Danielle R. Taber

From: Laura L. Malone
Sent: Tuesday, February 24, 2015 6:23 PM
To: Danielle R. Taber
Subject: FW: Human Health Risk Assessment at the WVB WQARF Site
Attachments: JATAP Memorandum.pdf; JATAP Exhibits 1-5.pdf

For the file

Laura

From: Jerry Worsham [mailto:JWorsham@rhlfirm.com]
Sent: Tuesday, February 24, 2015 11:12 AM
To: Lagas, Philip (PLagas@haleyaldrich.com); Rolf Halden (Rolf.Halden@asu.edu); 'dciwanski@cox.net'; peggyeastburn@hotmail.com; jsaccomani@hotmail.com; Creyes99_0@yahoo.com
Cc: Laura L. Malone; Tina LePage; Ana I. Vargas; Wendy Flood; Anthony E. Young (anthony.young@azag.gov)
Subject: Human Health Risk Assessment at the WVB WQARF Site

West Van Buren (WVB) WQARF Site Citizens Advisory Board (CAB) Members:
Laura Malone, Director, Waste Programs Division, Arizona Department of Environmental Quality and
West Van Buren WQARF Public Comment Docket:

At the last WVB WQARF CAB meeting on December 1, 2014, a member of the public, Mr. Steve Brittle, talked about toxic ambient air pollution and referenced some EPA/ADEQ report which allegedly supported the premise that there is a significant air toxics problem from the Roosevelt Irrigation District (RID) wells. In addition, Mr. Brittle suggested that ambient air toxic emissions currently have health implications affecting the local citizenry in the West Van Buren area. Further research has indicated that Mr. Brittle was most likely referring to a 9 year old report titled, "*Analysis of Air Toxics Collected As Part of the Joint Air Toxics Assessment Project",* JATAP Final Report, ADEQ (December 29, 2006). At that hearing, most members in the audience were not familiar with this 9 year old JATAP report or why it was relevant to the CAB Public Meeting on the Feasibility Studies (FS) presented at the Public Meeting. This 2006 JATAP Report is linked to the web site for the group that Mr. Brittle represents. Attached is an evaluation of the 2006 JATAP Report for your review and the West Van Buren WQARF Public Comment Docket.

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dc283e6c5d6056f88257426007417a2/bd0cae65f8ca89368825790d0056f0e4/$FILE/Final%20Rpt_Phoenix%20Air%20Toxics_JATAP%202005.pdf

Closer scrutiny of the 2006 JATAP Report does not support the premise that there was (or is) a significant air toxics problem from the RID wells or that air toxic emissions now have health implications affecting the local citizenry in the West Van Buren area. Looking at the air quality data collected for the contaminants of concern (PCE and TCE) from the three closest air quality monitors to the WVB area utilized in the 2006 JATAP Report (i.e. identified as **West Phoenix**, **Greenwood** and **South Phoenix**), the reported values for PCE and TCE are either **non-detect** or **below the Arizona Ambient Air Quality Guidelines (AAAQGs**) established by the Arizona Department of Health Services (ADHS). Additional support for the premise that there are **no ambient air toxic problems** from the RID wells comes from recent site specific **human health risk assessment studies** completed by the WVB FS Group (July 2014), RID (September 2011) and ADHS (January 2015). These recent human health risk studies are currently on the ADEQ's website for the West Van Buren Regional Remedy Evaluation.

I hope this data and report evaluation helps clear up any public concerns about PCE/TCE air toxics and will allow ADEQ to review the competing FS Reports without unsubstantiated allegations of health implications affecting the local

citizenry in the West Van Buren area. Certainly the **recent human health risk studies** by the WVBFS Group and the ADHS are better evaluations of site specific human health risk in the ADEQ's process of reviewing the competing FS Reports for a Record for Decision (ROD) under WQARF procedures.

Please call me direct at (602) 744-5763 with any questions.

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Ridenour Hienton PLLC

RESPECT HONESTY LEGACY

MEMORANDUM

TO:	West Van Buren WQARF Site Community Advisory Board Members Laura L. Malone, Arizona Department of Environmental Quality, Director Waste Programs Division West Van Buren WQARF Public Comment Docket
FROM:	Jerry D. Worsham II
RE:	2006 JATAP Air Toxic Report concerning the West Van Buren Water Quality Assurance Revolving Fund ("WVB WQARF") Site
DATE:	February 23, 2015

Introduction:

At the December 1, 2014 public meeting of the WVB WQARF Site Community Advisory Board ("CAB") meeting, Mr. Steve Brittle, President of Don't Waste Arizona, Inc., addressed the CAB members at the end of the CAB meeting. Mr. Brittle randomly spoke to the CAB about "Toxic Air Pollution in the Phoenix Metro Area," referring most likely to a 2006 Report titled "*Analysis of Air Toxics Collected As Part of the Joint Air Toxics Assessment Project*," JATAP Final Report STI-905039.03-3016-FR, Arizona Department of Environmental Quality, ("ADEQ") Phoenix, AZ (December 29, 2006)[1] ("JATAP Report"). This JATAP Report is prominently displayed on the Don't Waste Arizona, Inc. website. Mr. Brittle is not a licensed attorney with the State Bar of Arizona. His position was that the population in proximity to the Roosevelt Irrigation District's ("RID") wells are currently exposed to unacceptable levels of hazardous air pollutants within the WVB WQARF Site[2].

The 2006 JATAP Report was originally presented at an EPA National Air Monitoring Conference on November 8, 2006 by the authors. The presentation identified by Mr. Brittle titled "Volatile Organic Compounds in Phoenix Outdoor Air – JATAP" was presented by Gerry Hiatt, Ph.D. from EPA Region 9 on September 21, 2011 to the Motorola 52nd Street Superfund Site CIG Meeting. However, Mr. Hiatt only made a brief summary presentation and he was not involved with JATAP or particularly knowledgeable about the report or the recommendations. (*See* **Exhibit 1**)

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1 http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dc283e6c5d6056f88257426007417a2/bd0cae65f8ca89368825790d0056f0e4/$FILE/Final%20Rpt_Phoenix%20Air%20Toxics_JATAP%202005.pdf

2 "The West Van Buren WQARF site is located in the western portion of Phoenix, Arizona. The site is bounded approximately to the north by West McDowell Road, to the east by 7th Avenue, to the south by West Lower Buckeye Road, and to the west by 75th Avenue. In addition, a finger shaped plume exists from approximately West Buckeye Road and South 41st Avenue to West Watkins Street and South 11th Avenue." (*See* **Exhibit 2**)

ISSUE:

Does the JATAP Report conclude that the population in proximity to the RID's wells are currently exposed to unacceptable levels of hazardous air pollution, principally tetrachloroethene (PCE-CAS #127-18-4) and trichloroethene (TCE-CAS #79-01-6)?

BRIEF ANSWER:

No. The JATAP Report collects some relevant air toxic data but only concludes with recommendations for further research. Review of the JATAP Report, including data from three air quality monitors identified as West Phoenix, Greenwood and South Phoenix indicate that for relevant air pollutants tetrachloroethene (PCE) and trichloroethene (TCE) the values are below the Annual and 24-hour Arizona Ambient Air Quality Guidelines (AAAQGs). Three more recent human health risk analysis reports, one by the West Van Buren WQARF Site Working Group, one by the Roosevelt Irrigation District (RID) and one by the Arizona Department of Health Services (ADHS) confirm that no human health risk is incurred by the population within the WVB WQARF Site by volatile organic compounds (VOCs) emitted by the pumping of the Roosevelt Irrigation District (RID) wells.

DISCUSSION:

In review of the JATAP Report, the air quality monitoring sites identified as **West Phoenix, Greenwood** and **South Phoenix** may be relevant to any discussions of the WVB WQARF Site due to their relative proximity to the RID wells. (*See* **Exhibit 2**) The West Phoenix site is located at 3847 West Earll, Phoenix, Arizona. The Greenwood site is located at 1128 N 27th Avenue, Phoenix, Arizona and actually within the geographic confines of the WVB WQARF Site. The South Phoenix site is located at 33 West Tamarisk, Phoenix, Arizona.

Facts:

The primary contaminants of concern ("COCs") in groundwater identified in the ADEQ's Remedial Objectives Report ("RO Report") for the WVB WQARF Site include the following:

	COC	Also Known As	CAS Number
1.	**tetrachloroethene**	PCE or PERC, tetrachloroethylene	CAS #127-18-4
2.	**trichloroethene**	TCE	CAS #79-01-6
3.	1,1,1-trichloroethane	TCA, methylchloroform, trichloromethane	CAS #71-55-6
4.	cis 1,2-dichloroethene	cis 1,2-DCE, acetylene dichloride, 1,2-dichloroethylene	CAS #156-59-2
5.	1,1-dichloroethane	1.1-DCA	CAS #75-34-3
6.	1,1-dichloroethene	1,1-DCE, 1,1-dichloroethylene	CAS #75-34-4

JATAP Table 2-4 reveals the various (i.e. 20) chemical species analyzed. It appears that the only overlap between COCs identified in the ADEQ's RO Report for the WVB WQARF Site and the chemical species analyzed in the JATAP Report include **tetrachloroethene** (PCE) and

trichloroethene (TCE). My comments below focus on these two VOCs using the 2006 JATAP data for tetrachloroethene (PCE) and trichloroethene (TCE) for comparison.

JATAP Report Methodology:

The 2006 JATAP Report indicates that between January 2005 through January 2006, the JATAP consortium collected air toxic samples in stainless steel containers (either one 24-hour sample or two 12-hour samples) every six days (365/6 = 61 maximum samples). Of particular interest are the samples and data that were collected and identified as West Phoenix, Greenwood and South Phoenix throughout the JATAP Report. There were 59 samples determined as valid samples for all three monitoring sites. (*See* **Exhibit 3** including Tables, E-1, E-6 and E-7, Table A-2, Table 1-1, Table 2-2 and Table 2-4).[3] A careful analysis of the tetrachloroethene (PCE) and trichloroethene (TCE) data in **Exhibit 3** from the three monitoring sites identified can be utilized to challenge Mr. Brittle's assertion concerning unacceptable levels of ambient VOCs in the West Van Buren Area in proximity to the RID wells.

West Phoenix Air Monitoring Station

After the West Phoenix JATAP samples were collected in canisters for analysis, they were analyzed and validated by Sonoma Technology, Inc. (STI) for the JATAP Report. Table 1-1 indicates that for West Phoenix only one 24-hour sample was obtained every six days. Table A-2 indicates that two samples apparently were not included in the review due to sample canister problems. **The average minimum detection limits (MDL)** for the comparison of the chemicals tetrachloroethene (PCE) and trichloroethene (TCE) were both 0.08 parts per billion (ppb). (*See* **Exhibit 3** - Table E-7)[4]

Table 2-4 indicates that in the West Phoenix samples for tetrachloroethene (PCE) 63% (39/59) of the samples were above the 0.08 ppb MDL or a total of 39 samples had relevant data to analyze. Table 2-4 also indicates that in the West Phoenix samples for trichloroethene (TCE) only 17% of the samples were above the 0.08 ppb MDL or a total of 10 samples had relevant data to analyze.

