U.S. Environmental Protection Agency
Office of Solid Waste
Contract No. 68-W9-0041

1996
RECEIVED
HAZARDOUS WASTE
PROGRAM

RCRA Implementation Contract
Zone II
Regions VI-X

PRC Environmental Management, Inc.

In Association with:
NUS Corporation
ICF Technology, Inc.
Versar, Inc.
Ecology & Environment, Inc.
HydroGeoLogic, Inc.

1 Dallas Centre
350 North St. Paul Street
Suite 2600
Dallas, TX 75201
214-754-8765
Fax 214-922-9715

PRC

April 27, 1993

Ms. Nancy Morlock
Work Assignment Manager
U.S. EPA Region 6
1445 Ross avenue
Dallas, TX 75202

Re: EPA Contract No. 68-W9-0041
Work Assignment No. R2652
Project No. 01
Signetics Corporation, RCRA Facility Assessment - Report additions

Dear Ms. Morlock:

Please find enclosed the additional information EPA requested for inclusion in the above referenced RFA report. The additions include a table (Table 6-2) summarizing the ground-water analytical data, copies of the monitoring well construction logs, and revised figures 2-2, 3-1, and 4-2. In addition, PRC has enclosed the revised table of contents, references, and text pages.

If you have any questions, please call me at (214) 754-8765.

Sincerely,

Stephen D. Phillips, P.G.
Regional Liaison

Enclosures

cc: T. Reilly, EPA Regional Project Officer
File

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RCRA FACILITY ASSESSMENT REPORT
SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO
NMD000709782

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 6
Allied Bank Tower 12th Floor
1445 Ross Avenue
Dallas, Texas 75202

Prepared by

PRC Environmental Management, Inc.
350 North St. Paul
Suite 2600
Dallas, Texas 75201

EPA contract No. 68-W9-0041

Work Assignment No. R2652

October 26, 1992

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DISCLAIMER

This report was prepared for the U.S. Environmental Protection Agency (EPA), Region 6 by PRC Environmental Management, Inc. in fulfillment of Contract No. 68-W9-0041, Work Assignment No. R2652. The opinions, findings, and conclusions expressed herein are those of the contractor and not necessarily those of EPA or other cooperating agencies. Mention of company or product names is not to be considered as an endorsement by EPA.

This document is intended to assist EPA and state personnel in developing requirements for a Resource Conservation and Recovery Act (RCRA) - regulated facility owner or operator to conduct a RCRA Facility Investigation (RFI) pursuant to Title 40, Code of Federal Regulations (CFR), Part 264. EPA will not necessarily limit the RFI or other requirements to those that correspond with the recommendations set forth herein. EPA and state personnel must exercise their technical judgement in using the RCRA Facility Assessment (RFA) report, as well as other relevant information, in determining what RFI or other requirements to include in a permit or order.

EXECUTIVE SUMMARY

The Signetics Corporation Albuquerque facility (EPA ID. No. NMD000709782) is located at the northern boundary of the city of Albuquerque, New Mexico, is a subsidiary of North American Phillips Company, and is primarily a manufacturer of metal oxide semiconductor integrated circuits (IC). The site is bordered on the east by the Pan American Freeway (Interstate 25), to the north by vacant land, to the south by private businesses, and to the west by manufacturing facilities. There is a residential area to the southwest of Signetics.

The construction of the plant began in 1978 and operations began in 1982, with full operation status being reached in 1983. The production of ICs has remained the principle activity at the facility with expansion activities currently occurring and changes in process equipment and chemical use ongoing. Expansion activities have involved the construction of additional production areas (clean rooms) with more stringent levels of cleanliness and installation of greater levels of equipment automation to improve production efficiency.

All production areas are within the Signetics facilities fabrication building as are the wastewater treatment facility and hazardous waste storage areas. As a result of these production activities, Signetics generates four classes of hazardous waste; corrosive (D002), toxic (D004 and D009), ignitable (D001), and listed (F002 and F003). These wastes are either treated and disposed of into the City of Albuquerque Publicly Owned Treatment Works (POTW) (D002 wastes) or are stored on site prior to shipment to a permitted disposal facility (D001, D004, D009, F002, and F003 wastes) (Signetics, 1980b).

An etching step in the manufacture of ICs produces waste hydrofluoric acid and buffered oxide etch (hydrofluoric acid and ammonium fluoride solution) which is transferred through a segregated drainage system to the facility's Neutralization Wastewater Treatment System. Subsequent IC cleaning steps utilize acid solutions of nitric and sulfuric acid. These spent acidic solutions are also treated in the wastewater treatment system. A mixed solvent waste, Solvent I, contains ignitable (D001) and listed (F003 and F002) wastes from an IC photo stripping process. This waste is stored in a 5,000-gallon tank prior to shipment to a Treatment, Storage, and Disposal Facility (TSDF) for use in a waste fuels program. A second waste, Solvent II, also contains ignitable and listed hazardous

waste constituents (F003). Solvent II waste is primarily waste photolithographic chemicals that are stored in 55-gallon drums in a secure storage room. Toxic wastes include; arsenic contaminated gloves, containers, and rags from IC "doping" activities, and mercury waste in the form of mercury lamps and broken thermometers that are classified as D004 and D009 hazardous wastes, respectively. These wastes, which are stored separately on site in 55-gallon drums, are ultimately shipped to commercial TSDFs by permitted transporters (Signetics, 1980b).

The Signetics Corporation Albuquerque facility submitted RCRA Part A and Part B Permit applications to EPA Region 6 on August 14, 1980. The permit applications listed six hazardous wastes generated and stored at the facility. These wastes included three stored-in-bulk quantities, including waste Solvent I stored in 5,000-gallon Tank 3, waste hydrofluoric acid stored in 5,000-gallon Tank 4, and waste buffered oxide etch stored in 5,000-gallon Tank 5. The other three wastes were identified as drummed ignitable (Solvent II) stored in 55-gallon drums in Flammable Storage 4, and arsenic- and mercury-contaminated wastes stored in separate 55-gallon drums in Chemical Storage 2 (Signetics, 1980b). The facility operated under interim status until receiving a draft RCRA hazardous waste storage permit from the State of New Mexico on February 11, 1985 and a final 10-year hazardous waste permit on April 1, 1986 (EPA, 1985 and NMEID, 1986). Signetics is an indirect discharger of neutralized acid wastewater into the City of Albuquerque's POTW and operates under a city wastewater discharge permit number 2023A-3, which is current until July 31, 1993 (Albuquerque, 1991). The facility is also permitted for air emissions and was granted Air Quality Permit Number 166 on December 15, 1986 by the City of Albuquerque (Albuquerque, 1992a).

