseph's Hospital hospital bed capacity to over 485. He indicated that their well has been off line almost half of the year due to pump problems but they are getting it fixed [since it's costing them \$20,000/month to pay for City water]. He expects that the hospital will be pumping their ADWR-permitted maximum of 205 acre-feet in the next 5 years or so. On January 15, 2004, ADEQ sent a Water Use Study inquiry letter to Ron Rhoads, Maintenance Director, Catalina Village, the facility at 5324 East 1st Street, Tucson, Arizona. Mr. Rhoads did not respond to the letter so ADEQ contacted him by telephone on May 18, 2004. Mr. Rhoads said that they have no plans to increase water usage or install additional wells. Catalina Vista uses the water for 107 apartments and 5 acres of grounds. Their water usage last year was 18,995 acre-feet. On June 12, 2008, Ann Lisika, managers office, indicated that they still use the well water for 107 apartments and 5 acres of grounds.

Well Owner	Well Address	ADWR Well #55- + Groundwater Right #58-	Information Obtained from Telephone Conversation
City of Tucson Water Department--Tucson Water	Numerous wells.	Multiple wells	Ralph Marra, Chief Hydrologist for the City of Tucson (City), Water Department, was asked by Superfund Programs Unit (SPU) to provide an update to the City's October 27, 2003 letter to ADEQ regarding the City's "Present and Reasonably Foreseeable Uses" of Groundwater in the Vicinity of the Broadway-Pamano WQARF Site. ADEQ spoke with Mr. Marra via telephone on October 6, 2006, and he indicated that the City's October 27, 2003 letter does not require updating. [NOTE: Ralph Marra and Bruce Prior of Tucson Water provided updated information via letter and e-mail in 2007 and 2008.]
Grace Full Gospel Church/Grace to the Nations	6180 East Pima Street	55-635545	On February 27, 2007, Ms. Peavy, church administration, indicated that they are on City water and do not know of an on-site well.
Mayo residence	5362 East 3rd Street	55-594986	On June 13, 2008, Ms. Peavy confirmed that they are still on City water. On July 3, Ginger Middleton, Operations Pastor, indicated that they know of no well on the site and they are on City water. NOTE: ADWR WQARF docs indicate search of the site by their staff did not result in discovery of a well.
Newell residence	330 North Indian House Road	55-202261	On January 15, 2004, ADEQ sent a Water Use Study inquiry letter to Dr. Michael Mayo, the owner of the well/property at 5362 East 3rd Street in Tucson, Arizona.
Pima Alamo Heights LLC	6074 East Pima Street	55-610399	On January 29, 2004, Dr. Mayo indicated that the well was used solely for his residence and he had no plans to install a second well. Left message on June 12. Did not return message. Neighbor, Ms. Alberts, said that Mr. Newell is away for the entire summer and indicated that he has a well.
Ralph McPheeters (at that time now it is owned by Pima Alamo Heights LLC)	6074 East Pima Street	55-610399	On February 27, 2007, ADEQ spoke with Mr. Eddie McPheeters regarding the groundwater well located at 6074 East Pima Street in Tucson, Arizona. This property was previously owned by the McPheeters. The property is presently owned by Pima Alamo Heights LLC but the McPheeters are still operating their nursery there. Mr. McPheeter indicated that they are using the well there for plant irrigation and potable water supply. [ADWR TAMA office confirmed that this well is no longer non-exempt (it is exempt now).] On June 12, 2008, Mr. Eddie McPheeter, owner of Catalina Heights Nursery which is leasing the land/well, indicated that the on-site well is still being used for irrigation and potable water supply. Nursery will be closing--7/18/08 AZ Daily Star article indicate closing newspaper-- July 17, 2008. Some plants still on site. Possible residential--unknown--still irrigation. Annette McPheeters. On July 18, 2008, William Di Vito of Pima Alamo Heights LLC, indicated that the land could be used for either a park or multi-family residences, but, either way, the water use is likely to continue to be irrigation/potable residential.
Reckart residence	410 North Sahuara Avenue	55-210351	On January 15, 2004, ADEQ sent a Water Use Study inquiry letter to the Ralph D. McPheeters, owner of the facility [Catalina Heights Nursery] and property at 6074 East Pima Street in Tucson, Arizona. ADEQ did not receive a response to this letter so ADEQ contacted him via telephone on May 20, 2004. Mr. Eddie McPheeters, son of the owner, indicated that they use the water for the nursery business and the residence there. Their well pump doesn't produce enough for their water usage to be regulated [35 gpm, per Arizona Department of Water Resources], so they aren't required to have a meter and do not know how much water they use. He indicated that the water level has dropped greatly over the past several decades. Also, he indicated that City water department installation of a large pumping well a few blocks away has reduced the amount of water that they are able to get out of the well—even with the pump set at the bottom of the well. He said that they are only able to pressurize two hoses at a time now and also indicated that when the water pressure drops below 45 psig that they supplement their water system with City water.
Reilly residence	365 North Indian House Road	55-208987	On June 13, 2008, Jane Reckart indicated that only the first 20 feet of drilling has been performed on their well and they may not finish the drilling the well for some time; therefore, they are still on City water. On November 16, 2006, Mr. Robert Reilly confirmed that the well has been installed.
Simoniz/Wash Depot	6042 East Speedway	55-801196	On June 13, 2008, Mr. Reilly indicated that the well is used irrigation and they rely on City water for their potable household water supply; however, he also indicated that in the future they may switch their household over to the on-site well. On January 16, 2004, ADEQ sent a Water Use Study inquiry letter to Wash Depot, the owner of the well/property at 6042 East Speedway Boulevard in Tucson, Arizona. On January 29, 2004, Theresa Rapanella of Wash Depot responded via telephone, indicating that Wash Depot did not plan to change their well water usage in the future. She stated that this facility uses the well water solely for non-potable uses. She also stated that the facility used approximately 63,000 gallons in October 2004 and 95,000 gallons in November 2004. On June 12, 2008, Cathy Tompson, Administrative Assistant, confirmed via telephone that they plan to continue using this well water for car washing and not for drinking water.
Swain residence	431 North Indian House road	55-210048	On November 16, 2006, Mr. John Swain indicated that only the first 20' of the well has been installed. On June 12, 2008, Mr. Swain indicated that their well was installed and they plan to use the well for their household for the foreseeable future.

NOTE: This is a record of phone conversations held between Gretchen Wagenseller, Project Manager, Superfund Programs Unit, Southern Regional Office, ADEQ and well owners, well owner's contact person, or the well user. The "DATE" is the date of the phone conversation.



Janet Napolitano
Governor

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us



Stephen A. Owens
Director

C.T.S. 95249

August 25, 2003

SROSPU124,03

Mr. Ralph Marra, Chief Hydrologist
Tucson Water
P.O. Box 27210
Tucson, AZ 85726

Re: Water Use Studies Relating to Tucson Metropolitan Area Water Quality Assurance
Revolving Fund (WQARF) Registry Sites; Information Request

Dear Mr. Marra:

ADEQ is in the process of developing draft Remedial Investigation (RI) reports for several WQARF registry sites in the Tucson area. As you may be aware, each draft RI report will include information regarding impacts to water resources at each site collected in consultation with water providers and well owners within each area. We are currently working to draft RI reports for the following Tucson area WQARF registry sites:

- Broadway-Pantano
- El Camino del Cerro
- Miracle Mile
- Park-Euclid
- Shannon Road-Rillito Creek

As described in the attached WQARF Remedy Selection rules [R18-16-406 (D)], we are requesting information you possess regarding current and reasonably foreseeable uses¹ of water resources that have been or are threatened to be impacted by releases at each of the above sites and projected time frames for future changes in those uses. Specifically:

- information regarding current and reasonably foreseeable uses of water for each aquifer that is impacted or threatened to be impacted by the release at the site, considering any hydraulic connection between aquifers;
- the locations and uses of existing wells, including all wells already impaired due to contamination, the location and uses, if known, of any planned wells;
- any written water management plans used by Tucson Water for areas at and near the above listed WQARF registry sites.

The attached WQARF Remedy Selection rules describe how water use information that you and others provide will be used by ADEQ to establish remedial objectives and to select final remedies for these sites. A summary of that process has also been attached for your information.

¹Reasonably foreseeable uses of water are those likely to occur within 100 years unless a longer time period is shown to be reasonable based on site specific circumstances.

Mr. Ralph Marra
Page 2 of 2

As part of our preparation for this study, we have assembled existing information from our files regarding Tucson Water and other City of Tucson owned wells of record at and near the above listed sites as represented on the attached maps. We are also in possession of the following Tucson Water/City of Tucson documents:

- *Operations Map with Wells*; Tucson Water, updated August 2002.
- *The General Plan (Element 8: Water Resources)*; City of Tucson, December 6, 2001.
- *Present and 'Reasonably Foreseeable Uses' of Groundwater in the Vicinity of the Broadway-Pantano WQARF Site*; Letter to Steven L. Vaughn from Ralph P. Marra, February 29, 2000 (reference RM:cwf_current&futureuses.doc) (attached).
- *Table 2, Central Well Field Wells*; listing "last date in regular service," April 26, 2002 (attached).

We request you supplement this information as you feel appropriate for ADEQ to understand Tucson Water's current and future uses of groundwater at each of the above sites.

As we are working to issue the draft RI reports for public comment by the end of this calendar year, please forward to me any supplemental information you may wish to provide by October 31, 2003. Should you wish to discuss this request for information, feel free to give me a call at 628-6740.

Sincerely,

Mike Fulton, Supervisor
Superfund Programs Unit
Southern Regional Office

c: Karen Masbruch, Deputy Director, City of Tucson Environmental Services (w/o attachments)

attachments:

Remedy Selection Rules [R18-16-406]
Remedy Selection Process Summary
Site Maps

Present and 'Reasonably Foreseeable Uses' of Groundwater in the Vicinity of the Broadway-Pantano WQARF Site; Letter from Steven L. Vaughn to Ralph P. Marra, February 29, 2000 (reference RM:cwf_current&futureuses.doc)

Table 2, Central Well Field Wells; listing "last date in regular service," April 26, 2002.



**CITY OF
TUCSON**
TUCSON WATER
DEPARTMENT

October 27, 2003

Mr. Mike Fulton
Southern Regional Office
Arizona Department of Environmental Quality
400 West Congress Street, Suite 433
Tucson, Arizona 85701

SUBJECT: Present and 'Reasonably Foreseeable Uses' of Ground Water in the Vicinity of Specified WQARF Sites in the Tucson Water Service Area

Dear ^{M. Fulton} Mr. Fulton:

In your letter dated 25 August 2003, you requested information regarding current and anticipated uses of ground water in the vicinity of the following WQARF sites: Broadway-Pantano, El Camino del Cerro, Miracle Mile, Park-Euclid, and Shannon Road-Rillito Creek. I understand that this information is needed to complete remedial investigation reports and that it should conform to specifications in ADEQ's Remedy Selection Rules (R18-16-406 (D)).

The Remedy Selection Rules specify that the information provided should address both present and "reasonably foreseeable uses" of water which are likely to occur within a "reasonable time period." This time period is recognized to be the next 100 years unless a longer period can be shown to be reasonable. Because of the inherent uncertainties associated with long-term water resources planning, any comments or discussion regarding the future use of ground water in the vicinity of the above noted WQARF sites is subject to change. Nonetheless, it is critical that the regional aquifer be managed to ensure that it will be available to satisfy the community's current and future needs. Our community will rely on the regional aquifer in the vicinity of these WQARF sites to satisfy projected water demands. Contaminated ground-water sites in the vicinity of the Central Well Field must be remediated as soon as possible to ensure that both potable and non-potable water supply operations will not be unduly hampered.

Current Use of Ground Water

The City of Tucson Water Department (Tucson Water) and other water providers/users in the Tucson basin primarily rely on ground water or groundwater-derived effluent to meet their respective demands. Because the overall area relies on ground water for more than 50 percent of its drinking water supply, the regional aquifer has been designated by the Environmental Protection Agency as a "sole source" aquifer.



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Tucson Water currently relies on the productive capacity of five well fields to meet current municipal demand. Of the five, the Central Well Field is the largest and encompasses most of the developed parts of the City of Tucson as well as some outlying areas. Until recently, this well field annually supplied about 60 percent of the water required by Tucson Water to meet municipal potable demand. However, a major shift was initiated in 2001 when the Central Avra Valley Storage and Recovery Project (CAVSARP) began delivering Central Arizona Project water, a renewable water source, to Tucson Water customers. As a result, groundwater withdrawals in the Central Well Field have been reduced since CAVSARP will annually provide about 60,000 acre-feet (54 million gallons per day) of base load supply. Although the total volume of aquifer withdrawals in the Central Well Field area will decrease over time, it will remain a significant source of supply and will continue to be an essential element within the City of Tucson's water-supply infrastructure. Hence, the five WQARF sites referenced in your letter continue to be causes of concern since they are all located within or immediately adjacent to the Central Well Field and to some degree constrain the use of ground water for potable supply.

In addition to potable concerns in and around the Central Well Field, one or more of the listed WQARF sites are located in the vicinity of Tucson Water's effluent underground storage and recovery facilities. The presence of these WQARF sites has impacted the development and potential future expansion of these facilities which in turn constrains the community's ability to reuse effluent—the only other renewable water resource available for supply. The impacts associated with these WQARF sites on both the Central Well Field and Tucson Water's effluent recharge and recovery facilities will be discussed more fully below.