Greenwood Air Monitoring Station

After the Greenwood JATAP samples were collected in canisters for analysis, they were analyzed and validated by STI for the JATAP Report. Table 1-1 indicates for Greenwood only one - 24 hour sample was obtained every six days. Table A-2 indicates that one Greenwood sample was missing or invalid. The **average minimum detection limits (MDL)** for the comparison of the chemicals tetrachloroethene (PCE) and trichloroethene (TCE) were both 0.02 ppb. (*See* **Exhibit 3** – Table E-1)[4]

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[3] Gas – Chromatograph/Mass-Spectrometer (GC-MS), Selective Ion Monitoring (SIM) or Gas-Chromatograph-Flame-Ionization-Detection (FID) techniques were utilized to analyze the samples. Samples were initially analyzed by Environmental Analytical Services (EAS) or the San Diego Air Pollution Control District (SDAPCD). For Quality Assurance (QA) purposes, the EPA Region 9 laboratory analyzed a subset of samples and canisters.

[4] Note that raw data under Exhibit 3 in Table E-7 for West Phoenix, Table E-1 for Greenwood and Table E-6 for South Phoenix were originally reported in parts per billion by volume (pppv) and have been converted by STI to micrograms per cubic meter ($\mu g/m^3$) for the body of the JATAP Report.

Table 2-4 indicates that in the Greenwood samples for tetrachloroethene (PCE) 100% (59/59) of the samples were above the 0.02 ppb average MDL or a total of 59 samples had relevant data to analyze. Table 2-4 also indicates that in the Greenwood samples for trichloroethene (TCE) 90% of the samples were above the 0.02 ppb MDL or a total of 53 samples had relevant data to analyze.

South Phoenix Air Monitoring Station

After the South Phoenix JATAP samples were collected in canisters for analysis, they were analyzed and validated by STI for the JATAP Report. Table 1-1 indicates for South Phoenix only one - 24 hour sample was obtained every six days. Table A-2 indicates that twelve South Phoenix samples were missing or invalid. The **average minimum detection limits** (MDL) for the comparison of the chemicals tetrachloroethene (PCE) and trichloroethene (TCE) were both 0.05 ppb. (*See* **Exhibit 3** – Table E-6)[4]

Table 2-4 indicates that in the South Phoenix samples for tetrachloroethene (PCE) 54% (32/59) of the samples were above the 0.05 ppb average MDL or a total of 32 samples had relevant data to analyze. Table 2-4 also indicates that in South Phoenix samples for trichloroethene (TCE) only 17% of the samples were above the 0.05 ppb MDL or a total of 10 samples had relevant data to analyze.

Data Comparison:

The JATAP Report compared the sample results from West Phoenix, Greenwood and South Phoenix to the Arizona Ambient Air Quality Guidelines (AAAQGs) prepared by the ADHS for the ADEQ. (*See* **Exhibit 4**) According to the ADHS, the AAAQGs are protective of human health, including children and chemical concentrations in air that exceed AAAQGs may not necessarily represent a health risk. Rather, when contaminant concentrations exceed these guidelines, further evaluation may be necessary to determine whether there is a true threat to human health. AAAQGs consider human health risk from inhalation of contaminants in ambient air; they do not take into account odor thresholds or threats to wildlife.

The AAAQGs guidelines were calculated using a human health-based approach developed by the ADHS. One-hour and 24-hour AAAQGs are calculated using occupational exposure limits established or recommended by the United States Occupational Safety and Health Administration (OSHA) the National Institute of Occupational Safety and Health (NIOSH) and the National Institute for Environmental Health Sciences. Annual AAAQGs use toxicity information from the United States Environmental Protection Agency.

Review of the summarized JATAP data from Table 3-3 and Table D-1 (*See* **Exhibit 5**) for West Phoenix, Greenwood and South Phoenix in comparison to the Annual AAAQG standard ($\mu g/m^3$), **these sites did not exceed the previous JATAP Reported Annual AAAQG standard of 2.1 $\mu g/m^3$ or the ADHS 1999 Annual AAAQG 1.7 $\mu g/m^3$ standard.** Review of the top 5 24-hour concentrations for the three sites also confirm that they did not exceed the 24-hour AAAQGs Standard for either tetrachloroethene (PCE) or trichloroethene (TCE). Of particular note, the JATAP Report does not include either tetrachloroethene (PCE) or

trichloroethene (TCE) as one of the top five air toxics of concern at the West Phoenix, Greenwood or South Phoenix sites[5]. The JATAP Report data does not provide sufficient data to calculate the risk from air toxics from the West Phoenix, Greenwood or South Phoenix sites but does indicate that the levels for tetrachloroethene (PCE) and trichloroethene (TCE) are below the ADHS Annual and 24-hour AAAQG Standards in 2005.

Summary of JATAP Table 3-3. Annual mean concentrations (µg/m³) at JATAP sites in 2005 compared to Arizona Ambient Air Quality Guidelines (AAAQG) Annual Standards.

Species	West Phoenix Annual Mean (µg/m³)	Greenwood Annual Mean (µg/m³)	South Phoenix Annual Mean (µg/m³)	Annual AAAQG (µg/m³)	
				JATAP	1999 ADHS
Tetrachloroethene[6]	0.94	0.89	1.32	2.10	(1.70)
Trichloroethene[7]	0.42	0.27	0.22	0.76	(0.58)

Summary of JATAP Table D-1. The five highest 24-hour concentrations (µg/m³) at each JATAP site in 2005 compared to Arizona Ambient Air Quality Guidelines (AAAQG) 24-Hour Standards.

Species	West Phoenix 24 Hour (µg/m³) [5 Highest]	Greenwood Annual 24 Hour (µg/m³) [5 Highest]	South Phoenix 24 Hour (µg/m³) [5 Highest]	AAAQG 24 Hour Standard (µg/m³)	
				JATAP	1999 ADHS
Tetrachloroethene	6.2 2.0 2.0 1.4 1.2	8.4 3.3 2.4 1.7 1.7	6.3 3.9 3.8 3.4 3.3	770	(640)
Trichloroethene	12 0.5 0.4 0.4 0.4	1.7 0.6 0.6 0.5 0.5	3 0.7 0.5 0.4 0.3	280	(210)

[5] See JATAP Table 3-2 (p. 3-7) for West Phoenix, Greenwood and South Phoenix.

[6] Workplace Standards for tetrachloroethylene (PCE) – The Occupational Safety and Health Administration (OSHA) has set an 8-hour time-weighted average permissible exposure limit of 100 ppm (6.8419 E+5 µg/m³), an acceptable ceiling exposure limit of 200 ppm (1.3684 E+6 µg/m³), and a maximum peak of 300 ppm (2.0526 E+6 µg/m³) (not to be exceeded for more than 5 minutes of any 3-hour period).

[7] Workplace Standards for trichloroethylene (TCE) – The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 100 ppm (5.4210 E+5 µg/m³) for trichloroethylene in air averaged over an 8-hour work day, an acceptable ceiling concentration of 200 ppm (1.0842 E+6 µg/m³) provided the 8-hour PEL is not exceeded , and an acceptable maximum peak of 300 ppm (1.6263 E+6 µg/m³), for a maximum duration of 5 minutes in any two hours.

Human Health Risk Assessment:

In the ADEQ's final RO Report (August 8, 2012) which is incorporated in the ADEQ's Final Remedial Investigation Report ("RI") (August 2012), ADEQ included the following response:

> "Data collected to date do not indicate a current risk to human health or environment by groundwater contamination within the WVBA WQARF site. Data collection has been requested of the RID to confirm historic determinations. **As soon as these data are available, ADEQ will reassess the potential for risk."** (p. Appendix C-3) (emphasis added)

The Feasibility Study (FS) Report on the WVB WQARF Site submitted by the West Van Buren WQARF Site Working Group (July 2014) includes a complete Human Health Risk Assessment (HHRA) under Appendix D. This HHRA Report finds that, "Based on the results of this HHRA for the residents within the WVBA, the cumulative ILCR is 8×10^{-7} and total HI is 0.13. This cumulative ILCR is less than the cumulative ILCR point of departure of 1×10^{-6} and the total HI is less than the acceptable total HI of 1.0. Based on these results, mitigation is not warranted to protect the residents within the WVBA from potential exposure to groundwater from the RID wells." (p. 37)

The Roosevelt Irrigation District (RID) submitted to ADEQ a screening level determination or assessment of potential exposure of individuals living and working in the West Van Buren area[8] titled "*Public Health Exposure Assessment and Mitigation Summary Report*," (September 16, 2011). This RID Summary Report states that:

> Backgroumd Exposure Evaluation (inhalation exposure)
>
> Background VOC concentrations were evaluated by collecting air samples at locations away from the sources of air emissions associated with the RID water system. The following samples were collected and results obtained to quantify VOC concentrations in air expected to be unaffected by VOC emissions from contaminated groundwater.
>
> - Air sample [A13] from the open turf area in the cemetery north of Van Buren Street at a location approximately ½ mile northwest of RID-114:
>
> [A21] 1,1-DCE = ND TCE = ND PCE = ND

[8] The screening tools are generally based on conservative assumptions in order to assure the screening values derived are protective of human health. Thus screening levels used in this [RID's] study may overestimate the potential health risk. (RID Summary Report, p. 24)

- Air sample [A14] from vacant, unimproved dirt lot on the west side of 43rd Avenue located approximately 1,700 feet south of the RID Main Canal:

  [A21] 1,1-DCE = ND TCE = ND PCE = ND

  The analytical results for these samples are non-detect (ND) for all COCs. Reporting levels for TCE, PCE and 1,1-DCE are 0.21 $\mu g/m^3$, 0.27 $\mu g/m^3$, 0.16 $\mu g/m^3$, respectively.

The RID Summary Report asserts, "The overall findings of this investigation lead to the conclusion that emissions of COCs currently associated with the pumping and conveyance of contaminated groundwater do not pose an imminent air inhalation hazard to public health." (RID Summary Report, p. 22)

Finally, the ADHS has recently completed a Health Consultation Report titled, "*Evaluation of Water Sampling Results in the Roosevelt Irrigation District*" ("RID") (January 8, 2015). That ADHS Report on page 3 concludes as follows:

> **Update of the 1992 Statement of Risk (ADHS 1992):** ADHS re-evaluated the potential health risks associated with the exposure to RID #84 as if it were used as potable water. **With the available information, ADHS concluded that exposure to trichloroethene (TCE), tetrachloroethene (PCE) and 1,1-dichloroethene (1,1-DCE), in RID #84 would not be expected to harm people's health under typical conditions of household water use.**
>
> **RID irrigation wells and canal water:** This health consultation evaluated the potential health risks associated with the exposure to groundwater collected from RID irrigation wells and canal water collected in the RID area. **With the available information, ADHS concluded that ingestion exposure to TCE and PCE in groundwater and canal water in RID sampling area is not expected to harm people's health.**

Note: [EPA has established a target risk range of 1 in 1,000,000 to 10,000 (10^{-6} to 10^{-4}) for hazardous waste sites.] [The c]alculated cancer risk was below EPA's target risk range.

