ADDENDUM TO SITE INSPECTION WORKPLAN
LAS CRUCES PCE

LAS CRUCES, NEW MEXICO

CERCLIS Number:

10 June 1999

Prepared By

christopher holmes
New Mexico Environment Department
Ground Water Quality Bureau
Superfund Oversight Section

903282

Addendum to Site Inspection Workplan
Las Cruces PCE

Table of Contents

Tables

Figures

1. INTRODUCTION

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the New Mexico Environment Department is conducting a site inspection (SI) at the Las Cruces PCE site (CERCLIS number NM0002271286) in Las Cruces, New Mexico. The original workplan for the site investigation, dated 30 December 1997, was revised to incorporate information provided by the City of Las Cruces and to take advantage of a hydrogeologic investigation at the nearby Doña Ana County maintenance yard which is a leaking underground storage tank (LUST) site. The Revised Site Inspection Workplan, dated 6 February 1998, was approved by the Environmental Protection Agency on 6 April 1998. This addendum to the workplan addresses the second phase of the SI as proposed in the revised workplan dated 6 February 1998.

Because the Las Cruces PCE site consists of contaminated ground water with no identified source of contaminant, a phased approach to the SI was proposed. The activities of each phase are contingent on information collected in the preceding phase. The first phase included reviewing, New Mexico Environment Department records and databases, New Mexico Office of State Engineer well records and publications, New Mexico Bureau of Mines publications, United States Geological Survey (USGS) publications, Las Cruces telephone books, the Comprehensive Environmental Response, Compensation, and Liability Information System the (CERCLIS) and Resource Conservation and Recovery Information System (RCRIS). In phase 1, Superfund Oversight Section staff also examined aerial photographs, collected water samples from existing production wells and monitoring wells, observed the hydrogeolgic investigation at Doña Ana county yard LUST site, and collected soil and water samples from potential waste sources.

For the phase 2 of the SI, the Environment Department proposes to use a soil gas survey to identify the locations where the contaminant of concern was discharged. The U.S. Geological survey (USGS) will provide a geoprobe, gas chromatograph, and qualified operators for the soil vapor survey.

Upon completion of the soil vapor survey, a second addendum to the workplan describing the installation and sampling of monitoring well will be submitted. When the site inspection is complete, the site will be evaluated using on Hazard Ranking System (Reference 1) and the Superfund Chemical Data Matrix (Reference 2) to determine if further action under CERCLA/SARA is warranted.

2. SITE DESCRIPTION, LOCATION, AND WASTE CHARACTERISTICS

2.1 Site Description and Location

The Las Cruces PCE site consists of contaminated ground water with no identified source of contaminant. Tetrachloroethylene, also referred to as perchloroethylene (PCE), has been detected in water samples from Las Cruces municipal wells 18, 19, 21, and 27 (Reference 3; Reference 4; Reference 5; Reference 6; Reference 7; Reference 8, pages 64-65,74-75, 92). All four of the effected wells are located in Las Cruces (Figure 1) (Reference 9; Reference 10; Reference 11; Reference 12), in an area approximately 2,500 feet by 4,000 feet (Figures 2) (Reference 9; Reference 10). Well 18

is located at 153 North Cottonwood Street (Reference 10). Well 19 is located at 101 South Triviz Drive (Reference 10). Well 21 is located at 671 North Triviz Drive (Reference 10). Well 27 is located at 2025 East Griggs Avenue (Reference 10). The effected wells range from 576 to 730 feet deep (Reference 13). The depth to water in the effected wells ranges from 208 to 250 feet (References 13). Tetrachloroethylene has not been detected in water samples from surrounding municipal wells, 10, 20, 26, 28, 54, and 57 or the Paz Park well (Reference 3; Reference 4; Reference 5; Reference 8, pages 74-75). Municipal well construction and PCE concentration information are summarized in Tables 1 and 2 on pages (Reference 3; Reference 4; Reference 5; Reference 6; Reference 7; Reference 8, pages 64-65,74-75, 92; Reference 13; Reference 14; Reference 15; Reference 16; Reference 17; Reference 18; Reference 19).

The geographic coordinates of well 18 are 32° 19' 56" latitude and 106° 45' 36" longitude (Reference 13). The effected municipal wells are located in Township 23 S, Range 2 E, sections 8 and 9 (Reference 13).

The climate of Doña Ana County is arid (Reference 20, page 4). In the basin area along the Rio Grande, temperatures reach 90° F or greater an average of 101 days a year (Reference 20, page 5). Winters are mild. The average daily minimum in January, the coolest month, is 25°F. The average daily maximum is 57°F (Reference 20, page 5). Potential evaporation and transpiration greatly exceeds rainfall (Reference 20, page 5). The net precipitation prescribed by the Hazard Ranking System for the area is 0 inches (Reference 1, page 51598).

2.2 Waste Characteristics

The contaminant of concern is PCE. It is CERCLA hazardous substance (Reference 1, pages A-721 and A-722). Tetrachloroethylene is a chlorinated solvent for fats, greases, waxes, rubber, gums, and caffeine. It is widely used for dry cleaning fabrics, cleaning metal, and vapor degreasing (Reference 21, pages 580-581). According to a study published in 1995, approximately, 15% of PCE was used for drying cleaning, 55% for manufacturing other chemicals and 10% for metal cleaning and degreasing (Reference 22, page 177). A survey conducted in 1989, indicated that 88.4% of dry cleaners in the United States used PCE (Reference 22, page 177).

Under ambient environmental conditions, PCE is a dense nonaqueous phase liquid (DNAPL) chemical (Reference 23, page 3-1). Nonaqueous phase liquids do not completely dissolve in water and may exists as two separate phases in water; a liquid (nonaqueous) phase and an aqueous (dissolved) phase (Reference 23, pages C-2 and C-3). Although the solubility of PCE in water is low, 200,000 μg/l, (Reference 2, page A-721), it is much greater than the federal maximum contaminant level (MCL) of 5 μg/l and the Superfund Chemical Data Matrix cancer risk benchmark of 1.6 μg/l for PCE (Reference 2, page A-722). Because PCE is denser than water, it sinks through the saturated zone until reaching a barrier (Reference 23, page 2-1). The subsurface movement of DNAPL is controlled substantially by the nature of the release; the density, interfacial tension, and viscosity of the DNAPL; the capillary properties of the porous media; and to a lesser extent the hydraulic forces in the aquifer (Reference 23, page 2-1). Because of their high density and low viscosity, chlorinated solvents such as PCE are highly mobile in the subsurface as a separate liquid phase (Reference 23, page 3-9).

3. WASTE SOURCE SAMPLING

3.1 Sampling Locations

The locations where PCE was discharged to ground water have not been identified. Samples were collected from potential sources to identify the locations. Sample numbers and locations are presented in Tables 3, 4, and 5 (Reference 4; Reference 5; Reference 6; Reference 7, Reference 8, pages 14, 17-20, 23-24, 29-35, 41, 51-52, 56-58, 61; Reference 25; Reference 26; Reference 27; Reference 28; Reference 29; Reference 30; Reference 31). Potential sources were identified from site reconnaissance, record review, and correspondence from City of Las Cruces staff (Figure 3) (Reference 8, pages 16, 47, 62, 91, 96-98, 113; Reference 9; Reference 10; Reference 32, Figure 1; Reference 33; Reference 34; Reference 35; Reference 36)

The Doña Ana County Transportation Department maintenance yard was identified as a potential source because of its proximity to well 18 (Figure 4) (Reference 32). During the Leaking underground storage tank (LUST) investigation at maintenance yard, Superfund Oversight Section Staff collected eighteen subsurface soil samples and submitted them for volatile organic analysis (VOA) through EPA's contract Laboratory program (CLP). The Environment Department also collected nine subsurface samples and submitted them to the New Mexico Department of Heath laboratory for VOA. A water sample was later collected from the drainage sump in the maintenance yard's diesel shop and submitted to the New Mexico Department of Heath laboratory for VOA (Figure 4) (Reference 8, page 91).

The wash pad used by the City of Las Cruces, Traffic Operations Division was identified as a potential source because of its proximity to well 27 (Figures 5a nd 5b) (Reference 8, pages 113; Reference 33). Two water and two soil samples were collected from the discharge area at a wash pad and submitted to a local laboratory for analysis (Reference 8, page 113).

The City of Las Cruces identified the former Crawford Airport and former National Guard Armory as a potential sources of chlorinated solvents (Reference 34, page 1). Both facilities are shown in an aerial from 1967 (Reference 35). The National Guard Armory is visible in aerial photographs from 1972 (Reference 36) but the airport has been replaced. The site of the airport, 1501 and 1501A Hadley is occupied by Road Runner Area Transit Service and the City of Las Cruces Support Service (Reference 8, page 80). A water sample was collected from the wash pad drain sump at the National Guard Armory (Figure 6) (Reference 8, page 96-98). Samples were not collected at former location of the Crawford airport.

Because PCE is and was widely used for dry cleaning, Environment Department staff reviewed the Las Cruces Yellow Pages for the years 1955, 1959, 1965, 1970) 1975, 1980, 1985, and 1992 ((Reference 37; Reference 38 Reference 39; Reference 40, Reference 41, Reference 42; Reference 43 Reference 44) to identify former existing dry cleaners in the area.. The nearest dry cleaner to the site listed in the yellow pages for years between 1955 and 1985, was 1.5 miles east of well 18 Figure 3. The 1992 yellow pages list two dry cleaners on Lohman Avenue 1,000-1,500 feet south of well 27. Samples were not collected from the former dry cleaner locations because their distance from the effected wells.

6The BLM-Las Cruces Landfill site, CERCLIS number NMD980864268, is located approximately 2 miles east of well 21 (Reference 45). Tetrachloroethylene was detected in a water sample collected at the site pursuant to the New Mexico Environment Solid Waste Management Regulations (Reference 46). Samples were not collected from this site for the SI because of its distance from the effected wells.

The old Las Cruces landfill site is approximately 1.5 miles east of well 19 (Reference 47). It is on Bureau of Land Management and private property. Samples were not collected from this site for the SI because of its distance from the effected wells.

