Hazard Ranking System Documentation Record

Bandera Road Ground Water Plume
Leon Valley/San Antonio
Bexar County, Texas
TXN000606565

REGION VI

Prepared in cooperation with the
U.S. Environmental Protection Agency

September 2006

TABLE OF CONTENTS

Page

TABLES

FIGURES

1.0 INTRODUCTION

The Hazard Ranking System (HRS) Documentation Record is the principle mechanism the U.S. Environmental Protection Agency (EPA) uses to place sites on the National Priorities List (NPL). The HRS serves as a screening device to evaluate the potential for releases of uncontrolled hazardous substances to cause human health or environmental damage. The HRS provides a measure of relative rather than absolute risk. It is designed so that it can be consistently applied to a wide variety of sites.

The preparation of this report by the Texas Commission on Environmental Quality was financed through grants from the U.S. EPA.

2.0 HRS DOCUMENTATION RECORD - REVIEW COVER SHEET

SITE NAME: Bandera Road Ground Water Plume

CONTACT PERSON:

Documentation: Brenda Cook, USEPA 214/665-7436
Region 6 NPL Coordinator

Pathway, Components, or Threats Not Evaluated:

Surface Water Pathway

The Surface Water Pathway was evaluated and not scored due to lack of documentation of a release to surface water targets and because the inclusion of this pathway would not significantly affect the site score.

Soil Exposure Pathway

The Soil Exposure Pathway was evaluated and not scored due to lack of documentation of a release to soil exposure pathway targets and because the inclusion of this pathway would not significantly affect the site score.

Air Migration Pathway

The Air Migration Pathway was evaluated and not scored due to lack of documentation of a release to air-migration pathway targets and because the inclusion of this pathway would not significantly affect the site score.

NOTES TO THE READER

The following rules were used when citing references in the Documentation Record:

1. All references attached to this report have been stamped with a designated page number (example: Ref. 1, p. 10 = 01 010).

2. The State predecessor agencies: Texas Natural Resource Conservation Commission (TNRCC), Texas Water Quality Board (TWQB), Texas Department of Water Resources (TDWR), Texas Water Commission (TWC), and Texas Air Control Board (TACB), referred to throughout this report are now known as the Texas Commission on Environmental Quality (TCEQ). The new agency, TCEQ, became effective September 1, 2002, as mandated under House Bill 2912, Article 18 of the 77th Regular Legislative Session.

2.1 HRS DOCUMENTATION RECORD - OVERVIEW

Name of Site: Bandera Road Ground Water Plume **Date Prepared:** September 2006

CERCLIS Site ID Number: TXN000606565

Site Specific Identifier: Unidentified Ground Water Plume (Other)

Street Address of Site*: The center of the known ground water plume is located between Poss Road and Grissom Road, approximately 590 feet southwest of Bandera Road (see Figure 2, Site Location Map and the site coordinates below).

City, County, State, Zip Code: Leon Valley / San Antonio, Bexar County, Texas, 78238

General Location in the State:
The Bandera Road Ground Water Plume site is situated in Bexar County, in the City of Leon Valley (see Figure 1, Regional Location Map).

Topographic Maps: US Geological Survey 7.5 Minute Topographic Maps, Helotes Quadrangle. Photorevised 1992, Castle Hills Quadrangle, Photorevised 1992, San Antonio West Quadrangle, Photorevised 1993 and the Culebra Hill Quadrangle, Photorevised 1993 (Ref. 4, Sheets 1, 2, 3 & 4, Respectively).

Latitude: 29° 29' 39.96" North **Longitude:** 98° 37' 13.80" West
The geographic coordinates represent the approximate center of the known ground water plume (Reference 4, Sheet 3).

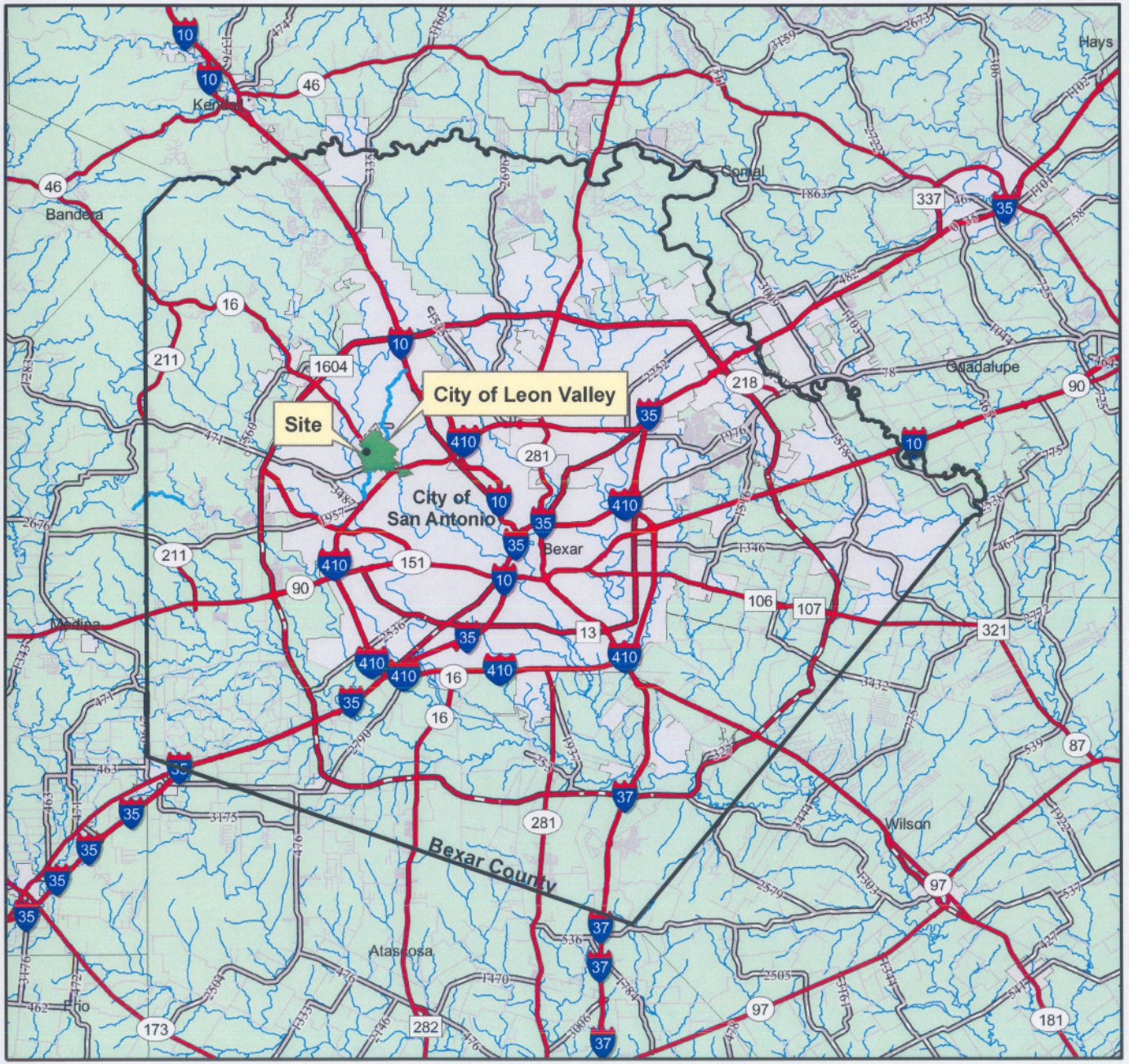
* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Pathway Scores:
Ground Water Migration Pathway - 100.00
Surface Water Migration Pathway - NS
Soil Exposure Pathway - NS
Air Migration Pathway - NS

NS = Not Scored - Pathways were evaluated but not scored due to their minimal contribution to the overall site score.

HRS SITE SCORE: 50.00

Figure 1 - Regional Location Map



TCEQ

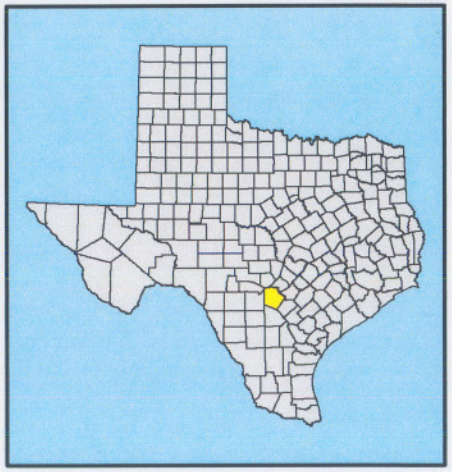
Legend

- Interstate Highways
- Reservoirs
- Rivers of Texas
- Urban Areas
- Counties

N

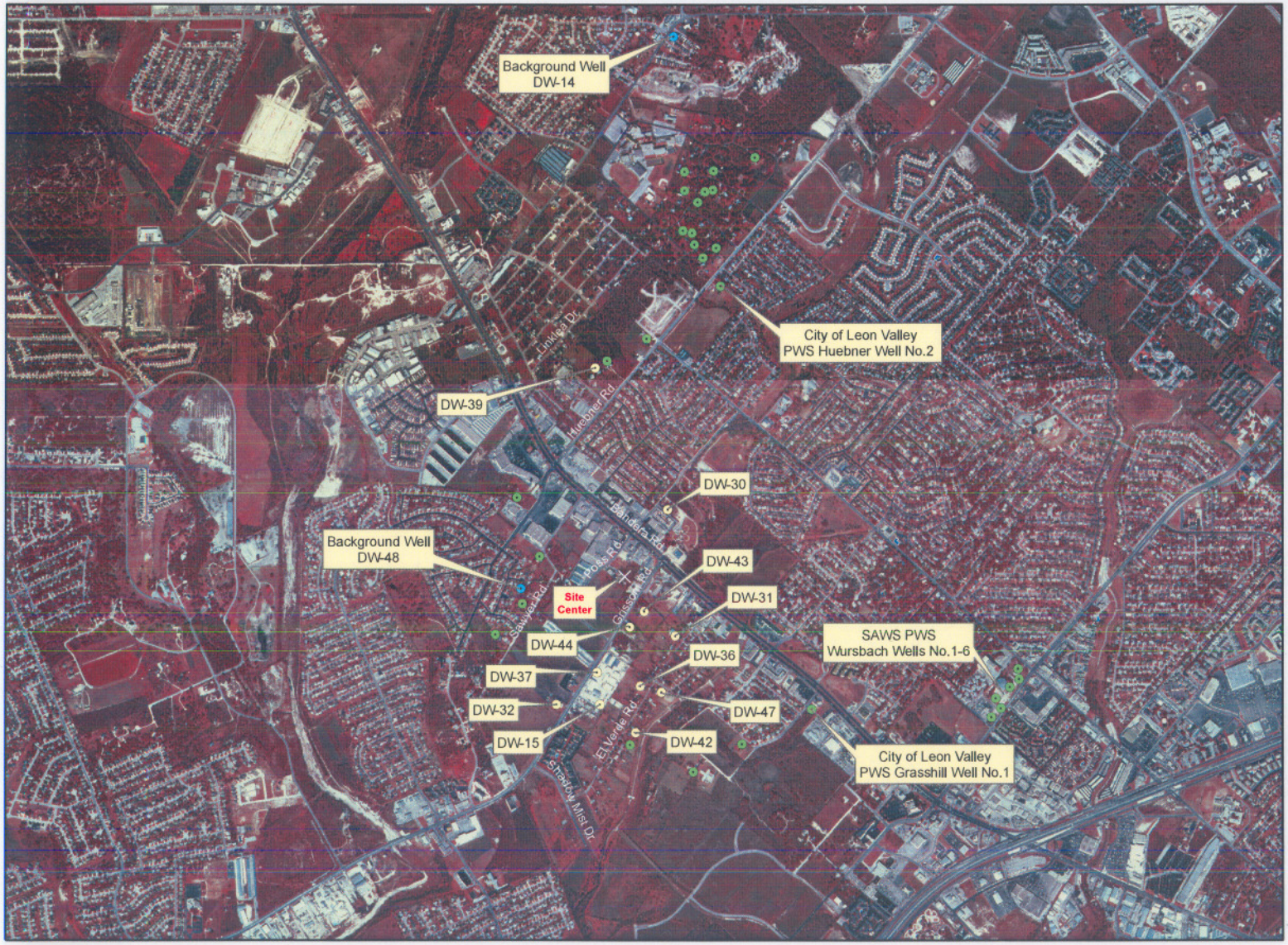
Figure 1
Regional Location Map

Bandera Road
Ground Water Plume Site
Leon Valley, Bexar County, Texas
TXN000606565



The base map used is from ArcIMS Image Service Internet Server: http://www.tnris.state.tx.us. Coordinate System: GCS_WGS_1984.

Figure 2. Site Location Map



0 0.5 1 2 Miles

The base data used is the 2998352a.sid, 2998361a.sid, 2998274a.sid and 2998283a.sid Digital Orthoquarter Quads (DOQQs), which are digital versions of aerial photographs. These DOQQs were produced by the TCEQ using USGS guidelines UTM NAD83 Zone 14.