Conclusion:

In close review of the JATAP Report referenced by Mr. Brittle at the ADEQ's Public Meeting on the WVB WQARF Site CAB Meeting, it is clear that air quality data gathered in 2005 for the JATAP Report does not support his position that the population in proximity to the RID wells are currently exposed to unacceptable levels of hazardous air pollutants within the WVB WQARF Site concerning the representative VOCs tetrachloroethene (PCE) and trichloroethene (TCE). Review of the summarized JATAP data from Table 3-3 and Table D-1 for West Phoenix,

Greenwood and South Phoenix monitors confirm that these sites did not exceed the JATAP Reported Annual AAAQG standard of 2.1 $\mu g/m^3$ or the 1999 ADHS Annual AAAQG standard of 1.7 $\mu g/m^3$. Review of the top 5 24-hour concentrations for the three sites also confirms that they did not exceed the previous or current 24-hour AAAQGs Standard for either tetrachloroethene (PCE) or trichloroethene (TCE). Three more recent human health risk analysis reports, one by the West Van Buren WQARF Site Working Group, one by the RID, and one by ADHS, confirm that no relative human health risk is incurred by the population within the WVB WQARF Site from the volatile organic compounds (VOCs) emitted by the pumping of the Roosevelt Irrigation District (RID) wells.

West Van Buren WQARF Site CAB Members

Via U.S. Mail and E-Mail:

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EXHIBIT "1"

ANALYSIS OF AIR TOXICS COLLECTED AS PART OF THE JOINT AIR TOXICS ASSESSMENT PROJECT

FINAL REPORT
STI-905039.03-3016-FR

By:
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December 29, 2006

1. OVERVIEW

The Joint Air Toxics Assessment Project (JATAP) is a consortium of federal, state, local, and tribal air pollution control officials designed to address the risk from air toxics in the greater Phoenix Metropolitan area. Participants include the U.S. Environmental Protection Agency (EPA) Region 9, the EPA Office of Air Quality, Planning, and Standards (OAQPS), Arizona Department of Environmental Quality (ADEQ), the Maricopa County Environmental Services Division, the Pinal County Air Quality Control District (PCAQCD), the Intertribal Council of Arizona, the Gila River Indian Community (GRIC), the Salt River–Pima Maricopa Indian Community (SRPMIC), and the Fort McDowell Yavapai Nation. The purpose of the study is to determine which air toxics are of most concern to South Phoenix and tribal communities. The measurements made in 2005 are the second phase of the study. Phase I consisted of air toxics measurements at the South Phoenix and West 43rd Avenue sites from August 2001 through March 2004 (McCarthy et al., 2004a). The ultimate goal of this consortium is to obtain a metropolitan-wide assessment of the risk associated with airborne toxics in greater Phoenix.

Currently, 188 hazardous air pollutants (HAPs), or air toxics, regulated by the federal Clean Air Act have been associated with a wide variety of adverse health effects, including cancer, neurological effects, reproductive effects, and developmental effects (U.S. Environmental Protection Agency, 2000). Air toxics are emitted by a range of anthropogenic sources such as automobiles, commercial and retail entities, and industrial sources. Air toxics monitoring data are needed to characterize ambient concentrations in representative areas (i.e., at regional levels) to support and evaluate dispersion modeling efforts, and to quantify trends and the effectiveness of air toxics reduction strategies (e.g., the reduction of source-specific pollutant concentrations).

For JATAP 2005, air toxics samples (24-hr average or two 12-hr samples) were collected every sixth day at five sites operated by ADEQ: South Phoenix, West Phoenix, Greenwood, Phoenix Supersite (typical urban site, National Air Toxics Trends Site [NATTS]), and Queen Valley (background/downwind site). The SRPMIC collected air toxics samples at its Senior Center site, and the GRIC collected air toxics samples at its St. Johns site. Air toxics samples were also collected at Fort McDowell, but were assessed separately. ADEQ contracted with Sonoma Technology, Inc. (STI) to validate and assess gaseous air toxics data collected from January 2005 through January 2006. The sites are shown in **Figure 1-1**. Monitoring details and objectives are provided in **Table 1-1** (Sundblom et al., 2006).

5. RECOMMENDATIONS

As this second phase of JATAP ends, several tasks are yet to be performed according to the original JATAP blueprint, including emission inventory development, urban airshed modeling of air toxics, risk assessment, and communication of risk to the general population. The work performed in this project—analysis of air toxics collected as part of the JATAP 2005—leads to additional recommendations for further research:

- Part of this work included exploring the use of source apportionment with the air toxics data. Exploratory analysis using positive matrix factorization (PMF) showed that there was an insufficiently large matrix of air toxics samples and other species to obtain meaningful results. However, STI's recent work with EPA exploring multiple pollutant source apportionment indicates that it may be useful to perform source apportionment on a large data set of combined air toxics and speciated $PM_{2.5}$, such as that available from the Supersite from 2000-2005.
- This work focused on gaseous air toxics. Validation and analysis of speciated $PM_{2.5}$ data collected at the Supersite should be performed. This site has an especially rich record of data including data from the national networks, STN and IMPROVE. Particulate toxics can be important in terms of risk in urban areas, and the $PM_{2.5}$ data could be placed in a broader national context: how do toxics metals fit into the national picture? Are concentrations above benchmarks?
- Another area of concern to the air toxics community is diesel particulate matter (DPM), which was not examined in this work. Aethalometer™ black carbon measurement occurring at the Supersite can help us better understand DPM: . Validation and analysis of Aethalometer data from the Supersite should be performed with the goal of better understanding the importance of DPM.
- A formal analysis of spatial variability could be performed to statistically compare concentrations and the coefficient of variation by pollutant among the sites. However, in qualitative review of the data, the Supersite appears to be fairly representative of most of the other urban sites, indicating that some of the other urban sites may be redundant. The Greenwood site was very interesting in that concentrations of many pollutants were higher at this site, likely due to its proximity to the freeways. The concentrations at the West and South Phoenix sites were similar to each other and to those at the Supersite, indicating that these sites may not be as important to maintain in the future. For the more rural sites, Queen Valley continues to be useful as a remote site, but concentrations of air toxics are very low and often below detection. While the measurements provide information, ADEQ may want to work with EPA and others to consider ways to lower the detection limits to improve data quality at the low concentration sites (e.g., longer duration samples). The tribal land sites are different from each other and show some features different from Queen Valley, indicating that retaining these sites may be important.
- The air toxics data collected during JATAP 2005 are sufficient to perform a risk assessment screening.

- Analyses focused on the air toxics with cancer benchmarks; however, further exploration of species with noncancer benchmarks, ozone precursors, and chlorofluorocarbons could be made, including trends over time and spatial variability.
- For the Supersite, trends in air toxics should be compared with trends in criteria pollutants and known emission control programs to assess whether control programs targeting criteria and other pollutants may have a beneficial multipollutant effect, including on air toxics.

Joint Air Toxics Assessment Project (JATAP) for the Maricopa/Pinal Urban Area, Arizona

Presented by:
Mike Sundblom, Arizona Department of Environmental Quality
Christella Armijo, Salt River Pima Maricopa Indian Community
Hilary Hafner, Sonoma Technology, Inc.

To:
EPA National Air Monitoring Conference
Date: November 8, 2006

Jerry Worsham

From: Jerry Worsham
Sent: Tuesday, February 10, 2015 2:25 PM
To: Jerry Worsham
Subject: FW: 2006 JATAP Report on VOCs in Outdoor Air

From: Hiatt, Gerald [mailto:Hiatt.Gerald@epa.gov]
Sent: Friday, February 06, 2015 11:38 AM
To: Jerry Worsham
Subject: RE: 2006 JATAP Report on VOCs in Outdoor Air

Mr. Worsham, You need to contact someone who was involved with the JATAP project to get the answers you seek. I was not personally involved and prepared my presentation based on the project's report and summaries found on its website. Perhaps start with the authors of the report you reference...

Gerald F.S. Hiatt, Ph.D.
Senior Regional Toxicologist
U.S. EPA, Region 9
(415) 972-3064
hiatt.gerald@epa.gov

Please be advised I have only intermittent and limited ability to read and send email when I am not in the office (e.g., when on travel), therefore please be patient with any communication delays.

From: Jerry Worsham [mailto:JWorsham@rhlfirm.com]
Sent: Friday, February 06, 2015 10:20 AM
To: Hiatt, Gerald
Subject: 2006 JATAP Report on VOCs in Outdoor Air

Gerry:
You made a presentation in 2011 on the JATAP report identified below and I am focusing on Summary Statistics for **West Phoenix.**

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dc283e6c5d6056f88257426007417a2/bd0cae65f8ca89368825790d0056f0e4/$FILE/Final%20Rpt_Phoenix%20Air%20Toxics_JATAP%202005.pdf.

You can call me direct at (602) 744-5763

Jerry D. Worsham II

Member
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Volatile Organic Compounds in Phoenix Outdoor Air - JATAP

Phoenix, AZ
September 2011

Gerald (Gerry) Hiatt, Ph.D.
U.S. EPA, Region 9
415-972-3064
hiatt.gerald@epa.gov

EXHIBIT "2"