During the Visual Site Inspection (VSI) and Preliminary Review (PR), PRC identified eight Solid Waste Management Units (SWMU) at Signetics Corporation. Of these, five are active and three are inactive. No areas of concern (AOC) were identified. PRC recommends further investigation at one SWMU, the abandoned Coronado Municipal Landfill.

1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC), received Work Assignment No. R2652 from the U.S. Environmental Protection Agency (EPA) under Contract No. 68-W9-0041 to conduct RCRA facility assessments (RFA) and visual site inspections (VSI) of RCRA facilities permitted to store and treat hazardous wastes. Under this Work Assignment, PRC is contracted to provide technical support on a RFA/VSI of the Signetics Corporation (Signetics) facility in Albuquerque, New Mexico.

This report describes the findings of a PR and a VSI. It includes (1) a description of the facility and its SWMUs, (2) an identification of waste release potential through various contaminant migration pathways, and (3) a summary of conclusions and recommendations regarding further EPA activity, i.e., the need for an RFI.

1.1 PURPOSE OF THE RCRA FACILITY ASSESSMENT

The purpose of the RFA is to identify environmental releases or potential releases from SWMUs that may require corrective action. The RFA is the first step in implementing the corrective action provisions of the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA. Specifically, Sections 3004(u), 3004 (v), and 3008(h) grant EPA the authority to initiate corrective action for releases of hazardous wastes and constituents from SWMUs at RCRA-regulated facilities. An RFA generally consists of three steps; a PR, a VSI, and if necessary, a Sampling Visit (SV). A sampling visit is conducted only when available information is insufficient to support a recommendation for a RCRA Facility Investigation (RFI). The RFA at Signetics did not include sampling.

2.0 FACILITY DESCRIPTION

This section of the RFA report describes the location of the facility and its historical and current operations, provides a list of the identified SWMUs and AOCs, and describes the sources and types of wastes managed at the facility.

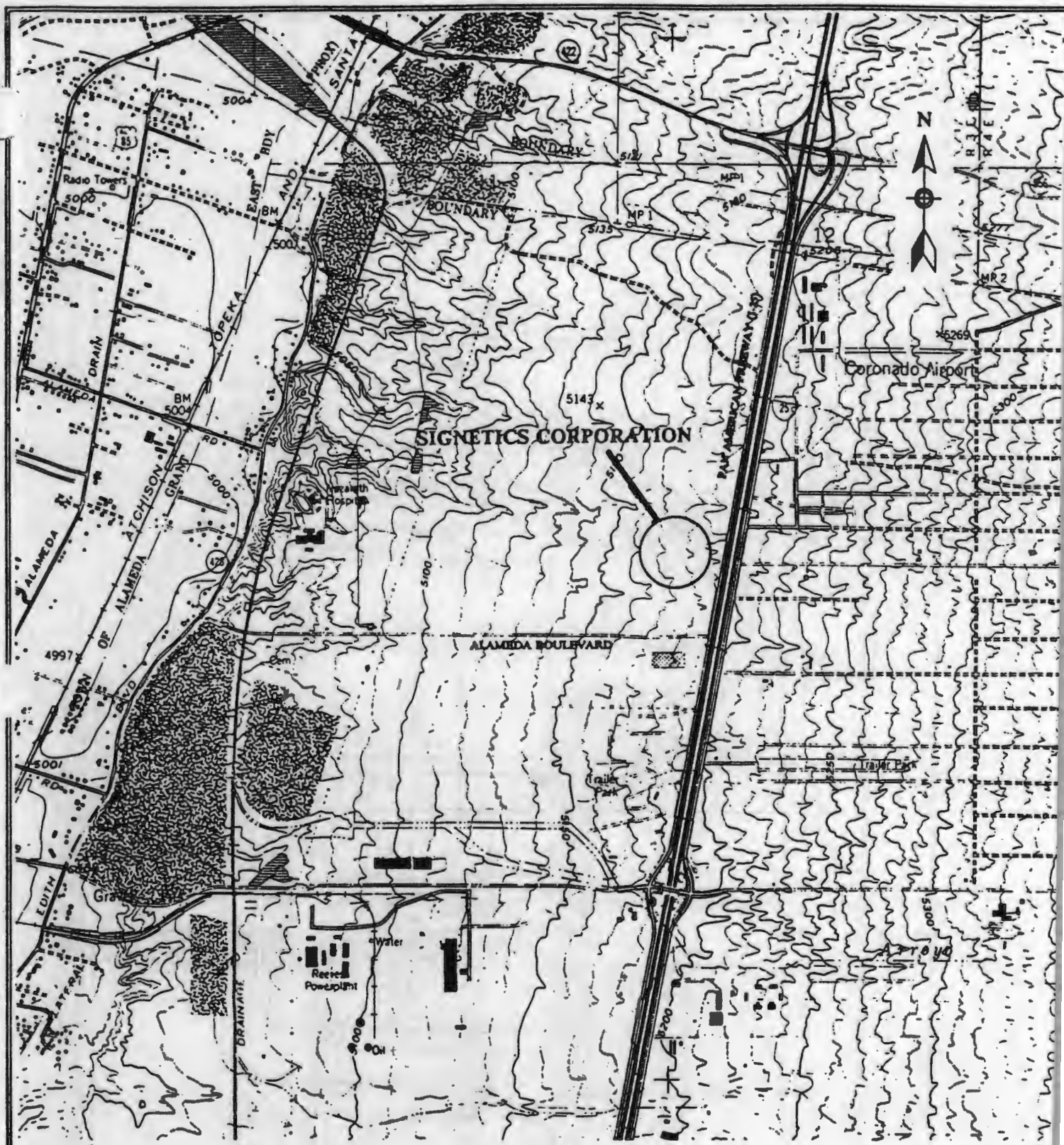
2.1 FACILITY LOCATION

The Signetics Corporation facility is located at the north edge of the city of Albuquerque, at the northwest juncture of the Pan American Freeway (Interstate 25) and Alameda Boulevard (Figure 2-1). The facility is on an approximately 60-acre plot obtained from the City of Albuquerque in an industrial bond process (Figure 2-2) (EPA, 1986). The site is situated close to the north boundary of the Elena Gallegos Land Grant, within the city limits, and just south of the Sandia Pueblo Land Grant boundary. The facility is bordered on the east by the freeway, on the north by vacant land, to the south by private businesses, principally Western Power and Construction, Inc., and to the west by Honeywell, Inc., a manufacturing facility. There is a residential area to the southwest of Signetics. The geographic coordinates of the facility are north 35° 05' 020" latitude and west 106° 39' 015" longitude. Figure 2-2 illustrates the layout of the Signetics facility.