TCEQ

Legend
(References 14, 31, 32, 33 and 47)

- Background Wells
- Wells with No Observed Release
- Wells with an Observed Release

N

Figure 2
Site Location Map

Bandera Road
Ground Water Plume Site
Leon Valley, Bexar County, Texas
TXN000606565

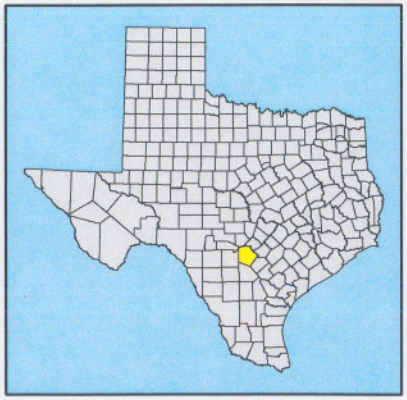
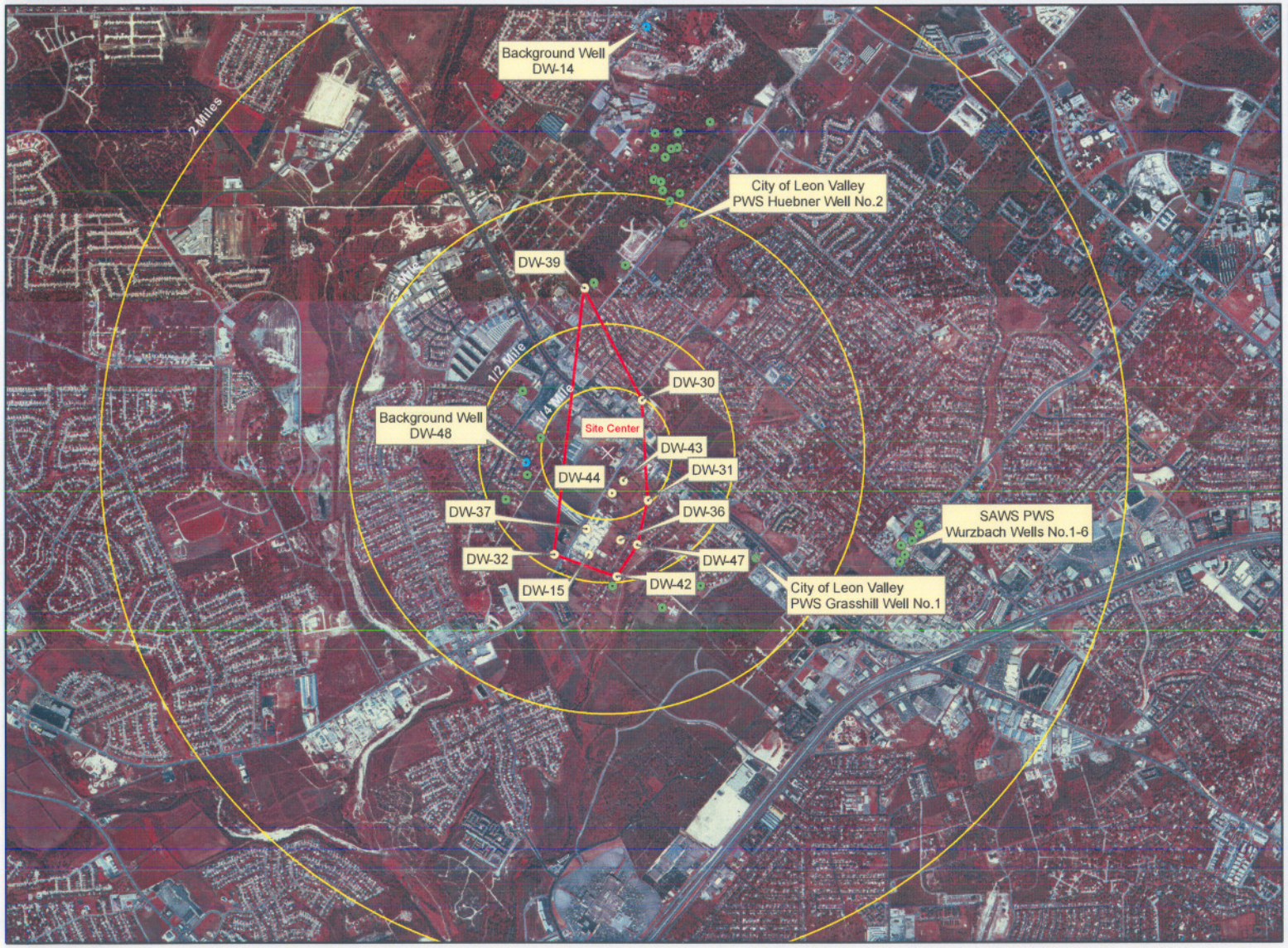


Figure 3. Ground Water Plume Map



The base data used is the 2998352a.sid, 2998361a.sid, 2998274a.sid and 2998283a.sid Digital Orthoquarter Quads (DOQQs), which are digital versions of aerial photographs. These DOQQs were produced by the TCEQ using USGS guidelines UTM NAD83 Zone 14.

TCEQ

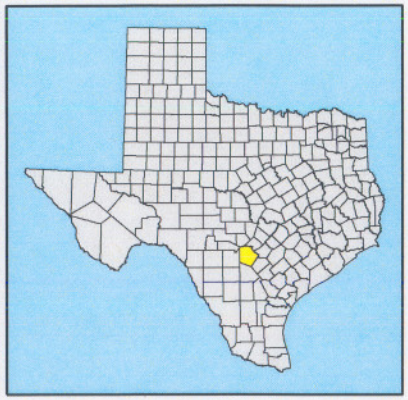
Legend
(References 14, 31, 32, 33 and 47)

- Ground Water Plume
- Background Wells
- Wells with No Observed Release
- Wells with an Observed Release

N

Figure 3
Ground Water Plume Map

Bandera Road
Ground Water Plume Site
Leon Valley, Bexar County, Texas
TXN000606565



WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13 *)	100	10,000
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30 *)	NS	
2b.	Ground water to Surface Water Migration Component (from Table 4-25, line 28 *)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	NS	
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22 *)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12 *)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	10,000	
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root.	50.00	

NS = Not Scored

*** = Tables identified in the HRS Rule**

GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor Categories and Factors			Maximum Value	Value Assigned	
Likelihood of Release to an Aquifer					
1.	Observed Release		550	550	
2.	Potential to Release				
	2a.	Containment	10		
	2b.	Net Precipitation	10		
	2c.	Depth to Aquifer	5		
	2d.	Travel Time	35		
	2e.	Potential to Release			
		(Lines 2a(2b + 2c + 2d))	500		
3.	Likelihood of Release				
	(Higher of Line 1 and 2e)		550		550
Waste Characteristics					
4.	Toxicity/Mobility		*	10000	
5.	Hazardous Waste Quantity		*	100	
6.	Waste Characteristics		100		32
Targets					
7.	Nearest Well		50	50	
8.	Population:				
	8a.	Level I Concentrations	**	220	
	8b.	Level II Concentrations	**	4.78	
	8c.	Potential Contamination	**	2,868	
	8d.	Population (Lines 8a + 8b + 8c)	**	3,092.78	
9.	Resources		5	0	
10.	Wellhead Protection Area		20	20	
11.	Targets (Lines 7 + 8d + 9 + 10)		**		3,162.78
Ground Water Migration Score for an Aquifer					
12.	Aquifer Score				
	(Lines 3 x 6 x 11)/82,500)(Max Value is 100)		100		100
Ground Water Migration Pathway Score					
13.	Pathway Score (S_{gw}), (Highest value from Line 12 for all aquifers evaluated)(Max Value is 100)		100		100

REFERENCE LISTING

Number Description of the Reference

1. U.S. Environmental Protection Agency. Federal Register - 40 CFR Part 300; Hazard Ranking System; Final Rule, Volume 55, No. 241, December 14, 1990. 1 page.

2. Reserved.

3. U. S. Environmental Protection Agency, Superfund Chemical Data Matrix (SCDM), EPA/540/R-96/028, OERR Publication 9345.1-21, January 2004. 8 pages.

4. U.S. Geological Survey. 7.5 Minute Series Topographic Maps (4 Sheets).
   A. Helotes, Texas Quadrangle, 1992.
   B. Castle Hills, Texas Quadrangle, 1992.
   C. San Antonio West, Texas Quadrangle, 1993.
   D. Culebra Hill, Texas Quadrangle, 1993.

5. Texas Water Development Board (TWDB) - PWS ID #0150208; Details/Data Sheets. 4 pages.

6. Texas Water Development Board (TWDB) - San Antonio Water System (SAWS) PWS, Details/Data Sheet Query for the Texas Natural Resource Conservation Commission, TNRCC, PWS ID #0150018. 67 pages.

7. Bandera Road Ground Water Plume Investigation Photographs for Sampling Event Nos. 1, 2 and 3; 42 Photographs with captions; 22 pages (0 through 21 pages).

8. Texas Commission on Environmental Quality. Field Log Notes from Roy D. Deen. June 9, 2004 through December 16, 2004. 58 pages (0 through 57 pages).

9. Lower Colorado River Authority Environmental Lab Services. Analytical Results, including QA/QC Data, narrative and Sample Summary, for the Bandera Road GWP Investigation Phase 1 Sampling Event. Project Samples taken 06/15/04. 48 pages (0 through 47 pages).

10. Lower Colorado River Authority Environmental Lab Services. Analytical Results, including QA/QC Data, narrative and Sample Summary, for the Bandera Road GWP Investigation Phase 2 Sampling Event. Project Samples taken 08/25-26/04.
    90 pages (0-89 pages).

REFERENCE LISTING (continued...)

Number Description of the Reference

11. Lower Colorado River Authority Environmental Lab Services. Analytical Results, including QA/QC Data, narrative and Sample Summary, for the Bandera Road GWP Investigation Phase 3 Sampling Event. Project Samples taken 12/15-16/04. 192 pages (0 through 191 pages).

12. Intera, Incorporated. Data Usability Summary (DUS) for the Bandera Road Ground Water Plume, Data Packages Job Numbers 0408655, 0412477, and 0406514. Project Samples taken June, August & December, 2004, respectively. May 2005. 39 pages.

13. Reserved

14. Severn Trent Laboratory Analytical Report, Job Number 224351 prepared for the Edwards Aquifer Authority. Samples collected April through May, 2004. 101 pages.

15. Texas Commission on Environmental Quality Superfund Cleanup Section, Remediation Division, Quality Assurance Project Plan for the Superfund Program; Document Control Number (200919.3). March 2004. 150 total pages.

16. U.S. Census Bureau. Bexar County, Texas. http://quickfacts.census.gov/qfd/states/48/48201.html. October 22, 2004. 2 pages.

17. Texas Commission on Environmental Quality (formerly the Texas Natural Resource Conservation Commission, TNRCC. Query - Public Water System Data Sheet for the City of Leon Valley, PWS ID 0150178, Last Survey Date January 27, 2004. 5 pages.

18. U.S. Environmental Protection Agency. National Primary Drinking Water Standards, List of Drinking Water Contaminants and MCLs, EPA 816-F-02-013. 12 pages.

19. Texas Commission on Environmental Quality. Wellhead Protection Area (WHPA) Map for Bandera Road, Texas. January, 2005. 4 pages.
    A. E-mail from Mr. David P. Terry, TCEQ, Source Water Assessment & Protection Program, to Roy D. Deen showing Wellhead Protection Areas near the TCEQ DW-30A Well.
    B. E-mail from Mr. Scott Sherrill, Water Quality Inspector at SAWS, to Roy D. Deen at TCEQ, confirming that the Wurzbach #1-#6 Wells are participants in a Wellhead Protection Program.

20. U.S. Environmental Protection Agency. Evaluating Ground Water Plumes Under the Hazard Ranking System, EPA 540-F-95-034, OSWER Publication 9320.8-01FS, September 1998. 5 pages.

REFERENCE LISTING (continued...)

Number Description of the Reference

21. Texas Commission on Environmental Quality. Roy D. Deen, P.G.; Screening Site Inspection Report for Bandera Road Ground water Plume, San Antonio, Bexar County, Texas. TXD Pending. January 2005. 52 pages.

22. TCEQ. Bandera Road Ground Water Plume Site Summary/Hot Topics Summary, as of December, 2004. 7 pages.

23. A. Savings Square Shopping Center, 6715 Bandera Road, Leon Valley, Bexar County, TX; Voluntary Cleanup Program (VCP) No. 1511; Response Letter from Birch & Becker, L.L.P., dated June 3, 2004 regarding Background Information, Proposed Work Plan for Conducting an Investigation, and Response to TCEQ Letter dated May 19, 2004; 26 Pages, including Maps and Figures.
    B. Telephone memo to the file, permission from Attorneys for Savings Square Partners, Ltd. to use their Report as a Reference for the Preliminary Assessment an Site Inspection Program; 1 page.

24. Reserved.

25. U. S. Geological Survey Water Resources Investigations Report 95-4030. Prepared in cooperation with the San Antonio Water System, Austin, Texas 1995; Geologic Framework and Hydrogeologic Characteristics of the Edwards Aquifer Recharge Zone, Bexar County, Texas; by William G. Stein and George B. Ozuna. 9 pages.

26. Reserved.

27. U. S. Department of Agriculture, Soil Conservation Service, In cooperation with the Texas Agricultural Experiment Station; Soil Survey Bexar County, Texas; Soil Survey Series 1962, No. 12. 17 Pages.

28. STC Environmental Services, Incorporated Well Data Base for the TCEQ's Voluntary Cleanup Program (VCP) Site No. 1511; The Data Base information compiled during the time period May - June, 2004, by STC, Environmental Services, Inc., San Antonio, TX. 10 pages.

29. Reserved.

30. Reserved.

31. Table 3, Summary Table of Non-Purgeable Volatile Organic Compounds, Private Water Wells Sampled for Bandera Ground Water Plume Site No. R00061; Phase 1 Sampling, Compiled by Daniel B. Stephens & Associates (DBS&A), June 15, 2004. 2 pages (0 through 1 page).

REFERENCE LISTING (continued...)

Number Description of the Reference

32. Table 3, Summary Table, of Non-Purgeable Volatile Organic Compounds, Private Water Wells Sampled for Bandera Ground Water Plume Site No. R00061; Phase 2 Sampling, Compiled by Daniel B. Stephens & Associates (DBS&A), August 25-26, 2004. 2 pages (0 through 1 page).

33. Table 3, Summary Table, of Non-Purgeable Volatile Organic Compounds, Private Water Wells Sampled for Bandera Ground Water Plume Site No. R00061; Phase 3 Sampling, Compiled by Daniel B. Stephens & Associates (DBS&A), December 15-16, 2004. 4 pages (0 through 3 pages) .

34. Reserved.

35. Reserved.

36. Reserved.

37. Edwards Aquifer Authority - Bandera Road Ground water Plume Investigation information, including Scale Drawings of the location of the area of study (Leon Valley) relative to the Edwards Aquifer recharge and artesian zones, and includes a schematic drawing of a geologic cross section along Bandera Road. The geologic cross-section is based on analyses of eleven geophysical well-logs of wells located adjacent to Bandera Road. 7 pages.

38. Reserved.

39. Texas Board of Water Engineers - Bulletin #5911 - Arnow, Ted, Geologist - Ground water Geology of Bexar County, Texas. October, 1959. 49 pages.

40. Texas Water Development Board (TWDB) - Excerpts from Report 296, Carbonate Geology and Hydrology of the Edwards Aquifer in the San Antonio Area, Texas, 1984. 21 pages.

41. Edwards Aquifer Authority - Two Geophysical Well Logs from wells in the Leon Valley area located on Grissom (TCEQ DW-32, monitored by the TCEQ) and Sawyer Road (well not monitored by the TCEQ). March, 2005. 2 well logs, 10 pages (1 through 9 pages).

42. Texas Water Development Board (TWDB) Ground Water Data - Driller's Logs from thirty-four (34) wells located within 2.0 miles of TCEQ DW-43A Well. 93 pages.

43. Reserved.

REFERENCE LISTING (continued...)

Number Description of the Reference

44. Texas Commission on Environmental Quality (TCEQ) - Record of Communications for drinking water population count, by Robert Musick, TCEQ Project Manager. October 24-31, 2005. 8 pages.