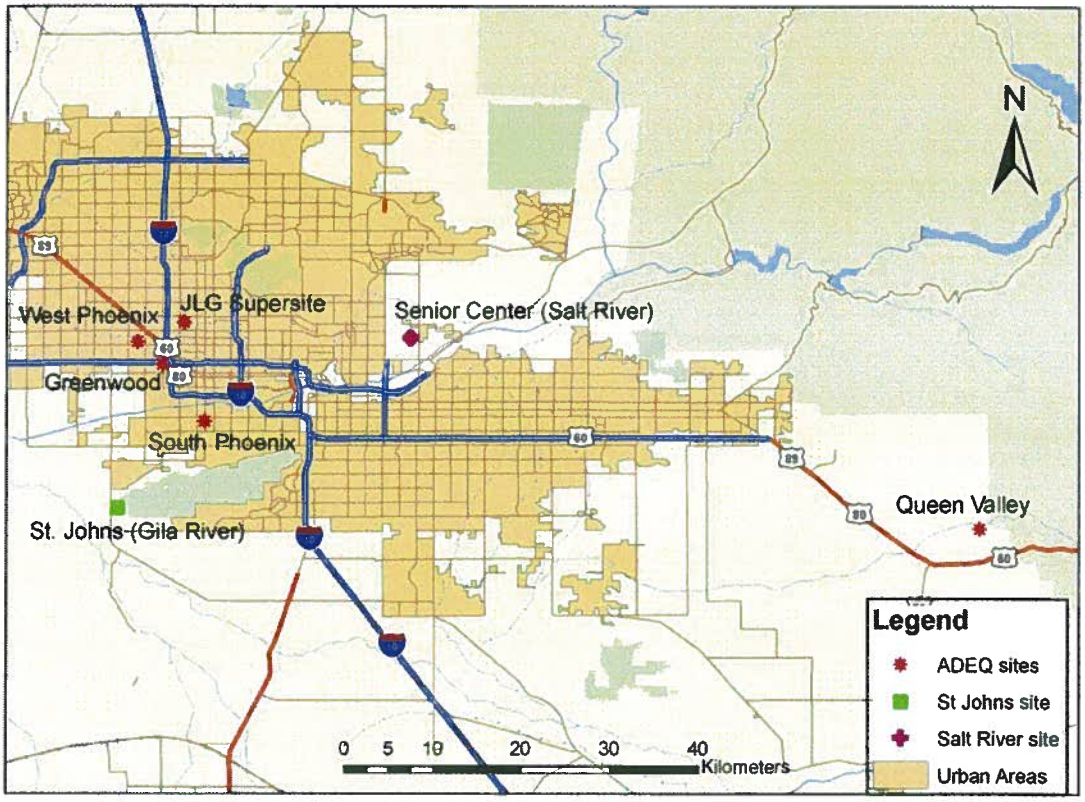
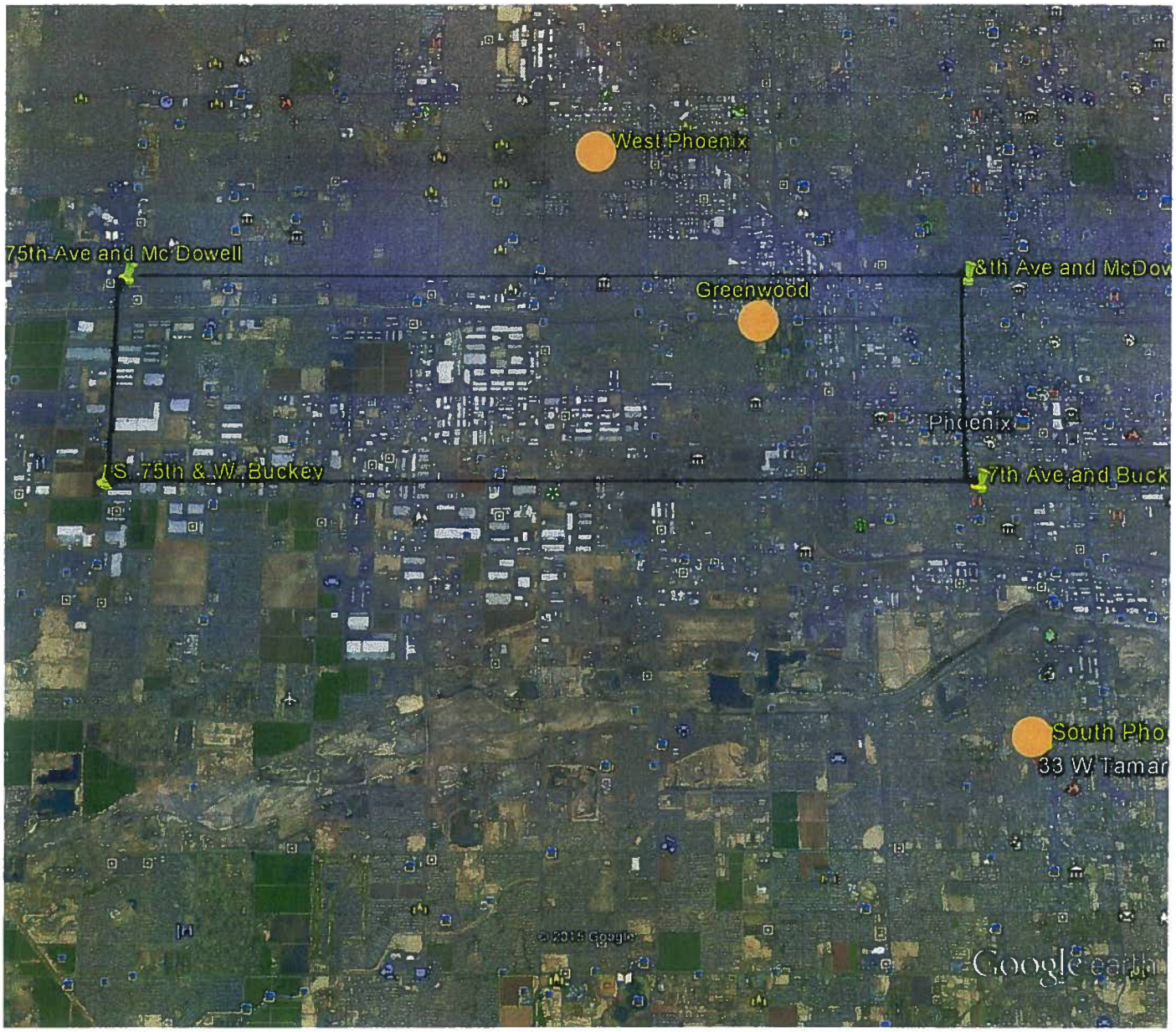


Figure 1-1. Monitoring sites contributing data to JATAP 2005 and discussed in this report.

West Van Buren WQARF Site Map

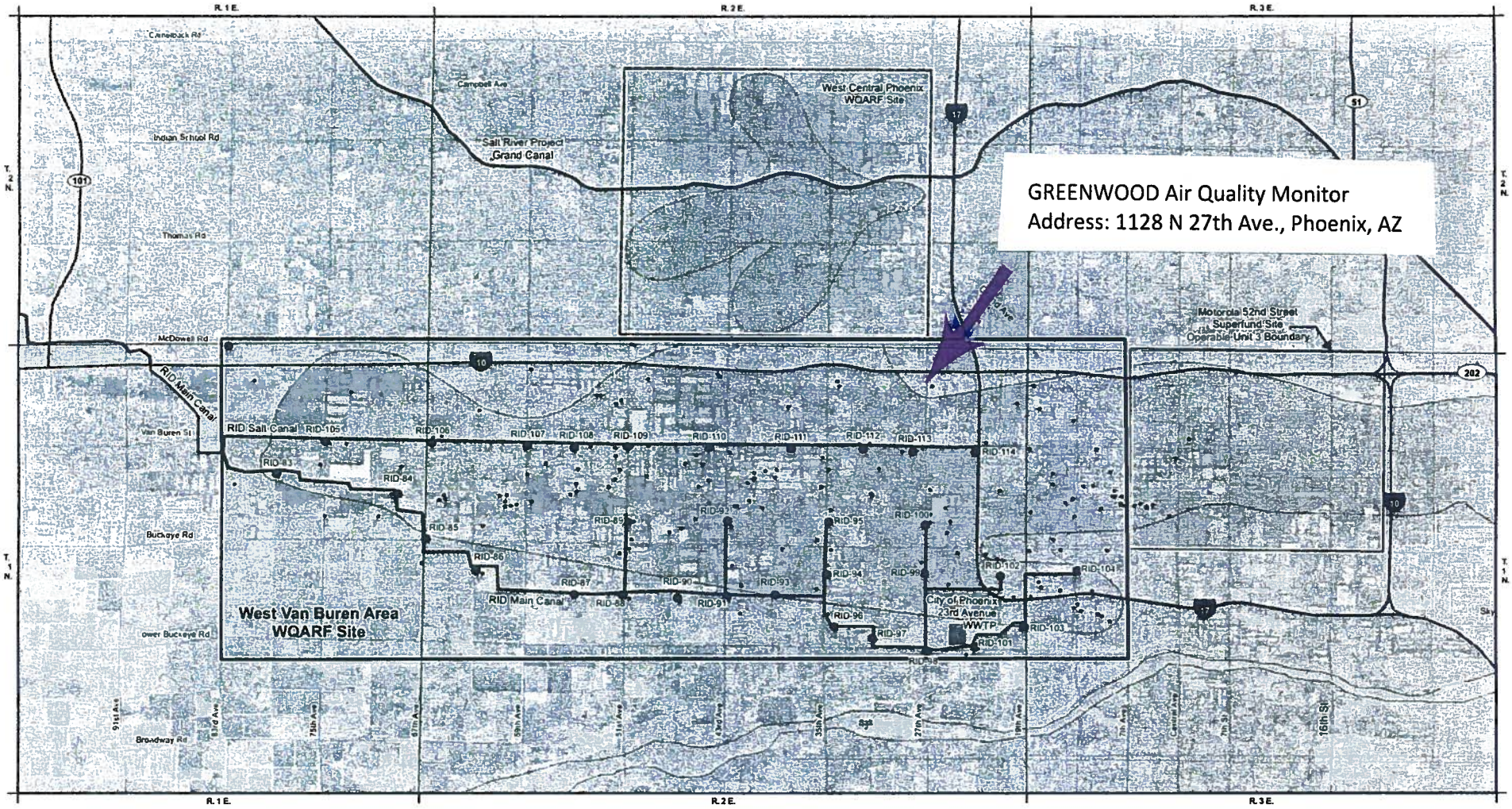
and Surrounding Air Quality Monitors



WEST PHOENIX Air Quality Monitor
Address: 3847 W Earll, Phoenix, AZ

GREENWOOD Air Quality Monitor
Address: 1128 N 27th Ave., Phoenix, AZ

SOUTH PHOENIX Air Quality Monitor
Address: 33 W Tamarisk, Phoenix, AZ



EXPLANATION

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

G:\GIS-Tuc\Projects\802\03\Site_Map_StudyArea.mxd\05Aug2010

Abbreviations

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

N

0 5,000

Feet

Roosevelt Irrigation District
Early Response Action
Well Evaluation Work Plan

STUDY AREA

2010

MONTGOMERY & ASSOCIATES

FIGURE 1

West Phoenix (WP, 04-013-0019)

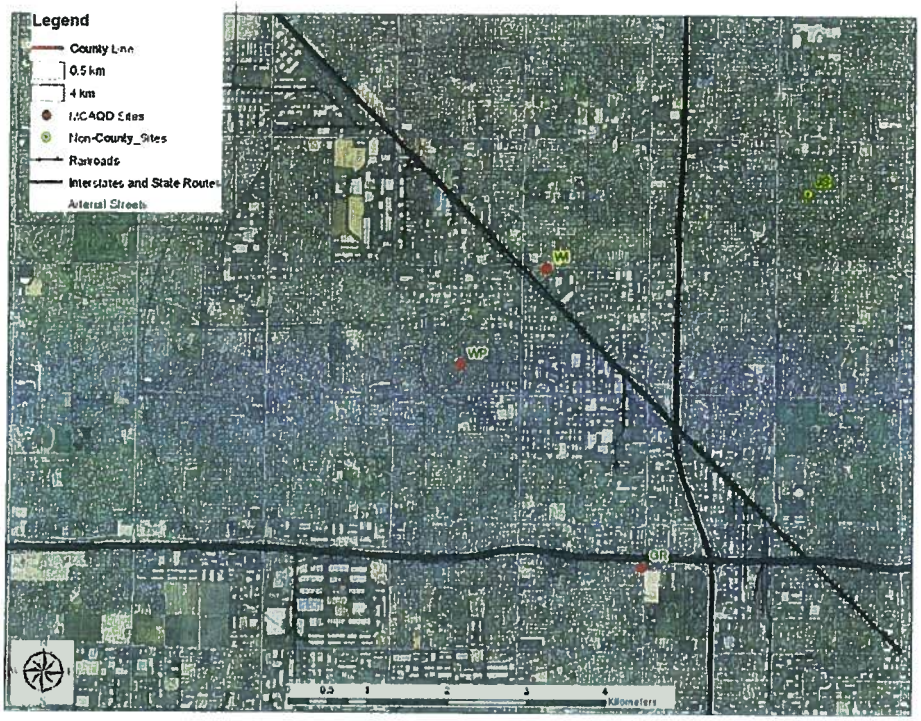


Figure 2.28. Map showing the location of the West Phoenix monitoring site (center), with concentric circles representing the 0.5–4 km radius of the "neighborhood" monitoring scale.