3.2 Analytical Results

Trichloroethylene, 1.2 μg/l, and PCE, 3.3 μg/l, were detected in the water sample, OR-9802531, collected from the drainage sump in the Doña Ana County Transportation Department maintenance yard's diesel shop (Reference 8, page 91; Reference 30) indicating that PCE was used at the facility. Sample OR-98000441 collected from boring MW-5 at the depth of 135 feet during the LUST investigation at the maintenance yard contained 0.2 mg/kg of PCE. Chlorinated solvents were not detected in the other soil samples collected during the LUST investigation (Reference 25; Reference 26; Reference 28).

Chlorinated solvents were not detected in water or soil samples from the former wash pad used by the City of Las Cruces, Traffic Operations Division (Reference 31) or in the water sampled collected from the wash pad drain sump at the former National Guard Armory (Reference 29).

4. GROUND WATER PATHWAY

4.1 Hydrogeologic Setting

Las Cruces is located within the Mesilla Ground-Water Basin (Figure 7) (Reference 48, page 3). The Santa Fe Group and flood plain alluvium of the Rio Grande constitute the major aquifer of the Mesilla Ground-Water Basin (Reference 49, page 1). The aquifer is bound by less permeable bedrock (Figure 8) (Reference 50, page 1; Reference 49, page 21).

The flood plain alluvium is about 4 miles wide along the Rio Grande and 80 feet thick. It generally has a thick basal channel unit consisting of sand and gravel overlain by finer grained flood-plain deposits (Reference 49, page 28). Horizontal hydraulic conductivities for the river alluvium range from 3.53×10^{-2} cm/s to 1.23×10^{-1} cm/s (Reference 50, page 15).

The Santa Fe Group is a rock-stratographic unit, classified on the basis of lithology and depositional environment. It consists of unconsolidated to moderately consolidated sedimentary deposits, minor ash-fall volcaniclastics, and other volcanic rocks (Reference 49, page 23). It is approximately 2,500 feet thick (Reference 50 page 12). Dividing the Santa Fe Group into three hydrostratigraphic units facilitates assigning hydraulic properties (Reference 50, page 13). For the upper unit of the Santa Fe Group, estimates of horizontal hydraulic conductivity range from 7.06×10^{-4} cm/s to 2.40×10^{-8} cm/s (Reference 50, page 13). Estimates of horizontal hydraulic conductivity for the middle unit range from 3.53×10^{-4} cm/s to 3.53×10^{-2} cm/s (Reference 50, page 13). For the lower unit,

estimates of horizontal hydraulic conductivity range from 3.53 x 10^{-4} cm/s to 1.20 x 10^{-2} cm/s. From which unit(s) the Las Cruces municipal wells are pumping is has not been documented yet.

The Rio Grande is the primary source of recharge to the aquifer system of the Mesilla basin (Reference 45, page 65). Water moves from the shallow flood plain alluvium to the upper Santa Fe Group through a series of interbedded gravel, sand, and clay lenses (Reference 48, page 65). Thin interbedded clay lenses in the lower part of the flood plain alluvium and upper Santa Fe Group restrict vertical flow. Horizontal permeability usually exceeds vertical permeability by several orders of magnitude because of vertical heterogeneity (Reference 48, page 65).

4.2 Ground Water Use

Las Cruces is served by two municipal water systems, Las Cruces Municipal Water and West Mesa Water System (References 34, page 2). Both water systems are operated by the City of Las Cruces and rely completely on ground water as their source of water (Reference 51). The City of Las Cruces is and been in compliance with the New Mexico Water Supply Regulations with respect to PCE (Reference 52).

The Las Cruces Municipal Water System is a blended system supplying water from twenty-eight wells to 67,900 people (2,425 people per well) (Reference 51). Twenty-three of these municipal wells, including the four wells from which samples containing PCE have been collected, are located with in four miles of the Las Cruces PCE site (Reference 53). Since no single well contributes more than 40% of the total water flowing through the system (Reference 14), each well was assumed to contribute equally and the population was apportioned accordingly, as prescribed by the Hazard Ranking System (Reference 1, page 51603). On 26 September 1996, the City of Las Cruces took well 18 permanently off the water supply system due to falling production from the well and the detection of PCE in samples collected from it (References 34, page 2; Reference 54). As the state of New Mexico has designated a radius of 1,000 feet around public well heads as wellhead protection area (WHPA), this site is within WHPA (Reference 55).

4.3 Sampling Locations and Analytical Results

Ground water samples were collected from the four effected municipal wells, three additional production wells, and seven monitoring wells by Superfund Oversight Section staff and were submitted for VOA through the CLP. Sampling locations are shown in Figure 2 and Figure 9 (Reference 8, pages 6, 9, 64-69, 74-79). Tetrachloroethylene was detected in samples from Las Cruces municipal wells 18, 19, 21, and 27 (Table 2, on page 9) (Reference 4; Reference 5; Reference 6; Reference 7; Reference 8, pages 64-65, 74-75, 92). The concentrations of PCE in three samples collected from well 18 after it was permanently taken off-line, exceeded the maximum contaminant level (MCL) of 5.O μg/l of PCE for drinking water.

Tetrachloroethylene was not detected in water samples collected from the Paz Park well approximately 1,500 feet north of well 18 (Figure 9) (Table 7) (Reference 4; Reference 5; Reference 8; pages 64-65, 74-75) or an out-of-service production well, LRG- 7375 located approximately 800 feet east of Well 19 (Reference 5; Reference 8, pages 6, 9, 77; Reference 24). Well LRG-7375 could not be purged but grab samples were collected using a disposable bailer(Figure 10) (Reference 8,

page 6, 77). Low concentrations of PCE (<2 μg/l) were detected in water samples were collected from another privately owned production well, LRG-3191, located approximately 4,400 feet west of well 18 (Reference 5; Reference 8, pages 52, 79; Reference 9; Reference 10; Reference 27).

Water samples were collected from monitoring wells at the Doña Ana County Transportation Department maintenance yard leaking underground storage tank (LUST) site, 2025 East Griggs Avenue, adjacent to well 18 (Figure 11) (Reference 32) and at the Gas Card LUST site, 801 North Solano Drive, approximately 3,300 feet west of well 18 (Reference 8, page 76). Elevated concentrations of PCE were measured in samples from both sites indicating release of PCE to ground water near those areas (Table 7 and Table 8) (Reference 4, Reference 5; Reference 8, pages 49-51, 63-65, 76; Reference 27; Reference 56; Reference 57)

5. PROPOSED GROUND WATER SAMPLING

To provide additional information for HRS evaluation, an additional round of water samples will be collected from the Paz Park well and the effected municipal wells, 18, 18, 21, and 27. The wells will be sampled through their sampling ports after running at least 15 minutes. A confirmation sample will also be collected from the monitoring well at the Gas Card LUST site. The monitoring well will be purged with a disposable bailer prior to sampling. Samples, duplicates, and blanks will be submitted for VOA through the CLP.

6. PROPOSED SOIL VAPOR SURVEY

A soil vapor survey will be conducted at the Doña Ana County Transportation Department and the area near well 18 to identify locations were PCE was discharged. Soil gas samples will be extracted from approximately 8 feet below ground at suspected points of discharge using a Geoprobe designed for soil gas collection. Soil gas samples and associated quality assurance/quality control samples will be analyzed in the field using a portable gas chromatograph and ionization detector.

Initially, samples will be collected from around the diesel shop, wash pad, paint shop, a trench containing paint cans, and locations suggested by county staff (Figure 12). Additional soil gas samples will be collected around locations with elevated PCE concentrations to determine as closely as possible the locations of discharges. An increase of contaminant concentration in soil gas generally indicates greater proximity to a source of contaminant or an increase of contaminant in the subsurface (Reference 58).

6. HEALTH AND SAFETY

A standard Ground Water Quality Bureau site safety plan including emergency numbers and the route to the nearest hospital (Appendix A) will be kept with the site field book. Level D personal protective equipment including steel-toe safety shoes and hard hats worn while drilling is on going. Latex gloves will be worn while collecting samples.

7. SCHEDULE AND DELIVERABLES

The soil vapor survey is scheduled for 12-17 July 1999. The information collected in the soil vapor survey will be used to prepare a second addendum to the Site Inspection Workplan for the installation of ground monitoring wells will be submitted in August 1999. Ground water monitoring wells will be installed in August 1999.

References

8. REFERENCES

1. U.S. EPA, 1990, 40 CFR Part 300, Hazardous Ranking System Final Rule, p. 51532 -51667, December 14, 1990.

2. U. S. EPA, 1994, Revised Superfund Chemical Data Matrix (SCDM), pages A-721 and A-722, June 1996.

3. New Mexico Environment Department, Drinking Water Bureau Database, New Mexico Public Water System Chemical Results During the Period Beginning 01-JUL-93 and Ending 29-JAN-99, Las Cruces Municipal Water System.

4. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 26142, 8 May 1998.

5. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 26301, 21 July 1998

6. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 26579, 18 November 1998.

7. New Mexico Department of Health, Scientific Laboratory Division, Organic Chemistry Section Analysis Numbers OR-980697 through OR-98703, 28 April 1998.

8. New Mexico Environment Department, Ground Water Quality Bureau, Superfund Oversight Section, Las Cruces PCE Field Notes, Volume I, 19 May 1997 to date 30 May 1999.

9. City of Las Cruces Tech Support / Drafting Staff, 1996 Water Well Map.

10. City of Las Cruces Tech Support, ArcView files.

11. U.S. Geological Survey, "Seismic Investigation of Buried Horst Between the Jornada Del Muerto and Mesilla Ground Water Basins Near Las Cruces, Doña County, New Mexico", Water-Resources Investigations Report 97-4147, 1997, page 2.

12. US West, White and Yellow Pages for the Las Cruces, New Mexico Area, 1997/1998, page 11.

13. New Mexico Environment Department, Drinking Water Bureau, Water System Sample Points, Las Cruces Municipal Water System, 12 March 1996.

14. City of Las Cruces, Water Resources, Total Monthly Water Report, Well Operation and Water Production, March 1994.

15. U.S. Geological Survey, "Selected Hydrologic Data for the Mesilla Ground-Water Basin, 1987 Through 1992 Water Years, Doña County, New Mexico, and El Paso County, Texas, Open File Report 95-111, 1999, page 71.

16. Slumberger Well Surveying Corporation, Induction-Electrical Log, City of Las Cruces Water Well #18, July 1960.

17. R.W. Beck and Associates and W. Carlos Powell, City of Las Cruces, 1961 Utilities Construction Program, Water System, Water Well No. 19, Pumping Station, Sheet 2 of 4, April 1962.