Tucson Water has a number of water supply wells in the immediate vicinity of the Broadway-Pantano WQARF Site. Since the late 1980s, four Tucson Water supply wells have been taken off line because of the occurrence of VOCs in well water samples. These wells include C-021A, D-021A, D-022A and most recently C-026B. The City currently has a policy to take out of service wells which have VOC concentrations which exceed half of the potable drinking water standards for such substances. The City also has four production wells with restricted-use ("Last-On/First-Off") status because of their proximity to the Broadway-Pantano VOC plume. These four wells located north and west of the Broadway North Landfill are C-020B, C-056B, C-058B, and C-114A. These wells have been needed to help meet peak demand between May and October. Because of their restricted use status, they have been among the last wells brought into service and among the first taken off line. Results of modeling studies have indicated that unrestricted use of well C-056B would have little if any effect on the VOC plume. Because of the critical need for additional pumping capacity in the Central Well Field, Tucson Water may recommend to City management that this well be dropped from the "Last-On/First-Off" list. Two other active wells, C-025B and D-018A, lie south of the VOC plume. Because these two wells have not been needed to meet peak- and off-peak demand since August 1999, they have for the time being been taken off line but this could change. Modeling analysis has indicated that if these wells were used

continuously, they could have an impact on the existing western containment of the plume and hence could necessitate additional remedial action. All six of these wells are considered available to meet municipal demand should they be required. Many other active wells are also in the general area but they are located farther away from the Broadway-Pantano WQARF Site.

The El Camino del Cerro, the Shannon Road-Rillito Creek, and the Miracle Mile WQARF Sites are all in close proximity to one another; hence, the water resource impacts associated with each are collectively addressed. To date, Z-006A is the only Tucson Water water-supply well that has been taken off line because of the presence of contaminants associated with one or more of these WQARF sites. Expansion of the Sweetwater Recharge Facilities and the planning and siting of recovery facilities associated with the Santa Cruz Managed Underground Storage Facility have been constrained by the existence of the ground-water contamination associated with the El Camino del Cerro WQARF Site. In addition, many of the existing wells in the vicinity of El Camino del Cerro and the Shannon Road-Rillito Creek WQARF Sites could be used as effluent recovery wells if it were not for issues associated with the VOC contamination of ground water. Also, the siting of constructed in-channel recharge facilities has been similarly constrained by ground-water contamination at the El Camino del Cerro WQARF Site. As points of correction, well Z-001A is not an active production well and should instead be shown on the provided map as a "partially equipped, not operational" well. Also, the map does not show EW-007A (55-582679), an "active production, but not connected" (to the potable system) well located on the west bank of the Santa Cruz River between WR-200A and PK-001A.

There are currently no active Tucson Water production wells in the WQARF Community Involvement Area associated with the Park-Euclid WQARF Site. The absence of currently active production wells is partially due to the reported presence of VOCs and/or diesel in ground water. For instance, well B-003B was converted from an active production well to a "monitor" well partially due to its proximity to the VOC ground-water contamination associated with the Park-Euclid WQARF Site. On the map provided, wells B-003A and B-003B are shown as "unknown" when in fact the location and status of both are known. Well B-003B is located at 127 North Campbell Avenue (parcel 124-09-067A) while B-003A, formerly located on the same parcel, was abandoned and should be shown as such. Well A-033A, located adjacent to railroad tracks, was abandoned due to the detection of diesel fuel in the well. Ground water in this area has been significantly impacted by local land uses.

Future Use of Ground Water

Tucson Water is currently ramping up its full-scale implementation of the Central Avra Valley Storage & Recovery Project and as noted previously, will soon be annually delivering up to 60,000 acre-feet of renewable supply. The utility goal is to utilize its full annual CAP allotment in the next 15 to 20 years. One of the key goals of Tucson Water will be to continue

reducing the amount of ground water that will be needed for municipal supply from its Central Well Field as well as from the other well fields. When reducing ground-water pumping in the Central Well Field and surrounding areas, the goal is to keep off line those wells located in that part of the Central Well Field where the largest historical water level declines have occurred. This area includes wells located near the Broadway-Pantano WQARF Site. In addition, other wells with a history of operational problems will also be among the first taken off line and this will apply throughout the Central Well Field as well as surrounding areas. By taking a large number of wells off line much of the year, water levels are generally expected to rise in the Central Well Field area. During times when peak demand will exceed the base supply provided by CAVSARF and other envisioned facilities, some Central Well Field wells will be brought back on line. The wells to be pumped to meet peak demand are selected based on operational need. It is anticipated that wells in the immediate vicinity of WQARF sites will be given a lower priority and hence kept off line as much as possible.

It is critical to recognize, however, that all available wells may be needed in both the near and long terms in order to respond to scheduled/unplanned CAP outages or supply shortfalls. Similarly, if potable drinking water standards become more stringent with regard to radon for instance or some other constituent, it may be necessary to rely on wells in the vicinity of WQARF sites for supply. Whatever remedial action approaches ADEQ elects to pursue, be it for interim plume containment or final remedy for all WQARF sites, they should be developed and implemented with two purposes in mind: 1) to achieve the specified remedial objectives, and 2) to preserve Tucson Water's flexibility in being able to operationally respond to a range of potential near- and long-term water-supply scenarios.

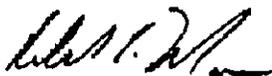
In the longer term, the community's water demand will at some point exceed the City of Tucson's current annual CAP allotment. The City may elect to obtain additional CAP water if it is available and/or treat wastewater effluent to a potable standard. Within the next fifty years or so, Tucson Water will probably find it necessary to resume the year-around pumping of ground water in the Central Well Field. This pumping will likely have an impact on ground-water conditions in the vicinity of the five WQARF sites.

In general, significant water supply changes will occur in the vicinity of the five WQARF sites over the next 100 years. It is imperative that the regional aquifer be managed to ensure that it will be available to satisfy the community's future needs. Anticipated operational changes in the Central Well Field and the increasing importance of aquifer management in the vicinity of existing and future effluent recharge and recovery projects during this period have been summarized. Water-resources planning has to respond to constantly changing circumstances; however, it is certain that the community will rely on the regional aquifer in the vicinity of these WQARF sites to satisfy current and projected water demands. It is imperative that contaminated ground-water sites in the vicinity of the Central Well Field be

Water Resources & WQARF Sites
Page 5 of 5

remediated to ensure that both potable and non-potable supply operations will not be unduly hampered. If you have any questions regarding the information provided, please feel free to give me a call at (520) 791-2689.

Sincerely,



Ralph P. Marra
Chief Hydrologist

RM:cwf_current&futureuses_wqarf_oct2003.doc

cc: Marie Pearthree
Bruce Johnson
Joe Babcock
Jeff Biggs
Ted Sroka
Larry Mulhern,
Sandy Elder
Marie Light
Tim Thomure
Karen Masbruch (Environmental Services)
Ray Murray (Environmental Services)
Blake Ashley (City Attorney's Office)
Chris Avery (City Attorney's Office)
Hydrology File

Gretchen A. Wagenseller

From: Ralph Marra [Ralph.Marra@tucsonaz.gov]
Sent: Friday, February 23, 2007 11:21 AM
To: Gretchen A. Wagenseller
Subject: Re: Broadway--RI text re Tucson Water water use--TucsonWater's Response

Attachments: Six Restricted Use Wells_Pumpage 2000 to 2006.xls; TW Revision_Draft RI--Water Use_BP WQARF Site_022307.doc



Six Restricted Use Wells_Pumpage 2000 to 2006.xls
TW Revision_Draft RI--Water Use_BP WQARF Site_022307.doc

Hi Gretchen,

Thanks for sending the draft over for review. The narrative needed significant updating given the changes that have occurred. There are a number of imbedded comments in the draft which will light up when you place your cursor on them. If you want to compare the new draft with the old, you can run a compare documents in Word.

I've also attached a spreadsheet showing well production at the six restricted use wells from 2000 through 2006. It clearly shows that the wells were operated in 2006. I provided this information so that you can update Table 4 accordingly.

If you have any questions or comments regarding the attached, please give me a call. And again, thanks for the look.

RM

>>> "Gretchen A. Wagenseller" <Wagenseller.Gretchen@azdeq.gov>
2/22/2007 11:18 AM >>>

I got behind schedule. Attached is the draft RI text section on the water use study that pertains to Tucson Water. Let me know if there is anything that is incorrect or anything that should be added (or should be reworded for better clarity). THANK YOU.

The Water Use Study itself, which will be an appendix, I'm still finishing up. I'll e-mail you that section for TW as soon as it's finished-I hope tomorrow.

Gretchen Wagenseller

Project Manager

Superfund Programs Unit

Arizona Department of Environmental Quality

Tucson, Arizona

gaw@azdeq.gov

520-628-6708 (phone)

520-628-6745 (fax)

Ralph Marra, Chief Hydrologist
City of Tucson, Water Department (Tucson Water)

TW, which is the COT's water department, currently relies on water supply production from five well fields located within the Tucson Basin and Avra Valley to meet current municipal demand (TW, 2004). The most significant renewable source of potable supply is the Central Avra Valley Storage and Recovery Project (CAVSARP) Well Field located in Avra Valley while the CWF is TW's largest groundwater supply source (TW, 2004). The CWF is located in the Tucson Basin and encompasses much of the urbanized footprint of the COT. The GOU is situated near the center of the CWF.

TW has numerous water supply wells in the vicinity of the GOU (Figure 5). Four wells (C-021A, C-026B, D-021A, and D-022A) have been removed from operation since the late 1980s and early 1990s due to the presence of VOCs. A fifth well, C-022A, was contaminated after it was removed from service in October 1975. In addition, four active water supply wells currently have restricted use status ("last on/first off", or LOFO) because of their proximity to the GOU. "Last on/first off" wells are among the last wells to be brought into service and the first wells to be taken out of service when a period of increased water supply need arises. Since August 1999, COT voluntarily has placed two other wells (wells C-025B and D-018A; Figure 5), both situated immediately south of the GOU, on restricted use to limit the potential for the GOU groundwater contamination to migrate toward these wells and to ensure the availability of these wells for supply should a need arise. All of these restricted use wells were pumped in 2006 to assess the viability of the well infrastructure to meet system demand. TW is continuing to maintain and sample these wells so that they will remain available to meet system demand as may be required. Table 4 provides a summary of annual production (in millions of gallons) of CWF water supply wells located within the vicinity of the GOU. The table presents full production data for 1957 through 2000, as well as partial data (for only the six restricted use wells) for 2001 through 2006.

COT currently has a policy to take wells out of service that have VOC concentrations that exceed half of the potable drinking water standards for any regulated compound (i.e., EPA Maximum Contaminant Levels [MCLs] or ADEQ AWQSSs). The six municipal wells in the immediate vicinity of the GOU are being monitored for VOCs at least semi-annually, and at least monthly during those times when the wells are brought into service for more than seven days. This policy ensures the quality of potable water supplies drawn from this area.

According to TW, the CWF has historically been and will remain an essential component of COT's water supply infrastructure. Current TW plans include continuing the recharge and recovery of Central Arizona Project (CAP) water at CAVSARP, an operating storage and recovery facility in the Avra Valley. Potable use of the recovered blend of CAP water and Avra Valley groundwater began in May 2001 and continues to the present. TW has expanded the recharge capacity of CAVSARP up to 80,000 acre-feet per year and has plans to expand its recovery capacity in the near term. TW is currently in the process of developing a project similar to CAVSARP several miles to the south; this facility is called the Southern Avra Valley Storage and Recovery Project (SAVSARP) and it will provide an additional source of renewable supply. The SAVSARP facility will be permitted to recharge up to 80,000 acre-feet per year and is expected to become

Comment [COT1]: Use Tucson Water's Water Plan: 2000-2010 as your citation. It was issued on November 22, 2004. If you would like a copy, one can be sent to you or you can access it online at <http://www.tucsonaz.gov/water/waterplan.htm>

Comment [COT2]: Gretchen: The citation here is TW's Water Plan: 2000-2010 which was issued in November 2004.

Comment [COT3]: Gretchen: All the remaining LOFO wells (C-026B used to be one) as well as C-025B and D-018A were put on line in 2006 to evaluate their operational availability should a peak demand need or a system need arise later on.

Comment [COT4]: Gretchen: Why not use updated pumping data through 2006. An EXCEL spreadsheet with updated numbers will accompany the email transmittal.

operational in 2008. TW anticipates that use of both CAVSARP and SAVSARP will further reduce its reliance on groundwater pumping in the CWF during most of each year as long as current CAP supply availability continues and/or until water demand exceeds renewable supplies.

As the use of blended groundwater/CAP water from these facilities in Avra Valley increases and assuming normal operating conditions will prevail, the need for the LOFO wells in the CWF as potable water supply wells will likely be reduced in the near and mid terms. However, as TW achieves maximum renewable resource utilization and as potable demand grows, the availability of these LOFO wells (and the aquifer from which they pump) will increase in importance as COT sources of supply. Also, most if not all of the wells in the CWF will be needed in both the short and long terms as backup sources of supply. For instance, the CWF will be a critical source of supply if there are disruptions to CAP supply due to infrastructure failure of CAP's deliver system or because of a declaration of shortage on the Colorado River, power outages, major potable system emergencies. Therefore, COT believes that it is extremely important to maintain operational use of the CWF as well as other available supply sources (URS, 2002a).

According to TW pumpage data for the six restricted-use wells for 2008 (Table 4), the pumpage rates (in millions of gallons) ranged from 12.6 (for well D-018A) to 78.2 (for well C-114A) and totaled 278.6 for all six wells. By contrast, during 1992 these same six wells were pumped at rates (in millions of gallons) ranging from 3.311 (for well C-025B) to 240.014 (for well C-020B), and the total pumpage was 1,165.649 (or approximately 1.17 billion gallons). The reduced reliance on these wells (albeit temporary) in recent years is a function of TW's increasing utilization of renewable supplies to meet potable water demand, the absence of any major potable system emergencies, and the restricted use status of these wells.