Pollutant(s) Monitored	Year Established	Scale	Objective(s)
CO	1984	Neighborhood (0.5–4 km)	Population exposure
NO_2	1990	Neighborhood (0.5–4 km)	Population exposure
O_3	1984	Neighborhood (0.5–4 km)	Population exposure
PM_{10}	1988	Neighborhood (0.5–4 km)	Population exposure
SO_2	2000	Neighborhood (0.5–4 km)	Maximum concentration

Site Description: This site became operational in 1984. The spatial scale for the West Phoenix site is neighborhood. It is located in an area of stable, high-density residential population. CO, PM_{10}, O_3, and NO_2 are monitored at this site. The department also operates collocated $PM_{2.5}$ FRM monitors and a continuous FEM $PM_{2.5}$ monitor at this site.

Greenwood (GR, 04-013-3010)

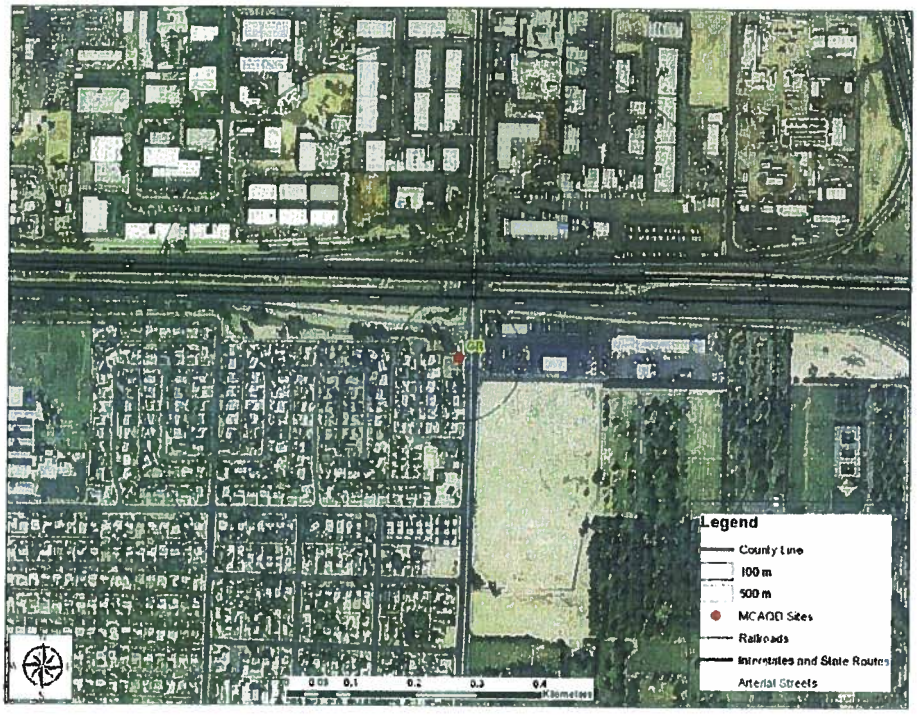


Figure 2.13. Map showing location of the Greenwood monitoring site (center), including the assumed 100-500 m radius of the Middle monitoring scale.

Pollutant(s) Monitored	Year Established	Scale	Objective(s)
CO	1993	Middle (100–500 m)	Population exposure
NO_2	1993	Middle (100–500 m)	Population exposure
PM_{10}	1993	Middle (100–500 m)	Population exposure

Site Description: Monitoring began at this site in December 1993. The station is bordered on the north by Interstate 10, on the west and south by neighborhood homes, and to the east by Greenwood Cemetery. Interstate 17 is approximately one mile to the east of the site. CO, NO_2, and PM_{10} are the criteria pollutants monitored at this location. This site was converted to continuous PM_{10} monitoring in the beginning of 2006.

South Phoenix
The site is owned by MCAQD. ADEQ operates the toxics sampler at the site. The site is situated in South Phoenix, at the edge of a high population area, bordering a mixture of residential and commercial properties. Two high population areas are located north and west of the site.

Site Information			
AQS ID	04-013-4003	ADEQ ID	16377
Street Address	33 W. Tamarisk St. Phoenix, AZ 85041		
County	Maricopa	Groundcover	Asphalt
CBSA	Phoenix-Mesa-Scottsdale	Latitude	33.4030
Surrounding Area	Residential/Commercial	Longitude	-112.0750
Distance to roadway	83 m – N – Tamarisk St.	Elevation	330 m
Traffic count of Nearest Major Roadway	19,110 – Central Ave. – 165m – E	Site Established Date	01/01/1997

Monitoring Information				
Pollutant	VOC			
Basic monitoring objective	Research			
Site type(s)	Population Exposure			
Monitor type(s)	UATMP			
Instrument manufacture and model	ATEC 8001			
Spatial scale	Neighborhood			
Monitor Start Date	8/5/2001			

Site Photos

Aerial view of South Phoenix

Shelter and meteorological tower at South Phoenix site – 04/2005

EXHIBIT "3"

Table E1. Summary statistics for Greenwood in 2005.

SITE	GWAZ	GWAZ	GWAZ	GWAZ	GWAZ	GWAZ	GWAZ
Species	Number of cases	Mean (ppbv)	Median (ppbv)	Minimum	Maximum	Standard Dev	Average MDL
1,1,2,2-Tetrachloroethane	59	0.011	0.010	0.010	0.020	0.002	0.02
1,1,2-Trichloroethane	59	0.010	0.010	0.010	0.010	0.000	0.02
1,1-Dichloroethane	59	0.010	0.010	0.010	0.010	0.000	0.02
1,1-Dichloroethene	59	0.011	0.010	0.010	0.048	0.005	0.02
1,2,4-Trichlorobenzene	59	0.046	0.010	0.010	0.192	0.057	0.02
1,2,4-Trimethylbenzene	59	0.496	0.406	0.010	1.069	0.275	0.02
1,2-Dichlorobenzene	59	0.014	0.010	0.010	0.096	0.015	0.02
1,2-Dichloroethane	59	0.017	0.010	0.010	0.091	0.013	0.02
1,2-Dichloropropane	59	0.010	0.010	0.010	0.010	0.000	0.02
1,3,5-Trimethylbenzene	59	0.187	0.169	0.010	0.362	0.068	0.02
1,3-Butadiene	59	0.273	0.234	0.035	0.763	0.149	0.02
1,3-Dichlorobenzene	59	0.015	0.010	0.010	0.107	0.018	0.02
1,4-Dichlorobenzene	59	0.131	0.120	0.010	0.244	0.044	0.02
Acetaldehyde	60	2.728	2.410	0.740	9.290	1.598	0.20
Benzene	59	0.844	0.731	0.203	2.023	0.435	0.02
Benzyl Chloride	59	0.012	0.010	0.010	0.157	0.019	0.02
Bromoform	59	0.012	0.010	0.010	0.032	0.005	0.02
Bromomethane	59	0.014	0.010	0.005	0.060	0.011	0.02
Carbon Tetrachloride	59	0.097	0.097	0.068	0.115	0.010	0.02
Chlorobenzene	59	0.013	0.010	0.010	0.035	0.006	0.02
Chloroethane	59	0.020	0.010	0.010	0.066	0.014	0.02
Chloroform	59	0.066	0.056	0.010	0.149	0.033	0.02
Chloromethane	59	0.435	0.449	0.250	0.566	0.073	0.02
Cis-1,2-Dichloroethene	59	0.014	0.010	0.010	0.266	0.033	0.02
Cis-1,3-Dichloropropylene	59	0.016	0.010	0.010	0.123	0.020	0.02
Dichlorodifluoromethane	59	0.447	0.454	0.093	0.842	0.108	0.02
Dichloromethane	59	0.321	0.228	0.056	1.107	0.245	0.02
Ethylbenzene	59	0.457	0.355	0.115	1.049	0.265	0.02
Ethylene Dibromide	59	0.011	0.010	0.010	0.040	0.007	0.02
Formaldehyde	60	7.479	6.893	0.071	22.871	3.895	0.15
Freon 113	59	0.067	0.067	0.042	0.087	0.011	0.02
Freon 114	59	0.014	0.014	0.010	0.020	0.002	0.02
Hexachlorobutadiene	59	0.010	0.010	0.010	0.035	0.003	0.02
Isoprene	59	0.461	0.389	0.119	1.130	0.289	0.02
M,P-Xylene	59	1.211	1.115	0.114	3.066	0.678	0.02
Methyl Chloroform	59	0.024	0.024	0.009	0.069	0.010	0.02
Methyl Ethyl Ketone	59	0.728	0.717	0.050	1.597	0.328	0.02
Methyl Tert-Butyl Ether	59	0.010	0.010	0.010	0.010	0.000	0.02
M-Xylene	59	0.831	0.775	0.104	2.062	0.467	0.02
O-Xylene	59	0.464	0.377	0.083	1.130	0.265	0.02

Table E1. Summary statistics for Greenwood in 2005.

SITE	GWAZ	GWAZ	GWAZ	GWAZ	GWAZ	GWAZ	GWAZ
Species	Number of cases	Mean (ppbv)	Median (ppbv)	Minimum	Maximum	Standard Dev	Average MDL
P-Ethyltoluene	59	0.213	0.188	0.010	0.456	0.100	0.02
P-Xylene	59	0.381	0.332	0.010	1.004	0.214	0.02
Styrene	59	0.390	0.286	0.010	1.035	0.249	0.02
Tetrachloroethene	59	0.128	0.090	0.024	1.196	0.165	0.02
Toluene	59	2.266	1.858	0.234	6.766	1.458	0.02
Trans-1,2-Dichloroethylene	59	0.013	0.010	0.010	0.177	0.022	0.02
Trans-1,3-Dichloropropylene	59	0.014	0.010	0.010	0.106	0.016	0.02
Trichloroethene	59	0.049	0.042	0.010	0.309	0.041	0.02
Trichlorofluoromethane	59	0.311	0.283	0.220	1.405	0.152	0.02
Vinyl Chloride	59	0.011	0.010	0.010	0.050	0.005	0.02

Table E6. Summary statistics for South Phoenix in 2005.