18. Robinson and Roberts, Ground Water Geologist, Tacoma, Washington, Details of Screen Assembly, Well No. 20, Las Cruces, New Mexico June 1962.

19. The Layne Texas Company, Ltd, Well Data, Well No. 27, 1 March 1971.

20. King, W.E., et al, "Geology and Ground-Water Resources of Central and Western Doña County, New Mexico," New Mexico State Bureau of Mines and Mineral Resources, 1971, pages 4-5.

21. Verschueren, Karel, "Handbook of Environmental Data on Organic Chemicals," Second Edition; Van Nostrand Reinhold Company, 1983, pages 580-583.

22. U.S. Department of Public Health, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Tetrachloroethylene.

23. Cohen, Robert M. and James W. Mercer, "DNAPL Site Evaluation," C.K. Smoley, 1993, pages 2-1, 3-1 to 3-9, c-2, and c-3.

24. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 25989, 20 February 1998.

25. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 26032, 27 March 1998.

26. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 26035, 31 March 1998.

27. U.S. Environmental Protection Agency, Region 6, Contract Laboratory Program, Data Review, Case Number 26054, 13 April 1998.

28. New Mexico Department of Health, Scientific Laboratory Division, Organic Chemistry Section Analysis Numbers OR-9800419 through OR-9800443, 10 March 1998.

29. New Mexico Department of Health, Scientific Laboratory Division, Organic Chemistry Section Analysis Numbers OR-9802523, 20 October 1998.

30. New Mexico Department of Health, Scientific Laboratory Division, Organic Chemistry Section Analysis Numbers OR-9802530 through OR-9802531, 10 March 1998.

31. Pinnacle Laboratories, Pinnacle Lab ID number 812051, 21 December 1998.

32. Souder Miller & Associates, Form 1210, Hydrogeologic Investigation Report, Doña Ana County Transportation Department, 4/8/98.

33. New Mexico Environment Department, Ground Water Quality Bureau, Assessment and Abatement Section, Field Sketches by Jim Horner, 9 December 1999.

34. City of Las Cruces, Water Resources Division, Letter from William McKinney to christopher holmes, 9 January 1998.

35. America Soil Conservation Service, aerial photograph DEY-4BB-54R, 1967.

36. Bureau of Land Management, aerial photograph, NM 80 AC 5 43 22, 10-23-80.

37. The Mountain States Telephone & Telegraph Company, Telephone Directory, Las Cruces & Vicinity, April 1955.

38. Mountain States Telephone & Telegraph Company, Telephone Directory, Las Cruces La Mesa Hatch, April 1959.

39. Mountain States Telephone, Telephone Directory, Las Cruces, June 1965.

40. Mountain Bell, Telephone Directory, Las Cruces, August 1970.

41. Mountain Bell, Telephone Directory, Las Cruces, August 1975.

42. Mountain Bell, Telephone Directory, Las Cruces, August 1980.

43. Mountain Bell, Telephone Directory, Las Cruces, April 1985.

44. U.S. West Direct, The Yellow & White Pages, February 1991/1992.

45. ICF Technology Incorporated, Las Cruces Landfill Final Report, BLM Contract AA852-CT852-16, April 1989.

46. John Shomaker & Associates, Inc. Results from Installation of Ground-Water Monitoring System, and Proposed Ground-Water Monitoring Plan, Las Cruces Landfill, Las Cruces, New Mexico.

47. New Mexico Environment Department, Ground Water Quality Bureau, Superfund Oversight Section, Record of Conversation Between christopher homes and Tom Custer, Bureau of Land Management, 17 June 1999.

48. U.S. Geological Survey, "Geohydrology of the Mesilla Basin, Doña County, New Mexico, and El Paso County, Texas, Water -Resources Investigations Report 92-4156, 1993, pages 1-3, 8-9, and 65.

49. U.S. Geological Survey, "Simulation of Ground-Water Flow in the Mesilla Basin, Doña County, New Mexico, and El Paso County, Texas," Water -Resources Investigations Report 91-4155, 1992, pages 1, 12-15.

50. U.S. Geological Survey, "Geohydrology and Simulation of Ground-Water Flow in the Mesilla Basin, Doña County, New Mexico, and El Paso County, Texas," Open-File Report 88-305

51. New Mexico Environment Department, Drinking Water Bureau, Water System Inventory 29 July 1997.

52. New Mexico Environment Department, Drinking Water Bureau, Water Supply Violations, WS Code: 11707, 8 February 1998.

53. New Mexico Environment Department, Ground Water Quality Bureau, Superfund Oversight Section, Las Cruces PCE , Four-Mile Radius Map, November 1994.

54. New Mexico Environment Department, Ground Water Quality Bureau, Superfund Oversight Section, Record of Conversation Between christopher holmes and William McKinney, 22 January 1998.

55. New Mexico Health and Environment Department, Environmental Improvement Division, Well Head Protection Program, August 1990.

56. Souder Miller & Associates, Form 1216, Quarterly Monitoring Report, Doña Ana County Transportation Department, 4/2/99.

57. Souder Miller & Associates, Form 1216, Quarterly Monitoring Report, Gas Card 5/15/99.

58. New Mexico Environment Department, Ground Water Quality Bureau, Superfund Oversight Section, Record of Conversation Between christopher holmes and Ricardo Jacquez, 20 January 1998.

Tables

Table 1: Construction Information for City of Las Cruces Production Wells.

Well	OSE Number	PCE Detected	Date Drilled	Well Head Elevation	Total Depth	Intake Screen Depth	Depth to Water	Intake Screen Elevation	Water Level Elevation	Address	References
10	LRG-430	No	1951	3,935	381	281-381	[1]74	3,654 -3554	[1]3,861	708 E. Chestnut Av.	3, 10, 13, 14, 15
18	LRG-430-S-5	yes	1960	4,040	576	310-576	[2]215	3,730 -3,464	[2]3,825	153 N. Cotton wood St.	3, 4, 5, 6, 7, 8, 10, 13, 14, 16
19	LRG-430-S-6	yes	1962	4,060	612	348-603	[3]208	3,712 -3,457	[3]3,852	101 S. Triviz Dr.	3, 4, 5, 6, 7, 8, 10, 13, 14, 17
20	LRG-430-S-7	no	1962	4,080	677	385-673	[3]238	3,675 -3,407	[3]3,842	820 S. Triviz	3, 10, 13, 14, 18
21	LRG-430-S-8	yes	1962	4,070	632	?	[3]238	?	[3]3,832	671 N. Triviz Dr.	3, 4, 5, 6, 7, 8, 10, 13, 14, 15
26	LRG-430-S-12	no	1969	4,025	700	410-700	[1]176	3,615 - 3,325	[1]3,849	832 S. Walnut St.	3, 10, 13, 14, 15
27	LRG-430-S-14	yes	1971	4,054	730	430-715	[1]223	3,626 - 3,339	[1]3,873	2225 E. Griggs Av.	3, 4, 5, 6, 7, 8, 10, 13, 14, 19
28	LRG-430-S-15	no	1971	4,060	532	420-751	[1]223	3,640 -3,309	[1]3,842	1755 N. Triviz Dr.	3, 10, 13, 14, 15
54	LRG-430-S-25	no	?	?	?	?	?	?	?	1003 Stagecoach Dr.	3, 10, 13, 14
57	LRG-430-S-31	no	1990	?	532	?	?	?	?	2506 E. Lohman Av.	3, 10 13, 14
PAZ	LRG-430-S-34	no	?	?	?	?	?	?	?	?	4, 5, 7, 8

OSE Office of State Engineer,
PCE perchloroethylene or tetrachloroethylene
[1]water Level measured 1/15/92
[2]water Level measured 10/20/98
[3] water level measurement date unknown

Table 2: **Tetrachloroethylene Concentrations (μg/l) in Water Samples from Las Cruces Municipal Wells. The City of Las Cruces is and has been in compliance with the New Mexico Water Supply Regulations with respect to PCE (Reference 58). The sample collected from well 18 on 1/10/95 was invalidated because the well was off-line at that time and the sample was not representative of the water entering the distribution system. Well 18 was permanently taken off-line 26 September 1996.**

Well 18				Well 19				Well 21				Well 27			
Date	PCE	code	Ref.	Date	PCE	code	Ref.	Date	PCE	code	Ref.	Date	PCE	code	Ref.
3/13/94	ND(0.5)	R	3	3/13/94	0.3	R	3	8/9/93	0.9	C	3	8/9/93	1.4	C	3
1/10/95	**32.0**	I	3	5/16/94	0.3	C	3	2/17/94	0.8	C	3	5/16/94	0.7	R	3
2/22/95	1.5	C	3	10/3/94	ND(0.5)	R	3	6/21/94	1.0	R	3	6/21/94	0.7	R	3
2/27/95	1.1/1.2 [1]	C	3	1/9/95	ND(0.5)	R	3	10/10/94	1.0	R	3	10/3/94	0.6	M	3
4/12/95	0.5	R	3	4/5/95	ND(0.5)	R	3	1/10/95	0.7	R	3	5/9/95	0.8	R	3
8/18/95	0.6	R	3	8/18/95	ND(0.5)	R	3	4/5/95	1.3	R	3	8/18/95	ND(0.5)	R	3
10/4/95	ND(0.5)	R	3	10/4/95	ND(0.5)	R	3	8/18/95	1.2	R	3	10/4/95	0.8	R	3
1/9/96	**6.4**	R	3	1/9/96	0.6	R	3	10/4/95	1.2	R	3	2/23/96	1.0	R	3
2/21/96	0.8	C	3	7/23/97	ND(0.5)	R	3	1/9/96	1.1	R	3	7/29/97	1.8	R	3
4/3/96	0.8	R	3	4/15/98	1.1/1.0[2]	CLP	4, 7,8	1/22/97	1.3	R	3	4/15/98	1.4[2]/1.0[1]/1.0 [1]	CLP	4, 7, 8
5/2/96	1.0	R	3	6/23/98	0.8 J	CLP	6, 8	4/15/98	1.9/2.0[2]	CLP	4, 7, 8	6/23/98	2.0	CLP	6, 8
7/23/96	ND(0.5)	R	3					4/27/98	2.0	R	3				
4/15/98	**15.0[1]/12.3[1]/14.0 [2]**	CLP	4, 7, 8					6/23/98	2.0	CLP	7				
6/23/98	**18.0/18.0 [1]**	CLP	6, 8												
10/20/98	**16.0/17.0 [1]**	CLP	7, 8												

Drinking Water Bureau codes: R = compliance (routine), I = invalidated, C = confirmation; CLP= sample collected by Superfund Oversight Section and analyzed through Contract Laborartoy Program (not in the Drinking Water Database).
Bold indicates a concentration greater than federal drinking water standard of 5.0 μg/l. ND(0.5) not detected at 0.5 μg/l
[1] duplicate samples, [2] split samples

Table 3: Samples Collected for the Las Cruces PCE Site Inspection and Submitted for Analysis Through the Contract Laboratory Program.