The Signetics Albuquerque facility, a subsidiary of North American Philips Company, manufactures metal oxide semiconductor ICs from silicon wafers in its 470,000 square foot (ft^2) plant utilizing various masking, etching, cleaning, oxidation, metallization, and doping processes. The facility operates on a 24-hour per day schedule and has approximately 1,006 employees. All manufacturing processes are conducted inside the fabrication building in two clean room production areas designated as Fab 22 and Fab 23. Construction is currently ongoing to create additional manufacturing capacity.

Standard facility data are provided below:

Facility Location:	Intersection of the Pan American Freeway (Interstate 25) and Alameda Boulevard, Bernalillo County, New Mexico
Facility Address:	Signetics Corporation 9201 Pan American Freeway, N.E. Albuquerque, New Mexico 87113
Facility Contact:	Gary Mavrakis Material/Environmental Compliance Manager
Telephone:	(505) 822-7188

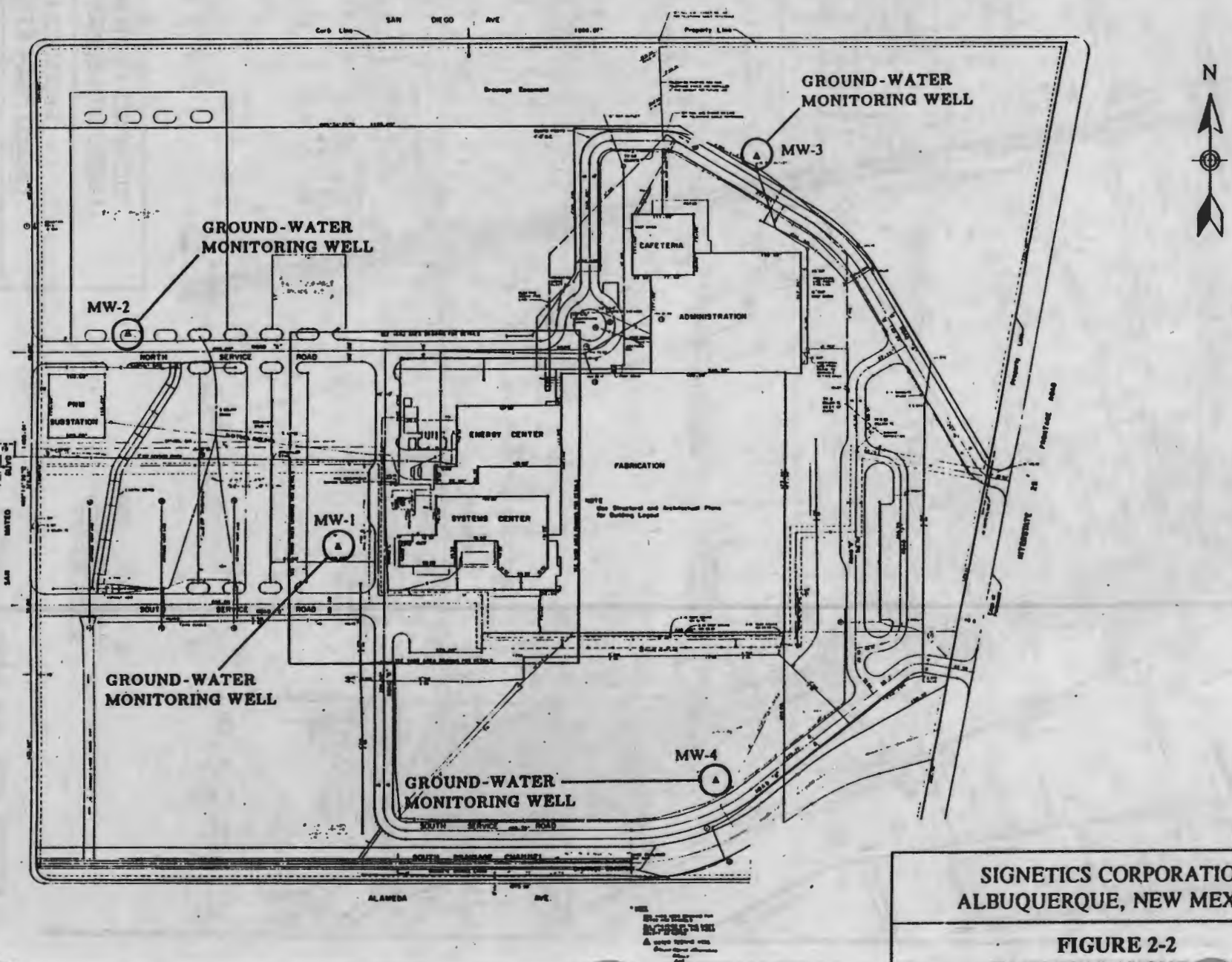


SOURCE: USGS - NEW MEXICO, ALAMEDA QUADRANGLE, PHOTO-REVISED 1972

SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO

FIGURE 2-1
FACILITY LOCATION MAP

PRC Environmental Management, Inc.



SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO

FIGURE 2-2
FACILITY LAYOUT MAP

PRC Environmental Management, Inc.