SITE	SPAZ	SPAZ	SPAZ	SPAZ	SPAZ	SPAZ	SPAZ
Species	Number of cases	Mean (ppbv)	Median (ppbv)	Minimum	Maximum	Standard Dev	Average MDL
1,1-Dichloroethene	59	0.010	0.010	0.005	0.027	0.004	0.02
1,2,4-Trimethylbenzene	59	0.238	0.131	0.006	1.644	0.303	0.02
1,2-Dichloroethane	59	0.015	0.016	0.008	0.035	0.006	0.03
1,2-Dichloropropane	59	0.019	0.020	0.010	0.044	0.007	0.04
1,3,5-Trimethylbenzene	59	0.094	0.072	0.008	0.639	0.101	0.03
1,3-Butadiene	59	0.280	0.160	0.035	1.640	0.332	0.10
Acetaldehyde	52	1.695	1.500	0.020	8.200	1.093	0.10
Benzene	59	0.706	0.619	0.021	5.158	0.690	0.02
Bromoethane	59	0.025	0.013	0.005	0.279	0.039	0.02
Carbon tetrachloride	59	0.093	0.081	0.009	0.856	0.106	0.03
Chloroform	59	0.063	0.041	0.006	0.979	0.127	0.02
Dichloromethane	59	0.179	0.137	0.024	0.833	0.145	0.03
Ethylbenzene	59	0.248	0.184	0.010	0.663	0.177	0.03
Formaldehyde	52	3.310	3.350	0.015	5.600	1.106	0.10
Hexachlorobutadiene	59	0.226	0.145	0.130	0.660	0.170	0.44
M,P-Xylene	59	0.771	0.618	0.018	2.030	0.542	0.05
O-Xylene	59	0.268	0.201	0.010	0.736	0.194	0.03
Styrene	59	0.090	0.070	0.009	0.575	0.102	0.05
Tetrachloroethene	59	0.189	0.057	0.013	4.913	0.647	0.05
Toluene	59	1.763	1.351	0.021	7.295	1.428	0.03
Trichloroethene	59	0.039	0.026	0.013	0.582	0.074	0.05
Vinyl chloride	59	0.008	0.008	0.004	0.018	0.003	0.02

Table E7. Summary statistics for West Phoenix in 2005.

SITE	WPAZ	WPAZ	WPAZ	WPAZ	WPAZ	WPAZ	WPAZ
Species	Number of cases	Mean (ppbv)	Median (ppbv)	Minimum	Maximum	Standard Dev	Average MDL
1,1-Dichloroethene	59	0.015	0.010	0.005	0.176	0.023	0.03
1,2,4-Trimethylbenzene	59	0.292	0.215	0.006	3.069	0.434	0.04
1,2-Dichloroethane	59	0.023	0.016	0.008	0.281	0.040	0.05
1,2-Dichloropropane	59	0.026	0.020	0.010	0.351	0.044	0.06
1,3,5-Trimethylbenzene	59	0.131	0.092	0.008	1.357	0.187	0.05
1,3-Butadiene	59	0.311	0.185	0.035	1.270	0.302	0.11
Benzene	58	0.736	0.600	0.440	2.419	0.537	0.03
Bromoethane	59	0.026	0.016	0.005	0.176	0.030	0.03
Carbon tetrachloride	59	0.083	0.076	0.013	0.316	0.043	0.05
Chloroform	59	0.067	0.050	0.006	0.346	0.056	0.03
Dichloromethane	59	0.290	0.223	0.018	1.676	0.265	0.04
Ethylbenzene	59	0.528	0.205	0.014	13.319	1.717	0.05
Hexachlorobutadiene	59	0.265	0.130	0.130	1.675	0.287	0.49
M,P-Xylene	59	1.080	0.634	0.018	7.986	1.239	0.07
O-Xylene	59	0.374	0.237	0.014	1.813	0.354	0.05
Styrene	59	0.186	0.084	0.009	1.005	0.239	0.08
Tetrachloroethene	59	0.135	0.066	0.013	2.012	0.281	0.08
Toluene	59	3.306	1.860	0.023	31.936	5.777	0.05
Trichloroethene	59	0.075	0.028	0.013	2.127	0.278	0.08
Vinyl chloride	59	0.011	0.008	0.004	0.140	0.018	0.03

Jerry Worsham

From: Jerry Worsham
Sent: Tuesday, February 17, 2015 10:59 AM
To: Jerry Worsham
Subject: FW: 2006 JATAP Report

From: Hilary Hafner [mailto:Hilary@sonomatech.com]
Sent: Thursday, February 12, 2015 2:13 PM
To: Jerry Worsham
Subject: RE: 2006 JATAP Report

That sounds correct

Hilary R. Hafner
Sr. Vice President
Sonoma Technology, Inc.
1455 N. McDowell Blvd., Suite D
Petaluma, CA 94954-6503
p 707.665.9900 | f 707.665.9800
sonomatech.com

From: Jerry Worsham [mailto:JWorsham@rhlfirm.com]
Sent: Thursday, February 12, 2015 1:01 PM
To: Hilary Hafner
Subject: RE: 2006 JATAP Report

Hilary:
I noticed that in **Exhibit 3**- JATAP Summary Stats for (PCE/TCE) in Table E-1 Greenwood, Table E-6 South Phoenix and Table E-7 West Phoenix do not match the **Exhibit 5** – JATAP Table 3-3 and Table D-1 Charts.

You explained that the raw data for PCE/TCE was originally reported in ppbv in Tables Table E-1 Greenwood, Table E-6 South Phoenix and Table E-7 West Phoenix. The raw data was converted by STI from ppbv to micrograms/ cubic meter for the comparisons in the Report for Tables and Figures including JATAP Table 3-3 and Table D-1 Charts. I knew there was some answer!

Please confirm that I understand the difference and there is no problem with the body of the Report or data presented!

Jerry

Jerry D. Worsham II
Member
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Table 1-1. Monitoring details and sampling objectives for JATAP 2005.

Location	Measurements	Sampling Frequency	Objective
Phoenix - JLG Supersite	VOCs, PAHs, carbonyls, continuous BC, continuous ECOC, continuous NMHC, PM metals	1 – 24-hr Sample Every 6 Days	Population Exposure
	Collocated VOCs, carbonyls, PM metals	1 – 24-hr Sample, Schedule Varies by Sample Type	Quality Assurance
West Phoenix	VOCs, PM metals	1 – 24-hr Sample Every 6 Days	Population Exposure
South Phoenix	VOCs, carbonyls, PM metals	1 – 24-hr Sample Every 6 Days	Population Exposure
Gila River Indian Community, St. Johns	VOCs, PM metals	Sampling Every 6 Days, Alternate 2 - 12-hr Samples and 1 – 24-hr Sample	Transport/ Gradient
Salt River Pima-Maricopa Indian Community, Senior Center	VOCs, PM metals	Sampling Every 6 Days, Alternate 2 - 12-hr Samples and 1 – 24-hr Sample	Transport/Gradient
Fort McDowell Yavapai Nation	VOCs	1 – 24-hr Sample Every 12 Days	Transport/Gradient
Greenwood, SW Corner of I-10/I-17	VOCs, carbonyls, PM metals	1 – 24-hr Sample Every 6 Days	Maximum Concentration
Queen Valley	VOCs, EC, PM metals	1 – 24-hr Sample Every 6 Days	Background

Volatile organic compounds (VOCs), organic and elemental carbon (OCEC), particulate matter (PM), nonmethane hydrocarbon (NMHC), black carbon (BC)

The three primary tasks for STI in this data validation and analysis project were to (1) validate the 2005 gaseous air toxics data (Section 2), (2) analyze gaseous air toxics data collected as part of JATAP in 2005 (Section 3), and (3) interpret and communicate the results (this report). STI previously validated and analyzed the gaseous air toxics data collected in 2003-2004 at ADEQ sites (Hafner et al., 2004; McCarthy and Hafner, 2004) and GRIC sites (McCarthy et al., 2004b) as part of JATAP.

Table 2-2. List of available data collected at JATAP sites in 2005.

Site	Sampling	Sampling Duration	Samples Expected	Samples Available	Valid Samples	Percent Valid
Greenwood	Cartridges[a]	24-hr	61	60	60	98
	Canisters	24-hr	61	61	59	97
JLG Supersite	Cartridges[a]	24-hr	61	61	49	80
	Canisters	24-hr	61	61	55	90
St. Johns	Canisters	24-hr and 12-hr	30 (24-hr) 62 (12-hr)	37 (24-hr) 44 (12-hr)	79	95[b]
Senior Center	Canisters	24-hr and 12-hr	30 (24-hr) 62 (12-hr)	37 (24-hr) 46 (12-hr)	83	98[b]
South Phoenix	Cartridges[a]	24-hr	61	60	52	85
	Canisters	24-hr	61	60	59	97
Queen Valley	Canisters	24-hr	32	32	30	94
West Phoenix	Canisters	24-hr	61	60	59	97

[a] Carbonyls only.
[b] Alternating schedule was not consistent; 24-hr samples were collected in place of some 12-hr samples. This percentage is based on total number of sample days.

2.2 DATA VALIDATION APPROACH

Many air toxics are present in concentrations too low to be detected using standard analysis techniques. Species with concentrations below the reported minimum detection limits (MDLs) were tabulated for the South Phoenix and West Phoenix sites. Further validation of species with more than 75% of measurements below the MDL is difficult because we cannot easily check species relationships or time series for patterns.

Data displays—scatter, fingerprint, and time series plots—were inspected to identify problems and inconsistencies. Scatter plots enable investigation of the relationships among species at one site or at a number of sites. Fingerprint plots show the concentration of each species in a sample and help identify unique characteristics of the samples. Time series plots show the concentrations of species in every sample over a specified time period and are useful in showing the diurnal behavior of a species. Specific investigations were performed during validation of the air toxics data using VOCDat (Hafner and Prouty, 2004)and database tools:

- Quantified the percentage of measurements with concentrations above the MDL at each site.
- Inspected time series plots of every species, looking for seasonal variations, high and low values, and relationships to other species.

Table A-2. Missing or invalid samples from JATAP sites in 2005.