Case Number	Reference Number	Sample Number	Sample Type	Location	Date	Time
25989	24	FQ725	aqueous	well LRG-7375, approximately 800 ft east of well 19.	1/27/98	09:30
		FQ726	aqueous	trip blank	1/26/98	12:48
		FQ727	aqueous	duplicate of FQ725	1/2798	09:30
26032	25	FQ728	subsurface soil	Doña Ana County yard, boring MW-2, 15 ft deep	2/25/98	09:30
		FQ729	subsurface soil	Doña Ana County yard, boring MW-2, 135 ft deep	2/25/98	16:30
		FQ730	subsurface soil	Doña Ana County yard, boring MW-2, 160 ft deep	2/26/98	10:30
		FQ731	subsurface soil	Doña Ana County yard, boring MW-2, 190 ft deep	2/26/98	14:20
		FQ732	subsurface soil	Doña Ana County yard, boring MW-3, 20 ft deep	2/27/98	10:35
26035	26	FQ733	subsurface soil	Doña Ana County yard, boring MW-3, 155 ft deep	3/2/98	12:03
		FQ734	subsurface soil	Doña Ana County yard, boring MW-3, 160 ft deep	3/2/98	16:00
		FQ735	subsurface soil	Doña Ana County yard, boring MW-3, 190 ft deep	3/2/98	16:00
		FQ736	subsurface soil	Doña Ana County yard, boring MW-4, 15 ft deep	3/3/98	10:36
		FQ737	subsurface soil	Doña Ana County yard, boring MW-4, 50 ft deep	3/3/98	11:46
		FQ738	subsurface soil	Doña Ana County yard, boring MW-4, 140 ft deep	3/4/98	09:44
		FQ739	subsurface soil	Doña Ana County yard, boring MW-4, 185 ft deep	3/4/98	14:58
		FQ740	subsurface soil	duplicate of FQ739	3/4/98	14:58
		FQ741	subsurface soil	Doña Ana County yard, boring MW-5, 15 ft deep	3/5/98	10:30
		FQ742	subsurface soil	Doña Ana County yard, boring MW-5, 45 ft deep	3/5/98	11:25
		FQ743	subsurface soil	Doña Ana County yard, boring MW-5, 85 ft deep	3/5/98	14:25
		FQ744	subsurface soil	Doña Ana County yard, boring MW-5, 135 ft deep	3/6/98	09:50
26054	27	FQ745	aqueous	equipment blank	3/11/98	13:30
		FQ747	aqueous	Doña Ana County yard, monitoring well MW-2	3/11/98	14:50
		FQ748	aqueous	aqueous	3/11/98	15:40
		FQ749	aqueous	trip blank	3/9/98	16:23
		FQ750	aqueous	well LRG-3191, approximately 5,500 ft west of well 18	3/12/98	08:35
		FQ751	aqueous	Doña Ana County yard, monitoring well MW-4	3/12/98	09:49
		FQ752	aqueous	Duplicate of FQ751	3/12/98	10:09
		FQ753	aqueous	Doña Ana County yard, monitoring well MW-5	3/12/98	11:00
26142	4	FQ761	aqueous	Las Cruces municipal well 18	4/15/98	08:19
		FQ762	aqueous	trip blank	4/14/98	09:49
		FQ763	aqueous	Las Cruces municipal well 27	4/15/98	08:34
		FQ764	aqueous	duplicate of FQ763	4/15/98	08:40
		FQ765	aqueous	Las Cruces municipal well 19	4/15/98	08:52
		FQ766	aqueous	Las Cruces municipal well 21	4/15/98	09:01
		FQ767	aqueous	Paz Park Well	4/15/98	09:04
		FQ768	aqueous	Doña Ana County yard, monitoring well MW-3	4/15/98	10:30
		FQ769	aqueous	Doña Ana County yard, monitoring well MW-4	4/15/98	11:40
		FQ770	aqueous	Doña Ana County yard, monitoring well MW-1	4/15/98	15:15
		FQ771	aqueous	field blank	4/15/98	15:30
		FQ772	aqueous	Doña Ana County yard, monitoring well MW-2	4/15/98	15:45
		FQ773	aqueous	Doña Ana County yard, monitoring well MW-6	4/15/98	16:58

Table 3: Samples Collected for the Las Cruces PCE Site Inspection and Submitted for Analysis Through the Contract Laboratory Program.

Case Number	Reference Number	Sample Number	Sample Type	Location	Date	Time
26301	5	FQ832	aqueous	Las Cruces municipal well 18	6/23/98	08:35
		FQ833	aqueous	trip blank	6/21/98	15:20
		FQ834	aqueous	duplicate of FQ834	6/23/98	08:35
		FQ835	aqueous	Las Cruces municipal well 27	6/23/98	08:58
		FQ836	aqueous	Las Cruces municipal well 19	6/23/98	09:03
		FQ837	aqueous	Las Cruces municipal well 21	6/23/98	09:14
		FQ838	aqueous	Paz Park well	6/23/98	09:40
		FW977	aqueous	monitoring well at Gas Card, 801 North Solano Drive	6/23/98	11:29
		FW978	aqueous	well LRG-7375, approximately 800 ft east of well 19.	6/23/98	13:31
		FQ711	aqueous	well LRG-3191, approximately 5,500 ft west of well 18	6/24/98	08:28
		FQ712	aqueous	duplicate of FQ711	6/24/98	08:28
		FQ713	aqueous	trip blank	6/21/98	15:20
26579	6	FR853	aqueous	Las Cruces Municipal well 18	10/20/98	08:17
		FR854	aqueous	trip blank	10/18/98	NA
		FR855	aqueous	duplicate of FR853	10/20/98	08:17

Table 4. Samples Collected for the Las Cruces PCE Site Inspection and Submitted for Analysis to the New Mexico Department of Health Laboratory.

Report Number	Sample Type	Reference Number	Location	Date	Time
OR-9800419	subsurface soil	28	Doña Ana County yard, boring MW-2, 15 ft deep	2/25/98	09:30
OR-9800420	subsurface soil		Doña Ana County yard, boring MW-2, 135 ft deep	2/25/98	16:30
OR-9800421	subsurface soil		Doña Ana County yard, boring MW-2, 160 ft deep	2/26/98	10:30
OR-9800422	subsurface soil		Doña Ana County yard, boring MW-2, 190 ft deep	2/26/98	14:20
OR-9800439	subsurface soil		Doña Ana County yard, boring MW-4, 185 ft deep	3/4/98	14:58
OR-9800440	subsurface soil		Doña Ana County yard, boring MW-3, 155 ft deep	3/2/98	12:03
OR-9800441	subsurface soil		Doña Ana County yard, boring MW-5, 135 ft deep	3/6/98	09:50
OR-9800442	subsurface soil		Doña Ana County yard, boring MW-3, 185 ft deep	3/2/98	16:00
OR-9800443	subsurface soil		Doña Ana County yard, boring MW-3, 160 ft deep	3/2/98	16:00
OR-9800697	aqueous	7	Las Cruces municipal well 27	4/15/98	08:34
OR-9800698	aqueous		Las Cruces municipal well 18	4/15/98	08:19
OR-9800699	aqueous		Las Cruces municipal well 21	4/15/98	09:01
OR-9800700	aqueous		Paz Park well	4/15/98	09:04
OR-9800701	aqueous		Las Cruces municipal well 19	4/15/98	08:52
OR-9800702	aqueous		trip blank	4/15/98	08:23
OR-9800703	aqueous		duplicate of OR-9800698	4/15/98	08:27
OR-9802523	aqueous	29	former National Guard Armory, wash pad, drain sump	10/20/98	14:45
OR-9802530	aqueous	30	trip blank	10/21/98	08:11
OR-9802531	aqueous		Doña Ana County yard, shop drain sump	10/21/98	07:30

Table 5: Samples Collected for the Las Cruces PCE Site Inspection and Submitted to Pinnacle Laboratory for Analysis.

Sample Number	Sample Type	Reference Number	Location	Date	Time
CLC-TRAFFIC-1	surface soil	31	City of Las Cruces, Traffic Operations Division Wash Pad	12/9/98	09:30
CLC-TRAFFIC-2	surface soil		City of Las Cruces, Traffic Operations Division Wash Pad	12/9/98	09:50
CLC-TRAFFIC-3	aqueous		City of Las Cruces, Traffic Operations Division Wash Pad	12/9/98	13:52

Table 6. Population Served by Municipal Wells within 4 miles of Las Cruces PCE site.

Distance, miles	Well numbers	Population
off-line	18	2,425
on site	19, 21, 27	7,275
0.5 to 1.0	20, 26	4,850
1.0 to 2.0	10, 24, 25 ,28, 38, 54, 57	16,975
2.0 to 3.0	22, 23,29, 34 35, 39, 44, 45	17,150
3.0 to 4.0	29, 33	4,850
	Total	**55,775**

On 26 September 1996, the City of Las Cruces took well 18 permanently off system due to falling production and the detection of PCE in samples from the it (Reference 34, page 2) (Reference 52).

Table 7: Tetrachloroethylene Concentrations in Samples Collected from Existing Wells Near the Las Cruces PCE Site.

LRG-3191 approximately 5,500 ft west of well 18			LRG-430-S-34 Paz Park Well approximately 1,500 ft north of well 18			LRG-7375 approximately 800 ft east of well 19			Monitoring Well at Gas Card LUST site approximately 4,500 ft north west of well 18		
Date	**PCE**	**Ref.**	**Date**	**PCE**	**Ref.**	**Date**	**PCE**	**Ref.**	**Date**	**PCE**	**Ref.**
3/12/98	1.0	8, 27	4/15/98	ND(1)	4, 8	1/27/98	ND(1)/ND(1)	8, 24	5/5/98	15.0	57
6/24/98	0.9/0.9	5, 8	6/23/98	ND(1)	5, 8	6/23/98	ND(1)	5, 8	6/23/98	17.0	5, 8

Table 8: Tetrachloroethylene Concentrations (μg/l) in Water Samples from Monitoring Wells at the Doña Ana Transportation Department, Adjacent to Well 18.