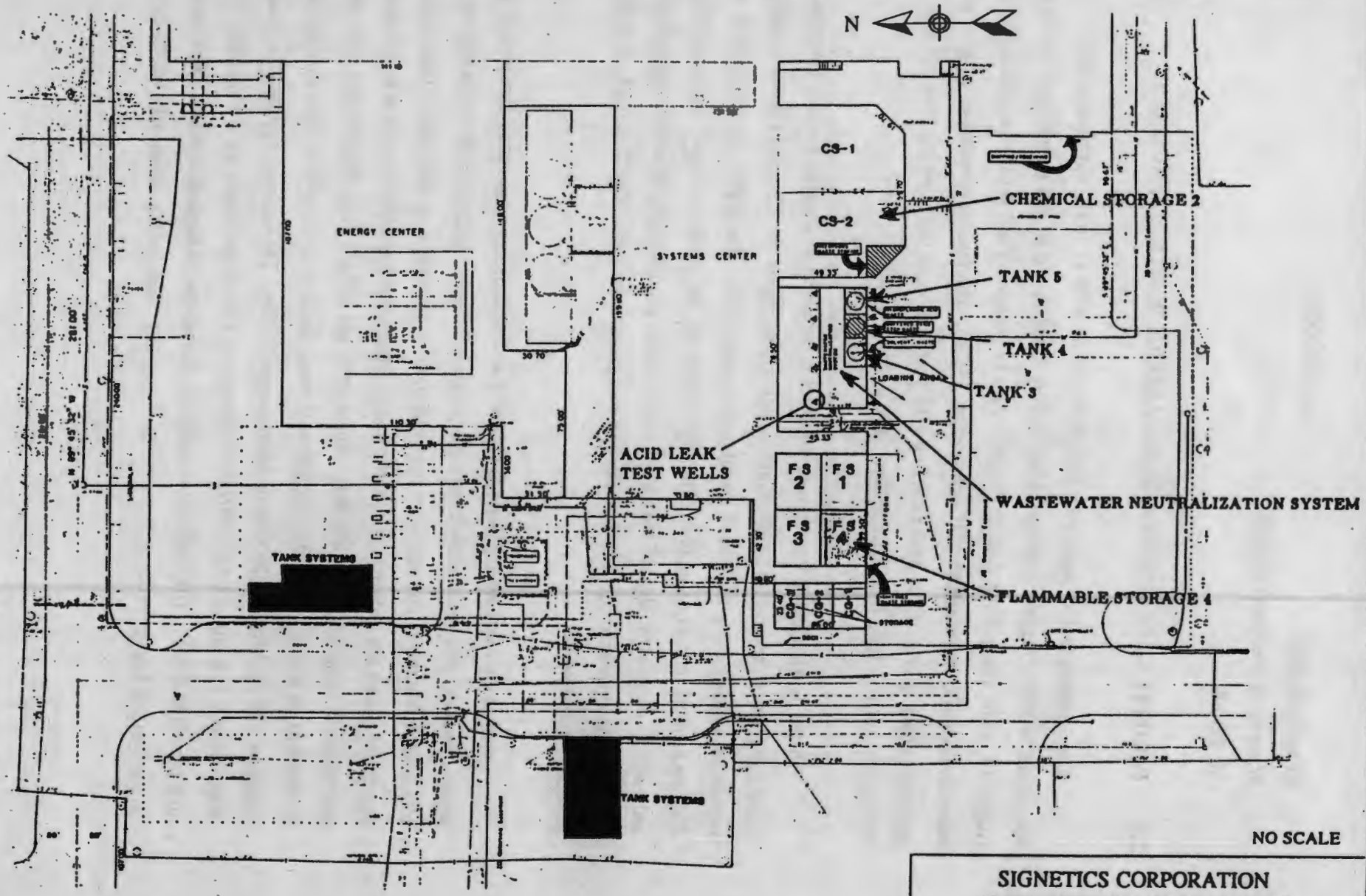
EPA ID Number:	NMD000709782
Wastewater Discharge Permit:	2023A-3
Air Permit:	166

2.2 FACILITY OPERATIONS AND HAZARDOUS WASTE MANAGEMENT

The Signetics facility underwent construction from 1978 to 1982, and became fully operational in 1983. Signetics submitted both a Part A and Part B RCRA permit applications on August 14, 1980, recognizing that the facility would be generating and storing hazardous wastes associated with the manufacture of ICs (Signetics, 1980b). The facility operated as a hazardous waste generator under interim status until receiving a 10 year hazardous waste permit from the State of New Mexico on April 1, 1986 (NMEID, 1986).

Under its Air Quality Permit 166, Signetics is permitted to annually process a maximum of 1,300,000 blank 4- and 6-inch silicon wafers. Manufacturing of the ICs occurs in the facility's fabrication building using automated manufacturing equipment. The wafers are subjected to a circuit diagram printing process using photolithographic material, the pattern is etched with hydrofluoric acid and buffered oxide etch, cleaned with acids and solvents, and impregnated with a conductive material, arsenic. The automated equipment, located in two clean room areas, Fab 22 and 23, is continuously serviced by operators.

Hazardous waste management is generally accomplished by continuous transport of waste streams from the automated manufacturing equipment through a segregated drainage system, or contained within the equipment and transported daily to a central treatment and storage area. The segregated drains are dedicated to specific waste streams and transport the wastes to a wastewater neutralization system or other SWMUs. Spent nitric and sulfuric acid, hydrofluoric acid, and buffered oxide etch solutions are transported in these drains to a wastewater neutralization facility for treatment and discharge to the City of Albuquerque POTW. The drainage system also transports waste Solvent I, a mixed solvent cleaning solution, to Tank 3 for temporary storage prior to shipment to a permitted TSDF. The wastewater treatment system and all hazardous waste SWMUs are located in the Systems Center building illustrated in Figure 2-3. The facility stores only wastes generated



NO SCALE

SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO

FIGURE 2-3
SIGNETICS SYSTEMS CENT[illegible]LDING

on-site and no off-site wastes are accepted (Signetics, 1980b). The segregated drainage system was designed specifically for the waste streams associated with IC production.

The contained waste stream, waste Solvent II, is a spent photolithographic solution and is collected in 5-gallon Nalgene carboys that are removed daily from the automated equipment and transported to a temporary storage room, Flammable Storage 4 (FS-4). The carboy contents are transferred to 55-gallon metal drums for on site storage until shipment to a TSDF.

Other process wastes, arsenic-contaminated material from servicing "doping" equipment and mercury-contaminated materials from broken thermometers and mercury lamps, are transported daily in separate sealed bags to a temporary storage room, Chemical Storage 2 (CS-2). The bagged wastes are placed in separate 55-gallon metal drums and stored on site until shipment to a TSDF. Signetics has received three awards from the EPA in 1988, 1989 and in 1991 for its waste management practices. The facility operates an aggressive recycling and reuse program of non-hazardous wastes generated from daily operations. In addition to standard paper, plastic, cardboard, and metal recycling; construction and maintenance materials, such as paint, are offered to employees rather than disposed of, and non-hazardous machine and pump oils are collected for reprocessing and reuse at the facility. Signetics has reported its intention to phase out the use of freon (NMED, 1991).

2.2.1 Summary of Wastes Handled

The IC manufacturing process at the Signetics plant results in several different waste streams including six hazardous wastes presented in Table 2-1 and described below. In addition to the process wastes generated, other non-hazardous wastes are generated as a result of plant maintenance and daily operations.