Site	Date of Expected Sample	Sample Type	Reason Sample is Missing or Invalid
Greenwood	December 30, 2005	Cartridge	no sample taken
Senior Center	January 4, 2005	Canister	no sample taken
South Phoenix	January 10, 2005	Cartridge	sample flow rate out of limits
South Phoenix	January 19, 2005	Cartridge	sample flow rate out of limits
South Phoenix	February 3, 2003	Canister	no air to canister
South Phoenix	July 15, 2005	Canister	voided by EAS lab
South Phoenix	July 21, 2005	Canister	make up run on July 24
South Phoenix	October 19, 2005	Cartridge	sample flow rate out of limits
South Phoenix	November 24, 2005	Cartridge	sample flow rate out of limits
South Phoenix	November 30, 2005	Cartridge	sample flow rate out of limits
South Phoenix	December 6, 2005	Cartridge	sample flow rate out of limits
South Phoenix	December 12, 2005	Cartridge	lost
South Phoenix	December 18, 2005	Cartridge	sample flow rate out of limits
South Phoenix	December 24, 2005	Cartridge	sample flow rate out of limits
Supersite	January 10, 2005	Cartridge	sample flow rate out of limits
Supersite	January 16, 2005	Cartridge	sample flow rate out of limits
Supersite	January 28, 2005	Cartridge	sample flow rate out of limits
Supersite	February 9, 2005	Cartridge	sample flow rate out of limits
Supersite	October 25, 2005	Cartridge	sample flow rate out of limits
Supersite	November 24, 2005	Cartridge	sample flow rate out of limits
Supersite	November 30, 2005	Cartridge	sample flow rate out of limits
Supersite	December 6, 2005	Cartridge	sample flow rate out of limits
Supersite	December 12, 2005	Cartridge	sample flow rate out of limits
Supersite	December 12, 2005	Cartridge	sample flow rate out of limits
Supersite	December 18, 2005	Cartridge	sample flow rate out of limits
Supersite	December 24, 2005	Cartridge	sample flow rate out of limits
West Phoenix	January 4, 2005	Canister	canister not analyzed
West Phoenix	October 7, 2005	Canister	canister broken

Table 2-4. The percentage of canister samples collected in 2005 for each species with 24-hr or averaged 24-hr concentrations above reported MDLs.

Species	Percent Above MDL						
	St. Johns	Senior Center	South Phoenix	West Phoenix	Greenwood	JLG Supersite	Queen Valley
1,3-Butadiene	10	17	78	81	100	100	17
1,1-Dichloroethene	24	17	9	13	2	0	0
1,2,4-Trimethylbenzene	73	86	86	92	98	100	83
1,2-Dichloroethane	2	5	5	6	42	25	20
1,2-Dichloropropane	1	1	0	2	0	0	3
1,3,5-Trimethylbenzene	60	71	68	76	98	100	23
Benzene	100	99	100	100	100	100	100
Bromomethane	40	36	37	49	24	33	23
Carbon tetrachloride	89	89	89	83	100	100	100
Chloroform	43	90	77	83	98	100	53
Dichloromethane	76	94	97	98	100	100	97
Ethylbenzene	71	92	92	94	100	100	93
Hexachlorobutadiene	0	0	0	0	2	4	0
m,p-Xylene	89	96	94	97	100	100	97
o-Xylene	73	92	94	94	100	100	87
Styrene	40	89	57	78	98	100	37
Tetrachloroethene	21	30	54	63	100	100	83
Toluene	99	98	100	98	100	100	100
Trichloroethene	6	18	17	17	90	84	37
Vinyl chloride	12	1	3	3	2	0	0

EXHIBIT "4"

Jerry Worsham

From: Jennifer Botsford <Jennifer.Botsford@azdhs.gov>
Sent: Thursday, February 05, 2015 2:18 PM
To: Jerry Worsham
Subject: RE: Current Version of AAAQG

That is the only copy I am aware of.

Jennifer Botsford, Program Manager for
Environmental Toxicology Program

150 North 18th Avenue, Suite 140
Phoenix, AZ 85007

(602) 364-3128
jennifer.botsford@azdhs.gov

From: Jerry Worsham [mailto:JWorsham@rhlfirm.com]
Sent: Thursday, February 05, 2015 2:17 PM
To: Jennifer Botsford
Cc: Hsin-I Lin Cox
Subject: RE: Current Version of AAAQG

Is it still draft or now final?

Jerry

From: Jennifer Botsford [mailto:Jennifer.Botsford@azdhs.gov]
Sent: Thursday, February 05, 2015 1:41 PM
To: Jerry Worsham
Cc: Hsin-I Lin Cox
Subject: RE: Current Version of AAAQG

Yes it is the most recent.

Jennifer Botsford, Program Manager for
Environmental Toxicology Program

150 North 18th Avenue, Suite 140
Phoenix, AZ 85007

(602) 364-3128
jennifer.botsford@azdhs.gov

From: Jerry Worsham [mailto:JWorsham@rhlfirm.com]
Sent: Thursday, February 05, 2015 10:48 AM
To: Jennifer Botsford
Cc: Hsin-I Lin Cox
Subject: Current Version of AAAQG

Jennifer/ Hsin I – *Lin:*
Is 1999 the most recent version of ADHS's Arizona Ambient Air Quality Guidelines? This was listed on the website but not sure if it is up to date.

http://www.maricopa.gov/aq/divisions/permit_engineering/docs/pdf/aaaqgs.pdf

If this isn't the current AAAQ, could you send me the link to the current version?

Jerry D. Worsham II
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Draft

1999 Update
Arizona Ambient Air Quality Guidelines
(AAAQGs)

Prepared by

The Office of Environmental Health

Prepared for

The Arizona Department of Environmental Quality
Air Programs Division

May 11, 1999

1.0 INTRODUCTION

The Arizona Department of Health Services (ADHS) began developing health-based guidelines for contaminants in air for the Arizona Department of Environmental Quality (ADEQ) shortly after the ADEQ was formed in July of 1987. The ADHS added chemicals to the list and updated Arizona Ambient Air Quality Guidelines (AAAQGs) for the ADEQ over the next several years. A comprehensive list of AAAQGs was compiled in 1992. The ADEQ and various counties in Arizona have been using the 1992 list of AAAQGs as health-based reference values for making risk management decisions in their environmental programs.

This document updates the 1992 AAAQGs list, incorporating more recent toxicological data and occupational standards. The methods, equations, and assumptions used to develop this updated list are identical to those historically used to develop AAAQGs.

AAAQGs are residential screening values that are protective of human health, including children. Chemical concentrations in air that exceed AAAQGs may not necessarily represent a health risk. Rather, when contaminant concentrations exceed these guidelines, further evaluation may be necessary to determine whether there is a true threat to human health.

AAAQGs are not intended to be used as standards. Rather, they are intended to provide health-based guidelines that may be useful in making environmental risk management decisions. AAAQGs consider human health risk from inhalation of contaminants in ambient air. They do not take into account odor thresholds or threats to wildlife.

2.0 METHODOLOGY

2.1 Overview

AAAQGs are calculated using a human health-based approach developed by the ADHS. One-hour and 24-hour AAAQGs use occupational exposure limits established or recommended by the United States Occupational Safety and Health Administration (OSHA), the National Institute of Occupational Safety and Health (NIOSH), the National Institute for Environmental Health Sciences (NIEHS). Annual AAAQGs use cancer slope factors (SF) from the United States Environmental Protection Agency (USEPA). The most protective occupational standards or recommended levels from the United States (US) were used when a standard or recommendation existed. When no US standard or recommendation was found, the most protective standard or recommendation from Western Europe or Japan was used. If standards or recommendations were lacking from those sources, values from Eastern Europe, the former Soviet Union or South America were used. In the cases where no data could be located, the AAAQG value was left blank.

The methodology used to calculate Annual, 24-Hour, and One-Hour AQGs are discussed in Sections 2.2 through 2.4.

2.2 Annual AQGs

Annual AQGs are calculated for possible, probable and known human carcinogens. They protect against toxic doses of systemic toxicants, and limit excess lifetime cancer risk to one-in-one million (10^{-6}) for known human carcinogens. The guidelines use standard USEPA residential exposure assumptions. They assume that constant exposure occurs over a lifetime (70 years). The default exposure factors were obtained primarily from *Risk Assessment Guidance for Superfund (RAGS), Supplemental Guidance Standard Default Exposure Factors* (OSWER Directive, 9285.6-03) dated March 25, 1991.

Annual AQGs assume an exposure frequency of 365 days/year for 70 years. Exposure doses are averaged over a lifetime (70 years) for carcinogens. They use USEPA carcinogenic slope factors from the USEPA Integrated Risk Information System (IRIS) through January 1999, USEPA Health Effects Assessment Summary Tables (HEAST) through 1998, and the USEPA National Center for Environmental Assessment (NCEA). The priority among sources of toxicological values used is as follows: (1) IRIS, (2) HEAST, (3) NCEA, and (4) withdrawn values from IRIS or HEAST and values under review. Oral cancer slope reference doses and cancer slope were used when no toxicity values were available for inhalation exposure.

The target excess lifetime cancer risk is one-in-one-million (1E-6). Equation 1 displays the formula and assumptions used to calculate Annual AQGs. Annual AQGs are not developed for those substances on the list that are not suspected of causing cancer.

2.3 Twenty-four-hour AAAQGs

Twenty-four-hour AAAQGs are developed using a methodology that uses occupational exposure limits and appropriate conversion safety factors. Twenty-four-hour AAAQGs also protect against excessive exposure to possible, probable, and known human carcinogens.

Twenty-four-hour AAAQGs were developed by dividing the most recent and lowest 8-hour OSHA Time Weighted Average (TWA) or other occupational exposure limit or recommendation by 126. The divisor of 126 is a factor which incorporates the conversion of an 8-hour, 5 day work week to a 24-hour, 7 day week of 4.2, and a safety factor of 30 to protect the most sensitive members of the population such as children and the elderly. Equation 2 displays the formula for calculating 24-hour AQGs based upon systemic toxicity.

Twenty-four-hour AAAQGs for probable and known human carcinogens were developed by taking the more protective value of the 24-hour AAAQG based upon systemic toxicity, or 365 times the Annual AAAQG, which is based on a one-in-a-million excess lifetime cancer risk. Equation 3 displays the formula for calculating the 24-hour AAAQG for carcinogens.

2.4 One-hour AAAQGs

One-hour AAAQGs are calculated by taking the more protective of the Short Term Exposure Limit (STEL) or other short term standard or guideline divided by 120, or the 24-Hour AQG multiplied by 3.8. The divisor for calculating a 1-Hour AQG using a STEL represents a conversion factor that converts a 15 minute exposure into a one-hour exposure, and a safety factor of 30 to protect the most sensitive members of the population such as children and the elderly.

The multiplier of 3.8, which is used in the calculation of a 1-hour AAAQG based upon the 24-hour AQG, represents the proportional difference in the lowest observed adverse effect level for 24-hour and 1-hour exposure to a common irritant (SO_2) in human subjects.

3.0 SUMMARY

The ADHS began developing health-based guidelines for contaminants in air for the ADEQ shortly after the ADEQ was formed in July of 1987. The ADHS added chemicals to the list and updated AAAQGs for the ADEQ over the next several years. The most recent comprehensive list of AAAQGs was developed in 1992. The ADEQ and various counties in Arizona have been using the 1992 list of AAAQGs as health-based reference values for making risk management decisions in their environmental programs.

This document updates the 1992 AAAQGs list, incorporating more recent toxicological data and occupational standards. The methods, equations, and assumptions used to develop this updated list are identical to those historically used to develop AAAQGs.

AAAQGs are protective of human health, including children. Chemical concentrations in air that exceed AAAQGs may not necessarily represent a health risk. Rather, when contaminant concentrations exceed these guidelines, further evaluation may be necessary to determine whether there is a true threat to human health. AAAQGs consider human health risk from inhalation of contaminants in ambient air; they do not take into account odor thresholds or threats to wildlife.