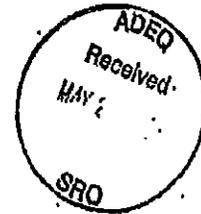
Comment [COTS]: Need to update Table 4 showing information through 2006. Note that these wells were used in 2006.



**CITY OF
TUCSON**
TUCSON WATER
DEPARTMENT

May 29, 2007

Ms. Gretchen A Wagenseller
Arizona Department of Environmental Quality
Southern Regional Office
400 W Congress; Suite 433
Tucson, AZ 85701



**SUBJECT: Transmittal of Tucson Water's Comments Regarding SECOR's
Draft Remedial Investigation Report—Groundwater Operable Unit
and Other Potential Source Areas**

Dear Ms. Wagenseller:

Please find tabulated in Attachment A Tucson Water's comments to SECOR's Draft Remedial Investigation Report Groundwater Operable Unit and Other Potential Source Areas. Included as Attachment B a suggested revision of the "Present and Future Water Use" section based on recently updated information which has become available. An electronic copy of the latter can be made available to you at your request.

Tucson Water appreciates your attention to these comments. If you should have any further questions or inquiries, please give me a call at (520) 791-5080 x1412.

Sincerely,

Ralph P Marra
Water Administrator

WW:RM P:\RSRT\Correspondence\2007\URS_RI_Response_052307.doc

Attachments

cc: David Modeer; Marie Pearthree, Bruce Johnson, John Kmiec, Bruce Pripr,
Joe Huerstel, and Dan Stanton of Tucson Water;
Alison Jones and Jeff Drumm of COT's Environmental Services Department



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ATTACHMENT B

2.8 PRESENT AND FUTURE GROUNDWATER USES

TW, which is COT's water department, currently relies on water supply production from five well fields within the Tucson Basin and Avra Valley to meet current municipal demand (COT Water Department, 2004). The most significant renewable source of potable supply is the Central Avra Valley Storage and Recovery Project (CAVSARP) Well Field located in Avra Valley, while the CWF is TW's largest groundwater supply source (COT Water Department, 2004). The CWF is located in the Tucson Basin and encompasses much of the urbanized footprint of the COT. The GOU is situated near the center of the CWF.

TW has numerous water supply wells in the vicinity of the GOU (Figure 5). Four wells (C-021A, C-026B, D-021A, and D-022A) have been removed from operation since the late 1980s and early 1990s due to the presence of VOCs. A fifth well, C-022A, was contaminated after it was removed from service in October 1975. In addition, four active water supply wells currently have restricted use status ("last on/first off", or LOFO) because of their proximity to the GOU. LOFO wells are among the last wells to be brought into service and the first wells to be taken out of service when a period of increased water supply need arises. Since August 1999, COT voluntarily has placed two other wells (wells C-025B and D-018A; Figure 5), both situated immediately south of the GOU, on restricted use to limit the potential for the GOU groundwater contamination to migrate toward these wells and to ensure the availability of these wells for supply when they are needed. All of these restricted use wells were pumped in the Summer of 2006 to assess the viability of the well infrastructure to meet system demand. In late 2006, four of the original LOFO wells were again put into service to provide potable supply due to a system outage in TW's groundwater supply infrastructure in Avra Valley. TW is continuing to maintain and sample these wells so that they will be available to meet system demand as may be required in future years. Table 4 provides a summary of annual production (in millions of gallons) of CWF water supply wells located within the vicinity of the GOU. The table presents full production data for 1957 through 2000, as well as partial data (for only the six restricted use wells) for 2001 through 2006.

COT currently has had a policy to take wells out of service that have VOC concentrations that exceed half of the potable drinking water standards for any regulated compound (i.e., EPA Maximum Contaminant Levels [MCLs] or ADEQ AWQSS). The six municipal wells in the immediate vicinity of the GOU are being monitored for VOCs at least semiannually, and at least monthly during those times when the wells are brought into service for more than seven days. This policy ensures the quality of potable water supplies drawn from this area (Marra, written communication, 2007).

According to TW, the CWF has historically been and will remain an essential component of COT's water supply infrastructure. Current TW plans include continuing the recharge and recovery of Central Arizona Project (CAP) water at CAVSARP, an operating storage

and recovery facility in the Avra Valley. Potable use of the recovered blend of CAP water and Avra Valley groundwater began in May 2001 and continues to the present. TW has expanded the recharge capacity of CAVSARP up to 80,000 acre-feet per year and is in the process of expanding its recovery capacity in the near term (Marra, written communication, 2007). TW is currently in the process of developing a project similar to CAVSARP several miles to the south; this facility is called the Southern Avra Valley Storage and Recovery Project (SAVSARP) and it will provide an additional source of renewable supply. The SAVSARP facility will be permitted to recharge up to 60,000 acre-feet per year and is expected to become operational in 2008; the recovery component of the project is expected to become operational in 2011. TW anticipates that use of both CAVSARP and SAVSARP facilities will further reduce its reliance on groundwater pumping in the CWF during most of each year. However, TW will continue to need its CWF, and in particular the six restricted use wells, in the near, mid, and long terms for the following reasons:

- To help meet peak water demand during the hottest months;
- To meet projected annual potable demand when it exceeds the COT's current annual CAP allocation—anticipated to occur within the next few years;
- To provide emergency backup supply should there be a disruption in CAP supply due to problems with the CAP infrastructure or due to supply disruptions caused by system outages on TW's own system;
- To provide potentially long-term backup potable supply should a shortage be declared on the Colorado River—the Secretary of Interior may make such a declaration within the next five years and it could be in place for an indeterminate period of time.

To summarize, as the use of blended groundwater/CAP water from these facilities in Avra Valley increases, and assuming normal operating conditions will prevail, the need for the LOFO wells in the CWF as potable water supply wells will likely be reduced in the near-term and mid-term except to meet peak potable demand. However, as TW achieves maximum renewable resource utilization, and as potable demand grows, the availability of these LOFO wells (and the aquifer from which they pump) will increase in importance as COT sources of supply. Also, most, if not all, of the wells in the CWF will be needed in both the short-term and long-term as backup sources of supply. For instance, the CWF will be a critical source of supply if there are disruptions to CAP supply due to infrastructure failure of CAP's delivery system or because of a declaration of shortage on the Colorado River, power outages, system outages associated with lengthy planned maintenance activities, or major potable system emergencies (Marra, written communication, 2007). Therefore, COT places a high priority on maintaining its operational use of the CWF, as well as other available supply sources (URS, 2002a)

According to TW pumpage data for the six restricted-use wells for 2006 (Table 4), the pumpage rates (in millions of gallons) ranged from 12.6 (for well D-Q18A) to 78.2 (for

well C-114A) and totaled 278.6 for all six wells. By contrast, during 1992, these same six wells were pumped at rates (in millions of gallons) ranging from 3.311 (for well C-025B) to 240.014 (for well C-020B), and the total pumpage was 1,165,649 (or approximately 1.17 billion gallons). The reduced reliance on these wells (albeit temporarily) in recent years is a function of TW's increasing utilization of renewable supplies to meet potable water demand (making them less necessary for year around use), the absence of any major potable system emergencies, and the restricted use status of these wells (Marra, written communication, 2007).

The vast majority of Tucson residences and businesses receive their water from TW, but there are some private water supply wells in the vicinity of the Site. The only private wells within the GOU groundwater plume are the previously shut-down TW production wells and the St. Joseph's Hospital well which is receiving wellhead treatment that removes the PCB (Section 1.4). There are two small municipal water providers -- Far Horizons, which provides water to the mobile homes and travel trailers in its residential park; and Catalina Village, which provides water to its assisted living residents. Also, there are two non-exempt (more than 35 gpm capacity well pump) wells that are used solely for irrigation and a non-exempt well used by a commercial car wash. There are also six private exempt (less than 35 gpm well pump) commercial wells used for irrigation/potable supply. For more information on groundwater users at the Site, see the Water Use Study Report in Appendix A.

Gretchen A. Wagenseller

From: Ralph Marra [Ralph.Marra@tucsonaz.gov]
Sent: Wednesday, July 16, 2008 5:07 PM
To: Gretchen A. Wagenseller
Subject: Re: Broadway site--Water Use Study

Hi Gretchen,

The "A" wells only matter if there is no "B" well at a given potable well site. So the wells listed check out.

Thanks for following up.

RM

.....
Ralph P. Marra
Water Administrator
Water Resources Management
City of Tucson -- Tucson Water
P.O. Box 27210
Tucson, AZ 85726-7210

Tele: (520) 837-2237
Email: ralph.marra@tucsonaz.gov

>>> "Gretchen A. Wagenseller" <Wagenseller.Gretchen@azdeq.gov> 7/16/2008
>>> 12:14 PM >>>
RALPH-

C-025B, C-046B, C-048B, C-049B, and C-051B were included in the universe of wells included in the Broadway-Pantano Water Use Study for the Groundwater Remedial Investigation Report. I realize that I did not include the "A" wells for these five wells in the Study. The Study will be an attachment to the draft groundwater Remedial Objectives report which will be put out for public comment, I hope within the next few months. If you have any questions/concerns re this, please let me know.

BRUCE-

I see now that we already had included the C-049B well in the Study, but not the "A" well for this well.

Thank you for providing the information on these wells.

Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Arizona Department of Environmental Quality

Tucson, Arizona

gaw@azdeq.gov

520-628-6708 (phone)

520-628-6745 (fax)

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Gretchen A. Wagenseller

From: Ralph Marra [Ralph.Marra@tucsonaz.gov]
Sent: Tuesday, July 22, 2008 9:27 AM
To: Gretchen A. Wagenseller
Cc: Bruce PRIOR; Joe Huerstel; Wally Wilson
Subject: Re: Question--clarification re "near-term", "mid-term", "long-term" in your comments on Broadway water use study

Gretchen,

I can appreciate your wanting to have greater clarity given the seemingly imprecise language. The reference to near term was meant to give a sense of immediacy which for us is often within the next five to ten years. The mid term meant to give a sense that our concern isn't immediate but it isn't too far out either (a decade or two?). The long term meant to indicate a sense of indefinite time beyond the mid term; for the longer term, we also try to prepare for the unforeseeable by keeping our options open to maintain our resource/supply flexibility so that we can respond to anything.

Does this help? If there is a problem with the language, we can discuss this further.

RM

>>> "Gretchen A. Wagenseller" <Wagenseller.Gretchen@azdeq.gov> 7/21/2008
>>> 5:08 PM >>>

In your attached comments on the Broadway-Pantano groundwater RI, you included an Attachment B (thank you) for revisions/improvements to the section in the water use study on Tucson Water. On page 2, at the end of the first (incomplete) paragraph, there is a reference to "near, mid, and long terms". Can you clarify? Is this another way for saying "from now until the foreseeable future"?

Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Arizona Department of Environmental Quality Tucson, Arizona gaw@azdeq.gov
520-628-6708 (phone)
520-628-6745 (fax)

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Gretchen A. Wagenseller

From: Bruce PRIOR [Bruce.PRIOR@tucsonaz.gov]
Sent: Wednesday, July 23, 2008 9:54 AM
To: Gretchen A. Wagenseller
Cc: Bruce PRIOR
Subject: Four Well Pumpage and Sampling Frequency

Attachments: C-051B Pumpage.pdf; C-046B Pumpage.pdf; C-048B Pumpage.pdf; C-049B Pumpage.pdf



C-051B



C-046B



C-048B



C-049B

umpage.pdf (25 KB)umpage.pdf (23 KB)umpage.pdf (22 KB)umpage.pdf (22 KB)
Gretchen,

1) C-046B is sample for Drinking Water Compliance every three years. That of course is a large set of constituents and contaminants. Additionally, until this past quarter, it was sampled annually for VOCs on a discretionary basis. It is now sampled for VOCs quarterly on a discretionary basis.

2) C-048B same as above.

3) C-051B was sampled for DWC every three years. It too is now sampled quarterly on a discretionary basis.

4) C-049B is unequipped and capped. It has not produced significant water since Oct 2002 (see attached). It was last sampled for Drinking Water Compliance (DWC) in 2004 and, since then, there have been no additional discretionary samples. The pump shaft broke at the well and, during maintenance operations, it was determined that the well produces significant sand. Although it remains unequipped, it is still considered a production well. TW staff will eventually install a liner to attenuate the sand production prior to re-equipping this well and putting it back into service.

Hope this helps. bmp

Bruce M. Prior
Hydrologist
City of Tucson/Water Dept.
Planning & Engineering Div.
Water Resource Management Sec.
P.O. Box 27210
Tucson, AZ 85726-7210

office (520) 791-2689
voice mail (520) 837-2230
cell (520) 349-5492
fax (520) 791-3293
Bruce.Prior@tucsonaz.gov

Gretchen A. Wagenseller

From: Bruce PRIOR [Bruce.PRIOR@tucsonaz.gov]
Sent: Wednesday, July 23, 2008 10:04 AM
To: Gretchen A. Wagenseller
Subject: Point to remember

Gretchen,

The "zeros" for C-0498 are real zeros since it is not equipped.

Remember that for the three wells still actively producing water, whenever you see a "zero" for a monthly total, there may have been water pumped that was too small of a volume to register due to rounding. For instance during special sampling or well testing.

25 # 04 - 2

January 20, 2004

Ms. Gretchen Wagenseller, Project Manager
Superfund Programs Unit
Southern Regional Office
Arizona Department of Environmental Quality
400 West Congress Street, Suite 433
Tucson, AZ 85701

RE: Letter of January 15th, 2004 (attached)

Dear Ms. Wagenseller,

Thank you for the phone call addressing my questions. I hope the following addresses yours. If not, please let know at your earliest convenience.