The majority of wastes handled at Signetics result from manufacturing activities occurring in two clean room areas, Fab 22 and 23. The IC etching step generates a hydrofluoric acid waste stream (D002) and buffered oxide etch solution (hydrofluoric acid and ammonium fluoride) waste stream (D002) that is transported to the Neutralization Wastewater Treatment System through the segregated drainage pipes. Previously, these two waste solutions were stored on site in separate 5,000-gallon tanks until sufficient quantities were accumulated for shipment to a TSDF. Signetics

TABLE 2-1
SOLID WASTES

Waste/EPA Waste Code	Source	Primary Management Unit*
Waste Solvent I/D001/F002/F003	Photolithographic Cleaning	Tank 3
Waste Solvent II/D001/F003	Photolithographic Circuit Printing	Flammable Storage 4 (FS-4)
Waste Hydrofluoric Acid/D002	Silica Oxide Etching	Tank 5 (inactive) and Neutralization Wastewater Treatment System
Waste Buffered Oxide Etch/D002	Silica Oxide Etching	Tank 4 (inactive) and Neutralization Wastewater Treatment System
Arsenic Waste/D004	IC "doping" Process	Chemical Storage 2 (CS-2)
Mercury Waste/D009	Production Activities	Chemical Storage 2 (CS-2)
Spent Nitric and Sulfuric Acid Wastewater/NA**	IC Cleaning Activities	Neutralization Wastewater Treatment System

Notes:

* Primary management unit refers to a SWMU that currently manages or formerly managed the waste.

** Nonapplicable (NA) designates nonhazardous waste.

hazardous waste storage permit limits the on-site storage capacity in each 5,000-gallon tank to 4,700 gallons (NMEID, 1986). In an agreement reached with the City of Albuquerque and the State of New Mexico in 1986, these two acid wastes are now neutralized in the Neutralization Wastewater Treatment System, along with other acidic wastewaters, and discharged into the City of Albuquerque POTW (EPA, 1988). Signetics reported the generation of approximately 50,000 gallons of waste hydrofluoric acid and 30,000 gallons of waste buffered oxide etch in 1991 (Signetics, 1992). The two 5,000-gallon tanks designated as Tank 5 for the waste hydrofluoric acid tank and Tank 4 for the buffered oxide etch waste tank are inactive, but maintained for possible future use.

A series of IC cleaning steps involve the use of acid solutions. The resultant spent nitric and sulfuric acid wastewaters are discharged through the segregated drainage system to the Neutralization Wastewater Treatment System. The neutralized wastewater effluent which includes the waste hydrofluoric and buffered oxide etch solutions, spent nitric and sulfuric acid wastewater, cooling tower blowdown, fabrication scrubber waters, and demineralizer regeneration wastewaters, is combined with the domestic wastewater and discharged into the City of Albuquerque POTW. The total quantity of acid/caustic wastewater discharged from the wastewater treatment system was reported by Signetics as approximately 160 million gallons in 1989 (Signetics, 1990).

The third hazardous waste stream generated in production activities is a mixed ignitable "Solvent I" waste with hazardous waste classifications of D001, F002, and F003. This photolithographic cleaning waste contains methanol, acetone, ethylene glycol, ethanolamine, diethylene glycol monobutyl ether, water, and occasional trace levels of chlorinated solvents (freon and 1,1,1-trichloroethane), resulting from the stripping of photolithographic material from the silica wafers. Collection of this waste stream is also through the segregated drainage system and stored in a 5,000-gallon SWMU, Tank 3 in the wastewater treatment area in the Systems Center building. The Solvent I waste is stored on site until shipped to a licensed commercial TSDF where it is utilized in a fuels program (Signetics, 1980b). Signetics reported the shipment of approximately 20,000 gallons of Solvent I waste in 1991 (Signetics, 1992). The 1986 hazardous waste storage permit under which Signetics operates, specifies a maximum storage limit of 4,700 gallons of waste Solvent I in Tank 3 prior to shipment to an off site TSDF (NMEID, 1986).

A fourth hazardous waste, "Solvent II", with hazardous waste classifications D001 and F003, is a waste photolithographic solution consisting of a mixture of proprietary vendor formulations of positive photoresists which include cellosolve acetate, glycol esters, and acetone. This waste stream is collected from individual automated IC manufacturing machines daily in 5-gallon Nalgene carboys and segregated into 55-gallon steel drums and stored in Flammable Storage 4 (FS-4). Room FS-4 is a designated SWMU for this waste (Signetics, 1980b). The drummed waste is stored for transport to a TSDF for use in a fuels program. Signetics reported the generation of 160 drums of Solvent II waste in 1991 (Signetics, 1992). The maximum allowable number of drums permitted in FS-4 under the provisions of Signetics hazardous waste storage permit, is 36 drums (NMEID, 1986).

The fifth and sixth hazardous waste streams associated with production activities are hazardous by characteristics of toxicity. The impregnation of the etch circuit diagrams with conductive material involves the use of arsine gas and results in the generation of arsenic contaminated gloves, containers, and rags with hazardous classification D004. A smaller hazardous waste stream with hazardous classification D009, mercury contaminated waste, includes used lamp bulbs, broken thermometers, and spill containment material. These two wastes are stored in separate 55-gallon steel drums in Chemical Storage 2 (CS-2), which is permitted to hold a maximum of 64 drums of these hazardous wastes (NMEID, 1986). The drummed arsenic waste is stored until sufficient quantity has accumulated to justify shipment. There was only one partially filled drum of mercury waste and no shipments had been made at the time of the VSI. Signetics reported the generation of 25 drums of arsenic-contaminated wastes in 1991 (Signetics, 1992).

Signetics uses only permitted hazardous waste transporters and TSDFs for the removal and disposal of the wastes generated at the Albuquerque facility. Three transporters and three TSDFs (Table 2-2) were identified by Signetics as companies whose services are currently used (Signetics, 1991).

2.2.2 Identification of Solid Waste Management Units

As a result of this RFA, a total of eight SWMUs have been identified at the Signetics facility. The definition of a SWMU adopted in this RFA reflects current EPA policy as stated in the July 15, 1985, Codification Rule (50 CFR 28701), the RCRA Facility Assessment Guidance Document

TABLE 2-2
HAZARDOUS WASTE TRANSPORTERS AND TSD FACILITIES

Company Name	Address	EPA ID Number
Transporters		
ENSECO	No Address	ARD069748192
Chemical Waste Management, Inc.	No Address	ILD099202681
RINCHEM Company, Inc.	No Address	NMD002208627
TSD Facilities		
ENSECO	American Oil Road El Dorado, AR 71730	ARD069784192
Oil & Solvent Process Company	9131 East 96th Ave. Henderson, CO 80640	COD980591184
Cameron-Yakima	1414 S. 1st Street Yakima, WA 98901	WAD009477175

(October 1986), and other recent policy directives from the Office of Solid Waste and Emergency Response (OSWER). A SWMU is defined as any discernable waste management unit at a RCRA facility from which hazardous constituents might migrate. The definition does not include accidental spills from production areas and units in which wastes have not been managed (such as product storage areas). Table 2-3 presents a summary of the regulatory and operating status for all SWMUs identified at the facility.