Date	MW-1	Date	MW-2	Date	MW-3	Date	MW-4	Date	MW-5	Date	MW-6	Ref.
3/12/98	NS	3/11/98	[1]48/52	3/11/98	[1]18/20	3/12/98	[1]9/11[2]/8.1	3/12/98	[1]3/2.3	3/27/98	ND(1)	8, 27, 32
4/15/98	3	4/15/98	[3] 23	4/15/98	[3] 15	4/15/98	[3] 9	4/16/98	[3] 3	4/15/98	[3] 3	4, 8
8/31/98	4.4	8/31/98	35	8/31/98	10	8/31/98	NS	8/31/98	2.5	9/1/98	1.4	56
12/3/98	ND(2)	12/3/98	40	12/3/98	11	12/3/98	NS		1.0	12/4/98	1.1	56
3/2/99	1.6	3/2/99	44	3/2/99	18	3/2/99	NS	3/2/99	0.5	3/2/99	1.5	56

[1] Split sample collected by Superfund Oversight Section and submitted for analysis through the CLP.
[2] Duplicate sample
[3] Samples collected by the Superfund Oversight Section and submitted for analysis through the CLP.

Figures

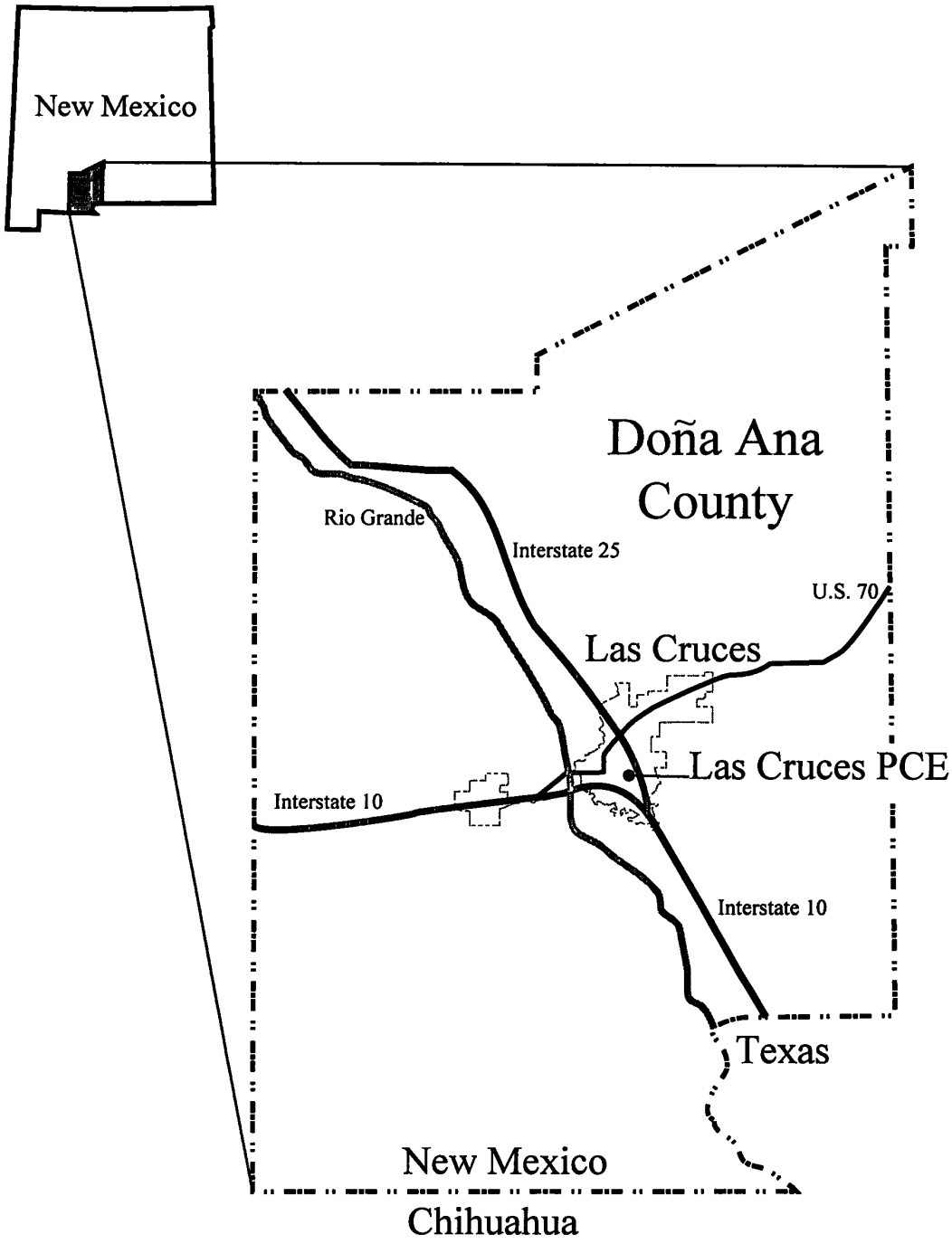

Figure 1: Location of Las Cruces PCE, Las Cruces, New Mexico (References 9, 10, 11, and 12).

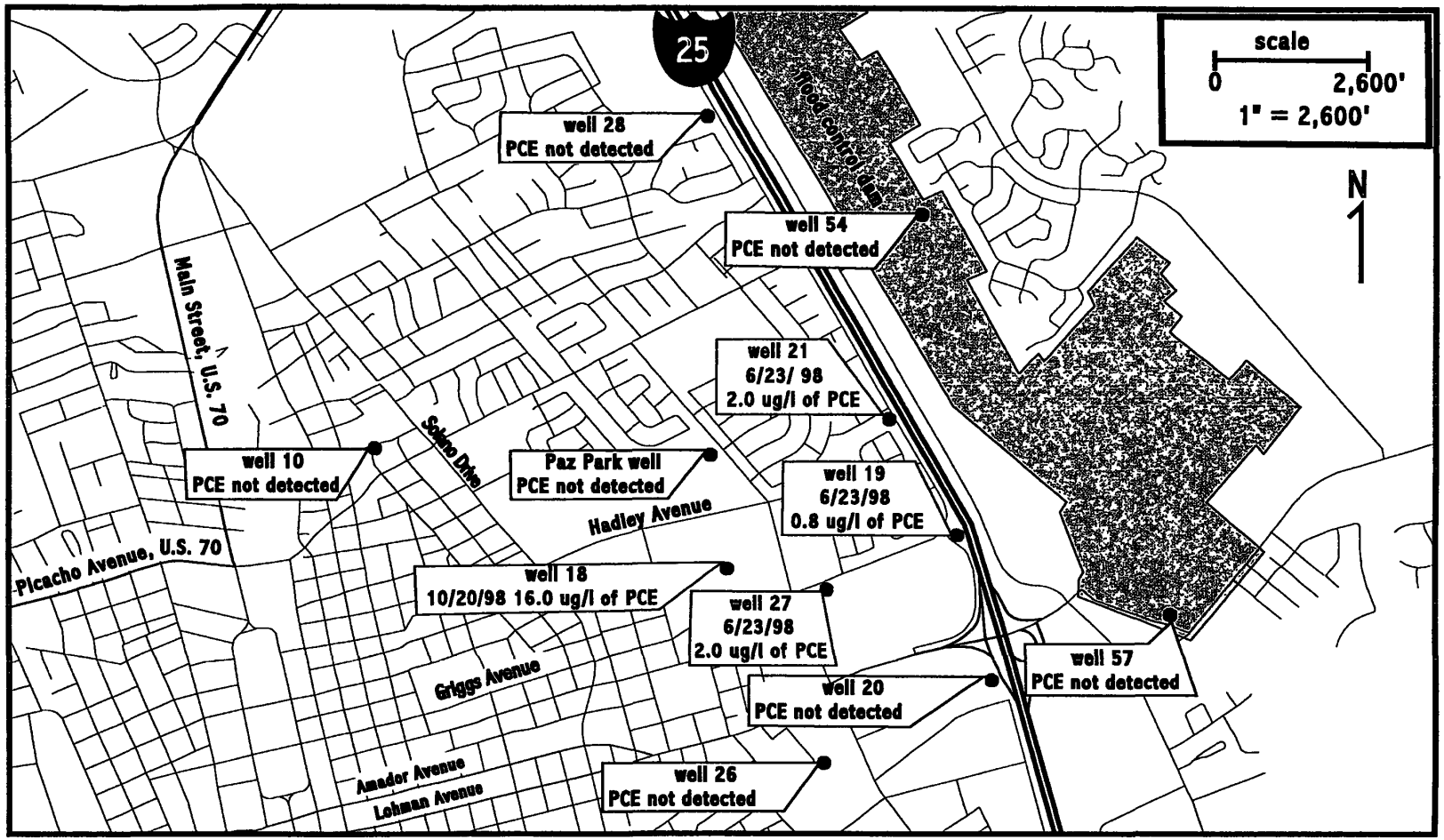

Figure 2: Locations of Las Cruces Municipal Wells 10, 18, 19, 20, 21, 26, 27, 28, 54, and 57 (References 8, 9, and10). The Las Cruces municipal water system is and has been in compliance with the New Mexico Water Supply Regulations with respect to PCE (Reference 52).