Locations - I believe the attached map (the one that Darril sent) gives you the location of the wells.

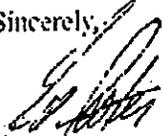
Uses - they are used to irrigate the golf courses' fairways and greens

Planned wells - none for the future.

Again, should these not answer your questions in full, please let me know.

It has been a pleasure working with you.

Sincerely,


Ed Foster
Vice President Hotel Operations



BCC - Mr H.S Lopez



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us



Stephen A. Owens
Director

SROSPU04, 17
January 15, 2004

E-5460.7.42.1

Any Travel, Inc.
136 3rd Street
Pittsburgh, Pennsylvania 15215

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 1181
North El Dorado Place, Tucson, Arizona

Dear Sirs/Mesdames:

Arizona Department of Environmental Quality (ADEQ) records indicate that Any Travel, Inc. is the owner of a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from your existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at your property.

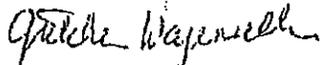
Northern Regional Office
1515 East Cedar Avenue • Suite F • Flagstaff, AZ 86004
(928) 779-0313

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ 85701
(520) 628-6733

Any Travel, Inc.
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,



Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

SROSPU04,20
January 15, 2004

E-5460.7.42.1

Ms. Jackie Olson
Director of Property Management and Development
Carondelet Health Network
2202 North Forbes
Tucson, AZ 85711

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; St. Joseph's
Hospital, 350 North Wilmot Road, Tucson, Arizona

Dear Ms. Olson:

The Arizona Department of Environmental Quality (ADEQ) is in the process of developing a draft Remedial Investigation (RI) report for the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Site. The RI Report will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources. Therefore, we are requesting information Carondelet Health Network (Carondelet), as the owner, may have regarding the current and future planned uses of the water supply well at St. Joseph's Hospital at 350 North Wilmot, Tucson, Arizona, and potential uses of water from other wells Carondelet may plan on installing there in the future. Specifically we are requesting information Carondelet may have regarding:

- location, uses, depth, and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- locations and uses, if known, of any planned wells.

We are also requesting that Carondelet include any additional information as you feel appropriate so that ADEQ may better understand current and future planned uses of groundwater pumped from well(s) at Carondelet's property.

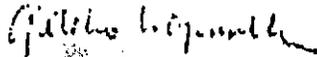
Northern Regional Office
1515 East Cedar Avenue • Suite F • Flagstaff, AZ
86004

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400 West Congress Street • Suite 433 • Tucson, AZ
85701

Ms. Jackie Olson
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment in spring 2004. Please forward to me any information Carondelet may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,



Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Site Map (well(s) of interest highlighted)



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

SROSPU04,14
January 15, 2004

E-5460.742.1

Mr. Ron Rhoads
Maintenance Director
Catalina Village
5324 East 1st Street
Tucson, Arizona 85711

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 5324
East 1st Street, Tucson, Arizona

Dear Mr. Rhoads:

Arizona Department of Environmental Quality (ADEQ) records indicate that Catalina Village owns a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from this existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at this property.

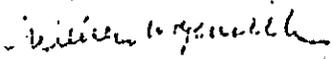
Northern Regional Office
1515 East Cedar Avenue • Suite F • Flagstaff, AZ
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400 West Congress Street • Suite 433 • Tucson, AZ
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Mr. Ron Rhoads
January 13, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,


Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

SROSPU04,25
January 15, 2004

E-5460.7.42.1

Dr. Michael T. Mayo
5362 East 3rd Street
Tucson, Arizona 85711

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 5362
East 3rd Street, Tucson, Arizona

Dear Dr. Mayo:

Arizona Department of Environmental Quality (ADEQ) records indicate that you own a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from this existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at this property.

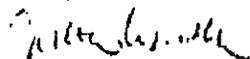
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Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ
85701

Dr. Michael T. Mayo
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,



Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

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Stephen A. Owens
Director

SROSPU04,15
January 15, 2004

E-5460.7.42.1

Mr. Ed Byrd
Far Horizons
7570 East Speedway Boulevard
Tucson, Arizona 85710

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 7570
East Speedway Boulevard, Tucson, Arizona

Dear Mr. Byrd:

Arizona Department of Environmental Quality (ADEQ) records indicate that Far Horizons is the owner of a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from this existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at your property.

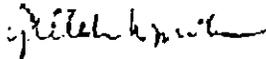
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Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ
85701

Mr. Ed Byrd
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,



Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

SROSPU04,19
January 15, 2004

E-5460.7.42.1

Mr. Humberto Lopez
HSL Properties
3901 East Broadway Boulevard
Tucson, Arizona 85711

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Registry Site; Information Request; Dorado Country Club Estates/Golf Course, 6601 East Speedway Boulevard, Tucson, Arizona

Dear Mr. Lopez:

Arizona Department of Environmental Quality (ADEQ) records indicate that HSL Properties is the owner of two wells at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from your existing wells or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- locations, uses, depths and screened intervals of existing wells, including all wells already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are also requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at your property.

Northern Regional Office
1515 East Cedar Avenue • Suite F • Flagstaff, AZ
86004

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ
85701



Janet Napolitano
Governor

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Stephen A. Owens
Director

SROSPU04,24
January 15, 2004

E-5460.7.42.1

Mr. Thomas Martin
841 North Pantano Road
Tucson, Arizona 85710

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 841
North Pantano Road, Tucson, Arizona

Dear Mr. Martin:

Arizona Department of Environmental Quality (ADEQ) records indicate that you own a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from this existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at this property.

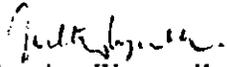
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85701

Mr. Thomas Martin
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,


Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

SROSPU04,26
January 15, 2004

E-5460.7.42.1

Mr. Ralph D. McPheeters
6074 East Pima Street
Tucson, Arizona 85712

SENT CERTIFIED MAIL

**Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 6074
East Pima Street, Tucson, Arizona**

Dear Mr. McPheeters:

Arizona Department of Environmental Quality (ADEQ) records indicate that you own a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from this existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at this property.

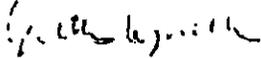
Northern Regional Office
1515 East Cedar Avenue • Suite F • Flagstaff, AZ
86004

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ
85701

Mr. McPheeters
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,



Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

SROSPU04, 18
January 15, 2004

E-5460.7.42.1

Mr. David Bacon
Misys Health Care Systems
4801 East Broadway
Tucson, Arizona 85711

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance
Revolving Fund (WQARF) Registry Site; Information Request; Property at 1181
North El Dorado Place, Tucson, Arizona

Dear Mr. Bacon:

Arizona Department of Environmental Quality (ADEQ) records indicate that Misys Health Care Systems is the lessee of a well at the referenced property which is located near the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [see attached Fact Sheet and Site Map]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from this existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth, and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are also requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at your property.

Northern Regional Office
1515 East Cedar Avenue • Suite F • Flagstaff, AZ
86004

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ
85701

Mr. David Bacon
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,

Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us



Stephen A. Owens
Director

SROSPU04, 16
January 15, 2004

E-5460.7.42.1

Ms. Carol Singer
Director of Corporate Services
Wash Depot
435 Eastern Avenue
Malden, Massachusetts 02148

SENT CERTIFIED MAIL

Re: Water Use Studies Relating to Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Registry Sites; Information Request; Simoniz Facility, 6042 East Speedway Boulevard, Tucson, Arizona

Dear Ms. Singer:

Arizona Department of Environmental Quality (ADEQ) records indicate that Wash Depot is the owner of a well at the Simoniz car wash facility at 6042 East Speedway Boulevard in Tucson, Arizona. This is the well that ADEQ has been periodically sampling since fall 2002 to help delineate the extent of the tetrachloroethene groundwater contamination at the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site [Fact Sheet and Site Map attached]. ADEQ is in the process of developing a draft Remedial Investigation (RI) report that will describe the extent of known contamination at the site and will also identify (in consultation with well owners) impacts to water resources.

We are requesting information you may have regarding the current and future uses of water from your existing well or from wells you may plan on installing in the future. Specifically we are requesting information you may have regarding:

- location, uses, depth and screened interval of the existing well(s), including any well(s) already impaired due to contamination; and
- location and uses, if known, of any planned wells.

We are also requesting that you supplement this information as you feel appropriate for ADEQ to better understand current and future planned uses of groundwater pumped from wells at your property.

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Ms. Carol Singer
January 15, 2004
Page 2

We are working to issue the draft RI report for public comment by spring 2004. Please forward to me any information you may wish to provide by February 16, 2004. If you have any questions regarding this request, please call me at 520-628-6708.

Sincerely,

Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office

Attachments: Fact Sheet
Site Map

Gretchen A. Wagenseller

From: anewell@math.arizona.edu
Sent: Tuesday, December 09, 2008 10:43 AM
To: Gretchen A. Wagenseller
Cc: tish.newell@cox.net
Subject: Well at 330 Indian House Road

Hi Gretchen,

We received your CD and am trying to figure out what the messages are. We put in our well in April 2004 and have used the water for domestic consumption, including drinking, and for irrigation (on a drip system). At the time, the only contaminant reported was an excess of iron which I figured was probably due to the new pipes. I am concerned, however, that your sampling has shown an unsafe amount of PCE. Is that correct? We may also be the folk that you did not contact. I do not recall speaking with you but we are sometimes away for lengthy periods in the summer and so may have missed you. I believe that we are either well #18 or 19 on your chart. I was not able to get to the Table listing names.

In any event, I would very much enjoy chatting with you either by email or by phone 514 8182. The water tastes great!

Best, Alan Newell.

Gretchen A. Wagenseller

Alan Newell

From: anewell@math.arizona.edu
Sent: Tuesday, December 09, 2008 10:43 AM
To: Gretchen A. Wagenseller
Cc: fish.newell@cox.net
Subject: Well at 330 Indian House Road

*ARSA - Comm Involvement
Water Use Study
RI*

Hi Gretchen,
We received your CD and am trying to figure out what the messages are. We put in our well in April 2004 and have used the water for domestic consumption, including drinking, and for irrigation (on a drip system). At the time, the only contaminant reported was an excess of iron which I figured was probably due to the new pipes. I am concerned, however, that your sampling has shown an unsafe amount of PCE. Is that correct? We may also be the folk that you did not contact. I do not recall speaking with you but we are sometimes away for lengthy periods in the summer and so may have missed you. I believe that we are either well #18 or 19 on your chart. I was not able to get to the Table listing names.
In any event, I would very much enjoy chatting with you either by email or by phone 514 8182. The water tastes great!
Best, Alan Newell.

APPENDIX B

**Responsiveness Summary for Proposed
Groundwater Remedial Objectives Report**



**FINAL GROUNDWATER
REMEDIAL OBJECTIVES**

RESPONSIVENESS SUMMARY

**BROADWAY-PANTANO WATER QUALITY
ASSURANCE REVOLVING FUND
REGISTRY SITE**

TUCSON, ARIZONA

June 1, 2012

PROPOSED GROUNDWATER REMEDIAL OBJECTIVES

RESPONSIVENESS SUMMARY

**BROADWAY-PANTANO WATER QUALITY ASSURANCE
REVOLVING FUND REGISTRY SITE**

TUCSON, ARIZONA

INTRODUCTION

Pursuant to the requirements of the Arizona Administrative Code (A.A.C.) R18-16-406(H), the Arizona Department of Environmental Quality (ADEQ) has prepared this comprehensive responsiveness summary for public comment regarding the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Registry Site Proposed Groundwater Remedial Objectives report. Public input prior to producing the report was accepted from April 4, 2007 through May 29, 2007. Public comment on the proposed report was accepted from November 25, 2008 through December 24, 2008.

PUBLIC COMMENTS RECEIVED IN RESPONSE TO ADEQ'S SOLICITATION OF INPUT PRIOR TO THE DEVELOPMENT OF THE GROUNDWATER REMEDIAL OBJECTIVES REPORT

Comment from the Broadway-Pantano Community Advisory Board

Comment 1:

The Broadway-Pantano Community Advisory Board recommends the following remedial objective: *It is imperative that this report leads to a final plan for remediation for this site. Because this site is located in the City of Tucson's central well field, there is the real potential for serious public health risks. In times of drought, contaminants can be pulled and may eventually contaminate city drinking wells. There are nearby wells designated as "last on/first off" that have been turned on in times of water shortages. It is unconscionable that the sustainability and the health of the population of a major city in this state be subject to such risks.*

Response 1:

The Groundwater Remedial Objective that pertains to the nearby City of Tucson water supply wells is "to restore, replace or otherwise provide for the current and future potable use of the regional aquifer threatened or impacted by PCE, TCE, and vinyl chloride emanating from the WQARF Site. ["Potable" is defined here as water which meets state and federal primary drinking water standards (a.k.a. Maximum Contaminant Levels) and Arizona Aquifer Water Quality Standards.] This action is needed for as long as the level of contamination in the groundwater resource prohibits its use as a potable water supply."

In 2010, ADEQ produced a groundwater fate-and-transport model to be used during the Groundwater Feasibility Study for this site. An important objective of the Groundwater Feasibility Study will be to evaluate the potential impact of this site contamination on the City of Tucson's nearby water supply wells. The Remedial Action Plan that is chosen for this site will address such potential impact.

Comments from Pima County

Comment 2:

Pima County recommends the following Groundwater Remedial Objective: *prevent exposure to contaminated groundwater above acceptable risk levels.*

Response 2:

See Response 1.

Comment 3:

Pima County recommends the following Groundwater Remedial Objective: *prevent further migration of contaminated groundwater.*

Response 3:

During the Feasibility Study, ADEQ will evaluate the remedial alternative of preventing further migration of contaminated groundwater. The Remedial Objectives are broadly written to allow ADEQ the flexibility needed to fulfill the requirements of § 49-282.06(A) when selecting a Final Remedy:

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.