2.3 REGULATORY STATUS

This section summarizes the regulatory status of the hazardous waste management units at the Signetics facility, as could be determined from the files reviewed and from facility personnel. In this section, we present information on permits and other environmental compliance issues under city, state, and federal regulations.

2.3.1 RCRA Permits

The normal operation of the Signetics facility results in the generation of hazardous wastes by characteristics of corrosivity (D002), ignitability (D001), toxicity (D004 and D009), and listed solvent wastes (F002 and F003). These hazardous wastes, along with other non-hazardous wastes (nitric/sulfuric acid wastewater) are treated on site for disposal in the City of Albuquerque POTW or stored on site prior to transport to an approved TSDF.

Signetics submitted a RCRA Part A and Part B applications to EPA Region 6 on August 14, 1980. The facility operated under interim status until February 11, 1985 when the New Mexico Environmental Improvement Department (NMEID) granted tentative approval for a hazardous waste storage permit and then gave final approval for the 10 year permit on April 1, 1986 (Signetics 1980a, Signetics 1980b, and NMEID 1986). As a result of a 1986 agreement with the City of Albuquerque and the State of New Mexico, the hydrofluoric acid and buffered etch wastes previously stored on site in regulated SWMUs, are now discharged to the wastewater neutralization system. SWMU Nos. 3 and 4, storage tanks for these wastes, are now inactive but are maintained for possible future use (EPA, 1988). Signetics has previously made minor amendments to their Part B permit in 1986 and 1988 to reflect changes in facility structures (NMEID, 1988b, Signetics, 1986, and Signetics, 1988).

TABLE 2-3
SOLID WASTE MANAGEMENT UNITS (SWMUs)

SWMU Number	SWMU Name	RCRA Hazardous Waste Management Unit*	Status
1	Segregated Drains	Unregulated	Active
2	Tank 3	Regulated	Active
3	Tank 4	Regulated	Inactive
4	Tank 5	Regulated	Inactive
5	Flammable Storage 4 (FS-4)	Regulated	Active
6	Chemical Storage 2 (CS-2)	Regulated	Active
7	Neutralization Wastewater Treatment System	Unregulated	Active
8	Coronado Municipal Landfill	Unregulated	Inactive

Note:

* A RCRA hazardous waste management unit is one that currently requires or formerly required submittal of a RCRA Part A or Part B permit application.

The Part B permit is currently being amended to reflect changes in Signetics personnel with responsibilities under this permit.

Regulatory compliance orders and notice of violations received by Signetics have generally dealt with minor regulatory documentation requirement issues. The only penalty assessed against Signetics occurred in 1983 and was in regard to the corporation's failure to submit documentation of closure and post-closure assurance (EPA, 1983a and EPA, 1983b).

2.3.2 Air Permits

The City of Albuquerque, Engineering/Air Monitoring Section, Air Pollution Control Division issued Air Quality Permit 166 to the Signetics facility on December 15, 1986. The permit has since been amended one time in 1987 to raise the levels of permitted volatile organic compound (VOC) and arsenic emissions, and the maximum annual silicon wafer processing volume. The permit requires air quality monitoring of VOCs, arsenic, and acid emissions from the facility. Signetics is required to submit quarterly reports (Albuquerque, 1992a).

Since the 1986 issuance of the original air permit, no notices of violations have been issued in response to submitted quarterly reports or facility inspections. The City of Albuquerque has routinely received submitted notifications from Signetics of stack air scrubber equipment upgrades and modifications (Albuquerque, 1992a).

2.3.3 Water Permits

The Signetics facility discharges process-related wastewater into the City of Albuquerque POTW after treatment and falls under the category of an indirect wastewater discharger; not requiring an NPDES permit. The City of Albuquerque is required to have an NPDES permit for its wastewater treatment plant effluent and regulates the wastewater discharges into the POTW. Signetics has a City of Albuquerque wastewater discharge permit 2023A-3 that regulates discharge of acid wastewater from the facility wastewater treatment system and is effective until July 31, 1993. The wastewater effluent from the wastewater treatment system is combined with general facility wastewater and discharged into the City's POTW (Albuquerque, 1991).

As required under the permit granted by the City of Albuquerque, the facility routinely monitors effluent from the wastewater treatment system. Quarterly reports are submitted to the Wastewater Utility Division's Southside Wastewater Treatment Plant documenting performance of the Signetics wastewater treatment process. Between July 1990 and July 1991 there were several instances where collected effluent samples exceeded the maximum concentration limits permitted under Permit 2023A-3 (Albuquerque, 1992b). The excursions usually involved excessive levels of fluoride, pH, and in one report, nickel. Additionally, Signetics has reported incidents of pH excursions resulting from wastewater treatment equipment failure and human error (Albuquerque, 1992b). To date, the facility has only been cautioned to take corrective action where necessary to ensure that it stays within the permitted limits. No notices of violation have been issued to Signetics for these permit violations.

3.0 ENVIRONMENTAL SETTING

This section describes the environmental setting of the Signetics site and the water resources of the Albuquerque, New Mexico area. The information provides a basis for evaluating potential impacts on human health and the environment from existing or potential releases of hazardous materials to the environment from the SWMUs identified at Signetics. The following subsections describe the land use, climate, topography and surface water, soils, geology, and ground water of the site.

3.1 LAND USE

Signetics Albuquerque facility is located approximately 8 miles east of the Rio Grande River in the north part of the City of Albuquerque. Land use in the vicinity of the facility is a mixture of industrial, private business, and residential. Signetics is bordered by open, undeveloped land to the north; on the east by the Pan American Freeway (Interstate 25); to the south by Western Power and Construction, Inc., and other private businesses; and to the west by Honeywell, Inc., a manufacturing facility. There is a residential development to the immediate southwest of Signetics, and extensive residential housing to the east, on the east side of the Pan American Freeway (Interstate 25).