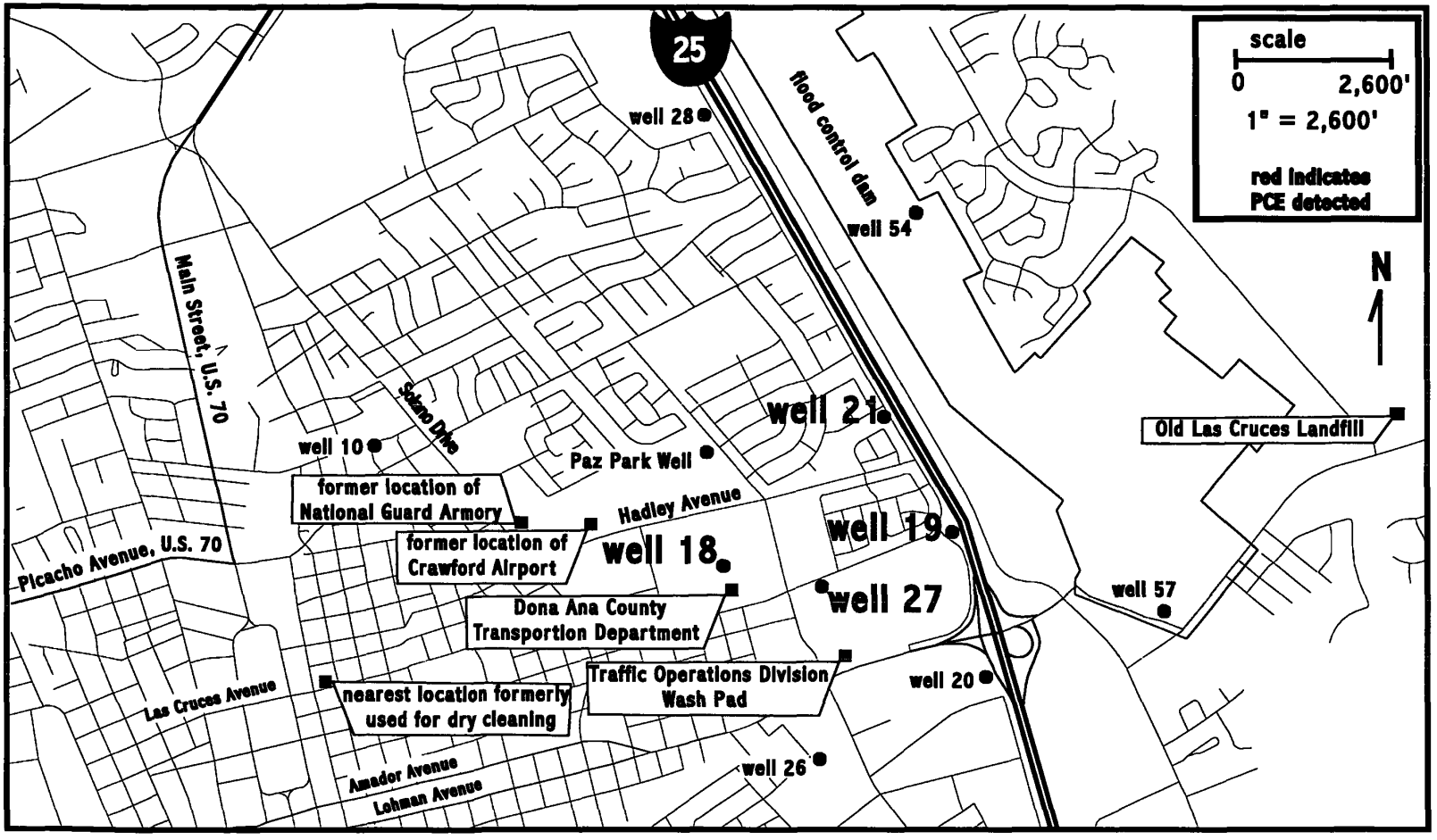

Figure 3: Potential Sources of Ground Water Contamination near the Las Cruces PCE Site(References 8, 9, 10, 32, 33, 34, 35, and 36).

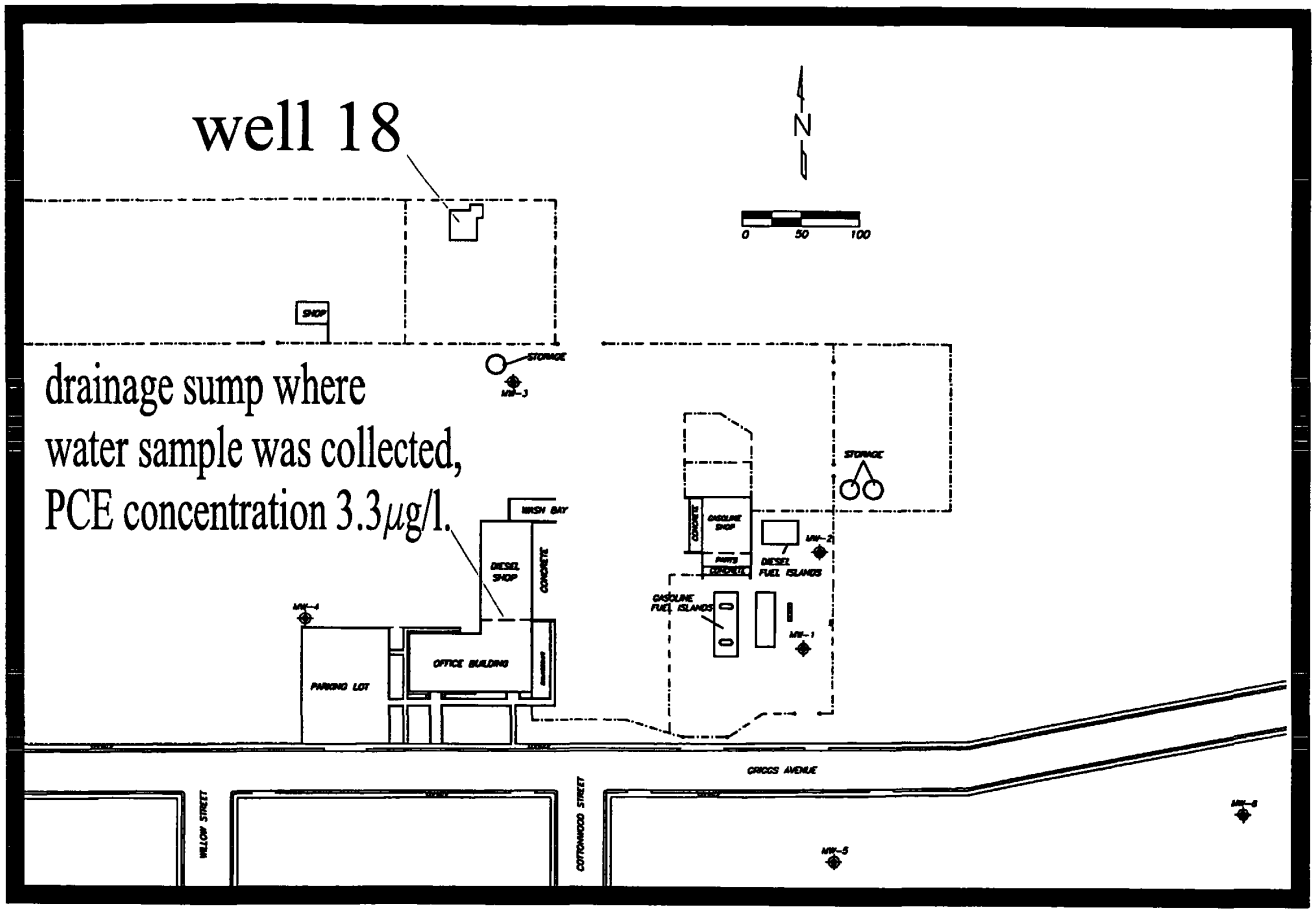

Figure 4: Doña Ana County Transportation Department (References 8 and 32).

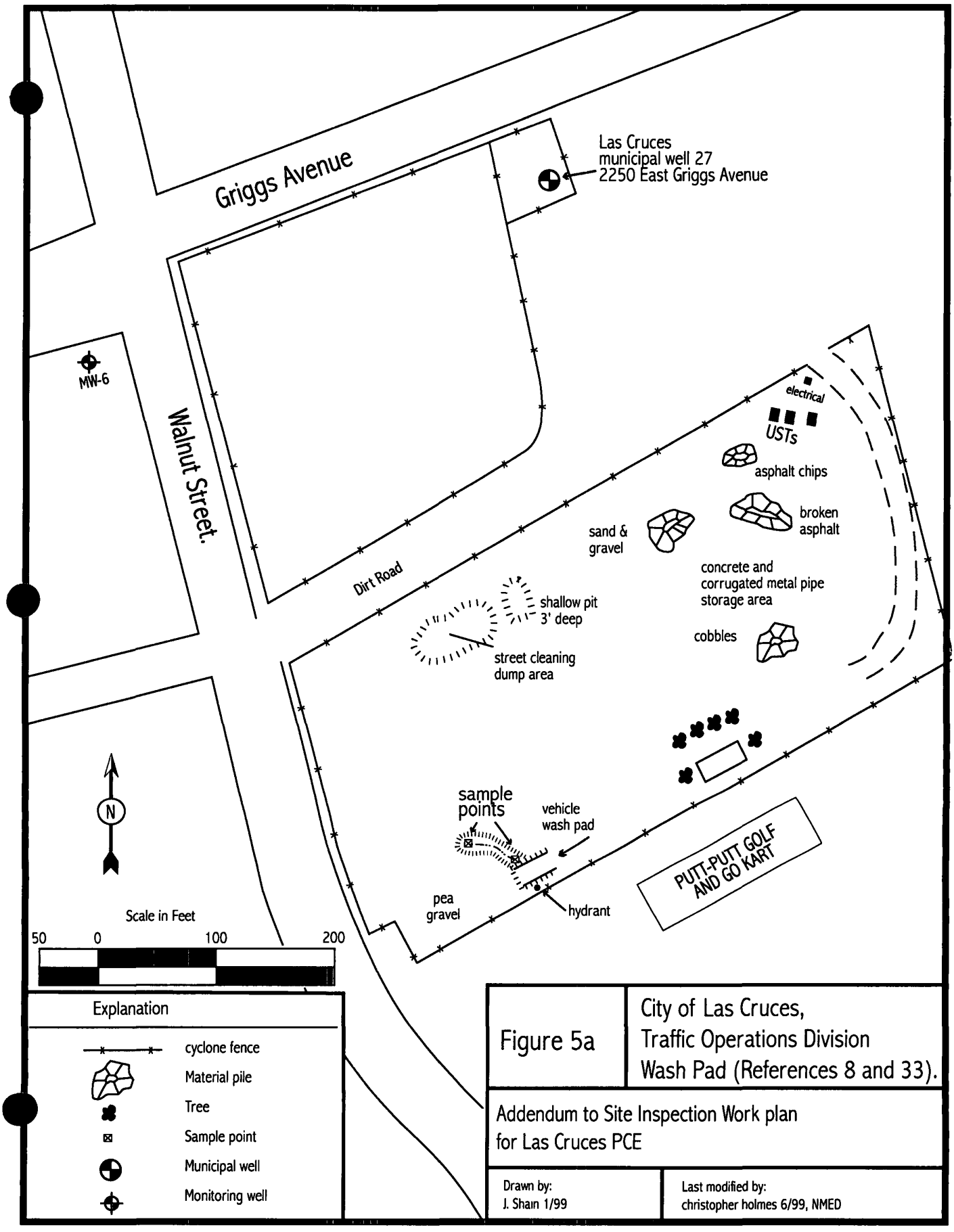

Figure 5a	City of Las Cruces, Traffic Operations Division Wash Pad (References 8 and 33).
Addendum to Site Inspection Work plan for Las Cruces PCE	
Drawn by: J. Shain 1/99	Last modified by: christopher holmes 6/99, NMED