Also, ADEQ and the City of Tucson, under a work share agreement, installed the Western Containment System (WCS) in 2003, and operation of the WCS has prevented further migration of most of the plume.

Comment 4:

Pima County recommends the following Groundwater Remedial Objective: *reduce the mass and concentration of CVOCs near suspected sources.*

Response 4:

During the Feasibility Study, ADEQ will evaluate the remedial alternative of treating groundwater close to the Broadway North Landfill (BNL) and the Broadway South Landfill (BSL).

Also, the City of Tucson and Pima County installed a soil vapor extraction (SVE) system at the BNL in 2000 to remove volatile organic compounds (VOCs) from the vadose zone. This system, which operated from 2000 to 2002, removed over 1200 pounds of tetrachloroethene and about 274 pounds of trichloroethene. Since the SVE system was turned off, ADEQ has collected and analyzed soil gas samples from the BNL deep nested soil gas monitor wells five times to determine whether VOCs levels in the vadose zone have rebounded. Thus far, the data collected have indicated that rebound has been insignificant and restarting of the SVE system is not warranted.

ADEQ also has installed deep nested soil gas monitor wells at the BSL. The soil gas sampling results obtained from these wells have indicated that installation of an SVE system at the BSL is unwarranted at this time.

Comment 5:

Pima County recommends the following Groundwater Remedial Objective: *beneficially use treated groundwater.*

Response 5:

During the Feasibility Study, ADEQ plans to work with the City of Tucson to evaluate options which include beneficial use of the treated water.

Comments from the City of Tucson

Comment 6:

The City of Tucson recommends the following Groundwater Remedial Objective: *fully define the lateral extent of the detectable contaminant plume, including the western leading edge.*

Response 6:

In January 2009, the ADEQ/City of Tucson work share agreement was amended to include the installation of three groundwater monitor wells downgradient of the BP-21 groundwater monitor well so that the toe of the plume could be defined. The City of Tucson, with technical input from ADEQ's modeling contractor Clear Creek Associates and ADEQ funding, sited and installed the three wells. The most downgradient of these three wells contained 9.2 ppb of PCE in November 2011. Therefore, the toe of the plume is farther west than this well, but not as far west as the Catalina Village well.

Comment 7:

The City of Tucson recommends the following Groundwater Remedial Objective: *fully remediate the contaminant plume that threatens the potable water supply for the community and private well owners.*

Response 7:

See Responses 1 and 3. As part of its Feasibility Study, ADEQ will evaluate acceleration of plume remediation. However, given that the sources of the groundwater contamination are landfills which may continue to release contamination to groundwater, it may not be feasible to fully remediate/restore the aquifer in the vicinity of the two landfills.

Comment 8:

The City of Tucson recommends the following Groundwater Remedial Objective: *fully contain the plume within 5 years, allowing for full use of potable production wells in the area and preventing further degradation of the aquifer.*

Response 8:

See Responses 1 and 3. ADEQ will evaluate containing the plume as part of its Feasibility Study.

Comment from Fred Brinker

Comment 9:

Fred Brinker recommended the following end use of treated waters: *ADEQ should consider beneficial use of treated water instead of reinjection.*

Response 9:

See Response 5.

PUBLIC COMMENTS RECEIVED ON ADEQ'S PROPOSED GROUNDWATER REMEDIATION OBJECTIVES REPORT

Comments from the Broadway-Pantano Community Advisory Board

Comment 10:

The Broadway-Pantano Community Advisory Board (CAB) agrees with the proposed remedial objectives as outlined in the Proposed Groundwater Remedial Objective Report for the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site, dated November 25, 2008.

Response 10:

No response needed.

Comment 11:

The Broadway-Pantano CAB also supports the installation of three more monitor wells west of the existing Western Containment System (WCS), and east of the City of Tucson central well field, to identify the extent of groundwater contamination that has escaped the WCS.

Response 11:

See Response 6.

Comment 12:

The CAB also strongly recommends remediation of the source of the contamination from the Broadway North Landfill.

Response 12:

During the Feasibility Study, ADEQ will evaluate further remediation options. However, given that the Broadway North Landfill covers approximately 100 acres, ADEQ does not anticipate that the Broadway-Pantano LOU Final Remedy will include cleaning up this enormous volume of waste. However, the LOU Final Remedy will address potential impacts of the BNL (and BSL) waste to groundwater and public health. See Response 4.

Comment from the City of Tucson

Comment 13:

Our comment pertains to Appendix A, page 3, Section 1.4, paragraph 1 of the document:

“The five COC’s in the GOU are the VOC’s PCE, TCE, cis-1,2-dichloroethene, vinyl chloride, and methylene chloride; however, the extent of the GOU is defined solely by PCE since the four other VOC’s have not exceeded the AWQS beyond a distance of one-third mile down gradient of the BNL. The lateral extent has been defined by recent RI groundwater sampling events”

The City of Tucson does not believe the lateral extent of the plume to the west of the Western Containment System has been defined as described. As you know this is why the City is working with ADEQ to install three additional monitoring wells down gradient of the Western Containment System to further define the plume.

Response 13:

See Response 6.

Comments from Metropolitan Domestic Water Improvement District

Comment 14:

The Metropolitan Domestic Water Improvement District (District) has comments on the above draft report for the Arizona Department of Environmental Quality (ADEQ). The District does not serve potable or non-potable water within the WQARF site, but believes the proposed Groundwater Remedial Objectives (GRO) developed by ADEQ for this site could influence Groundwater Remedial Objectives for other WQARF sites.

The District’s concern is that the following proposed remedial objective for potable water is to [sic] general by ADEQ as a policy statement to effectively maintain or improve on-going water quality treatment levels currently employed for direct potable use at this WQARF site or other WQARF sites.

The proposed GRO will be to restore, replace or otherwise provide for the current and future potable use of the regional aquifer impacted by PCE, TCE, and vinyl chloride contamination emanating from the WQARF Site. This action is needed for as long as the level of contamination in the groundwater resource prohibits its use as a potable water supply.

For example, on Page 7 of the Water Use Study notes in the last paragraph that St. Joseph Hospital has had a wellhead treatment system using GAC since 1997 that removes PCE and other VOCs to non-detectable levels. In Section 2.1.2 on Page 5 of the Proposed Groundwater Remedial Objectives Report the third sentence discusses the GAC system at St. Joseph Hospital [sic] removes PCE and other Site contaminants from groundwater, but does not clarify that the removal level is to non-detection. The District could not find any facts in the Proposed Groundwater Remedial Objectives Report on how contaminated groundwater affecting Tucson Water wells is currently clean up and to what contaminant level to ensure potable deliveries are

maintained. These facts are missing to help the affected public provide meaningful input on the proposed groundwater remedial objectives.

As a drinking water provider, the District must adhere to state and federal Drinking Water Rules for regulated VOCs which require increased monitoring and public notification when regulated VOCs are detected at 0.5 ppb or above. The District's concern is that the groundwater remedial objectives for potable water use to [sic] not reference state and federal drinking water standards and goals. State Aquifer Water Quality Standards are referenced in the report, but federal drinking water MCLGs adopted by ADEQ are not discussed for regulated VOCs which are zero. Under the State of Arizona Drinking Water Rules, if regulated VOCs are detected at or above 0.5 ppb and below the MCL at the Entry Point to the Distribution Systems (EPDS), then the water provider must conduct quarterly VOC monitoring at the EPDS and complete annual public notice to the customers. Our Board of Directors and customers do not support having regulated VOCs in their drinking water supply at or above detectable levels. The ADEQ WQARF Program has also supported this District policy when the District sought to improve its wellhead treatment system and ADEQ endorsed using a GAC treatment system to produce potable water with non-detectable VOCs as an IRA.

Response 14:

ADEQ agrees that “potable” needs to be clarified in the Groundwater Remedial Objective. The Groundwater Remedial Objective will be revised as follows:

The proposed GRO will be to restore, replace or otherwise provide for the current and future potable use of the regional aquifer threatened or impacted by PCE, TCE, and vinyl chloride contamination emanating from the WQARF Site. “Potable” is defined here as water which meets state and federal primary drinking water standards [a.k.a. Maximum Contaminant Levels] and Arizona Aquifer Water Quality Standards. This action is needed for as long as the level of contamination in the groundwater resource prohibits its use as a potable water supply.

The District has indicated that the District and its customers support ADEQ using the Maximum Contaminant Level Goals (MCLGs) instead of Maximum Contaminant Levels (MCL) as the cleanup level for drinking water at WQARF sites. ADEQ’s remedial action criteria under § 49-282.06(A)(3) require that ADEQ remedial actions be “necessary, cost-effective”. At a WQARF site with groundwater containing a contaminant of concern (COC) with an MCL, the “necessary, cost-effective” treatment level would be the MCL, not the MCLG. However, it should be noted that for sites with COCs with very low MCLs, e.g., tetrachloroethene or trichloroethene, a treatment system will be designed and operated to produce water with no detectable COCs. Such design/operation is needed because of the technical limitations of the cleanup technologies and the requirement for assurance in meeting the MCL. To provide assurance, all four existing WQARF wellhead treatment systems have granular activated carbon (GAC) tanks in series, GAC change-out scheduled after COC break-through from the lead GAC tank—not the lag tank, and site-specific sampling frequency requirements. Therefore, even though the treatment

performance goal is the MCL, the actual treatment level will be well below the MCL or non-detect.

Regarding the District's comment concerning the City of Tucson (Tucson Water) impacted wells: Section 2.1.1, paragraph 1, of the Proposed Groundwater Remedial Objectives Report indicates that the four City of Tucson wells which were impacted by the contamination were shut down. [In 2003, one of these wells became an extraction well for the WCS.] Also, Tucson Water has informed ADEQ that its policy is to stop serving water from any well exceeding one-half a Maximum Contaminant Level for any regulated VOC.

Comment 15:

The District recommends the following Groundwater Remedial Objective: *provide the most cost effective, flexible and operationally efficient treatment system for removing current and future PCE, TCE and vinyl chloride concentrations.*

Response 15:

ADEQ will include cost-effectiveness, flexibility, and operational efficiency as criteria when evaluating remedial alternatives during the Feasibility Study.

Comment 16:

The District recommends the following Groundwater Remedial Objective: *eliminate regulated VOC detections at or above 0.5 ppb from occurring in the potable water supply after any wellhead treatment process.*

Response 16:

See Response 14.

Comment 17:

The District recommends the following Groundwater Remedial Objective: *restore well production volumes to help with plume management and to meet existing and future potable water demands.*

Response 17:

The Groundwater Remedial Objective is "to restore, replace, or otherwise provide for the current and future potable use of the regional aquifer..." Remedial strategies to provide for the current and future potable uses of the regional aquifer will be evaluated during the Feasibility Study.

Comment 18:

The District recommends the following Groundwater Remedial Objective: *minimize O&M costs to ADEQ and the water provider.*

Response 18:

With groundwater remedial action possibly extending for decades, ADEQ certainly will include minimization of O&M costs as a Feasibility Study evaluation criterion. However, overall cost-effectiveness also will be evaluated.

Comment 19:

The District recommends the following Groundwater Remedial Objective: *meet the water provider's customer treatment level preference of non-detection.*

Response 19:

See Response 14.

APPENDIX C

Written Public Input on the Proposed Groundwater Remedial Objectives Prior to ADEQ Production of the Groundwater Remedial Objectives Report

[NOTE: Most of the Appendix C submittals from interested parties include both comments on the Draft Groundwater Remedial Investigation Report and input for the Proposed Groundwater Remedial Objectives Report. Comments on the Draft Groundwater Remedial Investigation Report are addressed in the Responsiveness Summary for the Draft Groundwater Remedial Investigation Report.]

CTS # 158521
(already filed)

The Broadway-Pantano Community Advisory Board
for the State of Arizona
Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Site
Tucson, Arizona

May 23, 2007

Gretchen Wagenseller, Project Manager
Arizona Department of Environmental Quality (ADEQ)
400 W. Congress, Suite 433
Tucson, AZ 85701



The following is a comment to the draft Groundwater Remedial Investigation (RI) Report and Remedial Objective comments for the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Site, Tucson, Arizona, from the Broadway-Pantano Community Advisory Board (CAB):

The Community Advisory Board for the Broadway-Pantano WQRF Site appreciates the extensive field investigations and the detailed draft Remedial Investigation (RI) Report that identifies the contaminants, their mode of transport, the extent of the contaminated groundwater, and potential public health risks. We are pleased that the Broadway South Landfill was added to the site.

However, we do think more vertical assessment of the groundwater plume needs to be done. But even more important, work needs to be done regarding soil gases. Looking at historical data, we are aware of the migration of soil gases within and also off of this site in some areas. Since gases that have been extracted from this site contain many VOCs that are a threat to human health and safety, there is an urgent need for the EPA to establish and release guidelines for measurement of acceptable limits for these types of volatile organic compounds inside structures.

Finally, it is imperative that this report leads to a final plan for remediation for this site. Because this site is located in the City of Tucson's central well field, there is the real potential for serious public health risks. In times of drought, contaminants can be pulled and may eventually contaminate city drinking wells. There are nearby wells designated as "last on/first off" that have been turned on in times of water shortages. It is unconscionable that the sustainability and the health of the population of a major city in this state be subject to such risks.

Sincerely,

Handwritten signature of James Garrett, Jr.

James Garrett, Jr.
Broadway-Pantano CAB Co-Chair

Handwritten signature of Judy Burns.