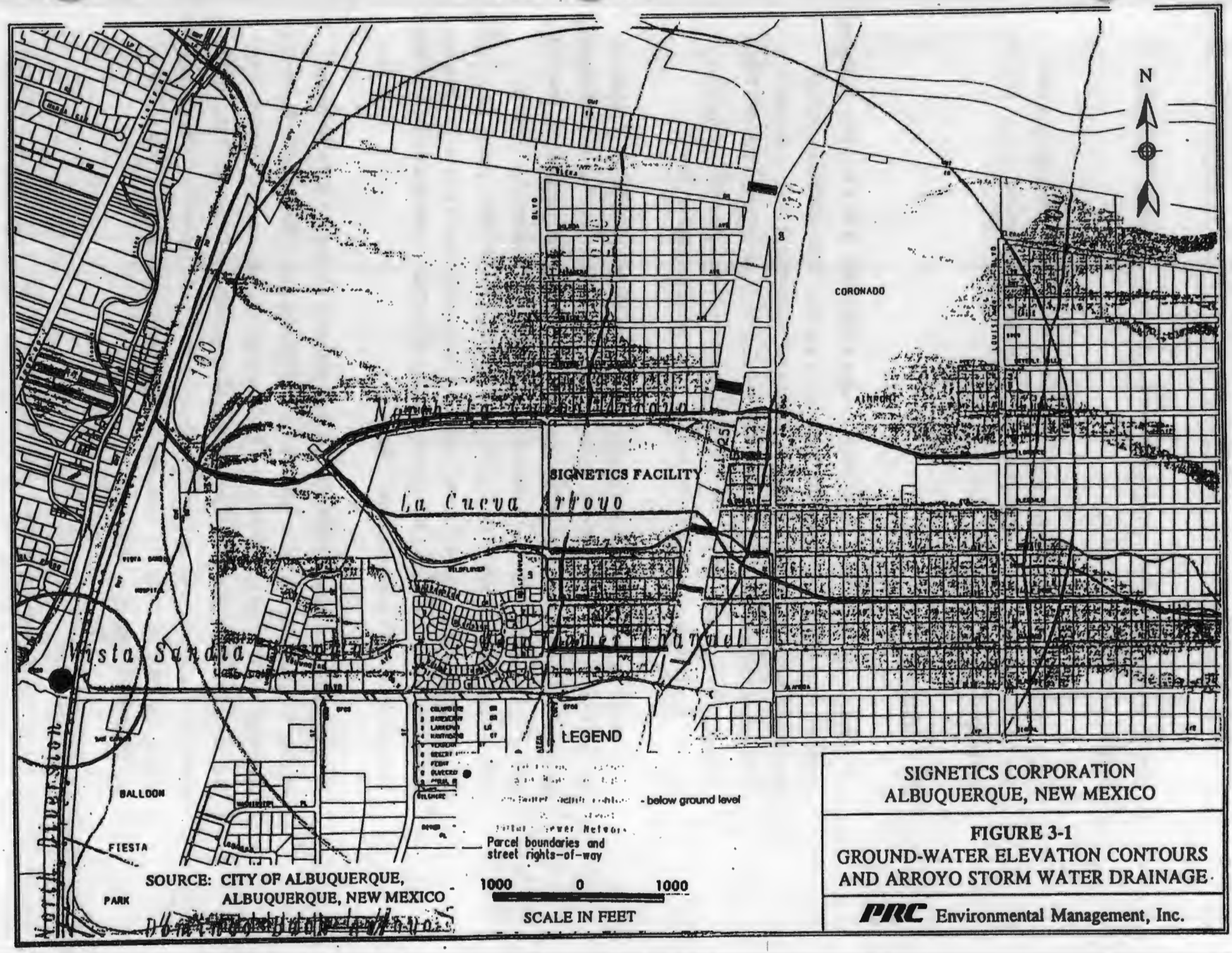
places (Reeder, 1967). The distance between the base of the mountains and the inner valley floor ranges from about 3 miles in the northern part of the area to about 9 miles in the southern part. The valley floor is relatively flat, sloping downstream 6 to 7 feet per mile, and ranging in width from 1 to 4 miles. The inner valley is separated from the east mesa by a bluff which is breached by arroyos from which alluvial fans spread out on the inner valley floor (Reeder, 1967).

A series of cut terraces parallel the Rio Grande on the west, and a broad upland surface, about 600 feet above the river, borders the terraces on the west. In the Albuquerque area, the upland and cut terraces are called the "west mesa." The upland surface slopes generally southeast at about 50 to 100 feet per mile. The Signetics facility is situated on the east mesa near the valley floor at an approximate elevation of 5,200 feet above mean sea level. The facility is situated in the La Cueva Arroyo and is protected from storm water runoff by constructed concrete channels that bypass Signetics on the north and south (Figure 3-1). La Cueva Arroyo drains an area of approximately 6.4 square miles upgradient of the Signetics facility (FEMA, 1983). The channels are designed to contain a 100-year flood and Signetics is, therefore, not in the 100-year flood zone. At this time, the 500-year flood plain has not been established in this area (Anderson, 1992). The concrete channel on the north side has a flow capacity of 5,500 cubic feet per second (ft^3/sec) and the southern channel, a flow capacity of 1,600 ft^3/sec (Signetics, 1980b). Flow from these channels discharges into the Albuquerque Metropolitan Arroyo and Flood Control Administration (AMAFCA) North Diversion Channel, which eventually discharges back into the Rio Grande. Surface water runoff from the facility is directed to the north and south storm water channels.

3.4 SOILS

The soils on which the Signetics facility is constructed are associated with the Embudo series and are described as a gently sloping soil of 0 to 5% on the east mesa, consisting of deep, well drained soils that formed in alluvium derived from decomposed, coarse grained, granite rocks on old alluvial fans (USDA, 1977).

Surface water runoff is medium, and the hazard of water erosion is moderate.



SOURCE: CITY OF ALBUQUERQUE, ALBUQUERQUE, NEW MEXICO

SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO

FIGURE 3-1
GROUND-WATER ELEVATION CONTOURS
AND ARROYO STORM WATER DRAINAGE

PRC Environmental Management, Inc.

a depth of 60 inches or more is stratified, pale brown gravelly loamy coarse sand. The soil is moderately alkaline (USDA, 1977).

Permeability is moderate in the upper 20 inches (0.2-0.6 inches per hour) and very rapid below (> 20 inches per hour). Available water capacity is 3 to 4 inches per inch of soil. Effective rooting depth is 60 inches or more (USDA, 1977).

3.5 GEOLOGY

The Albuquerque area lies mostly within a graben which is part of the Rio Grande depression, a connected series of grabens and structural basins having a general north - south alignment and which is bordered on the east and west by upfaulted blocks. The upfaulted blocks to the east form the Sandia and Manzano Mountains and the block to the west forms the highlands of the Rio Puerco and much of the Rio Puerco valley. The Jemez Caldera and the Jemez uplift, north of the Jemez River, are part of the west, upfaulted block that borders the depression (Reeder, 1967).