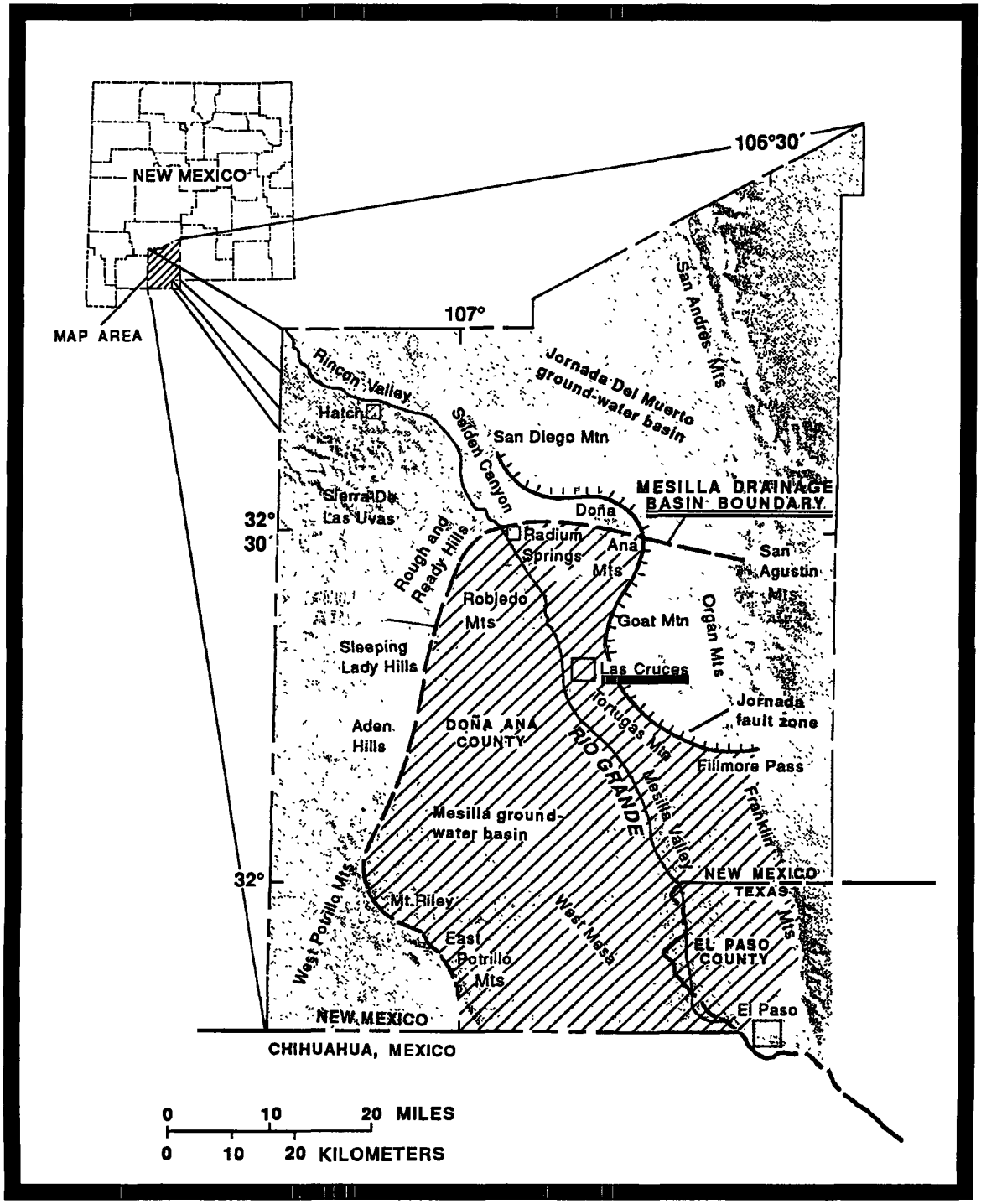

Figure 7: Boundary of Mesilla Ground Water Basin, Modified from Reference 47.

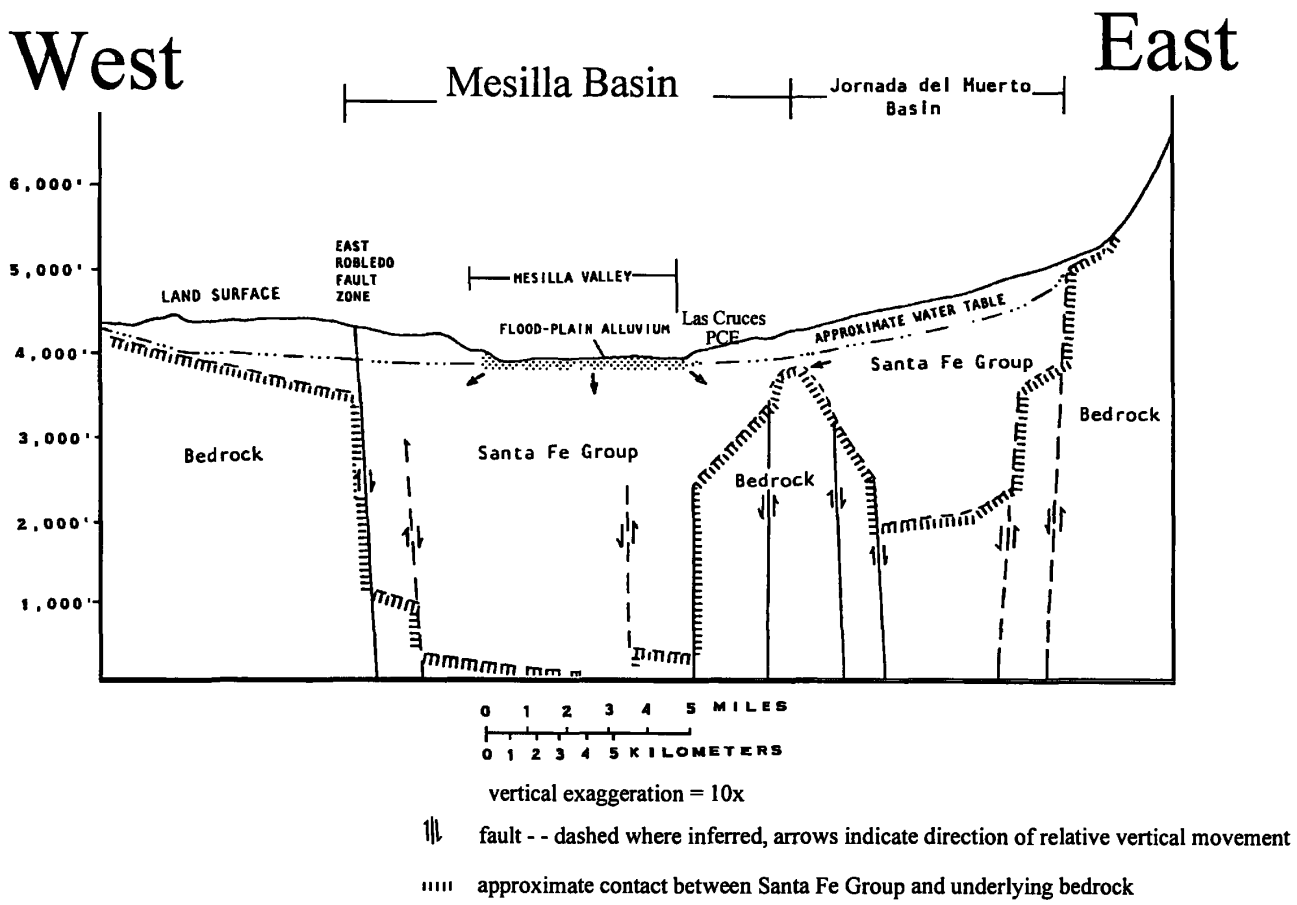

Figure 8: Generalized Hydrogeologic Section of Northern Mesilla Basing, Modified from Reference 48.