Judy Burns
Broadway-Pantano CAB Co-Chair

cc: Broadway-Pantano Community Advisory Board

CTS # 158524
(already filed)



May 29, 2007

CITY OF
TUCSON
TUCSON WATER
DEPARTMENT

Ms. Gretchen A Wagenseller
Arizona Department of Environmental Quality
Southern Regional Office
400 W Congress; Suite 433
Tucson, AZ 85701

SUBJECT: Transmittal of Tucson Water's Comments Regarding SECOR's Draft Remedial Investigation Report—Groundwater Operable Unit and Other Potential Source Areas

CTJ ✓

Dear Ms. Wagenseller:

Please find tabulated in Attachment A Tucson Water's comments to SECOR's Draft Remedial Investigation Report Groundwater Operable Unit and Other Potential Source Areas. Included as Attachment B a suggested revision of the "Present and Future Water Use" section based on recently updated information which has become available. An electronic copy of the latter can be made available to you at your request.

Tucson Water appreciates your attention to these comments. If you should have any further questions or inquiries, please give me a call at (520) 791-5080 x1412.

Sincerely,

Ralph P Marra
Water Administrator

WW:RM P:\R\SRF\Correspondence\2007\URS_RI_Response_052307.doc

Attachments

cc: David Modeer, Marie Pearthree, Bruce Johnson, John Kmiec, Bruce Prior, Joe Huerstel, and Dan Stanton of Tucson Water; Alison Jones and Jeff Drumm of COT's Environmental Services Department



ATTACHMENT A

Item	Reference	Review Comment
1	Exec Summary; pg E-1; last paragraph	"The purpose of the WCS was to prevent, to the extent feasible, further migration of the groundwater contamination within COT's CWF." Strike the qualifying phrase, "... to the extent feasible..." There is no question that this has always been, in the Water Department's opinion, the "purpose" of the WCS.
2	ES; pg E-4; last para.; 2nd line	The ADEQ RI has not identified the "lateral extent" of the contamination at the western toe of the plume, 5 ppb or otherwise.
3	Page 15; Last paragraph, third sentence	"Also, most, if not all, of the wells in the CWF will be needed in both the short-term and long-term as backup sources of supply." Change to: " All CWF wells including the Last On/First Off wells will be needed in both..." This is evidenced by the need for LOFO wells during Nov and Dec 06 when a 36" main broke in Avra Valley.
4	Page 15; Last paragraph, last sentence	Change to: " Therefore, COT believes that it is extremely important to maintain operational use of all CWF wells, including the Last On/First Off wells, as well as other available supply sources.
5	Page 16; First paragraph, last sentence	Change to: " Although TW has been able to temporarily reduce reliance on CWF wells in recent years, the Avra Valley 36" main break in Nov 06 resulted in the need to turn on CWF wells and the Last On/First Off wells for two months, and emphasized the need to contain the western migration of the Broadway-Pantano plume.
6	Section 8; pg. 71; first bullet	Does sample frequency and understanding of flow dynamics allow this statement?
7	Section 8; pg. 71; 3rd bullet	The first sentence is only true of 5ppb concentration plume boundary is our limit of concern. We are not satisfied with said level (TW)
8	Figure 15	On hole WR-275A, two zones designated "SC" are the wrong pattern.
9	Figure 20	Neither WR-458A nor WR-459A were installed for the 1992 RI Report. These wells were drilled much later.
10	Figure 21	This is the only Figure that shows BP-20 in its correct location. All other Figures show the well incorrectly located northwest of BP-21 (see 34 and 37).
11	General Comment	All Registered Wells should be included in the report and shown on all applicable figures.
12	General Comment	A figure should be included in the report that shows all monitoring points with detected PCE (i.e. SECOR quarterly progress reports include these figures).
13	Section 4.4.2; Page 46; paragraph two	There are multiple references to "second" and "third" plumes in this and subsequent sections. The report should reflect a single detectable contaminant plume not two or three separate plumes.
14	Section 5.4.3.4; third paragraph	The statement that the WCS "is effectively capturing groundwater flow containing COCs in the impacted portion of Central Well Field", is incorrect as evidenced by COCs detected at BP-021.

ATTACHMENT B

2.8 PRESENT AND FUTURE GROUNDWATER USES

TW, which is COT's water department, currently relies on water supply production from five well fields within the Tucson Basin and Avra Valley to meet current municipal demand (COT Water Department, 2004). The most significant renewable source of potable supply is the Central Avra Valley Storage and Recovery Project (CAVSARP) Well Field located in Avra Valley, while the CWF is TW's largest groundwater supply source (COT Water Department, 2004). The CWF is located in the Tucson Basin and encompasses much of the urbanized footprint of the COT. The GOU is situated near the center of the CWF.

TW has numerous water supply wells in the vicinity of the GOU (Figure 5). Four wells (C-021A, C-026B, D-021A, and D-022A) have been removed from operation since the late 1980s and early 1990s due to the presence of VOCs. A fifth well, C-022A, was contaminated after it was removed from service in October 1975. In addition, four active water supply wells currently have restricted use status ("last on/first off", or LOFO) because of their proximity to the GOU. LOFO wells are among the last wells to be brought into service and the first wells to be taken out of service when a period of increased water supply need arises. Since August 1999, COT voluntarily has placed two other wells (wells C-025B and D-018A; Figure 5), both situated immediately south of the GOU, on restricted use to limit the potential for the GIOU groundwater contamination to migrate toward these wells and to ensure the availability of these wells for supply when they are needed. All of these restricted use wells were pumped in the Summer of 2006 to assess the viability of the well infrastructure to meet system demand. In late 2006, four of the original LOFO wells were again put into service to provide potable supply due to a system outage in TW's groundwater supply infrastructure in Avra Valley. TW is continuing to maintain and sample these wells so that they will be available to meet system demand as may be required in future years. Table 4 provides a summary of annual production (in millions of gallons) of CWF water supply wells located within the vicinity of the GOU. The table presents full production data for 1957 through 2000, as well as partial data (for only the six restricted use wells) for 2001 through 2006.

COT currently has had a policy to take wells out of service that have VOC concentrations that exceed half of the potable drinking water standards for any regulated compound (i.e., EPA Maximum Contaminant Levels [MCLs] or ADEQ AWQSs). The six municipal wells in the immediate vicinity of the GOU are being monitored for VOCs at least semiannually, and at least monthly during those times when the wells are brought into service for more than seven days. This policy ensures the quality of potable water supplies drawn from this area (Marra, written communication, 2007).

According to TW, the CWF has historically been and will remain an essential component of COT's water supply infrastructure. Current TW plans include continuing the recharge and recovery of Central Arizona Project (CAP) water at CAVSARP, an operating storage

and recovery facility in the Avra Valley. Potable use of the recovered blend of CAP water and Avra Valley groundwater began in May 2001 and continues to the present. TW has expanded the recharge capacity of CAVSARP up to 80,000 acre-feet per year and is in the process of expanding its recovery capacity in the near term (Marra, written communication, 2007). TW is currently in the process of developing a project similar to CAVSARP several miles to the south; this facility is called the Southern Avra Valley Storage and Recovery Project (SAVSARP) and it will provide an additional source of renewable supply. The SAVSARP facility will be permitted to recharge up to 60,000 acre-feet per year and is expected to become operational in 2008; the recovery component of the project is expected to become operational in 2011. TW anticipates that use of both CAVSARP and SAVSARP facilities will further reduce its reliance on groundwater pumping in the CWF during most of each year. However, TW will continue to need its CWF, and in particular the six restricted use wells, in the near, mid, and long terms for the following reasons:

- To help meet peak water demand during the hottest months;
- To meet projected annual potable demand when it exceeds the COT's current annual CAP allocation—anticipated to occur within the next few years;
- To provide emergency backup supply should there be a disruption in CAP supply due to problems with the CAP infrastructure or due to supply disruptions caused by system outages on TW's own system;
- To provide potentially long-term backup potable supply should a shortage be declared on the Colorado River—the Secretary of Interior may make such a declaration within the next five years and it could be in place for an indeterminate period of time.

To summarize, as the use of blended groundwater/CAP water from these facilities in Avra Valley increases, and assuming normal operating conditions will prevail, the need for the LOFO wells in the CWF as potable water supply wells will likely be reduced in the near-term and mid-term except to meet peak potable demand. However, as TW achieves maximum renewable resource utilization, and as potable demand grows, the availability of these LOFO wells (and the aquifer from which they pump) will increase in importance as COT sources of supply. Also, most, if not all, of the wells in the CWF will be needed in both the short-term and long-term as backup sources of supply. For instance, the CWF will be a critical source of supply if there are disruptions to CAP supply due to infrastructure failure of CAP's delivery system or because of a declaration of shortage on the Colorado River, power outages, system outages associated with lengthy planned maintenance activities, or major potable system emergencies (Marra, written communication, 2007). Therefore, COT places a high priority on maintaining its operational use of the CWF, as well as other available supply sources (URS, 2002a)

According to TW pumpage data for the six restricted-use wells for 2006 (Table 4), the pumpage rates (in millions of gallons) ranged from 12.6 (for well D-018A) to 78.2 (for

well C-114A) and totaled 278.6 for all six wells. By contrast, during 1992, these same six wells were pumped at rates (in millions of gallons) ranging from 3.311 (for well C-025B) to 240.014 (for well C-020B), and the total pumpage was 1,165.649 (or approximately 1.17 billion gallons). The reduced reliance on these wells (albeit temporarily) in recent years is a function of TW's increasing utilization of renewable supplies to meet potable water demand (making them less necessary for year around use), the absence of any major potable system emergencies, and the restricted use status of these wells (Marra, written communication, 2007).

The vast majority of Tucson residences and businesses receive their water from TW, but there are some private water supply wells in the vicinity of the Site. The only private wells within the GOU groundwater plume are the previously shut-down TW production wells and the St. Joseph's Hospital well which is receiving wellhead treatment that removes the PCE (Section 1.4). There are two small municipal water providers – Far Horizons, which provides water to the mobile homes and travel trailers in its residential park; and Catalina Village, which provides water to its assisted living residents. Also, there are two non-exempt (more than 35 gpm capacity well pump) wells that are used solely for irrigation and a non-exempt well used by a commercial car wash. There are also six private exempt (less than 35 gpm well pump) commercial wells used for irrigation/potable supply. For more information on groundwater users at the Site, see the Water Use Study Report in Appendix A.



OFFICE OF THE
Pima County Attorney
Civil Division

32 N. STONE
SUITE 2100

Tucson, Arizona 85701-1412

(520) 740-5750
FAX (520) 620-6556

May 29, 2007

CTS #158526
(already filed)

Barbara LaWall
PIMA COUNTY ATTORNEY

CTSV



VIA HAND DELIVERY

Ms. Gretchen Wagenseller
Project Manager
Superfund Programs Unit
Southern Regional Office
ADEQ
400 W. Congress, Ste. 433
Tucson AZ 85701

Re: Broadway-Pantano WQARF Site
Comments Regarding Draft Remedial Investigation
Proposed Remedial Objectives

Dear Ms. Wagenseller:

Pima County and its consultant, Brown & Caldwell, have reviewed the draft Remedial Investigation ("RI"), dated April 2, 2007, for the Broadway-Pantano Water Quality Assurance Revolving Fund ("WQARF") site. While, from this review, it is apparent that a substantial amount of work has been done at this site, it is also apparent that the draft RI meets neither the statutory criteria nor the federal guidance for a proper RI.

At the public meeting on May 23rd, concerns were expressed about over-studying the site. However, that is not the case here. Statutory and regulatory standards are in place to ensure that the remedial investigation results in a feasibility study, record of decision, and ultimately, a site clean-up that is protective of human health and the environment while meeting the economic reasonableness and technical feasibility directives of the WQARF program. Due to the data gaps in the draft RI for this site, these goals are not achievable.

Attached hereto as Attachment A are Pima County's technical comments prepared by Brown & Caldwell regarding the draft RI. These address the data gaps, the areas where the draft RI fails to meet the minimal RI preparation standards, and areas where there are differing interpretations of the existing data.

This Remedial Investigation fails to meet the requirements of ARS 49-287.03 in that it did not achieve the minimum requirements of R18-16-406. This regulation sets out the requirements of the remedial investigation. The review by Brown and Caldwell clearly demonstrates that the first requirement has not been met. There has not been the establishment "of the nature and extent of the contamination and the sources thereof."

The standard for Remedial Investigations is to follow the guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 540-G-89-004, October 1988). This document provides that as a minimum the extent of the groundwater and soil contamination should be determined both horizontally and vertically. At the public hearing it was stated that this determination requires more data collection. This data should be collected before any conclusions can be made with regard to sources of contamination and completion of the RI. In order to move on to a Feasibility Study or drafting of a scope of work for a feasibility study, further work is required. The Remedial Investigation is not ready to be finalized.

A cursory review of the opening section of the RI shows there are misstatements of fact in Section 1.3: Site Background. These include:

1. The report asserts that landfilling began at Broadway South in 1953. While there is a 1953 agreement between the County and the then-owner of a small parcel of property that allowed disposal, there is no evidence that disposal ever occurred on this property during the two-year agreement period and, indeed no evidence that any disposal occurred at Broadway South until 1956 when Sanitary District #1 began operations.
2. The report seems to suggest that the PAG-estimated 200 ton per day disposal rate extended from 1953 through 1961 or 1962. As discussed above, there is no evidence that there was disposal anywhere on the site prior to 1956 when Sanitary District #1 opened a landfill on a portion of the property.

Other misstatements may exist but Pima County has had insufficient time to fully review all of the factual statements made.

In sum, the draft RI does not meet the statutory and regulatory minimums in that it: (1) fails to adequately identify and evaluate all potential sources of contamination; (2) does not adequately characterize the extent of the contamination; (3) suggests contaminant transport scenarios (*i.e.*, commingling of the plumes) that are not supported by the hydrology; and (4) does not provide sufficient information to effectively move toward the development of an economically reasonable feasibility study.