45. ECS Environmental Chemistry Services, Data Usability Summary for the November 16-18, 2005 Sampling Event; Bandera Road Ground Water Plume. 206 pages

46. Potential Responsible Party (PRP) List identified from Field Surveys and Internet Search. 10 pages.

47. URS Corporation - November 2005 Quarterly Ground Water Monitoring Report; Sampling Event for November 16, 17 and 18, 2005 for the Bandera Road Ground Water Plume Site, San Antonio, Texas; Work Order No. 179-0017; Prepared for the Texas Commission On Environmental Quality, Austin, Texas, Dated January 6, 2006 received by the TCEQ on February 10, 2006. 36 pages.

48. U.S. Environmental Protection Agency (EPA), Water Quality - Region 6; Query Results for Designation of Sole Source Aquifers and Sole Source Aquifer Protection Program in Region VI; Specifically Edwards Aquifer, San Antonio, Area as cited in the Federal Register Citation: 40 FR 58344 and published December 16, 1975. 6 pages.

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

2.2.1 Source Identification

Number of the source: 1

Name and description of the source: Ground Water Plume (with no identified source).

In June 2004, the TCEQ Superfund Site Discovery and Assessment Program (SSDAP) conducted an SSI at the site under the PA/SI Grant Program for the U.S. EPA Region 6.

The Bandera Road Ground Water Plume site (the "site") consists of chlorinated organic constituents in ground water, primarily tetrachloroethene (PCE) and trichloroethene (TCE) originating from unidentified sources in the Leon Valley area of San Antonio. The ground water plume is centered between Poss Road and Grissom Road, approximately 590 feet southwest of Bandera Road (see Figure 2, Site Location Map). The highest concentrations of PCE and TCE generally trend north-south along Grissom Road between Bandera Road and Shadow Mist Drive. The approximate geographical boundaries of the known extent of the contaminant plume are defined by the following streets: Linklea Drive (northern boundary); El Verde Road (eastern boundary); Shadow Mist Drive (southern boundary); and, Sawyer Road (western boundary)(see Figure 2).

A total of 33 private wells and 9 PWS wells have been sampled or evaluated to define the approximate current limits of the ground water contaminant plume (Ref. 14, pp. 1-101; Ref. 31, p. 1; Ref. 32, p. 1; Ref. 33, pp. 1-3; Ref. 47, pp. 1-36; Tables 1, 8 and 11). Out of the 33 private wells in the investigation, analytical results indicate that 11 wells met the criteria for an observed release of PCE and/or TCE. Six of the 11 private drinking water wells with an observed release also have concentrations exceeding health based levels (i.e., Maximum Contaminant Levels, MCL) (Ref. 18, pp. 1-12; Ref. 47, pp. 9-13). The ground water sampling included wells (private drinking water wells and Public Water Supply (PWS) wells) that were located within a 2 mile radius from the center of the known contaminant plume (see Figures 3).

The geographical boundaries of the contaminant ground water plume are defined by 11 private drinking water wells that met the criteria for an observed release to ground water as illustrated in Figure 3. These 11 private wells show the known extent of the plume and also establish the constituents of concern that have been released to ground water (see Table 1).

In response to the contamination found in private drinking water wells in the area that exceed MCL, the TCEQ installed Granulated Activated Charcoal (GAC) water filtration systems on five (5) private wells (Ref. 47, p. 4). TCEQ contractors also conducted a door-to-door well survey to locate any additional private wells within a 1.5 mile radius of this area (Ref. 22, p. 1-7; Ref.8, pp. 1-14; Figure 3).

The source of the PCE and TCE contamination is unknown and the area of contamination remains widely undefined. Previous investigations have suggested several potential source areas near the drinking water wells located on Grissom Road (Ref. 23, pp. 1-2, 19-20). Searches for potential sources have identified dry cleaners, automobile related service facilities, and several light industrial sites. A search for potential sources of ground water impacts within an approximate two-mile radius of the center of the contaminant plume has resulted in the identification of 21 current or former dry cleaners; 26 current or former automobile related service facilities; and, four (4) light-industrial sites (Ref. 23, pp. 24-26; Ref. 46, pp. 1-10).

Because approximately 51 potential sources that have been identified and the source(s) for the release are unknown, a ground water plume with no identified source was used for the source description. The ground water plume was characterized based on the following:

- The extent of the plume, although not fully demarcated, was defined for the purpose of this report using the criteria for an observed release to the Ground Water Migration Pathway; and,

- The level of effort to identify the original source(s) of the hazardous substances was equivalent to an Expanded Site Inspection (ESI).

  a. An initial environmental assessment was conducted at 6703 Bandera Road for a dry cleaner located near the intersection of Bandera and Grissom Road (Ref. 23, pp. 1-27). The assessment of the property located at 6703 Bandera Road resulted in soil borings to evaluate the property at 6715 Bandera Road; a water well survey and sampling program of 8 wells located within a ½ mile radius of the property; and, PRPs within a ½ mile radius of the property (Ref. 23, pp. 12-13). The assessment was inconclusive regarding the sources of the ground water release.

  b. The TCEQ conducted subsequent response actions from May 2004 through December 2005 that resulted in sampling of 32 private wells located within a 2 mile radius of the center of the plume (Ref. 47, p. 4). To date, approximately 130 samples have been collected from the 32 wells over four sampling events in 2004 and 2005 (Ref. 8, pp. 8-57; Ref. 9, pp. 1-47; Ref. 10, pp. 1-89; Ref. 11, pp. 1-91; Ref. 12, pp. 1-39; Ref. 31, p. 1; Ref. 32, p. 1; Ref. 33, pp.1-3; Ref 47 p. 1-36). Also, the TCEQ has identified approximately 51 PRPs within approximately a 2 mile radius of the center of contamination (Ref. 23, pp. 24-26; Ref. 46, pp. 1-10). The TCEQ response actions have demarcated the PCE and TCE plume associated with observed releases to ground water (see Figure 3), but have not determined the source(s) of the release to the ground water due to the karst conditions associated with the Edwards Aquifer (Ref. 25, p. 3).

Location of the source, with reference to a map of the site:
The current identified boundaries of the plume are as follows: Linklea Drive (northern boundary); El Verde Road (eastern boundary); Shadow Mist Drive (southern boundary); and, Sawyer Road (western boundary)(see Figure 2).

Source type for HRS evaluation purposes: Ground Water Plume (Other).

Containment

Gas release to air: The air migration pathway was not scored; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not scored; therefore, particulate containment was not evaluated.

Release to ground water: The Containment Factor Value for the ground water migration pathway was evaluated for "All Sources" for evidence of hazardous substance migration from source area (i.e., source area includes source and any associated containment structures). The applicable containment factor value was determined based on existing analytical evidence of hazardous substances in ground water samples from private and public wells. Therefore, based on no liner and evidence of a release, the highest Ground Water Migration Pathway Containment Factor Value of 10 was assigned to Source No. 1 as specified in Table 3-2 of the HRS Rule (Ref. 1, Section 3.1.2.1).

Release to surface water overland/flood migration component: The surface water pathway was not scored; therefore, surface water overland/flood migration component containment was not evaluated.

2.2.2 Hazardous Substances Associated With A Source

The ground water plume source hazardous substances are those hazardous substances for which an observed release was established within the Edwards Aquifer, the aquifer being evaluated per current EPA convention for the Ground Water Migration Pathway. The hazardous substances listed below in Table 1 were detected in samples collected by the TCEQ during the SSI sampling events tasked by the U.S. Environmental Protection Agency in June, August and December of 2004, during immediate removal activities in August and December of 2004, and during quarterly ground water monitoring in November 2005 (Ref. 8, pp. 8-57; Ref. 9, pp. 1-47; Ref. 10, pp. 1-89; Ref. 11, pp. 1-91; Ref. 45 pp. 1-206; Ref. 47 pp. 1-36).

Table 1 - Ground Water Plume (with no identified source) Source Hazardous Substances		
Hazardous Substance	**Evidence**	
	Sample Location/Well Sample Date	**References**
Tetrachloroethene (PCE)	Poss Road TCEQ DW-30A Well (pre filtration) [11/16/05]	Ref. 45, pp. 22 and 190; Ref. 47, pp. 8, 10, 16; Figure 2
	Grissom Rd. TCEQ DW-32 Well [12/15/04]	Ref. 8, p.50; Ref. 11, pp.36-37, 105, 83-93, 148-149; Figure 2
	El Verde Rd. TCEQ DW-36A Well (pre filtration) [11/17/05]	Ref. 45, pp.52-53,196; Ref. 47, pp. 8, 10, 16; Figure 2
	El Verde Rd. TCEQ DW-42 Well [12/15/04]	Ref. 8, p. 51; Ref. 11, pp.42-43, 83-93, 106, 154-155; Figure 2
	Grissom Rd. TCEQ DW-44A Well (pre filtration) [11/16/05]	Ref. 45, pp. 44, 191; Ref. 47, pp. 8, 12, 16; Figure 2
	Grissom Rd TCEQ DW-15 Well [06/15/04]	Ref. 8, p. 16; Ref. 9, pp. 4-5, 17-28, 36-37; Figure 2
	El Verde Rd. TCEQ DW-47 Well [11/18/05]	Ref. 45, pp. 106, 203; Ref. 47, pp. 8, 12, 16; Figure 2
	El Verde Rd. TCEQ DW-31 Well (pre filtration) [11/17/05]	Ref. 45, pp. 54, 196; Ref. 47, pp. 8, 10, 16; Figure 2
	Grissom Rd. TCEQ DW-43A Well (pre filtration) [11/16/05]	Ref. 45, pp. 30, 190; Ref. 47, pp. 8, 11, 16; Figure 2
	Grissom Rd. TCEQ DW-37A Well (pre filtration) [11/16/05]	Ref. 45, pp. 36, 190; Ref. 47, pp. 8, 10, 16; Figure 2

Table 1 - Ground Water Plume (with no identified source) Source Hazardous Substances (continued)		
Hazardous Substance	**Evidence**	
	Sample Location/Well Sample Date	**References**
Trichloroethene (TCE)	Poss Road TCEQ DW-30A Well (pre filtration) [11/16/05]	Ref. 45, pp. 22 and 190; Ref. 47, pp. 8, 10, 16; Figure 2
	Grissom Rd. TCEQ DW-43A Well (pre filtration) [11/16/05]	Ref. 45, pp. 30, 190; Ref. 47, pp. 8, 11, 16; Figure 2
	Grissom Rd. TCEQ DW-44A Well (pre filtration) [11/16/05]	Ref. 45, pp. 44, 191; Ref. 47, pp. 8, 12, 16; Figure 2
	Grissom Rd. TCEQ DW-37A Well (pre filtration) [11/16/05]	Ref. 45, pp. 36, 190; Ref. 47, pp. 8, 10, 16; Figure 2
	Huebner Road TCEQ DW-39 Well [12/15/04]	Ref. 8, p. 49; Ref. 11, pp. 30-31, 83-93, 96, 142-143; Figure 2
	El Verde Rd. TCEQ DW-36A Well (pre filtration) [11/17/05]	Ref. 45, pp.52-53,196; Ref. 47, pp. 8, 10, 16; Figure 2
cis-1, 2-Dichloroethene	Poss Road TCEQ DW-30A Well (pre filtration) [11/16/05]	Ref. 45, pp. 22 and 190; Ref. 47, pp. 8, 10, 16; Figure 2
	Grissom Rd. TCEQ DW-43A Well (pre filtration) [11/16/05]	Ref. 45, pp. 30, 190; Ref. 47, pp. 8, 11, 16; Figure 2

Table 1 - Ground Water Plume (with no identified source) Source Hazardous Substances (continued)		
Hazardous Substance	**Evidence**	
	Sample Location/Well Sample Date	**References**
	Grissom Rd. TCEQ DW-44A Well (pre filtration) [11/16/05]	Ref. 45, pp. 44, 191; Ref. 47, pp. 8, 12, 16; Figure 2
	Grissom Rd. TCEQ DW-37A Well (pre filtration) [11/16/05]	Ref. 45, pp. 36, 190; Ref. 47, pp. 8, 10, 16; Figure 2
	El Verde Rd. TCEQ DW-36A Well (pre filtration) [11/17/05]	Ref. 45, pp.52-53,196; Ref. 47, pp. 8, 10, 16; Figure 2

2.2.3 Hazardous Substances Available to a Pathway

Because the containment factor value for Source 1 is greater than 0, the following hazardous substances associated with Source 1 can migrate via the ground water pathway: PCE, TCE, and, cis-1, 2-Dichloroethene.

2.3 LIKELIHOOD OF RELEASE

An observed release to the Ground Water Migration Pathway has been established based on chemical analyses. Ground water samples from the aquifer being evaluated indicate that concentrations of hazardous substances are present at three times greater than the designated background levels and in concentrations greater than the corresponding SQLs.

Refer to Section 3.1.1 of this documentation record for specific information related to the observed release to the Ground Water Migration Pathway.

2.4 WASTE CHARACTERISTICS

2.4.1 Selection of Substance Potentially Posing Greatest Threat

The Mobility Factor Value for all hazardous substances that meet the criteria for an observed release by chemical analysis to one or more aquifers underlying the source(s) at the site, regardless of the aquifer being evaluated, is assigned a mobility factor value of 1 (Ref. 1, Section 3.2.1.2).

Contaminant characteristic values for hazardous substances found in an observed release to ground water were derived from SCDM (Ref. 3). The hazardous substance with the highest toxicity/mobility factor value available to the ground water migration pathway is TCE (10,000). Therefore, the hazardous substance TCE is the hazardous substance associated with this source posing the greatest threat (Ref. 1, Sections 2.4.1.2, 3.2.1).

Specific factors of the hazardous substances available to the Ground water Migration Pathway and selection of the hazardous substance with the highest combined factor value (toxicity and mobility), are presented under the Ground water Migration Pathway section (Ref. 1, Section 3.2.1) of this documentation record.

2.4.2. Hazardous Waste Quantity

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity (Tier A) - Not Evaluated (NE)

The information available is not sufficient to evaluate Tier A, as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier B, hazardous waste quantity (Ref. 1, Section 2.4.2.1.1).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B) - NE

The information available is not sufficient to evaluate Tier B, as required in Section 2.4.2.1.2 of the HRS Rule. As a result the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier C, volume (Ref. 1, Section 2.4.2.1.2).

2.4.2.1.3 Volume (Tier C)

Since the hazardous wastestream was not adequately determined under Tier B, the volume will be evaluated under Tier C. For the migration pathways, the source is assigned a value for volume using the appropriate Tier C equation from Table 2-5 (Ref. 1, Section 2.4.2.1.3). The hazardous waste quantity for a plume site with no identified source can be determined by measuring the area within all observed release samples combined with the vertical extent of contamination, to arrive at an estimate of the plume volume (Ref. 20, p. 4).

Since the extent of the ground water plume is unknown, the volume for the ground water plume will be designated as unknown, but greater than zero.

2.4.2.1.4 Area (Tier D) - 0

The area measure (Tier D) is not evaluated for source type "other" (Ref.1, Table 2-5; Ref. 20, p. 4).