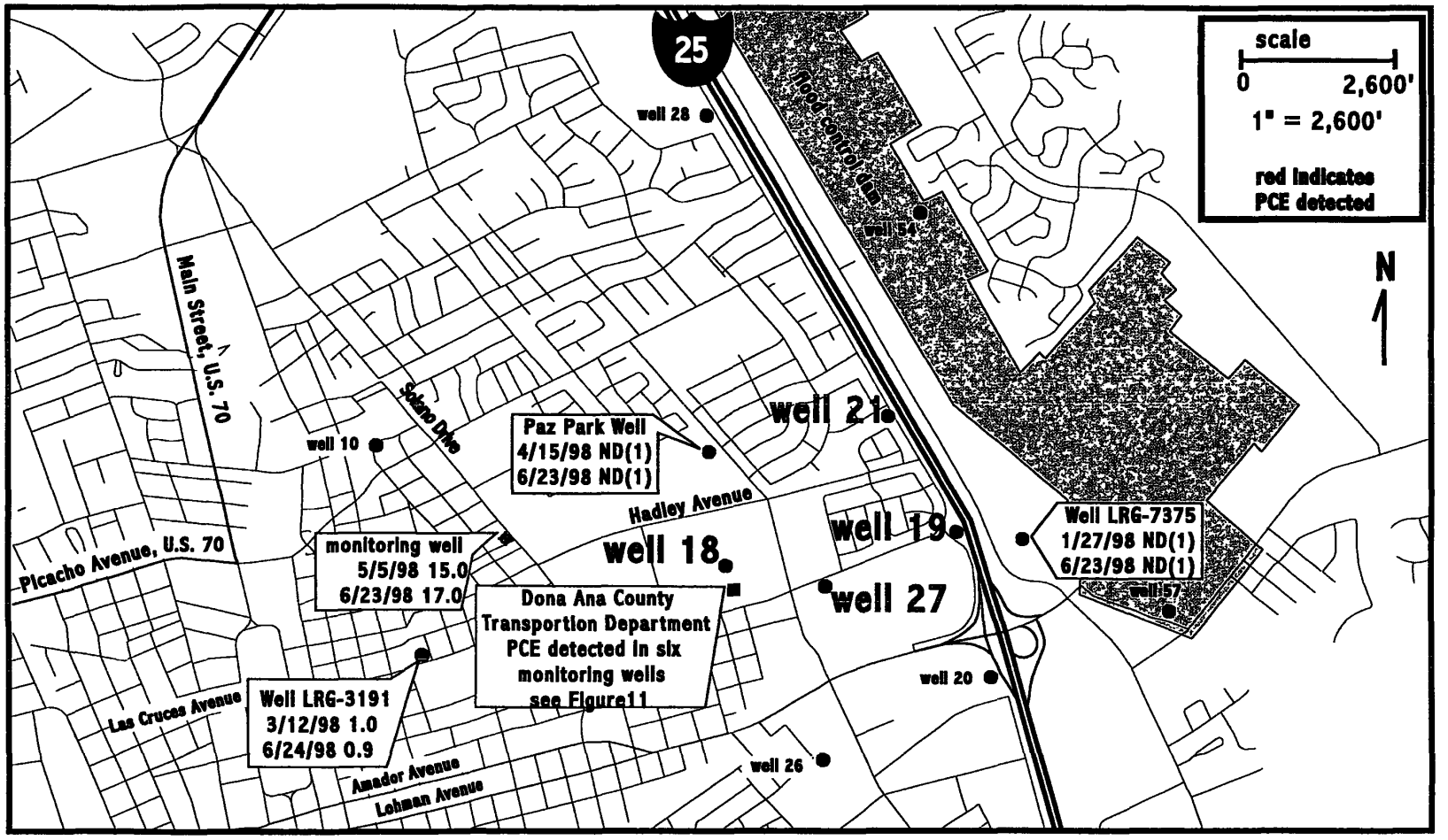

Figure 9: Ground Water Samples Collected from Existing Wells at the Las Cruces PCE Site (References 4, 5, 7, 8, 9, and 10) PCE concentrations in ug/l.

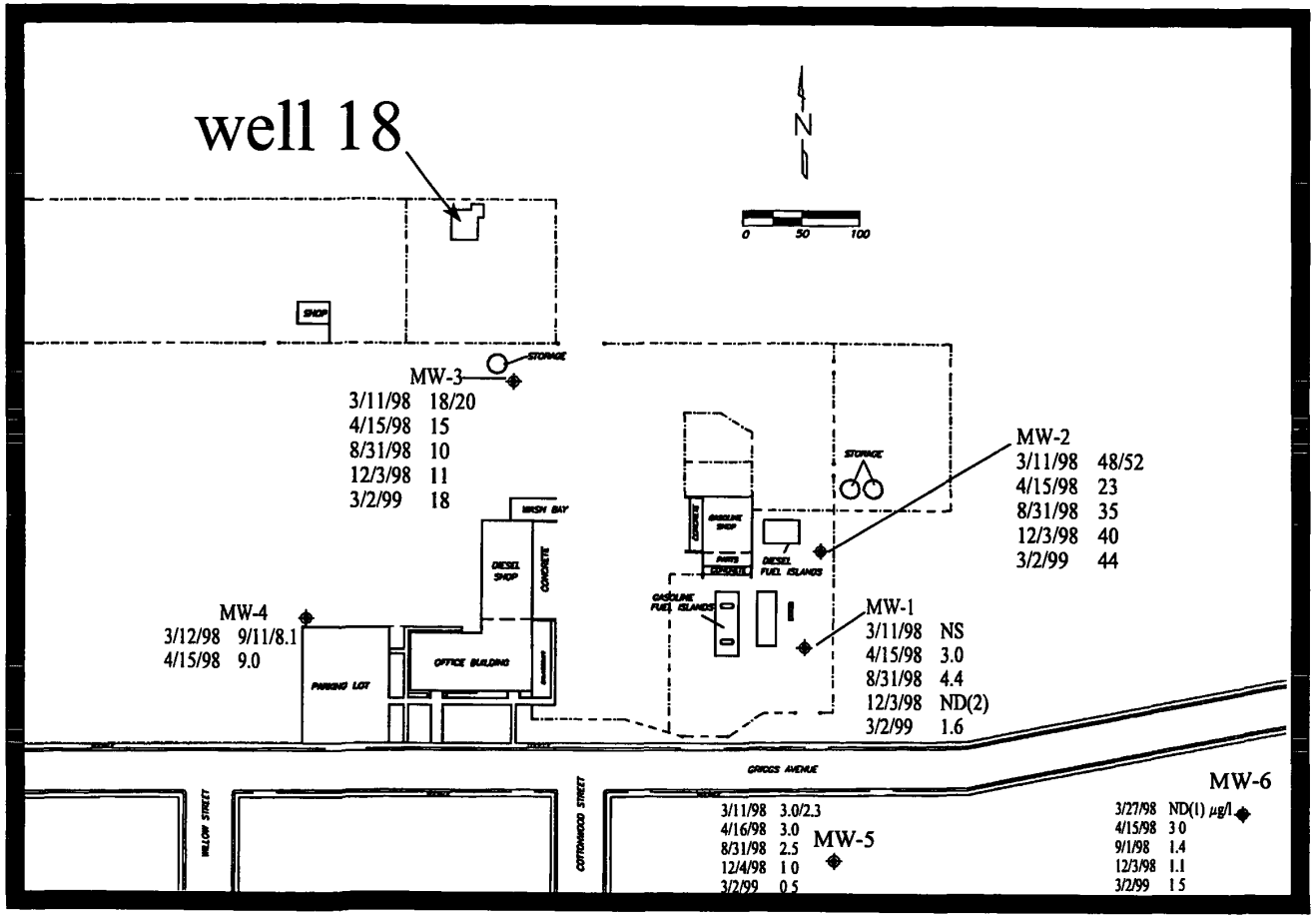

Figure 11: PCE Concentrations (μg/l) in Water Samples from Monitoring Wells at the Doña Ana County Transportation Department(References 57).

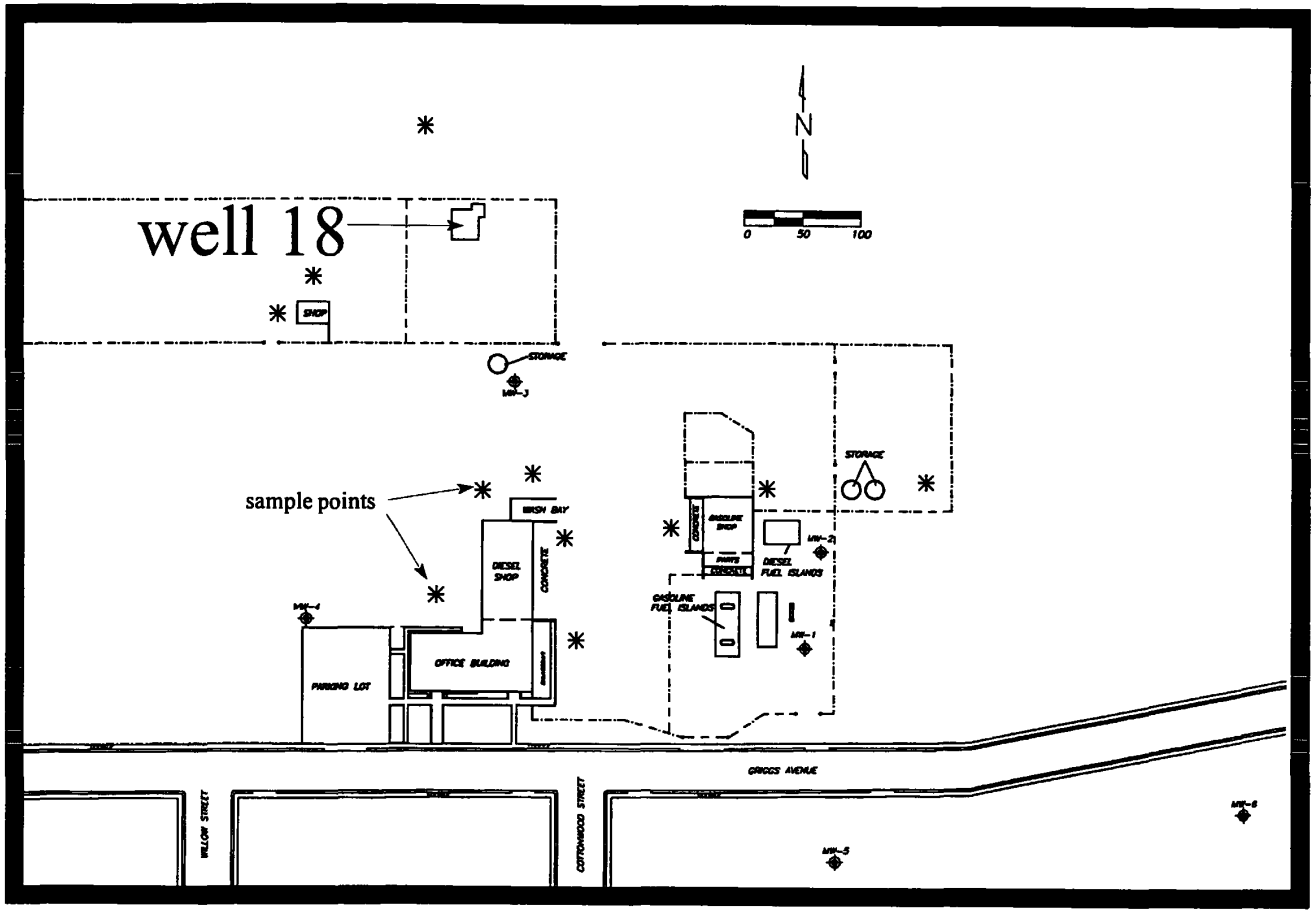

Figure 12: Proposed Soil Vapor Sampling Points.