These guidelines were calculated using a human health-based approach developed by the ADHS. One-hour and 24-hour AAAQGs are calculated using occupational exposure limits established or recommended by the United States Occupational Safety and Health Administration (OSHA), the National Institute of Occupational Safety and Health (NIOSH), the National Institute for Environmental Health Sciences. Annual AAAQGs use toxicity information from the United States Environmental Protection Agency.

They protect against toxic doses of systemic toxicants, and limit excess lifetime cancer risk to one-in-one million (10^{-6}) for known human carcinogens.

Equations 1 through 3 display the formulas and assumptions used to calculate AAAQGs. Table 1 displays the 1999 updated AAAQGs.

	Chemical Name	CAS#	1 Hour AAAQG µg/m^3	24 Hour AAAQG µg/m^3	Annual AAAQG µg/m^3
301	Selenourea	630-10-4			
302	Sevin Bait (Carbaryl)	63-25-2	8.3E+01	4.0E+01	
303	Silane	7803-62-5	8.3E+00	5.6E+00	
304	Silica (Amorphous Hydrated)	7631-86-9	1.8E+02	4.8E+01	
305	Silver	7440-22-4	3.0E-01	7.9E-02	
306	Sodium Aluminofluoride	15096-52-3	6.0E+01	1.6E+01	
307	Sodium Carbonate	497-19-8			
308	Sodium Chloride	7647-14-5			
309	Sodium Dichromate (VI)	10588-01-9	1.5E+00	4.0E-01	
310	Sodium Fluoride	7681-49-4	7.5E+01	2.0E+01	
311	Sodium Hydroxide	1310-73-2	1.7E+01	1.6E+01	
312	Sodium Oxide				
313	Sodium Sulfate	7757-82-6			
314	Strychnine	57-24-9	3.8E+00	1.2E+00	
315	Styrene (includes dimers)	100-42-5	3.5E+03	1.7E+03	
316	Sulfur				
317	Sulfur Dioxide	7446-09-5	NAAQS	NAAQS	
318	Sulfur Trioxide	7446-11-9			
319	Sulfuric Acid	7446-93-9	2.5E+01	7.9E+00	
320	Talc	14807-96-6	6.0E+01	1.6E+01	
321	1,2,4,5-Tetrachlorobenzene	95-94-3			
322	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	3.2E-05	8.5E-06	2.3E-08
323	1,1,2,2-Tetrachloroethane	79-39-5	2.4E+01	6.4E+00	1.8E-02
324	Tetrachloroethene	127-18-4	1.3E+03	6.4E+02	1.7E+00
325	2,3,4,6-Tetrachlorophenol (2,4,5,6)	58-90-2			
326	Tetraethyl Lead	78-00-2	2.3E+00	6.0E-01	
327	Tetrafluoromethane	75-73-0			
328	Tetrahydrofuran	109-99-9	6.1E+03	4.7E+03	
329	Thallium	7440-28-0	3.0E+00	7.9E-01	
330	Thiourea	62-56-6			

	Chemical Name	CAS#	1 Hour AAAQG ìg/m^3	24 Hour AAAQG ìg/m^3	Annual AAAQG ìg/m^3
331	Thorium 232	7440-29-1			
332	Titanium Dioxide (Total Dust)	13463-67-7	3.0E+02	7.9E+01	
333	Titanium Dioxide (Respirable Dust)	13463-67-7	1.5E+02	4.0E+01	
334	Toluene	101-88-3	4.4E+03	3.0E+03	
335	2,4-Toluene Diisocyanate	584-84-9	1.2E+00	3.2E-01	
336	Toxaphene	8001-35-2	4.4E+00	1.2E+00	3.2E-03
337	1,2,4-Trichlorobenzene	120-82-1	3.3E+02	3.2E+02	
338	1,1,1-Trichloroethane	71-55-6	5.7E+04	1.5E+04	
339	1,1,2-Trichloroethane	79-00-5	8.7E+01	2.3E+01	6.2E-02
340	Trichloroethene	79-01-6	8.1E+02	2.1E+02	5.8E-01
341	Trichloroflouromethane	75-69-4	5.8E+04	4.4E+04	
342	2,4,5-Trichlorophenol	95-95-4	1.3E+01	4.0E+00	
343	2,4,6-Trichlorophenol	88-06-2	1.3E+01	4.0E+00	3.2E-01
344	1,1,2-Trichloro-1,2,2-Triflouroethane	76-13-1	7.9E+04	6.0E+04	
345	Triethylenetetramine	112-24-3			
346	1,2,4-Trimethylbenzene	95-63-6	1.4E+03	9.9E+02	
347	1,3,5-Trimethylbenzene	108-67-8	1.4E+03	9.9E+02	
348	2,2,4-Trimethyl-1,3pentanediol Isobutyrate (Texanol)	25265-77-4			
349	Tungsten Trioxide	1314-35-8	8.3E+01	4.0E+01	
350	Turpentine	8006-64-2	7.0E+03	4.4E+03	
351	Uranium 238 (Soluble)	7440-61-1	1.5E+00	4.0E-01	
352	Uranium 238 (Insoluble)	7440-61-1	6.0E+00	1.6E+00	
353	Urea	57-13-6			
354	Vanadium	7440-62-2	1.5E+00	4.0E-01	
355	Vinyl Chloride	75-01-4	1.6E+01	4.3E+00	1.2E-02
356	VM & P Naptha (Benzin)	8030-30-6	4.1E+04	1.1E+04	
357	Xylenes,Mixed	1330-20-7	5.4E+03	3.5E+03	
358	Zinc Chloride	7646-85-7	1.7E+01	7.9E+00	
359	Zinc Oxide Fume	1314-13-2	8.3E+01	4.0E+01	
360	Zinc Oxide Respirable Dust	1314-13-2	1.5E+02	4.0E+01	

EXHIBIT "5"

Table 3-3. Annual mean concentrations ($\mu g/m^3$) at JATAP sites in 2005 compared with cancer benchmarks, RfCs, and AAAQG). Species in **boldface** type indicate >50% of data are above the MDL. Concentrations for species not boldfaced should be used with caution.

Species	Greenwood Annual Mean ($\mu g/m^3$)	JLG Supersite Annual Mean ($\mu g/m^3$)	Queen Valley Annual Mean ($\mu g/m^3$)	St. Johns Annual Mean ($\mu g/m^3$)	Salt River Annual Mean ($\mu g/m^3$)	South Phoenix Annual Mean ($\mu g/m^3$)	West Phoenix Annual Mean ($\mu g/m^3$)	Cancer Benchmark ($\mu g/m^3$)	RfC ($\mu g/m^3$)	AAAQG ($\mu g/m^3$)
1,3-Butadiene	**0.62**	**0.47**	0.03	0.13	0.15	**0.64**	**0.71**	0.033	2	0.067
Acetaldehyde	**5.07**	**3.13**				**3.15**		0.45	9	0.5
Benzene	**2.79**	**2.50**	**0.38**	**0.61**	**1.65**	**2.33**	**2.43**	0.13	30	0.14
Carbon tetrachloride	**0.63**	**0.62**	**0.61**	**0.56**	**0.57**	**0.60**	**0.54**	0.07	40	0.036
Chloroform	**0.33**	**0.59**	0.05	0.11	**0.35**	**0.32**	**0.34**		98	0.043
Dichloromethane	**1.15**	**0.83**	**0.12**	**0.26**	**0.46**	**0.64**	**1.04**	2.13	1000	5.6
Ethylbenzene	**2.06**	**1.61**	**0.82**	**0.37**	**0.71**	**1.12**	**2.38**		1000	
Formaldehyde	**9.81**	**5.61**				**4.20**		181.8	9.8	0.08
Hexachlorobutadiene	0.11	0.12	0.11	2.26	1.91	2.49	2.91	0.05	90	0.067
m,p-Xylene	**5.43**	**4.32**	**0.82**	**0.88**	**1.83**	**3.46**	**4.84**		100	
o-Xylene	**2.08**	**0.78**	**0.38**	**0.36**	**0.79**	**1.20**	**1.67**		100	
Styrene	**1.71**	**0.76**	**0.11**	0.35	**1.96**	**0.40**	**0.82**		1000	
Tetrachloroethene	**0.89**	**1.43**	**0.18**	0.35	0.76	**1.32**	**0.94**	0.17	270	2.1
Toluene	**8.82**	**7.18**	**0.59**	**2.51**	**7.23**	**6.86**	**12.87**		400	
Trichloroethene	**0.27**	**0.18**	0.09	0.18	0.18	0.22	0.42	0.5	600	0.76
Vinyl chloride	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.11	100	0.012

Table D-1. The five highest 24-hour concentrations (µg/m^3) at each JATAP site in 2005 compared to Arizona Ambient Air Quality Guidelines (AAAQG). Values ≥ AAAQG are in bold.

Species	Greenwood 24-hr (µg/m^3)	JLG Supersite 24-hr (µg/m^3)	Queen Valley 24-hr (µg/m^3)	St. Johns 24-hr (µg/m^3)	Salt River 24-hr (µg/m^3)	South Phoenix 24-hr (µg/m^3)	West Phoenix 24-hr (µg/m^3)	AAAQG 24-hr (µg/m^3)
o-Xylene	5.1	4.0	0.6	1.6	6.2	3.3	5.6	
	4.7	3.8	0.5	1.5	2.7	3.2	3.4	
	4.4	3.6	0.5	0.8	2.6	3.0	3.0	3500
	4.3	3.4	0.5	0.8	2.0	2.9	3.0	
	4.1	3.4	0.5	0.8	1.8	2.6	2.9	
Styrene	4.6	2.9	0.5	2.2	6.8	2.5	3.5	
	4.5	1.9	0.5	2.1	4.7	2.3	3.5	
	4.5	1.4	0.4	1.4	4.5	0.9	3.4	1700
	4.2	1.4	0.4	1.3	3.9	0.8	3.0	
	3.8	1.3	0.4	1.3	3.4	0.8	3.0	
Tetrachloroethene	8.4	5.5	0.5	2.3	8.1	6.3	6.2	
	3.3	4.4	0.4	2.1	6.6	3.9	2.0	
	2.4	4.2	0.3	1.7	4.8	3.8	2.0	770
	1.7	4.0	0.3	1.5	2.0	3.4	1.4	
	1.7	3.5	0.2	0.7	1.4	3.3	1.2	
Toluene	26.3	18.4	1.5	9.7	62.8	28.4	124	
	20.0	18.2	1.1	9.4	40.6	18.6	21.9	
	19.3	16.0	1.0	8.3	37.1	15.8	21.8	3000
	18.5	15.3	1.0	5.4	29.0	15.7	21.0	
	18.1	15.1	0.9	4.5	25.1	14.3	20.0	
Trichloroethene	1.7	0.5	0.2	1.0	0.7	3	12	
	0.6	0.4	0.2	0.9	0.5	0.7	0.5	
	0.6	0.4	0.2	0.7	0.4	0.5	0.4	280
	0.5	0.4	0.2	0.2	0.4	0.4	0.4	
	0.5	0.3	0.2	0.2	0.4	0.3	0.4	