2.4.2.1.5 Source Hazardous Waste Quantity Value

As described in the HRS Rule, the highest value assigned to a source from among the four tiers of hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C) or area (Tier D) shall be selected as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1).

Table 2 - Source 1 Ground water Plume (with no identified source)
Source Hazardous Waste Quantity

Tier Measure	Migration Pathway (Ground water)
Tier A, Constituent Quantity	NE
Tier B, Wastestream Quantity	NE
Tier C, Volume	Unknown, but > 0
Tier D, Area	0

NE = Not Evaluated

Source 1 - Hazardous Waste Quantity Value: > 0

SITE SUMMARY OF SOURCE DESCRIPTIONS

Table 3
Site Summary of Source Descriptions

Source Number	Source Hazardous Waste Quantity Value	Containment			
		Ground water	Surface Water	Gas	Air Particulate
1	Unknown, but > 0	10	NE	NE	NE

NE = Not Evaluated

A hazardous waste quantity factor value of 100 is assigned for the ground water migration pathway due to Level I concentrations in drinking water wells (see Section 3.2.2 of this documentation record) (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100

3.0 GROUND WATER PATHWAY

3.0.1 GENERAL CONSIDERATIONS

The Edwards Group and Georgetown Formation are considered one hydrological unit. Minor faults exist in the investigation area (within 2 miles of the center of the contaminant plume) but aquifer discontinuities were not observed within the known ground water contaminant zone that would inhibit lateral hydraulic communication (Ref. 37, pp. 3, 4). The karst and fractured limestone conditions associated with the geologic formations establish effective porosity that provide efficient pathways for contamination to enter the aquifer and migrate through fractures, etc. (Ref. 25, pp. 3, 5; Ref. 37, pp. 1-7; Ref. 39, p. 19; Ref. 40, p. 6, 9, 16; Ref. 42, pp. 5, 24, 28, 31, 32, 38, 43, 69, 75).

The aquifer that has been impacted by the Bandera Road Ground Water Contaminant Plume is called the Edwards Aquifer (Ref. 25, pp. 1-9). The Edwards Aquifer serves over a million people in south-central Texas (Ref. 25, pp.3, 8). The U.S. Environmental Protection Agency has designated the Edwards Aquifer as a Sole Source Aquifer as per the Code of Federal Regulations (CFR) 40 FR 5834 (Ref. 48, pp. 1- 6).

Geologically, the Edwards Aquifer is made up of the Edwards Group and Georgetown Formation. The Edwards Group can be further divided into the Kainer and Person Formations. The Kainer Formation is divided into the Grainstone, Kirschberg Evaporite, Dolomitic, and Basal Nodular Members, while the Person is divided into the Cyclic, Marine, Leached, Collapsed and Regional Dense Members. The Glen Rose Formation of the Trinity Group is the lower confining layer and the Del Rio Clay is the upper confining layer of the Edwards Aquifer. Overlying these formations are the Buda Limestone and Eagle Ford Shale. All of these formations and groups were formed on the San Marcos Platform during Cretaceous times (Ref. 25, p.6; Ref. 40, p. 8).

Regionally, the Edwards Aquifer is made up of eight aquifer units confined by the Eagle Ford Shale, Buda Limestone, and Del Rio Clay (upper confining beds) and the Glen Rose Formation (lower confining bed). See Table 4 for the typical stratigraphic correlations of the Edwards Aquifer in the region (Ref. 25, p. 6). In the Lower Cretaceous, hydrogeologic subdivision Unit I correlates to the Georgetown, where Units II, III, and IV correlate to the Person Formation, and Units V, VI, VII, and VIII correlate with the Kainer Formation (Table 4 of this document). Overlying the Edwards Aquifer are several stratigraphic units, such as the Austin Chalk and Quaternary Alluvium, that yield ground water (Ref. 39, Table 1, p. 16), and are a source of ground water recharge (Ref. 25, pp. 3, 8; Ref. 40, p. 3).

Within 2 miles of the study area, the Person and Kainer Formations are considered one hydrologic unit consistent with the historic regional approach (Ref. 37, pp. 3, 4; Ref. 39, pp. 22, 27; Ref. 40, pp. 3, 10, 11). Drilling logs from wells within the investigation area identify karst and/or fractured limestone conditions along with faulting which promotes hydraulic communication within the Edwards Aquifer (Ref. 25, pp. 3, 5; Ref. 40, p. 6, 9, 16; Ref. 42, pp. 5, 24, 28, 31, 32, 38, 43, 69, 75; Ref. 37. pp. 1-7; Ref. 39, p. 19).

TABLE 4. Hydrogeologic subdivisions, formations, members and lithologies of the Edwards Aquifer, Bexar County, Texas (Ref. 25, p. 6).

Hydrogeologic subdivision			Group, formation, or member			Hydrologic function	Thickness (feet)	Lithology	Field identification	Cavern development	Porosity/ permeability type
Upper Cretaceous	Upper confining units		Eagle Ford Group			CU	30 – 50	Brown, flaggy shale and argillaceous limestone	Thin flagstones; petroliferous	None	Primary porosity lost/ low permeability
			Buda Limestone			CU	40 – 50	Buff, light gray, dense mudstone	Porcelaneous limestone with calcite-filled veins	Minor surface karst	Low porosity/low permeability
			Del Rio Clay			CU	40 – 50	Blue-green to yellow-brown clay	Fossiliferous; *Ilymatogyra arietina*	None	None/primary upper confining unit
Lower Cretaceous	I	Edwards aquifer	Georgetown Formation			Karst AQ; not karst CU	2 – 20	Reddish-brown, gray to light tan marly limestone	Marker fossil; *Waconella waconsis*	None	Low porosity/low permeability
	II		Edwards Group	Person Formation	Cyclic and marine members, undivided	AQ	80 – 90	Mudstone to packstone; *miliolid* grainstone; chert	Thin graded cycles; massive beds to relatively thin beds; crossbeds	Many subsurface; might be associated with earlier karst development	Laterally extensive; both fabric and not fabric/water-yielding
	III				Leached and collapsed members, undivided	AQ	70 – 90	Crystalline limestone; mudstone to grainstone; chert; collapsed breccia	Bioturbated iron-stained beds separated by massive limestone beds; stromatolitic limestone	Extensive lateral development; large rooms	Majority not fabric/one of the most permeable
	IV				Regional dense member	CU	20 – 24	Dense, argillaceous mudstone	Wispy iron-oxide stains	Very few; only vertical fracture enlargement	Not fabric/low permeability; vertical barrier
	V			Kainer Formation	Grainstone member	AQ	50 – 60	*Miliolid* grainstone; mudstone to wackestone; chert	White crossbedded grainstone	Few	Not fabric/ recrystallization reduces permeability
	VI				Kirschberg evaporite member	AQ	50 – 60	Highly altered crystalline limestone; chalky mudstone; chert	Boxwork voids, with neospar and travertine frame	Probably extensive cave development	Majority fabric/one of the most permeable
	VII				Dolomitic member	AQ	110 – 130	Mudstone to grainstone; crystalline limestone; chert	Massively bedded light gray, *Toucasia* abundant	Caves related to structure or bedding planes	Mostly not fabric; some bedding plane-fabric/water-yielding
	VIII				Basal nodular member	Karst AQ; not karst CU	50 – 60	Shaly, nodular limestone; mudstone and *miliolid* grainstone	Massive, nodular and mottled, *Exogyra texana*	Large lateral caves at surface; a few caves near Cibolo Creek	Fabric; stratigraphically controlled/large conduit flow at surface; no permeability in subsurface
	Lower confining unit		Upper member of the Glen Rose Limestone			CU; evaporite beds AQ	350 – 500	Yellowish tan, thinly bedded limestone and marl	Stair-step topography; alternating limestone and marl	Some surface cave development	Some water production at evaporite beds/relatively impermeable

3.0.2 GEOLOGY

The hydrogeologic and aquifer characteristics of the region and the investigation area (within 2 miles from the center of the contaminant plume), the geologic stratum that comprise the Edwards Aquifer or contribute to the recharge of the Edwards Aquifer are described below from the oldest (Stratum 8) to youngest (Stratum 1):

Stratum 8 Glen Rose Formation

The Glen Rose formation is the lower confining bed of the Edwards aquifer and conformably underlies the Edwards Limestone. The Glen Rose formation consists of alternating beds of hard limestone, marls, and dolomites with some zones of evaporites (Ref. 40, p. 11).

Based on the analyses of driller's logs from the Public Water Supply Well (Wurzbach No. 5) located in the investigation area, the Glen Rose Formation is approximately 780 feet below Land Surface Datum (Ref. 42, pp. 81). The Glen Rose Formation ranges in thickness from approximately 500 to 700 feet (Ref. 40, p 11).

Stratum 7 Edwards Group

In Bexar County, the Edwards aquifer comprises the Kainer and the Person Formations of the Edwards Group and the overlying Georgetown Formation. The Kainer and Person Formations typically consist of seven informal members (Table 4; Ref. 25, p. 9).

The Person Formation is typically 170 feet thick in Bexar County (Table 4). The lithology of the Person Formation is dolomitic biomicrite, which contains layers of collapsed breccias, burrowed mudstones, and stromatolitic limestone (Table 4). The cyclic and marine members, undivided, consist of small upward-grading cycles of mudstones to grainstones that range from massive to thin beds and occasionally are cross-bedded (Ref. 25, p. 7). Typically, a regional dense member (identified as Subdivision Unit No. IV on Table 4) composed of argillaceous mudstone defines the lower limits of the Persons Formation (Table 4).

The Kainer Formation ranges in thickness from approximately 260 to 310 feet in Bexar County (Table 4). The lithology of the Kainer Formation includes marine sediments consisting of fossiliferous (most commonly rudistids) mudstones and wackestones that grade upward into intertidal and supratidal dolomitic mudstones with evaporites, and terminate in a shallow marine *miliolid* grainstone (Ref. 40, p. 8). Major collapse features in the Kirschberg evaporite member were not evident in Bexar County (Ref. 25, p. 8).

Within the investigation area, analyses of driller's logs established that the Edwards Group ranges from 53 feet to 350 feet in thickness and typically is encountered at approximately 300 to 430 feet below the Datum Land Surface (DSL) (Ref. 42, pp. 4, 9, 46; Ref. 37, pp. 3-7). The Edwards Group was described in the drilling logs as dense or hard Edwards Limestone with some logs describing fractured limestone or shale strips (Ref. 39, p. 19; Ref. 42, pp. 24, 28, 31, 32, 38, 43, 67-80). The drilling logs did not differentiate the Edwards Aquifer into the Person and Kainer Formations and their subdivisions (Ref. 42, pp. 24, 28, 31, 32, 38, 43, 67-80).

Stratum 6 Georgetown Limestone

The Georgetown limestone lies disconformably on the Edwards limestone, but the disconformity is barely evident because the lithology of the two formations is so similar (Ref. 39, p.20). The Georgetown crops out in scattered small areas in a belt extending across the north-central part of Bexar County. Maximum recorded thickness of the Georgetown in the subsurface in Bexar County is 65 feet (Ref. 39, p. 20). Well drillers usually do not distinguish between the Georgetown limestone and the Edwards limestone (Table 4; Ref. 39, p. 20).

The Georgetown limestone is a reddish-brown, gray to light tan marly limestone with low porosity and low permeability (Table 4). A depositional hiatus occurred before the open marine, biomicritic Georgetown Formation was deposited. Parts of the Person Formation were above sea level during this time and were substantially eroded along the ridge of the San Marcos Platform (Ref. 25, p. 7). The Georgetown Formation generally is a marly limestone and usually contains the brachiopod *Waconella wacoensis,* formerly *Kingena wacoensis* (Roemer), pectens, and other pelecypods. Most exposures of the Georgetown Formation that were identified were from 2 to 5 feet thick, and consisted of dark reddish-brown weathered and friable material with some shaley limestone (Table 4; Ref. 25, p. 7).

Based on analyses of driller's logs located in the investigation area (e.g., located on Bandera Road, Grissom Road, Huebner Road, etc.), the thickness of the Georgetown Formation is approximately 5 feet thick and is 397 feet below DSL (Ref. 42, pp. 7-9).

Stratum 5 Del Rio Clay

The Del Rio Clay conformably overlies the Georgetown limestone. The two formations, however, can be distinguished readily because they differ in lithology, fossil content, and electrical properties. The outcrops of the Del Rio are associated with those of the Georgetown and Buda Limestones in a belt extending across the north-central part of Bexar County. The maximum recorded thickness in Bexar County of the Del Rio is approximately 60 feet and occurs in several wells in the southern part of the county. The Del Rio is predominantly blue clay which weathers greenish-yellow brown. Pyrite and gypsum are scattered throughout the formation, but the most distinguishing characteristic is the presence of large numbers of *Exogyra arietina* (Roemer), a small oyster shaped like a ram's horn (Table 4; Ref. 39, p. 20).

Based on analyses of Driller's Logs located in the investigation area (e.g., located on Bandera Road, Grissom Road, Huebner Road, etc.), the thickness of the Del Rio (Grayson Shale) is approximately 50 feet thick and is 392 feet below DSL (Ref. 42, pp. 7-9).

Stratum 4 Buda Limestone

The Buda Limestone lies conformably on the Del Rio Clay, but the contact is marked byan abrupt lithologic change both in the outcrop and in the subsurface. The Buda Limestone crops out in scattered small patches in a belt extending across the north-central part of Bexar County. The maximum recorded thickness of 80 feet (from the H. and J. Drilling Co. Annie Chapaty No. 1 well) has been observed in the extreme southern part of Bexar County. The Buda Limestone is a close-

grained, dense, hard limestone. On surface exposure this rock is usually light-colored, or tinged with gray, yellow, or blue. As seen in well cuttings, the limestone is usually of light color, although a part of the formation frequently shows as a blue rock. Black specks in the limestone is a characteristic frequently referred to by drillers in describing the cuttings from wells. The Buda Limestone is relatively impermeable, yielding only enough water for domestic use and for livestock near the area of outcrop (Table 4; Ref. 39, pp. 20-21).

Based on analyses of driller's logs located in the investigation area (e.g., located on Bandera Road, Grissom Road, Huebner Road, etc.), the thickness of the Buda Limestone is approximately 57 feet thick and is 342 feet below DSL (Ref. 42, pp. 7-9).

Stratum 3 Eagle Ford Shale

The Eagle Ford Shale lies unconformably on the Buda limestone, the uppermost formation of the Comanche series. The contact is marked by an abrupt lithologic break. The Eagle Ford Shale crops out in a few scattered small areas in the north-central part of Bexar County. In Bexar County, the Eagle Ford Shale consists chiefly of flaggy calcareous and sandy shales which are light colored in the outcrop. Interbedded with the shale are layers of hard argillaceous limestone. The Eagle Ford is dark-colored in the subsurface, and drillers commonly refer to it as "lignite." The Eagle Ford, however, does not contain true lignite but does contains fish scales and teeth which mark the formation (Table 4; Ref, 39, p. 21).