Pima County also wishes to take this opportunity to submit proposed Remedial Objectives for the site. These are attached hereto as Attachment B.

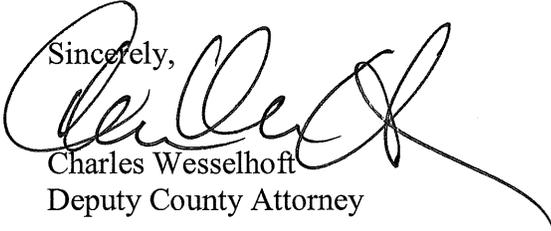
Ms. Gretchen Wagenseller

May 29, 2007

Page 3 of 3

If you have any questions regarding the above or wish to meet with the County to discuss these comments, please do not hesitate to contact either Dave Eaker or me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Charles Wesselhoff', with a long, sweeping underline that extends to the right.

Charles Wesselhoff
Deputy County Attorney

cc: Ursula Kramer – PDEQ
Dave Eaker – PDEQ
Harlan Agnew – PCAO
John Bernal

MEMORANDUM REPORT

BROWN AND
CALDWELL

TO: Charles Wesselhoft, Deputy County Attorney – Pima County

CC: Dave Eaker and Ursula Kramer,
Pima County Department of Environmental Quality

FROM: Steve Brooks, R.G.

PREPARED BY: Steve Brooks, R.G., Jeff Littell, and Randy Bauer, R.G

REVIEWED BY:

DATE: May 29, 2007

BC PROJECT NO.: 133032

SUBJECT: Review of the Draft Remedial Investigation Report – Groundwater Operable Unit and Other Potential Source Areas, Broadway-Pantano WQARF Site, Tucson, Arizona

Pima County retained Brown and Caldwell to perform a technical review of the *Draft Remedial Investigation Report for the Groundwater Operable Unit and Other Potential Source Areas for the Broadway-Pantano Water Quality Assurance Revolving Fund Registry Site, Tucson, Arizona*. The Draft Remedial Investigation (RI) Report dated April 27, 2007 was prepared by Secor International Incorporated (Secor) on behalf of the Arizona Department of Environmental Quality (ADEQ). Based on our review of the data included in the document and in other reports associated with the Broadway North Landfill (BNL), Broadway South Landfill (BSL) and Prudence Landfill (PL), Brown and Caldwell has developed a series of comments presented under a general categorization scheme below.

Overall, it is obvious that a large amount of work has gone into the various phases of remedial investigation activities associated with this report. In particular, a heavy emphasis has been placed on delineating the down-gradient extent of the PCE-impacted groundwater located west of the BNL in support of the design and operation of the Western Containment System (WCS). A second large effort was conducted at BNL regarding soil vapors as the mechanism for groundwater being impacted by chlorinated volatile organic compounds (CVOCs) and the subsequent design and operation of a landfill soil vapor extraction system. This latter work is not discussed in detail within the Draft RI report because (1) it was conducted by the City of Tucson, not ADEQ's contractor, and (2) the vadose one is being addressed under a separate document associated with the landfill operable unit (LOU). However, a presentation of BNL soil gas investigation results from 13 separate investigations over more than a 20-year time period are presented in Appendix C of the Draft RI.

TECHNICAL MEMORANDUM

B-P Draft RI

Page 2

A similar level of information was not discussed for the BSL. Based on the information presented in the Draft RI, the inclusion of the BSL into the Broadway-Pantano WQARF site is based largely if not entirely on the presence of PCE and TCE in monitor wells within and to the northwest of the BSL. Although such data warrants further investigation, the inclusion of the BSL into the Broadway-Pantano WQARF site in 2005 appears to be premature and contrary to what information was collected on the BSL site prior to 2005 (e.g., minimal to no CVOCs in soil gas) and groundwater sampling results from wells to the west and northwest of the BSL. In Section 3.1.4 Broadway South Landfill of the Draft RI data it was stated that "*ADEQ conducted a focused investigation, from July 2001 through March 2002, to evaluate the need for an ERA...*". That investigation was focused on the potential need for an ERA associated with the City of Tucson (COT) production wells C-025B and D-018A located west of BSL and not on whether BSL was a present source of groundwater contamination. A conclusion reached during that study was that based on the absence of PCE contamination in monitor well BP-8 and BP-15, no connection between potential CVOCs originating from the BSL and the PCE groundwater plume recognized to have originated from the BNL could be made. Based on this information and additional data collected since March 2002, the work completed to-date at the BSL and presented in the Draft RI does not meet Arizona Revised Statute (ARS) 49-287.03.E where it is stated "*The remedial investigation shall collect the data necessary to adequately characterize the site or the portion of the site for the purpose of developing and evaluating effective remediation alternatives pursuant to the feasibility study requirements prescribed by subsection F of this section.*". Nor does the information presented address "*The extent, general characteristics, and degree of the source of the release*" as required under R18-16-406 Remedial Investigation.

Comment No. 1- Commingling of PCE Plumes

In Section 1.3, page 2 of the Draft RI, Secor states that "*The GOU currently (as of April 2006) consists of two PCE plumes (Figure 3) ... One plume with two lobes extends westerly from the BNL and northwesterly from the BSL, respectively. The lobes conjoin further to the west.*"

Brown and Caldwell believes that there are numerous inconsistencies with both groundwater analytical data and groundwater elevation data that do not provide technical justification for the conjoining of the "two lobes" of impacted groundwater based on the information available. A number of these inconsistencies are detailed below:

- Based on the groundwater flow direction from the BSL, as presented in the maps presented as Figures 22 through 26 in the draft RI, the PCE concentrations measured in monitor wells downgradient of BSL in April 2006 do not support a commingling of the PCE plumes as presented in Figure 34 of the draft RI. In particular, the absence of PCE concentrations in wells WR-177A, WR-179A and D-039A, combined with the low levels of PCE measured in BP-10 and BP-16 do not support the tenuous connection between the plumes as presented on Figure 34 of the draft RI. To connect the PCE concentration at WR-367A to BP-8, a distance of 3,200 feet as shown on Figure 3 of the Draft RI, would require groundwater flow to maintain a consistent flow direction for an approximately 8

year period (based on the 1 foot per day advective flow velocity referenced in the Draft RI) with virtually no lateral dispersion. This is highly unlikely.

- It was stated in Section 5.4.3.2 Saturated Zone Fate and Transport Processes of the draft RI that “URS (2002a)¹ postulated that the plume originated at the closed BNL in approximately 1970 (approximately 10 years after the landfill began accepting refuse). This was apparently estimated based on the date of known impacts at COT supply wells west of BNL and an estimate of advective groundwater flow velocity of approximately 1 foot per day. Based on the presence of concentrations of PCE in excess of 5 µg/L as early as 1988 in COT well C-021A located more than 5,000 feet downgradient of BNL, this is likely a reasonable estimate. Current conceptual models are that the VOCs impacted the groundwater largely if not entirely via the downward movement of landfill gas (LFG) impacted with PCE and its degradation daughter products.

Based on reports that BSL received wastes from the early 1950s to the early 1960s, and assuming that a similar mechanism for vertical transport would be responsible, it is not unreasonable to assume that groundwater beneath BSL could have been impacted by sometime in the 1970s. However, based on water quality results from numerous wells located to the west and northwest of BSL (the feasible downgradient groundwater flow directions) no groundwater impacts were observed in a feasible down-gradient location from BSL until the mid 1990s. Due to the limited data available, this discrepancy in mechanisms and timing for impacts to groundwater should be discussed prior to connecting VOCs possibly emanating from BSL to those documented to have emanated from BNL.

- An analysis of time-series data presented for wells located to the southwest of BNL suggest that impacts to these wells is more likely the result of southwesterly movement of impacted groundwater from BNL than northwesterly movement of impacted groundwater from BSL. Along with information previously presented above, the southwesterly movement of impacted groundwater from BNL is supported by the shape of the GOU as presented in 2000 by URS as shown on Figure 4 of the Draft RI. Additionally, the absence of any detectable VOCs in well WR-179A until 1995 accompanied by increasing concentrations up till 2001 followed by a gradual decrease can be explained by the turning off of COT wells to the west of BNL in the late 1980s while COT wells to the southwest (C-025B and D-018A) of BNL were pumped to make-up the shortfall. This change in pumping pattern resulted in a southwesterly shift in groundwater flow direction, which was also documented in a memorandum (Clear Creek Associates, 2000²) completed on behalf of the City of Tucson and submitted to ADEQ on August 4, 2000.

¹ URS Corporation, 2002a, Remedial Investigation Report – Broadway-Pantano WQARF Site, Groundwater Operable Unit for mid 1980’s through 2000. June 30.

² Southern Interim Containment System Evaluation, prepared by Clear Creek Associates and submitted to Nancy Petersen (City of Tucson – Office of Environmental Management), Ralph Marra (Tucson Water) and Chris Cawein (Pima County) dated July 28, 2000.

- In Section 3.1.4, page 23, Secor states “*The results from the sampling events performed in 2002 through the middle of 2004 continued to indicate that the BSL plume was not commingled with the Broadway-Pantano Site plume. However, PCE was detected in well BP-8 (and BP-7) in November 2004 and most of the subsequent sampling events. ADEQ determined in 2005, on the basis of subsequent groundwater sampling, that the BSL plume was commingling with the BNL GOU groundwater plume; subsequently, the Broadway-Pantano Site boundary and RI were expanded to include the BSL groundwater plume.*”

The Draft RI does not provide an adequate discussion and evaluation of the groundwater sampling data to support the conclusion that the PCE detected in well BP-8 was derived from the BSL. The detection of PCE in well BP-8 could result from the migration of the BNL plume. The fact that PCE was initially detected in November 2004 in both wells BP-7 and BP-8 indicates that the source of the PCE should be located east and at an equidistant location from both wells. In the Clear Creek Associates (2000) memo described above, it was concluded that groundwater flow direction and migration of the BNL plume shifted to a southwest direction in the early 1990s. The shift was in response to the shutdown of five groundwater production wells located immediately downgradient of the BNL and the continued groundwater extraction from wells C-025B and D-018A located southwest of the BNL plume. The southwest groundwater flow direction and BNL plume migration direction continued until 2001, when the two extraction wells were also shutdown. Similarly, in 2002 URS Corporation (URS), following the conduct of several groundwater investigations at the Broadway-Pantano Site, concluded that the groundwater plume emanates primarily from the southern portion of the BNL and flows toward the southwest for approximately one mile and then shifts to the northwest. In fact, the GOU, as described by URS in 2000 and shown on Figure 4 in the Draft RI already includes both BP-7 and BP-8 without any impact from BSL being shown. However, the absence of noticeable PCE in BP-7 and BP-8 until 2004 (per Table 5 of the Draft RI) indicates that the URS figure was also in error. Although it is very possible that the BNL plume that migrated to the southwest during the 1990s and then shifted to the west-northwest after 2001 is the source of the PCE detected in BP-7 and BP-8, the discrepancies in data highlight the difficulties in connecting plumes based on spatially and temporally limited data.

- The BNL and BSL are in a hydraulically complex portion of the Tucson basin due to their location within the historically heavily pumped central well field. This hydraulic complexity is compounded by the presence of an apparent low hydraulic conductivity northwest-southeast trending feature referred to as the Pantano Feature by numerous past researchers and, specific to this Site, in Dames and Moore (2000)³. This feature trends roughly parallel with Pantano Wash but is offset approximately ½- to 1-mile to the east-northeast. An analysis of basin-wide groundwater flow maps prepared by Tucson

³ Groundwater Flow Model Report, Broadway-Pantano WQARF site, Groundwater Operable Unit. Prepared for City of Tucson and the Broadway-Pantano Joint Project Management Team, March 17, 2000.

Water during the 1980s through the present clearly show the “stacking up” of ground elevation contours along this feature. Although a detailed discussion of the feature is probably not needed for the RI due to its location upgradient of the landfills, its importance is reflected in the large effect it has on groundwater flow direction across both BNL and BSL. In particular, the combined effect of the Pantano Feature with groundwater pumping to the west of the BNL and BSL results in an abnormally sharp concave-west curve in the groundwater elevation contours. This is partially reflected in Figure 22 in the draft RI. An analysis of groundwater elevation maps prepared by Tucson Water for 1980 through the present identify that the direction of groundwater flow across BNL has varied from southwest to west, while across BSL it has varied from west to northwest. The convergence of groundwater flow directions across each landfill, i.e., southwest at BNL and northwest at BSL results in what is called a hydrogeologic singularity, or an area for which groundwater flow direction is mathematically undefined. At a minimum this reflects the variability over which groundwater flow directions have historically occurred in the area and the care that must be taken in drawing conclusions regarding groundwater flow paths over any length of time.

Based on the above comments, there is insufficient information within the Draft RI to adequately address “*The extent and general characteristics of the hazardous substances released, including physical state, concentration, toxicity, propensity to bioaccumulate, persistence and mobility*” for neither BNL or BSL nor “*The extent, general characteristics, and degree of the source of the release*” as required under R18-16-406 Remedial Investigation.

Comment No. 2 – PRP Search

- In Section 3.1.3, page 21 of the Draft RI, Secor states “The purpose of this review and site walk was to identify likely users (historical and current) of solvents or cleaning fluids containing VOCs (including drycleaners, lube shops, other automobile repair facilities, and other medical facilities).” It is not clear if Secor considered machine shops and/or metal fabrication facilities in their search of other likely users of solvents.
- Section 3.1.3, page 22, Secor states “*Based on the records review and site walk, SECOR (2001a) determined the following:*

Six current and former establishments were identified as possibly having on-site dry-cleaning operations...”