Based on analyses of driller's logs and geophysical logs of selected wells located in the investigation area (e.g., located on Bandera Road, Grissom Road, Huebner Road, etc.), the thickness of the Eagle Ford Shale is approximately 30 feet and is 295 feet below DSL (Ref. 42. pp. 7- 9).

Stratum 2 Austin Chalk

The Austin Chalk is an upper Cretaceous stratigraphic unit that is limestone and argillaceous chalky limestone that yields small to large supplies of water of good to poor quality (Ref. 39, Table 1, p. 16). The Austin chalk lies unconformably on the Eagle Ford shale in Bexar County. The Austin Chalk crops out in a discontinuous belt extending northeastward across the central part of Bexar County. Much of the outcrop boundary consists of fault lines. The maximum recorded thickness of the Austin chalk in Bexar County is 210 feet. The Austin chalk may be divided lithologically into three parts. The lowermost beds consist of hard thin-bedded limestone; the middle contains soft massive chalky limestone; and the uppermost beds consist of chalky limestone, some of which is argillaceous. On the surface, the rocks are predominantly creamy-yellow, whereas in the subsurface they are either blue, white or yellow. Fossils are particularly abundant in certain beds in the Austin Chalk. Among the most common are the oysters *Gryphaea aucella* (Roemer), *Exogyra laeviuscula* (Roemer), and *Exogyra ponderosa (*Roemer) (Table 4; Ref. 39, pp. 16, 21-22).

Based on analyses of driller's logs and geophysical logs of selected wells located in the investigation area (e.g., located on Bandera Road, Grissom Road, Huebner Road, etc.), the uppermost subsurface stratum is the Austin Chalk Formation of Cretaceous age (Ref. 37, pp. 3-5). The thickness of the Austin Chalk is approximately 167 feet thick and is typically 265 feet below DSL (Ref. 42, pp. 7-9).

Stratum 1 Quaternary Alluvium

The Quaternary Alluvium consists of silt, sand, and gravel that have been deposited along major flood plains during the Pleistocene and Holocene Epoch (Ref. 39, pp. 16, 25).

3.0.3 HYDROGEOLOGY

The Edwards Group is the primary drinking water aquifer in the region (Ref. 25, p. 3). Recharge to the Edwards occurs to a small extent, by direct infiltration of precipitation on the outcrop (Ref. 37, p. 1); to a greater extent, by seepage from the streams that cross the outcrop in the Balcones Fault Zone (Ref. 27, pp. 9, 15, 16); and, to the greatest extent, by underflow from Medina County (located to the west of Bexar County) (Ref. 37, p. 1). The amount of recharge by direct infiltration of precipitation on the outcrop is negligible in comparison to the amount of recharge from other sources. Primarily, the Edwards Aquifer is recharged in Bexar County by seepage from streams in an area drained by Cibolo, Salado, and Leon Creeks (Ref. 25, p. 3, 8; Ref. 40, p. 3; Ref. 39, pp. 10, 27).

The Edwards Aquifer and several of the units that recharge the Edwards are discussed below.

Aquifer 1 - Quaternary Alluvium

Quaternary alluvium are generally stream terraces which are composed of gravel, sand and silt and yield water of good quality (Ref. 39, p. 25). Within the investigation area (within 2 miles of the center of the contaminant plume), the soils that are hydro-geologically important are primarily classified as the Lewisville-Houston Black Series, a terrace alluvial soil associated with flood banks (Ref. 27, pp. 9, 15). Within 2 miles of the center of the contaminant plume, Huebner and Leon Creeks supply water to recharge the Quaternary Alluvium (Ref. 27, pp. 16, 17). Stream losses generally account for 60 to 80 percent of the recharge to the Edwards Aquifer in the San Antonio area, and the rest of the recharge is derived from direct infiltration in the inter-stream areas (Ref. 40, p. 3).

Aquifer 2 - Austin Chalk

The Austin Chalk supplies water for domestic or stock use where yields of 500 gpm or more were reported from several wells. Such yields may result when wells have been drilled into subsurface caverns. Some of the large yields from the Austin Chalk are believed to be obtained where the formation is in hydraulic communication (e.g., faults, secondary porosity) with the Edwards and associated limestones (Ref. 39, p. 22).

Based on cross-sections from the Edwards Aquifer Authority, minor faults appear to be present within the investigation area (within 2 miles from the center of the contaminant plume) and may contribute to the hydraulic communication between the Austin Chalk and the Edwards Aquifer (Ref. 37, pp. 3 and 4).

Aquifer 3 - Edwards Aquifer

Confining Beds - The Edwards Aquifer's upper confining beds are the Eagle Ford Shale, Buda Limestone, and Del Rio Clays (Ref. 25, p. 6; Table 4; Ref. 40, p. 10 and 11). Cross-sections of wells installed near or within the investigation area (within two miles of the center of the contaminant plume) suggest that these stratigraphic units are cumulatively approximately150 feet thick and are faulted (Ref. 37, pp. 3 and 4). The Edwards Aquifer's lower confining bed is the Glen Rose Formation. The Glen Rose generally has little permeability, but yields small quantities of water from distinct lateral zones. Vertical movement of ground water is restricted by marls with negligible permeability (Ref. 40, p. 11).

Edwards Aquifer - The seven members of the Person and the Kainer Formations, together with the overlying Georgetown Formation, makeup the eight informal hydrogeologic subdivisions of the Edwards Aquifer (Table 4; Ref. 25, p. 9). The first hydrogeologic member, the Georgetown, has negligible porosity and little permeability and actually acts more like a confining layer. Hydrogeologic subdivision VI (Kirschberg evaporite member) appears to be the most porous and permeable subdivision in the Kainer Formation (Ref. 25, p. 3; Ref. 40, p. 11). Hydrogeologic subdivision III (Leached and Collapsed members, undivided) is the most permeable subdivision in the Person Formation (Ref. 25, p. 3). Subdivision II (cyclic and marine members, undivided) is moderately porous and permeable with selective porosity (Table 4; Ref. 25, p. 3). The lithofacies of subdivisions I, IV, VIII are nearly impermeable and have effective porosities of less than 10 percent. Very permeable zones are distributed through out units II and VII. The most permeable zones occur in honeycombed rocks formed by large rudist molds and irregular openings developed in burrowed tidal wackestone deposits (Reference 40, p. 5, 6, 11).

Although there is heterogeneity in the Edwards Aquifer due to the lithologic characteristics of the different hydrogeologic subdivisions, it appears that hydraulic communication within the aquifer is fostered by movement of ground water along vertical or steeply inclined, open fractures that act as passageways by which water can enter permeable strata (Ref. 25, p. 7-9; Ref. 40, pp. 6, 11). Water moves from fractures into collapse breccias, burrowed wackestones, and rudist grainstones that have significant intrinsic permeability (Ref. 40. pp. 19, 20). Aquifer tests in the vicinity of the investigation area establish that the Edwards is under confined conditions and has a hydraulic conductivity in ft/day that ranges from 1.59 E+00 to 1.40E+04 (Ref. 42, pp. 90-93). The Person and the Kainer hydrologic units are considered one aquifer because of the following:

1. Traditionally the Edwards aquifer has been considered one aquifer (Ref. 25, p. 3, 5, 7; Ref. 39, p. 27; Ref. 40, pp. 10-11). In Bexar County, the Edwards aquifer comprises the Kainer and Person Formations of the Edwards Group and the overlying Georgetown Formation in rocks of Lower Cretaceous age (Ref. 25, p. 3, 5, 6, 7; Ref. 39, p 17; Ref. 40, pp. 10, 11).

2. The drinking water supply for a large portion of the City of Leon Valley and for portions of San Antonio, Texas are from the City of San Antonio's Public Water Supply (PWS) wells identified as Wurzbach Wells Nos 1 through 6. These six PWS Wells serve a population of

approximately 86,444 people (Ref. 6, pp. 5-65). These wells are fully screened across the entire Edwards aquifer (the Georgetown, Person and the Kainer Formations) (Ref. 42, pp. 67- 82). Therefore, the drinking water for the population in the area is a mixture of water from these hydrological units.

3. Subdivision Unit No. IV on Table 4 of this document describes a regional dense member composed primarily of argillaceous mudstone that defines the lower limits of the Person Formation. Drilling logs within two miles of the investigation area do not support a continuous regional dense member being present (Ref. 42, pp. 1-93).

4. A review of the driller logs indicate that the majority of these wells (both private drinking water and PWS) were cased only through the Del Rio Clay (Ref. 42, pp. 5, 24, 28, 31, 32, 38, 43, 67, 69, 75). Wells installed into the Edwards aquifer, both private and public water wells, were "open bore" or "open hole" for the length of the well that transects the Edwards Aquifer (Georgetown, Person, and Kainer Formations). Drilling logs in the vicinity of the investigation area document this practice (Ref. 42, pp. 1-93). Based on communication with the well owners and further documented by several of the drilling logs, the hydraulic pumps are typically placed in the open hole portion of the well (Ref. 44, pp 1-8 ; Ref. 42, pp. 67-77).

3.0.4 DEPTH TO GROUND WATER

Based on water well owners reports, and review of selected drillers logs located in the investigation area (within 2 miles of the center of the contaminant plume), the depth to the static water level typically ranges from 120 to 212 feet below DSL (Ref. 42, pp. 3-89).

Well depths from private water wells in the investigation area are between 280 to 500 feet below DSL (Ref.44, pp 1-8; Ref. 42, pp. 1 and 2). Several of the City of San Antonio's Public Water Supply (PWS) wells (i.e., Wurzbach Wells) range in depth from 780 to 824 feet below DSL (Ref. 42, pp.1, 2, 67-82).

Data supplied by the Edwards Aquifer Authority (EAA) based on analyses of geophysical logs of ten wells located along Bandera Road (approximately 3.75 miles along Bandera Road) and information from two additional Geophysical Logs of wells located at 2005 Grissom Road and 6208 Sawyer indicate the depth to the top of the Georgetown Formation of the Edwards Group ranges from an estimated 280 to 410 feet below DSL (Ref. 37, pp. 3-4, 6-7; Ref. 41, pp. 1-2).

3.0.5 DISCONTINUITIES AND FAULTS

Regionally, the site falls within the Balcones Fault Zone (Ref. 25, p. 3 and 6; Ref. 39, p. 36). The Balcones Fault Zone is a series of en echelon and normal faults, with the downward fault toward the coast (Ref. 25, p.3). Discontinuous heterogeneity occurs in the Edwards Aquifer where faults place rocks of significantly different permeabilities in laterally adjacent positions. This type of heterogeneity, which is very common in the Edwards Aquifer, exerts a major control on the direction

of ground water flow. According to the U.S. Geologic Survey, 50% vertical displacement has to occur before permeable zones are faulted against impermeable zones to produce no flow barriers (Ref. 40, p. 12).

Within the investigation area (within 2 miles of the center of the contaminant plume), the site lies between two minor faults which (Ref. 37, pp. 3-4) have less than 50% vertical displacement (approximately 40 feet) for the Edwards Aquifer; therefore no discontinuities appear to exist (Ref. 37, pp. 3-4; Ref. 40, p. 12). However, the ground water contamination is confined between the two minor faults which may indicate that the faults are acting as a partial barrier to perpendicular ground water flow as stated in Ref. 40, p. 12.

3.1 LIKELIHOOD OF RELEASE

3.1.1 Observed Release

Aquifer Being Evaluated: Edwards Aquifer (Aquifer 3)

An observed release to Aquifer 3 has been documented. This aquifer is the sole-source of drinking water for many private well owners in the Bandera Road - Grissom Road (Leon Valley) area (Ref. 47, pp. 1- 4).

Chemical Analysis

An observed release has been documented to the ground water pathway for the site by chemical analysis (see Table 8). Establishing an observed release by chemical analysis requires analytical evidence of a hazardous substance in the media significantly above the background level. If the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds its own sample quantitation limit and that of the background sample (Ref. 1, Section 2.3, Table 5).

Background Concentration

One private well and one PWS well were designated as background wells and were used to determine background levels of the Contaminants of Concern (COC), Tetrachloroethene (PCE), Trichloroethene (TCE) and cis-1, 2-Dichloroethene (DCE) (Ref. 8, pp. 19, 32-33; Ref. 21, p. 20). These two (2) sampling locations for the background ground water samples are up gradient of the ground water plume or outside of the suspected ground water plume area (Figure 2). The addresses of these background wells are as follows:

1. PWS ID #0150208 designated as TCEQ DW-14 located on Eckhert Road, in the northern part of the investigation area (Ref 8, pp. 32-33; Ref. 21, p. 20; Ref. 28, p.7; Ref. 32, p. 1; Figure 2), and
2. TCEQ DW-48 Well located on Sawyer Road, on the western edge of the investigation area (Ref. 8, p. 19; Ref. 21, p. 20; Ref. 31, p. 1; Figure 2).

The drinking water samples from these wells were collected during the Phases 1 and 2 Sampling Events in June and August, 2004, respectively (Ref. 8, pp. 19, 32-33; Ref. 21, p. 20).

The background ground water samples were collected upgradient (non-impacted wells) and in the Edwards Aquifer, the same aquifer as the observed release samples. The private drinking water wells with observed releases and the background wells typically have similar well construction (open hole" screened intervals) that range from approximately 280 to 800 feet below the DSL depending on the thickness of the Edwards Aquifer (Ref. 44, pp. 1, 4, 6; Ref. 42, pp. 1-89). The Public Water Systems Details/Data Sheet for PWS ID #0150208 (identified as TCEQ DW-14) indicates that this well is 360 feet deep. Review of driller's logs for a well located 0.14 mi. WSW of the TCEQ DW-14 Well, (State ID #6828706, Balcones Utilities), indicates it is 742 feet deep with an open-hole interval between 361 feet and 720 feet (Ref. 42, pp. 15, 16). Review of the driller's log for another nearby well (State Well ID #6827909, Linkwood Water Co.) located 0.46 mi. west of TCEQ DW-14 Well indicates it is 450 feet deep with an open-hole interval between 393 feet and 450 feet (Ref. 42, pp. 3- 4).

The owner of TCEQ DW-48 Well (a.k.a. DW-11 in cited references) located on Sawyer Road reported that the well is 400 feet deep (Ref. 8, p. 19; Ref. 21, p. 20; Ref. 31, p. 1). No State ID Number was found for this well and no documentation for this well has been retrieved. However, review of driller's logs for two nearby wells located on Sawyer Rd. (State ID Numbers #6836122 & #6836123) indicate the first well to be 390 feet deep with the well casing to 265 feet and an open hole from 265 feet to 390 feet; and the second well to be 400 feet deep with casing to 141 feet and an open hole from 141 feet to 400 feet (Ref. 42, pp. 50-53).