These six dry-cleaners seem to be the same six facilities located along Broadway Avenue identified by CDM in their Technical Memorandum Number 1 in 1996; however, Secor fails to identify the location of these potential sources on any figures of the draft RI. According to CDM, one of the dry-cleaning facilities is located adjacent to monitoring well BP-10, and two other dry-cleaning facilities are located immediately upgradient of well BP-8. These potential sources of PCE should have been investigated during the RI.

A release from any of these facilities could have contributed to PCE concentrations detected in nearby groundwater monitoring wells BP-10 and/or BP-8.

- The RI does not provide any reasoning for not considering the Prudence Landfill as a potential source of PCE groundwater contamination. It is disturbing that the RI does not mention or show on any figures well WR-434A, located west of well R-124A and immediately downgradient from the Prudence Landfill. This well was installed in 2002 and constructed with nested vapor monitoring probes at depths of 50, 150, 250 and 350 feet below surface. Analyses of vapor samples collected from each nested probe have consistently detected PCE, TCE and dichlorofluoromethane (DCFM) during each quarterly monitoring event. The concentrations of PCE, TCE and DCFM consistently increase with depth, and in June 2006, the 350-foot deep probe contained PCE concentrations of 29 µg/L, TCE of 3.5 µg/L and DCFM of 33 µg/L. Unfortunately, the RI fails to provide any groundwater analytical data from this well or from wells R-124A and R-125A located within the Prudence Landfill.

Based on the above comments, the Draft RI is insufficient to adequately “*Establish the nature and extent of the contamination and the sources thereof,*” as required under R-18-16-406.

Comment No. 3 – Vertical Mixing of Groundwater Quality

A great deal of effort was expended in the Draft RI to support or dismiss the depth-specific groundwater quality results collected from the long-screened monitor wells using depth-specific samples. This appeared to be justified based on results, where several of the long (over 100 feet in length) screened wells showed similar PCE concentrations from top to bottom. This extent of vertical mixing of groundwater is generally considered highly unlikely in alluvial basins due to the large contrast in horizontal versus vertical hydraulic conductivity. With properly constructed depth-discrete monitor wells this is even difficult to attain under vertical gradients imposed by pumping. Most deep or vertically extensive groundwater quality problems in basin and range alluvial groundwater systems have been traced to improper well seals or vertical mixing within old production wells with long screen lengths. Brown and Caldwell generally agrees with Section 4.2.3 in the Draft RI where it is stated “*The actual vertical extent of the groundwater plume in the GOU near the LOU needs to be determined by monitoring of a cluster of short screened length (either 15- or 20-foot long) wells installed at depths from 5 to 100 feet BWT.*” Although this level of detail may not be required, a more accurate understanding of the vertical extent of contamination is required before a Final RI can be developed, before a Groundwater Feasibility Study can be completed, before a Reference Remedy proposed, and realistically should have been completed during or immediately after the Western Containment System (WCS) was installed and turned on. The continued impact of the WCS on the lateral and vertical spreading of VOC-impacted groundwater is a major gap in the completion of RI.

Based on the uncertain nature of the vertical sampling results, the Draft RI is presently incomplete per R-18-16-406 where it is stated “*The remedial investigation for a site or portion of a site shall:*

TECHNICAL MEMORANDUM

B-P Draft RI

Page 7

1. *Establish the nature and extent of the contamination and the sources thereof;*

Comment No. 4 – General Comments

In Section 3.2, page 25, under COT 2001, and in Section 4.2.2, page 46, well WR-435A is located downgradient of the Prudence Landfill, not upgradient as stated in the Draft RI report.

**BROADWAY PANTANO
WQARF SITE**

**REMEDIAL OBJECTIVES
PROPOSED BY PIMA COUNTY
MAY 29, 2007**

1. Prevent exposure to contaminated groundwater above acceptable risk levels.
2. Prevent further migration of contaminated groundwater.
3. Reduce the mass and concentration of CVOCs near suspected sources.
4. Beneficially use treated groundwater.



CTS# 158523
(already filed)
ADEQ
Received
MAY 23 2007
SRO

COMMENT FORM

For the draft Groundwater Remedial Investigation Report, dated April 2, 2007,
and to propose Groundwater Remedial Objectives for the
Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Site, Tucson, Arizona

Please provide the following:

Name: FRAN BRINICER
Organization/Company: _____
Address: 4410 E BLACKWIDGE DR
City, State, Zip: TUCSON AZ 85712
Phone: () _____ E-Mail: febrnicer@yahoo.com

Please summarize your major comments or concerns below (use additional sheet if needed):

ADEQ should consider beneficial
use of treated water instead
of reinjection.

You may also submit a copy of your oral statement and any attachments to:
ADEQ, Attention: Gretchen Wagenseller, Project Manager,
400 W. Congress, Suite 433, Tucson, AZ 85701

Deadline: Comments must be postmarked to ADEQ by Tuesday, May 29, 2007.

[Signature] 5/23/07
(Please Sign) date

CTS# 158522
(already filed)

May 23, 2007



CITY OF
TUCSON

ENVIRONMENTAL
SERVICES

Ms. Gretchen Wagenseller
Project Manager
Arizona Department of Environmental Quality
400 W. Congress
Suite 433
Tucson, AZ 85701

Re: **Broadway-Pantano Water Quality Assurance Revolving Fund Registry Site
Remedial Objectives**

CTW

Dear Ms. Wagenseller:

The City of Tucson appreciates this opportunity to propose groundwater remedial objectives (ROs) for the Broadway-Pantano Water Quality Assurance Revolving Fund Registry Site. Since 1987, when the first City-owned water production well to the west of the Broadway North landfill was impacted by tetrachlorethene, the City has placed top priority on protection of the aquifer and the Central Well Field. Our proposed ROs reflect this priority.

The City of Tucson proposes the following ROs:

- Fully define the lateral extent of the detectable contaminant plume, including the western leading edge.
- Fully remediate the contaminant plume that threatens the potable water supply for the community and private well owners.
- Fully contain the plume within 5 years, allowing for full use of potable production wells in the area and preventing further degradation of the aquifer.

The City of Tucson looks forward to working with ADEQ to achieve these objectives. Please call Alison Jones at 837-7312 if you have any questions.

Very truly yours,

Andrew H. Quigley
Director

AHQ/AJ/dl

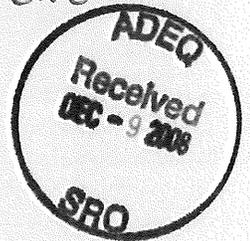
cc: Karen Masbruch, City of Tucson, Manager's Office
David Modeer, City of Tucson, Tucson Water
Blake Ashley, City of Tucson, City Attorney's Office
Nancy Petersen, City of Tucson, Environmental Services
Alison Jones, City of Tucson, Environmental Services
Broadway-Pantano file



APPENDIX D

**Written Public Comments on the Proposed
Groundwater Remedial Objectives Report**

CTS # 200628



**The Broadway-Pantano Community Advisory Board
for the State of Arizona
Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) Site
Tucson, Arizona**

December 9, 2008

Gretchen Wagenseller
Project Manager
400 W. Congress, Suite 433
Tucson, AZ 85701

RE: Comment to the Broadway-Pantano Proposed Groundwater Remedial Objectives Report From the Broadway-Pantano Community Advisory Board (CAB)

Dear Ms. Wagenseller:

The Broadway-Pantano Community Advisory Board (CAB) agrees with the proposed remedial objectives as outlined in the Proposed Groundwater Remedial Objectives Report for the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site, dated November 25, 2008.

The Broadway-Pantano CAB also supports the installation of three more monitor wells west of the existing Western Containment System (WCS), and east of the City of Tucson central well field, to identify the extent of the groundwater contamination that has escaped the WCS.

The CAB also strongly recommends remediation of the source of the contamination from the Broadway-North Landfill.

Sincerely,

Judy Burns
CAB Co-Chair

James Garrett, Jr.
CAB Co-Chair

cc: *The members of the Broadway-Pantano CAB*



CITY OF
TUCSON

ENVIRONMENTAL
SERVICES

December 19, 2008



Mr. Bill Ellett
Arizona Department of Environmental Quality
400 W. Congress
Suite 433
Tucson, AZ 85701

Re: Proposed Groundwater Remedial Objectives Report
Broadway Pantano Water Quality Assurance Revolving Fund (WQARF) Site

Dear Mr. Ellett:

The City of Tucson appreciates the opportunity to provide comments regarding the "Proposed Groundwater Remedial Objectives Report" for the Broadway-Pantano WQARF site.

Our comment pertains to Appendix A, page 3, Section 1.4, paragraph 1 of the document:

"The five COC's in the GOU are the VOC's PCE, TCE cis-1,2-dichlorethene, vinyl chloride, and methylene chloride; however, the extent of the GOU is defined solely by PCE since the four other VOC's have not exceeded the AWQS beyond a distance of one-third mile down gradient of the BNL. The lateral extent has been defined by recent RI groundwater sampling events."

The City of Tucson does not believe the lateral extent of the plume to the west of the Western Containment System has been defined as described. As you know this is why the City is working with ADEQ to install three additional monitoring wells down gradient of the Western Containment system to further define the plume.

Thank you for considering the above comment to the Proposed Groundwater Remedial Objectives Report. The City of Tucson looks forward to working with ADEQ as the RO is finalized and the feasibility study begins so that a suitable remedy can be implemented.

Very truly yours,

Andrew H. Quigley

Director

AHQ/JD/dg

c: Jeff Biggs, City of Tucson, Tucson Water
Ralph Marra, City of Tucson, Tucson Water
Nancy Petersen, City of Tucson, Environmental Services
Broadway-Pantano file



CTS# 200627



December 24, 2008

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Ms. Gretchen Wagenseller
WQARF Project Manager
Southern Regional Office
Arizona Department of Environmental Quality
400 West Congress, Suite 433
Tucson, Arizona 85701

Re: Comments on Proposed Groundwater Remedial Objectives Report for the Broadway-Pantano Water Quality Assurance Revolving Fund Site and Water Use Study, Tucson, Arizona

Dear Ms. Wagenseller:

The Metropolitan Domestic Water Improvement District (District) has comments on the above draft report for the Arizona Department of Environmental Quality (ADEQ). The District does not serve potable or non-potable water within the WQARF site, but believes the proposed Groundwater Remedial Objectives (GRO) developed by ADEQ for this site could influence Groundwater Remedial Objectives for other WQARF sites.

The District's concern is that the following proposed remedial objective for potable water is too general by ADEQ as a policy statement to effectively maintain or improve on-going water quality treatment levels currently employed for direct potable use at this WQARF site or other WQARF sites.

The proposed GRO will be to restore, replace or otherwise provide for the current and future potable use of the regional aquifer impacted by PCE, TCE, and vinyl chloride contamination emanating from the WQARF Site. This action is needed for as long as the level of contamination in the groundwater resource prohibits its use as a potable water supply.

For example, on Page 7 of the Water Use Study notes in the last paragraph that St. Joseph Hospital has had a wellhead treatment system using GAC since 1997 that removes PCE and other VOCs to non-detectable levels. In Section 2.1.2 on Page 5 of the Proposed Groundwater Remedial Objectives Report the third sentence discusses the GAC system at St. Joseph Hospital removes PCE and other Site contaminants from groundwater, but does not clarify that the removal level is to non-detection. The District could not find any facts in the Proposed Groundwater Remedial Objectives Report on how contaminated groundwater affecting Tucson Water wells is currently cleaned up and to what contaminant level to ensure potable deliveries are maintained. These facts are missing to help the affected public provide meaningful input on the proposed groundwater remedial objectives.

As a drinking water provider, the District must adhere to state and federal Drinking Water Rules for regulated VOCs which require increased monitoring and public notification when regulated VOCs are detected at 0.5 ppb or above. The District's concern is that the groundwater remedial objectives for potable water use do not reference state and federal drinking water standards and goals. State Aquifer Water Quality Standards are referenced in the report, but federal drinking water MCLGs adopted by

Ms. Gretchen Wagenseller
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ADEQ are not discussed for regulated VOCs which are zero. Under the State of Arizona Drinking Water Rules, if regulated VOCs are detected at or above 0.5 ppb and below the MCL at the Entry Point to the Distribution System (EPDS), then the water provider must conduct quarterly VOC monitoring at the EPDS and complete annual public notice to the customers. Our Board of Directors and customers do not support having regulated VOCs in their drinking water supply at or above detectable levels. The ADEQ WQARF Program has also supported this District policy when the District sought to improve its wellhead treatment system and ADEQ endorsed using a GAC treatment system to produce potable water with non-detectable VOCs as an IRA.

The District recommends that the below objectives be added to potable water GRO clarifying that the level of contamination in the groundwater resource:

- 1) provide the most cost effective, flexible and operationally efficient treatment system for removing current and future PCE, TCE and vinyl chloride concentrations,
- 2) eliminate regulated VOC detections at or above 0.5 ppb from occurring in the potable water supply after any wellhead treatment process,
- 3) restore well production volumes to help with plume management and to meet existing and future potable water demands,
- 4) minimize O&M costs to ADEQ and the water provider, and
- 5) meet the water provider's customer treatment level preference of non-detection.

Please call me at (520) 575-8100 if you need any other information or have questions on these comments. Again, thank you for this opportunity to provide comments.

Sincerely,



Michael W. Block
District Hydrologist

MWB/mwb

c: Mark Stratton, MDWID General Manager
Christopher W. Hill, MDWID Deputy Manager
Warren Tenney, MDWID Assistant General Manager
Gary Burchard, MDWID Hydrogeologist
Nick Wallwork, WQARF Advisory Board Chair
Marty Drozdoff and Randy Abbey, Shannon-El Camino WQARF Co-Chairs
Bill Ellet, SRO WQARF Manager
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