Review of the above-noted wells' respective driller's logs, along with the review of approximately thirty (30) other driller's logs of wells in this area (all within a 2-mile radius of the TCEQ DW-30A) well indicate that most of the private wells in this area are not screened at any one specific interval but rather are drilled to various Total Depths (TDs), then cased to approximately the same depth, and completed by leaving the wells as open holes to their TDs. The TDs of these wells vary considerably, but most of these wells are cased to the 300-foot to 400-foot depth, with the remainder of the bore-holes to the TD's being completed as open holes. Therefore, indications are that these wells are in the Edwards Aquifer (Ref. 42, pp. 4, 9, 17, 31, 45-46, 54-56, 67, 70-71, 81).

The hazardous substances associated with Source 1, PCE, TCE and DCE, were not detected in the background ground water samples (Table 6).

Background Samples

Two (2) ground water samples were collected during the site sampling investigations to be used as background samples. On June 15, 2004 during the EPA SSI sampling event one ground water sample from TCEQ DW-48 well was collected outside of the suspected ground water plume area (Ref. 8, p. 19 , Note: identified as DW-11 in Reference 8; Ref. 9, pp. 10-11, Note: identified as DW-11 in Reference 9; Ref. 21, p. 20; and Figure 2). On August 25, 2004, another ground water sample from TCEQ DW-14 Well, was collected up gradient of the suspected ground water plume for additional background attribution (Ref. 8, pp. 32-33; Ref. 10, pp. 10-11; Figure 2). Table 5 provides a summary of the background sample descriptions and Table 6 provides a summary of the background sample results.

Table 5
Ground Water Migration Pathway
Background Sample Descriptions

Well ID/ Street Address	Date Collected	Well Depth/ Screened Interval	References
TCEQ DW-48Well Sawyer Road (a.k.a. DW-11 in cited references)	06/15/04	Owner estimates well 400 feet deep Screened Interval unknown	Ref. 8, p. 19; Ref. 21, p. 20; Figure 2
TCEQ DW-14 Well Eckhert Road	08/25/04	well 360 feet deep Screened Interval unknown	Ref. 8 , pp. 32-33; Ref. 44, p. 6 Figure 2

Table 6
Ground Water Plume (with no identified source)
Background Sample Results

Well No./Sample Location	Background Samples			
	Hazardous Substances	**Sample Concentrations (µg/L)**	**MQL (µg/L)**	**References**
TCEQ DW-48 Sawyer Road	Tetrachloroethene (PCE)	ND	0.50	Ref. 9, pp.10-11, 17-28, 42-43, identified as DW-11 in Reference 9
	Trichloroethene (TCE)	ND	0.50	
	cis-1, 2-Dichloroethene (DCE)	ND	0.50	
TCEQ DW-14 Eckhert Road	Tetrachloroethene (PCE)	ND	0.50	Ref. 10, pp. 10-11, 34-47, 51, 65-66
	Trichloroethene (TCE)	ND	0.50	
	cis-1, 2-Dichloroethene (DCE)	ND	0.50	

Notes: ND = Not Detected at the SQL. [SQL] = Sample Quantitation Limit.

All samples were collected according to the EPA approved, FY 2004-2005 TCEQ Quality Assurance Project Plan (Ref. 15).

Contaminated Samples

The following samples meet the observed release criteria and are presented below indicating organic hazardous substances with their concentrations and MQLs. These samples were qualified as "releases" based on the criteria in Table 2-3 of the HRS Rule (Ref. 1, Section 2.3). The well locations are shown in Figure 2.

TABLE 7
Ground Water Migration Pathway
Observed Release Sample Descriptions

Well ID	Sample Location/Event	Date Collected	Location Reference
TCEQ DW-15	Drinking water well sample collected on Grissom Road.	6/15/2004	Figure 2; Ref. 8, p. 16; Ref. 7, p. 1
TCEQ DW-47	Drinking water well samples collected on El Verde Road (TCE the COC in this well).	6/16/2004	Figure 2; Ref. 8, p. 26-27, a.k.a DW-9 in reference; Ref. 7, p. 2, (a.k.a DW-9 in reference
TCEQ DW-30A	Drinking water well sample collected on Poss Road **(TCEQ installed GAC water filtration system on this well)**.	11/16/2005	Figure 2; Ref. 47. pp. 4, 8, 16 and 26
TCEQ DW-43A	Drinking water well sample collected on Grissom Road **(TCEQ installed GAC water filtration system on this well)**.	11/16/2005	Figure 2; Ref. 47. pp. 4, 8, 16 and 26
TCEQ DW-44A	Drinking water well sample collected on Grissom Road **(TCEQ installed GAC water filtration system on this well)**.	11/16/2005	Figure 2; Ref. 47. pp. 4, 8, 16 and 36
TCEQ DW-37A	Drinking water well sample collected on Grissom Road **(TCEQ installed GAC water filtration system on this well)**.	11/16/2005	Figure 2; Ref. 47. pp. 4, 8, 16 and 36

TABLE 7
Ground Water Migration Pathway
Observed Release Sample Descriptions

Well ID	Sample Location/Event	Date Collected	Location Reference
TCEQ DW-39	Drinking water well sample collected on Huebner Road (TCE is COC in this well).	12/15/2004	Figure 2; Ref. 8, p.49; Ref. 7, p. 10; Site Photos #13, 3rd Sampling Event
TCEQ DW-32	Drinking water well sample collected on Grissom Road.	12/15/2004	Figure 2; Ref. 8, p. 50; Ref. 7, p. 11; Site Photos #15 & #164, 3rd Sampling Event
TCEQ DW-36A	Drinking water well sample collected on El Verde Road **(Owner installed GAC water filtration system on this well)**.	11/17/2005	Figure 2; Ref. 47. pp. 4, 8, 16 and 28
TCEQ DW-42	Drinking water well sample collected on El Verde Road.	12/15/2004	Figure 2; Ref. 8, p. 51; Ref. 7, p. 13; Site Photos #19, 3rd Sampling Event
TCEQ DW-31	Drinking water well sample collected on El Verde Road **(TCEQ installed GAC water filtration system on this well)**.	11/17/05	Figure 2; Ref. 47. pp. 4, 8, 16 and 28

TABLE 8
Analytical Results,
Observed Release Characterization Samples

Sample Location	Hazardous Substances	Concentration (µg/L)	Qualifier	MQL (µg/L)	Reference
TCEQ DW-15	**Tetrachloroethene**	**1.17**		**0.50**	Ref. 9, pp. 4-5, 17-28, 36-37; Ref. 12, p. 34; Ref. 31; Figure 2
	cis-1, 2-Dichloroethene	ND		0.50	
	Trichloroethene	ND		0.50	
TCEQ DW-47	**Tetrachloroethene**	**5.01**	*	**0.50**	Ref. 45, pp. 106, 203; Ref. 47, pp. 12, 16; Figure 2
	cis-1, 2-Dichloroethene	0.38	J	0.50	
	Trichloroethene	0.26	J	0.50	

Notes: **Shaded and bold** = The sample met observed release criteria for that hazardous substance.
ND = Not detected at the Reporting Limit.
J = Analyte detected below quantitation limits.
* = Value exceeds Maximum Contaminant Level
MQL = Method Quantitation Limit.
MCL - Maximum Contaminant Level (Health Based Level).

TABLE 8 (continued) Analytical Results, Observed Release Characterization Samples					
Sample Location	**Hazardous Subtances**	**Concentration (µg/L)**	**Qualifier**	**MQL (µg/L)**	**Reference**
TCEQ DW-30A (pre filtration)	**cis-1, 2-Dichloroethene**	**2.79**		**0.50**	Ref. 45, pp. 22, 190; Ref. 47, pp. 10, 16; Figure 2
	Tetrachloroethene	**47.37**	*	**0.50**	
	Trichloroethene	**5.76**	*	**0.50**	
TCEQ DW-43A (pre filtration)	**cis-1, 2-Dichloroethene**	**1.18**		**0.50**	Ref. 45, pp. 30, 190; Ref. 47, pp. 11, 16; Figure 2
	Tetrachloroethene	**23.81**	*	**0.50**	
	Trichloroethene	**1.37**		**0.50**	

Notes: **Shaded and bold** = The sample met observed release criteria for that hazardous substance.
ND = Not detected at the Reporting Limit.
J = Analyte detected below quantitation limits.
* = Value exceeds Maximum Contaminant Level
MQL = Method Quantitation Limit.
MCL - Maximum Contaminant Level (Health Based Level).

TABLE 8 (continued) Analytical Results, Observed Release Characterization Samples					
Sample Location	**Hazardous Substances**	**Concentration (µg/L)**	**Qualifier**	**MQL (µg/L)**	**Reference**
TCEQ DW-44A (pre filtration)	**cis-1, 2-Dichloroethene**	**4.25**		**0.50**	Ref. 45, pp.44, 191; Ref. 47, pp. 12, 16; Figure 2
	Tetrachloroethene	**82.62**	*	**0.50**	
	Trichloroethene	**4.10**		**0.50**	
TCEQ DW-37A (pre filtration)	**cis-1, 2-Dichloroethene**	**2.02**		**0.50**	Ref. 45, pp. 36, 190; Ref. 47, pp. 10, 16; Figure 2
	Tetrachloroethene	**27.55**	*	**0.50**	
	Trichloroethene	**1.82**		**0.50**	

Notes: **Shaded and bold** = The sample met observed release criteria for that hazardous substance.
ND = Not detected at the Reporting Limit.
J = Analyte detected below quantitation limits.
* = Value exceeds Maximum Contaminant Level
MQL = Method Quantitation Limit.
MCL - Maximum Contaminant Level (Health Based Level).

TABLE 8 (continued) Analytical Results, Observed Release Characterization Samples					
Sample Location	**Hazardous Substances**	**Concentration (µg/L)**	**Qualifier**	**MQL (µg/L)**	**Reference**
TCEQ DW-39	cis-1, 2-Dichloroethene	ND		0.50	Ref. 11, pp. 30-31, 83-93, 142-143; Ref. 12, p. 39; Ref. 33; Figure 2
	Tetrachloroethene	ND		0.50	
	Trichloroethene	**0.96**		**0.50**	
TCEQ DW-32	cis-1, 2-Dichloroethene	ND		0.50	Ref. 11, pp. 36-37, 83-93, 148-149; Ref. 12, p.39; Ref. 33; Figure 2
	Tetrachloroethene	**3.35**		**0.50**	
	Trichloroethene	ND		0.50	

Notes: **Shaded and bold** = The sample met observed release criteria for that hazardous substance.
ND = Not detected at the Reporting Limit.
J = Analyte detected below quantitation limits.
* = Value exceeds Maximum Contaminant Level
MQL = Method Quantitation Limit.
MCL - Maximum Contaminant Level (Health Based Level).

TABLE 8 (continued) Analytical Results, Observed Release Characterization Samples					
Sample Location	**Hazardous Substances**	**Concentration (µg/L)**	**Qualifier**	**MQL (µg/L)**	**Reference**
TCEQ DW-36A (pre filtration)	**Tetrachloroethene**	**36.53**	*	**0.50**	Ref. 45, pp. 52-53, 196; Ref. 47, p. 10, 16; Figure 2
	cis-1, 2-Dichloroethene	**1.51**		**0.50**	
	Trichloroethene	**1.95**		**0.50**	
TCEQ DW-42	**Tetrachloroethene**	**3.53**		**0.50**	Ref. 11, pp. 42-43, 83-93, 154-155; Ref. 12, p. 39; Ref. 33; Figure 2
	cis-1, 2-Dichloroethene	ND		0.50	
	Trichloroethene	ND		0.50	

Notes: Shaded and bold = The sample met observed release criteria for that hazardous substance.
ND = Not detected at the Reporting Limit.
J = Analyte detected below quantitation limits.
* = Value exceeds Maximum Contaminant Level
MQL = Method Quantitation Limit.
MCL - Maximum Contaminant Level (Health Based Level).

TABLE 8 (continued) Analytical Results, Observed Release Characterization Samples					
Sample Location	**Hazardous Substances**	**Concentration (µg/L)**	**Qualifier**	**MQL (µg/L)**	**Reference**
TCEQ DW-31 (pre filtration)	cis-1, 2-Dichloroethene	ND		0.50	Ref. 45, pp. 54, 196; Ref. 47, pp. 10, 16; Figure 2
	Tetrachloroethene	**0.68**		**0.50**	
	Trichloroethene	ND		0.50	

Notes: Shaded and bold = The sample met observed release criteria for that hazardous substance.
ND = Not detected at the Reporting Limit.
J = Analyte detected below quantitation limits.
MQL = Method Quantitation Limit.
MCL = Maximum Contaminant Level (Health Based Level).

Attribution:

The site is designated as a contaminated ground water plume originating from unknown source(s) where hazardous substances may have been released and seeped through the ground to the aquifer. When the source itself consists of a ground water plume with no identified source, no separate attribution is required (Ref. 1, Section 3.1.1).

The source of the PCE and TCE contamination is unknown and the area of contamination remains widely undefined. Previous investigations have suggested several potential source areas near the drinking water wells located on Grissom Road (Ref. 23, pp. 1-2, 19-20). Searches for potential sources have identified dry cleaners, automobile related service facilities, and several light industrial sites. A search for potential sources of ground water impacts within an approximate two-mile radius of the center of the contaminant plume has resulted in the identification of 21 current or former dry cleaners; 26 current or former automobile related service facilities; and, four (4) light-industrial sites (Ref. 23, pp. 24-26; Ref. 46, pp. 1-10).

Because approximately 51 potential sources that have been identified and the source(s) for the release are unknown, a ground water plume with no identified source was used for the source description.

Hazardous Substances Released:

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- cis-1, 2-Dichloroethene (DCE)

As specified in the HRS Rule (Ref. 1, Section 3.1.1), an observed release factor value of 550 was assigned to the Edwards Aquifer (Aquifer 3) since an observed release by chemical analysis was established to the aquifer.

Observed Release Factor Value: 550

3.1.2 Potential to Release

As specified in the HRS Rule, since an observed release was established for the Edwards Aquifer (Aquifer 3), the potential to release was not evaluated (Ref. 1, Section 3.1.1).

3.1.3 Likelihood of Release Factor Category Value

As stated in the HRS Rule, if an observed release is established for an aquifer, assign the observed release factor value of 550 as the likelihood of release factor category value for the aquifer (Ref. 1, Section 3.1.3). Since an observed release has been established for the Edwards Aquifer, the Observed Release Factor Value of 550 is assigned as the likelihood of release factor category value.

Likelihood of Release Factor Category: 550

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

The following toxicity, mobility and combined toxicity/mobility factor values have been assigned to those substances associated with Source No. 1, or present in the observed release, which has a containment value greater than 0.

Table 9
Waste Characteristic Toxicity/Mobility Factor Values

Hazardous Substance	Toxicity Factor Value	Mobility Factor Value *	Toxicity / Mobility Value	Reference
Tetrachloroethene (PCE)	100	1	100	Ref. 1, Sections 2.4.1.2, 3.2.1; Ref. 3, pp. 5-6
Trichloroethene (TCE)	10,000	1	10,000	Ref. 1, Sections 2.4.1.2, 3.2.1; Ref. 3, pp. 2-4
cis-1, 2-Dichloroethene (DEC)	100	1	100	Ref. 1, Sections 2.4.1.2, 3.2.1; Ref. 3, pp. 7-8

Documentation for Toxicity/Mobility Values:

*The Mobility Factor Value for all hazardous substances that meet the criteria for an observed release by chemical analysis to one or more aquifers underlying the source(s) at the site, regardless of the aquifer being evaluated, is assigned a mobility factor value of 1 (Ref. 1, Section 3.2.1.2).

Contaminant characteristic values for hazardous substances found in an observed release to the Edwards Aquifer were derived from SCDM (Ref. 3). The hazardous substance with the highest toxicity/mobility factor value available to the ground water migration pathway is TCE (10,000).

Toxicity/Mobility Factor Value: 10,000

3.2.2 Hazardous Waste Quantity

Table 10 Source Hazardous Waste Quantity Values		
SOURCE NUMBER	SOURCE HAZARDOUS WASTE QUANTITY VALUE	HAZARDOUS CONSTITUENT QUANTITY DATA COMPLETE?
1	> 0.0	NO
Total	> 0.0*	

***** According to Section 2.4.2.2. of the HRS Rule, a hazardous waste quantity factor value of 100 was assigned because the hazardous constituent quantity data is not adequately determined for one or more sources, and targets for the Ground water Migration Pathway are subject to Level I concentrations (Ref. 1, Section 2.4.2.2).

3.2.3 Waste Characteristics Factor Category Value

As specified in the HRS Rule (Ref. 1, Section 3.2.3), the Hazardous Waste Quantity Factor Value of 100 was multiplied by the highest Toxicity/Mobility Value of 10,000, resulting in a product of 1,000,000 (1.0E+06). Based on this product, a Waste Characteristics Factor Value of 32 was assigned from Table 2-7 of the HRS Rule (Ref. 1, Section 2.4.3.1).

Hazardous Waste Quantity Factor Value: 100

Waste Characteristics Factor Category Value: 32

3.3 Ground Water Pathway Targets

Public water supply and private water wells have been identified within a 4.0-mile radius of approximate center of the plume. A door-to-door water well survey was conducted by the TCEQ and a TCEQ Contractor within a 2.0 mile radius (Ref. 8, pp. 1-14). State of Texas water well reports and Public Water Supply Maps were also utilized. The ground water target populations for each private well was obtained from the residents served by the well, or if unavailable the Bexar County/Housing/Population ratio calculation of 2.78 persons per household was used (Ref. 16, p. 1). Based upon this information, the following populations were defined.

Within 0 - 0.25 miles of the approximate center of the plume there are at least 5 private water wells. Three of these private wells had Level I concentrations serving a population of 13 people. One of the private wells had Level II concentrations serving 2 people (Ref. 47, p. 16; Tables 11, 12 and 13; Figure 3).

Between 0.25 - 0.50 miles of the approximate center of the plume, there are at least 10 private water wells. Five of these private wells had Level I concentrations serving a population of 6 people. One of the private wells had Level II concentrations serving 2.78 people. Another one of the private wells (DW-48) is located on the west side of the ground water plume and is used as a background well (Ref. 47, p. 16; Tables 11, 12 and 13; Figure 3).

Between 0.50 - 1.0 mile of the approximate center of the plume, there are at least 7 private water wells and 2 PWS wells. One of the private wells had Level I concentrations serving a population of 3 people. The 2 PWS wells are the City of Leon Valley Grasshill Well #1, and Huebner Well #2, serving a population of 7,434 people. The 2 PWS wells will be counted under potential contamination (Ref. 17, pp. 1-3, 5; Ref. 47, p. 16; Table 11; Figure 3).

Between 1.0 and 2.0 miles of the approximate center of the plume, there are at least 11 private water wells and 7 PWS wells. The PWS wells are the City of San Antonio Water System (SAWS) PWS Wurzbach Wells # 1 through #6, serving a population of 86,444.22 people, and the North Breeze Mobile Home Park PWS Well DW-14 which serves a population of 67 people. The 6 SAWS wells will be counted under potential contamination. The North Breeze Mobile Home Park PWS well (DW-14) is located on the north side of the ground water plume and is used as a background well, therefore the population used from this well is not included as part of the potential contamination in Section 3.3.2.4 (Ref. 5, pp. 1-5; Ref. 6, pp. 5-65; Ref. 44, p. 6; Ref. 47, p. 16; Table 11; Figure 3).

3.3.1 Nearest Well

According to Section 3.3.1 of the HRS Rule, if one or more drinking water wells is subject to Level I concentrations, a Nearest Well Factor value of 50 is assigned.

Level of Contamination (I, II, or potential): Level I

Eight (8) drinking water wells have been documented as having Level I concentrations of PCE and/or TCE (Ref. 3; Tables 8 and 12). Well location descriptions are indicated in Table 12 of this HRS documentation record.

For a well with Level I concentrations, a Nearest Well Factor Value of 50 is assigned (Ref. 1, Section 3.3.1).

Nearest Well Factor Value: 50

Table 11
Well Identification and Specifications

Well No. & Well Location	Number of Occupants Drinking From Well		Aquifer Well Screened	Depth of Well	
	Persons	Confirm		Depth /Interval	Confirm
TCEQ DW-30A Poss Road	3 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 1	Edwards Aquifer	Estimate well depth is 300 feet Screened interval unknown	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 1
TCEQ DW-31 El Verde Road	2 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 1	Edwards Aquifer	Estimated well depth is 300 feet Estimated screened interval is 280 to300 feet	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 1
TCEQ DW-33 Sawyer Road	2 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 1	Edwards Aquifer	Estimated well depth is approx. 400 feet Screened interval is 141 to 400 feet deep	Well Information Confirmed with owner on October 24, 2005 Ref. 42, p. 54 (Well No. 20) Ref. 44, p. 1
TCEQ DW-35 William Rancher Road	2.78 Persons	Estimate	Edwards Aquifer	Estimated well depth is 450 feet Screened interval is 395 to 450 feet deept	Ref. 42, p. 66 (Well 25) Ref. 44, p. 1
TCEQ DW-36A El Verde Road	1 Person	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 2	Edwards Aquifer	Estimated well depth is 300 feet Screened interval is unknown	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 2
TCEQ DW-108 Sawyer Road	1 person	Confirmed by Occupant on site visit on October 12, 2005 Ref. 44, p. 2	Edwards Aquifer	Estimated well depth is 350 feet Screened interval unknown	Well Information Confirmed with owner on October 12, 2005 during site visit. Ref. 44, p. 2
TCEQ DW-37A Grissom Road	1 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 2	Edwards Aquifer	Estimated well depth is 350 feet Estimated screened interval is 300 to 350 feet	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 2

Table 11
Well Identification and Specifications

Well No. & Well Location	Number of Occupants Drinking From Well		Aquifer Well Screened	Depth of Well	
	Persons	Confirm		Depth /Interval	Confirm
TCEQ DW-38 Samaritan Road	2.78 Persons	Estimated	Edwards Aquifer	Estimated well depth is 350 feet Screened interval unknown	Estimate Ref. 44, p. 2
TCEQ DW-39 Huebner Road	3 Person	Confirmed by Occupant by telephone On October 25, 2005 Ref. 44, p. 2	Edwards Aquifer	Estimated well depth is 320 feet Estimated screened interval is 280 to 320 feet	Well Information Confirmed with owner on October 25, 2005 Ref. 44, p. 2
TCEQ DW- 40 Huebner Road	2 Persons	Confirmed by Occupant by telephone On October 25, 2005 Ref. 44, p. 3	Edwards Aquifer	Estimated well depth is 350 feet Estimated screened interval is 320 to 350 feet	Well Information Confirmed with owner on October 25, 2005 Ref. 44, p. 3
TCEQ DW-41 Huebner Road	2 persons (Employees)	Confirmed by Occupant by telephone On October 25 , 2005 Ref. 44, p. 3	Edwards Aquifer	Estimated well depth is 294 feet Screened interval unknown	Confirmed by Occupant by telephone On October 31, 2005 Ref. 44, p. 3
TCEQ DW-42 El Verde Road	4 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 3	Edwards Aquifer	Estimated well depth is 300 feet Screened interval unknown	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 3
TCEQ DW-43A Grissom Road	6 Employees	Confirmed by Occupant by telephone On October 31, 2005 Ref. 44, p. 3	Edwards Aquifer	Estimated well depth is 350 feet Screened interval unknown	Confirmed by Occupant by telephone On October 31, 2005 Ref. 44, p. 3
TCEQ DW-44A Grissom Road	4 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 3	Edwards Aquifer	Estimated well depth is 400 feet Estimated screened interval is 250 to 400 feet	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 3

Table 11
Well Identification and Specifications

Well No. & Well Location	Number of Occupants Drinking From Well		Aquifer Well Screened	Depth of Well	
	Persons	Confirm		Depth /Interval	Confirm
TCEQ DW-34 Sawyer Road	4 Persons	Confirmed by Occupant by telephone On October 25, 2005 Ref. 44, p. 4	Edwards Aquifer	Estimated well depth is 350 feet Estimated screened interval is 300 to 350 feet	Well Information Confirmed with owner on October 25, 2005 Ref. 44, p. 4
TCEQ DW-32 Grissom Road	0 Persons; Sold to School District for expansion	Confirmed by site visit on October 12, 2005 Ref. 44, p. 4	Edwards Aquifer	Well Abandoned: Estimated well depth is 350 feet Unknown Screen Interval	Estimate Ref. 44, p. 4
TCEQ DW-46 El Verde Road	4 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 4	Edwards Aquifer	Estimated well depth is 350 feet Estimated screened interval is 300 to 350 feet	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 4
TCEQ DW-47- El Verde Road	0 Persons: used water for irrigation only.	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 4	Edwards Aquifer	Estimated well depth is 350 feet Estimated screened interval unknown	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 4
TCEQ DW-48 Sawyer Road	2.78 Person	Estimate	Edwards Aquifer	Estimated well depth is 400 feet deep Estimated screened interval unknown	Ref 42, pp. 54-55 (Well 20) Ref. 44, p. 4
TCEQ DW-117 Huebner Road	2.78 Persons	Estimate	Edwards Aquifer	Estimated well depth is 350 feet Estimated screened interval unknown	Estimate Ref. 44, p. 5
TCEQ DW-10 Thunderbird Road	1 Persons	Confirmed by Occupant by telephone On October 24, 2005 Ref. 44, p. 5	Edwards Aquifer	Estimated well depth is 310 feet Estimated screened interval is 280 to 300 feet	Well Information Confirmed with owner on October 24, 2005 Ref. 44, p. 5

Table 11 Well Identification and Specifications					
Well No. & Well Location	**Number of Occupants Drinking From Well**		**Aquifer Well Screened**	**Depth of Well**	
	Persons	**Confirm**		**Depth /Interval**	**Confirm**
TCEQ DW-11 **Stebbins Road**	**2 Persons**	**Confirmed by Occupant by telephone On October 25, 2005** **Ref. 44, p. 5**	**Edwards Aquifer**	**Estimated depth is 480 feet** **Estimated screened interval is estimated from 450 to 480 feet**	**Well Information Confirmed with owner on October 25, 2005** **Ref. 44, p. 5**
TCEQ DW-52 **Stebbins Road**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 350 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 5**
TCEQ DW-13 **Chaparral Road**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 360 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 6**
TCEQ DW-14 **North Breeze Mobile Home Park PWS ID#0150208 (single well)** **Eckhert Road**	**67 Persons**	**Confirmed by Owner by telephone On February 14, 2006** **Ref. 44, p. 6**	**Edwards Aquifer**	**Estimated well depth is 360 feet** **Screened interval unknown**	**Ref. 44, p. 6**
TCEQ DW-16 **Deer Lane**	**1 persons**	**Confirmed by Occupant by telephone On October 31, 2005** **Ref. 44, p. 6**	**Edwards Aquifer**	**Estimated well depth is 380 feet** **Screened interval unknown**	**Confirmed well depth by telephone on October 31, 2005** **Ref. 44, p. 6**
TCEQ DW-17 **Deer Lane**	**3 Persons**	**Confirmed by Occupant by telephone On October 24, 2005** **Ref. 44, p. 6**	**Edwards Aquifer**	**Estimated well depth is 300 feet** **Screened interval unknown**	**Well Information Confirmed with owner on October 24, 2005** **Ref. 44, p. 6**
TCEQ DW-18 **Redbird Lane**	**2 Persons**	**Confirmed by Occupant by telephone On October 25, 2005** **Ref. 44, p. 6**	**Edwards Aquifer**	**Estimated well depth is 300 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 6**

Table 11 Well Identification and Specifications					
Well No. & Well Location	**Number of Occupants Drinking From Well**		**Aquifer Well Screened**	**Depth of Well**	
	Persons	**Confirm**		**Depth /Interval**	**Confirm**
TCEQ DW-19 **Thunderbird Road**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 350 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 7**
TCEQ DW-60 **Redbird Lane**	**8 Persons**	**Confirmed by Occupant by telephone On October 31, 2005** **Ref. 44, p. 7**	**Edwards Aquifer**	**Estimated well depth is 300 feet** **Screened interval approx. 270 to 300 feet**	**Confirmed by telephone on October 31, 2005** **Ref. 44, p. 7**
TCEQ DW-21 **Bluebird Road**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 350 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 7**
TCEQ DW-23 **Redbird Lane**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 430 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 7**
TCEQ DW-15 **Grissom Road**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 350 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 7**
TCEQ DW-64 **Stebbins Road**	**2.78 Persons**	**Estimate**	**Edwards Aquifer**	**Estimated well depth is 350 feet** **Screened interval unknown**	**Estimate** **Ref. 44, p. 8**
City of Leon Valley PWS Well #1 Grasshill (blended PWS) **PWS ID# G0150178A (1 of 2 wells in system, both contributing >40% to overall system)**	**3,453.09 Persons (Ref. 17, pp.1-4)** **Well tested at 1,150 GPM contributes 46.45% to overall system population of 7,434 persons**	**Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150178**	**Edwards Aquifer**	**Well depth is 550 feet (Ref. 17, p.4)** **Screened interval unknown**	**Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150178**
City of Leon Valley PWS Well #2 Huebner (blended PWS) **PWS ID# G0150178B (1 of 2 wells in system, both contributing >40% to overall system)**	**3,980.91 Persons (Ref. 17, pp. 1-3, 5)** **Well tested at 1,326 GPM contributes 53.55% to overall system population of 7,434 persons**	**Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150178**	**Edwards Aquifer**	**Well depth is 450 feet (Ref. 17, p.5, Ref. 42, p.7-10)** **Screened interval unknown**	**Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150178**

Table 11
Well Identification and Specifications

Well No. & Well Location	Number of Occupants Drinking From Well		Aquifer Well Screened	Depth of Well	
	Persons	Confirm		Depth /Interval	Confirm
San Antonio Water System (SAWS) PWS Wurzbach Well #1 (blended PWS) PWS ID# G0150018BV (1 of 87 wells in system, with no well contributing >40%)	14,407.37 Persons (Ref. 6, pp. 5-65) Well rated at 8,750 GPM contributes <40% to overall system population of 1,253,442 persons	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018	Edwards Aquifer	Well depth is 785 feet (Ref. 6, p.54) Screened interval unknown	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018
San Antonio Water System (SAWS) PWS Wurzbach Well #2 (blended PWS) PWS ID# G0150018BW (1 of 87 wells in system, with no well contributing >40%)	14,407.37 Persons (Ref. 6, pp. 5-65) Well rated at 8,750 GPM contributes <40% to overall system population of 1,253,442 persons	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018	Edwards Aquifer	Well depth is 824 feet (Ref. 6, p.54) Screened interval unknown	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018
San Antonio Water System (SAWS) PWS Wurzbach Well #3 (blended PWS) PWS ID# G0150018BX (1 of 87 wells in system, with no well contributing >40%)	14,407.37 Persons (Ref. 6, pp. 5-65) Well rated at 6,458 GPM contributes <40% to overall system population of 1,253,442 persons	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018	Edwards Aquifer	Well depth is 808 feet (Ref. 6, p.54) Screened interval unknown	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018
San Antonio Water System (SAWS) PWS Wurzbach Well #4 (blended PWS) PWS ID# G0150018BY (1 of 87 wells in system, with no well contributing >40%)	14,407.37 Persons (Ref. 6, pp. 5-65) Well rated at 7,778 GPM contributes <40% to overall system population of 1,253,442 persons	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018	Edwards Aquifer	Well depth is 816 feet (Ref. 6, p.54) Screened interval unknown	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018
San Antonio Water System (SAWS) PWS Wurzbach Well #5 (blended PWS) PWS ID# G0150018BZ (1 of 87 wells in system, with no well contributing >40%)	14,407.37 Persons (Ref. 6, pp. 5-65) Well rated at 1,145 GPM contributes <40% to overall system population of 1,253,442 persons	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018	Edwards Aquifer	Well depth is 788 feet (Ref. 6, p.55) Screened interval unknown	Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018

Table 11 Well Identification and Specifications					
Well No. & Well Location	**Number of Occupants Drinking From Well**		**Aquifer Well Screened**	**Depth of Well**	
	Persons	**Confirm**		**Depth /Interval**	**Confirm**
San Antonio Water System (SAWS) PWS Wurzbach Well #6 (blended PWS) **PWS ID# G0150018CA (1 of 87 wells in system, with no well contributing >40%)**	**14,407.37 Persons (Ref. 6, pp. 5-65)** **Well rated at 1,395 GPM contributes <40% to overall system population of 1,253,442 persons**	**Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018**	**Edwards Aquifer**	**Well depth is 820 feet (Ref. 6, p.55)** **Screened interval unknown**	**Confirmed by the Public Water Systems Details/Data Sheet for PWS ID# G0150018**

3.3.2 Population

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

The concentrations of hazardous substance shown in Table 12 include concentrations of hazardous substances detected in 8 drinking water wells that meet or exceed their corresponding benchmark concentrations (Ref. 3, SCDM). An observed release to the Ground Water Migration Pathway has been established based on the detection of these compounds found in drinking water wells; thus, these wells are associated with Level I concentrations (Ref. 1, Section 3.3.2.1 and 3.3.2.2).

Calculations: 8 private wells (3 + 1 + 1 + 6 + 4 + 3 +0 + 4) = 22 people

As specified in the HRS Rule, (Ref. 1, Section 3.3.2.2), the number of people served by drinking water from points of withdrawal subject to Level I concentrations were summed. The total population served by the 8 Level I wells is 22. The total of 22 was multiplied by 10, for a product of 220 (Ref. 1, Section 3.3.2.2).

Level I Concentration Factor Value Calculations: 22 x 10 = 220

Table 12
Drinking Water Wells with Level I Concentrations

TCEQ Well No.	PCE & TCE Concentrations (µg/L) (as of November, 2005)	Benchmark Concentrations			Population Served	
		MCL/ MCLG (µg/L)	Cancer Risk (µg/L)	Non Cancer Risk (µg/L)	People	Reference
TCEQ DW-30A	47.37 (PCE) 5.76 (TCE)	PCE = 5.0 (Ref. 3,p.6) TCE = 5.0 (Ref. 3,p.3)	PCE = 1.6 (Ref. 3,p.6) TCE = 0.21 (Ref. 3,p.3)	PCE = 360.0 (Ref. 3,p.6) TCE = 11.0 (Ref. 3,p.3)	3 **	Ref. 44, p. 1 Tables 7&8
TCEQ DW-36A	36.53 (PCE) 1.95 (TCE)				1 **	Ref. 44, p. 2 Tables 7&8
TCEQ DW-37A	27.55 (PCE) 1.82 (TCE)				1 **	Ref. 44, p. 2 Tables 7&8
TCEQ DW-43A	23.81 (PCE) 1.37 (TCE)				6 ****	Ref. 44, p. 3 Tables 7&8
TCEQ DW-44A	82.62 (PCE) 4.10 (TCE)				4 **	Ref. 44, p. 3 Tables 7&8
TCEQ DW-39	0.96 (TCE)				3 ***	Ref. 44, p. 2 Tables 7&8
TCEQ DW-47	5.01 (PCE)				(I)	Ref. 44, p. 4 Tables 7&8
TCEQ DW-32	3.35 (PCE)				(A)	Ref. 44, p. 4 Tables 7&8
TCEQ DW-42	3.53 (PCE)				4 **	Ref. 44, p. 3 Tables 7&8

** Population served by well confirmed via telephone on October 24, 2005 (Ref. 44).
***Population served by well confirmed via telephone on October 25, 2005 (Ref. 44).
****Population served by well confirmed via telephone on October 31, 2005 (Ref. 44).
(A) Well was sold to school district for expansion project (Ref. 8, p. 05; Ref. 44, p. 4).
(I) Well is currently used for irrigation only (Ref. 44, p. 4).

Population Served by Level I Wells: 22

Level I Concentration Factor Value: 220

3.3.2.3 Level II Concentrations

The concentrations of hazardous substance shown in Table 13 include concentrations of hazardous substances detected in drinking water wells that do not meet or exceed their corresponding benchmark concentrations (Ref. 3, SCDM). An observed release to the Ground Water Migration Pathway has been established based on the detection of these compounds found in these drinking water wells; thus, these wells are associated with Level II concentrations (Ref. 1, Section 3.3.2.1 and 3.3.2.3). Level II concentrations have been documented at 2 wells within the ground water plume (see Section 3.3.2.3 of this HRS Documentation Record, Table 13).

As specified in the HRS Rule, (Ref. 1, Section 3.3.2.3), the number of people served by drinking water from points of withdrawal subject to Level II concentrations were summed, not including those people already counted under the Level I concentrations factor.

The population served by the 2 Level II private drinking water wells, not including the population served by the Level I private wells is 4.78 people.

Calculations: 2 private wells (2.78 + 2) = 4.78 people

The total population served by these 2 wells is 4.78 people. This sum is assigned as the value for this factor, for a resulting Level II Concentrations Factor Value of 4.78 (Ref. 1, Section 3.3.2.3).

Level II Concentration Factor Value Calculations: 2.78 + 2 = 4.78

Table 13
Drinking Water Wells with Level II Concentrations

Well Location	PCE Concentrations (µg/L) (as of November, 2005)	Benchmark Concentrations			Population Served	
		MCL/ MCLG (µg/L)	Cancer Risk Conc. (µg/L)	Non Cancer Risk Conc. (µg/L)	People	Reference
TCEQ DW-15	1.17 (PCE)	PCE = 5.0 (Ref. 3,p.6)	PCE = 1.6 (Ref. 3,p.6)	PCE = 360.0 (Ref. 3,p.6)	2.78 *	Ref. 16, p. 1; Ref. 44, p. 7; Tables 7 and 8
TCEQ DW-31	0.68 (PCE)				2**	Ref. 44, p. 1; Tables 7 and 8

* The estimated number of people served by a private drinking water well was calculated by using the United States Census Bureau 2000 profile of general demographic characteristics for Bexar County, Texas to determine the average number of persons per residence (Ref. 16, p.1).
** Population served by well confirmed via telephone on October 24, 2005 (Ref. 44)

Population Served by Level II Wells: 4.78

Level II Concentration Factor Value: 4.78

3.3.2.4 Potential Contamination

Two (2) City of Leon Valley PWS wells (Grasshill Well #1 and Huebner Well #2) are located within a 1 mile radius of the center of the ground water plume. Six (6) City of San Antonio Water System wells (Wurzbach Wells #1through #6) are located within 2 miles of the center of the ground water plume (see Figure 3). An observed release to the Ground Water Migration Pathway has not been established in these drinking water wells; thus, these wells are associated with potential contamination (Ref. 1, Section 3.3.2.1 and 3.3.2.4).

The City of Leon Valley PWS ID# G0150178 is a blended system that currently serves 7,434 people as of the last water system survey conducted on January 27, 2004. There are a total of 2 City of Leon Valley wells currently in service. The 2 active wells are Grasshill Well #1 and Huebner Well #2. Both of these wells provide more than 40% of the total supply capacity for the overall system, therefore, each well will be apportioned separately based on capacity. The Grasshill Well #1 is tested at 1,150 Gallons Per Minute (GPM) and contributes 46.45% to the overall system, serving a population of 3,453.09 people (1,150 GPM / 2,476 total system GPM = 46.45% x 7,434 total population = 3,453.09 people) (Ref. 17, pp. 1-4). The Huebner Well #2 is tested at 1,326 GPM and contributes 53.55% to the overall system, serving a population of 3,980.91 people (1,326 GPM / 2,476 total system GPM = 53.55% x 7,434 total population = 3,980.91 people) (Ref. 17, pp. 1-3, 5).

The City of San Antonio Water System (SAWS) PWS ID# G0150018 is a blended system that currently serves 1,253,442 people as of the last water system survey conducted on April 26, 2004. There are a total of 87 active SAWS wells currently in service. None of the active SAWS wells provide more than 40% of the total supply capacity for the overall system, therefore, all of the wells will be apportioned evenly. All of the active SAWS wells serve a population of 14,407.37 people (1,253,442 total population / 87 active wells = 14,407.37 people). The Wurzbach Wells #1 through #6 each serves 14,407.37 people (Ref. 6, pp. 5-65).

Population Calculations:
Greater than ½ to 1 mile = 3,453.09 + 3,980.91 = 7,434 people
Greater than 1 to 2 miles = 14,407.37 x 6 = 86,444.22 people

As specified in the HRS Rule, (Ref. 1, Section 3.3.2.1 and 3.3.2.4), determine the number of people served by drinking water from points of withdrawal subject to potential contamination, not including those people already counted under the Level I and II concentrations factor. Then assign the distance-weighted population values from Table 3-12 of the HRS Rule:

Distance-Weighted Population (Karst Aquifer) Calculations:
For 7,434 people greater than ½ to 1 mile = 2,607 people (Table 3-12)
For 86,444.22 people greater than 1 to 2 miles = 26,068 people (Table 3-12)

To calculate the potential contamination factor value, divide the sums of the distance-weighted population values from Table 3-12 by 10 (Ref. 1, Section 3.3.2.4). Assign this sum as the potential contamination factor value (Ref. 1, Section 3.3.2.4).

Potential Contamination Factor Value Calculations: 2,607 + 26,068 = 28,675 / 10 = 2,867.5, rounded to 2,868.

Potential Contamination Factor Value: 2,868

3.3.2.5 Calculation of Population Factor Value

As specified in the HRS Rule, (Ref. 1, Section 3.3.2.1 and 3.3.2.5), sum the factor values for Level I concentrations, Level II concentrations and potential contamination. Assign this sum as the population factor value for the aquifer.

Population Factor Value Calculations: 220 + 4.78 + 2,868 = 3,092.78

Potential Contamination Factor Value: 3,092.78

3.3.3 Resources

No resource, as defined in the HRS Rule, was documented for the aquifer being evaluated (Ref. 1, Section 3.3.3).

Resources Factor Value Assigned: 0

3.3.4 Wellhead Protection Area

According to Section 3.3.4 of the HRS Rule, if a Wellhead Protection Area (WHPA) is located either partially or fully within an area of observed ground water contamination attributable to the source(s) at the site, assign a value of 20 as the Wellhead Protection Area Factor Value (Ref. 1, Section 3.3.4).

The City of Leon Valley (PWS ID #G0150178) participates in the Wellhead Protection Area Program. TCEQ data indicates that the Wellhead Protection Areas for the City of Leon Valley, Grasshill Well #1 (PWS ID #G0150178A) and Huebner Well #2 (PWS ID #G0150178B), lie within an area on observed ground water contamination (Ref. 19, pp. 1-2). Therefore, a Wellhead Protection Area Factor Value is assigned a value of 20 (Ref. 1, Section 3.3.4).

Wellhead Protection Area Factor Value: 20

3.3.5 Calculation of Targets Factor Category Value

The target factor category value is calculated by determining the sum of the factor values for the nearest well (50), population (3,092.78), resources (0), and Wellhead Protection Area (20) (Ref. 1, Section 3.3.5).

Calculations: 50 + 3,092.78 + 0 + 20 = 3,162.78

3.4 Ground Water Migration Score for an Aquifer

The ground water migration score for an aquifer is calculated by multiplying the factor category values for likelihood of release (550), waste characteristics (32), and targets (3,162.78). Divide by 82,500, the resulting value (maximum value 100) is assigned as the ground water migration pathway score (Ref.1, Section 3.4).

Calculations: (550 x 32 x 3,162.78) ÷ 82,500 = 674.73 (100 maximum)

3.5 Calculation of Ground Water Migration Pathway Score

The Ground water Migration Pathway Score is calculated by assigning the highest ground water migration score for the Edwards Aquifer (100).

Ground Water Migration Pathway Score: 100

4.0 Surface Water Migration Pathway

The Surface Water Migration Pathway was evaluated, but not scored because the inclusion of this pathway would not significantly affect the site score.

5.0 Soil Exposure Pathway

The Soil Exposure Pathway was evaluated, but not scored because the inclusion of this pathway would not significantly affect the site score.

6.0 Air Migration Pathway

The air migration pathway was evaluated, but not scored because the inclusion of this pathway would not significantly affect the site score.