Fault zones trend along the west base of the Sandia and Manzano Mountains. The bedrock thus rises from the floor of the graben to the west of the mountains in steps. The fault zone bounding the west side of the graben may be similar to that on the east. The graben, or valley, has been partly filled by sand, gravel, silt, clay, and volcanic rocks of Tertiary and Quaternary age. Near the borders of the depression, beds of the Santa Fe group dip toward the axis of the graben, but along the axis the beds are nearly horizontal. Some of the dip of the Santa Fe group is depositional; however, later faulting and movement along old faults in older beds has in places, steepened the dip and caused faulting in the Santa Fe group (Bjorklund, 1961).

Rocks of pre-Tertiary age underlie the Albuquerque area and crop out in the Sandia and Manzano mountains, the Rio Puerco valley, and in the highlands west of the Zia Indian Reservation (Bjorklund, 1961). Rocks of the Tertiary and Quaternary age crop out in most of the valley area. They uncomformably overlie rocks of pre-Tertiary age and generally are composed of unconsolidated to loosely consolidated gravel, sand and silt, and a few beds of basalt and tuff; at places, the sequence is more than 6,000 feet thick. All water wells of large capacity are completed in rocks of Tertiary and Quaternary age (Reeder, 1967).

In the Albuquerque area the rocks of primary interest are the Santa Fe group, alluvial fans, and valley alluvium. The Santa Fe group, of middle (?) Miocene to Pleistocene (?) age, underlies the surficial deposits of the Rio Grande valley and crops out on the east and west mesas. Materials of the Santa Fe group were derived by erosion of the highlands east and west of the Rio Grande depression and by volcanic activity and erosión of the highlands farther north (Reeder, 1967). The Santa Fe group consists of beds of unconsolidated to loosely consolidated sediments and interbedded volcanic rocks. The deposits range from boulders to clay and from well-sorted stream-channel deposits to poorly sorted slopewash deposits. Extrusive volcanic rocks of Tertiary and Quaternary ages, mainly basaltic rocks, are interbedded with the sediments (Reeder, 1967).

A series of coalescing alluvial fans of Recent age were deposited unconformably on the Santa Fe group. They extend westward from the base of the Sandia and Manzano Mountains to the bluffs along the east side of the Rio Grande Valley. The fan deposits consist of sediments ranging from poorly sorted mudflow material to well-sorted stream gravel. The fan deposits range in thickness from 0 to 200 feet, thicken towards the mountains, and are not generally aquifers (Reeder, 1967).

Valley alluvium of Recent age underlies the flood plain of the Rio Grande and its tributaries. This alluvium is similar in appearance and composition to sediments of the underlying Santa Fe group and was derived from them in much of the area. The contact between the alluvium and the underlying Santa Fe group is difficult to distinguish but is generally 80 to 120 feet below the ground surface. Most of the irrigation wells along the Rio Grande tap the alluvium in the main valley (Reeder, 1967).

3.6 GROUND WATER

The valley fill is the principal aquifer in the Albuquerque area and is generally composed of unconsolidated and loosely consolidated gravel, sand, silt, and clay. The valley fill includes two geological units; the Santa Fe group and the alluvium. Both are interconnected hydraulically, and water moves from one formation into the other based on local hydraulic gradient conditions (Bjorklund, 1961).

The ground water in the valley fill generally is under water-table conditions, but locally, artesian conditions may exist owing to a confinement of saturated gravel or sand beds between beds of silt or clay. The water table in the Albuquerque area, in general, is an irregular, sloping surface. The irregularities in the water table are caused by differences in permeability and saturated thickness or by additions or withdrawals of water. The water table slopes generally southwestward from the Sandia and Manzano Mountains at a rate of about 5 to 20 feet to the mile (Bjorklund, 1961).

In the vicinity of the Signetics facility, ground water is encountered at a depth of approximately 190 to 220 feet (Figure 3-1) (Signetics, 1992).

Recharge to the ground-water reservoir, in the Albuquerque area is from precipitation, underflow of ground water from adjacent areas, and seepage from streams, drains, canals, surface reservoirs, and applied irrigation water. The order of importance of each type of recharge depends on local conditions. Much of the recharge comes from streams, particularly the Rio Grande (Reeder, 1967).

4.0 SOLID WASTE MANAGEMENT UNITS

This section discusses the SWMUs at the Signetics Corporation Albuquerque facility and evaluates actual or potential releases from those units. PRC identified eight SWMUs during the PR and VSI. Appendix A is a VSI summary and Appendix B provides photographs of the SWMUs. Unless otherwise referenced, data presented in this section were obtained during the VSI.

4.1 SWMU NO. 1 - SEGREGATED WASTE DRAINS (Photograph No. 1)

Description

The segregated drainage system serves to move most wastes generated in the production areas, Fab 22 and Fab 23, to the Systems Center building (Figures 2-2 and 2-3) for treatment of waste hydrofluoric acid, buffered oxide etch solution, and nitric and sulfuric acid wastewater in the Neutralization Wastewater Treatment System and storage of waste Solvent I in Tank 3 (SWMU No. 2). These drains were designed to be accessible in all parts of the facility, with no hidden piping or

drains, and are suspended from the basement ceiling under the production areas in the Fabrication building or routed to the wastewater area in concrete trenches in the floor of the Systems Center building.

Status

The segregated waste drains are operational and were part of the original construction of the facility in 1982. The drains are not regulated by permit under RCRA.

Waste Type

Each of the drains is consigned to handling an individual waste stream from the process areas. The wastes include:

- spent nitric/sulfuric acid solutions
- waste Solvent I photolithographic cleaning solution
- spent hydrofluoric acid solution
- spent buffered oxide etch (hydrofluoric and ammonium fluoride) solution

Waste Management

Waste streams associated with production activities in Fab 22 and 23 are transported in segregated drain lines to the wastewater treatment area. The spent acids and buffered oxide etch are discharged into the wastewater treatment system for neutralization, and the Solvent I is sent to Tank 3 (SWMU No. 2) for temporary storage. The segregated drains serve as conduits for the transport of these waste streams and no treatment is performed in this drainage system.

Environmental Releases

No environmental releases have been reported from this SWMU.

Remedial Action Taken

No remedial actions have been taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

Reasons

The drainage system is by design, highly visible and easily accessible to plant personnel. Spills from this unit would be immediately evident in the areas where piping is exposed and contained in the concrete trenches in the floor. The areas where piping is exposed are routinely inspected.

4.2 SWMU NO. 2 - TANK 3 (Photograph Nos. 5, 9, and 14)

Description

This 5,000-gallon capacity storage tank is a cylindrical mild steel tank, orientated vertically and containing a flat top and bottom. The tank is 10 feet in diameter and 8 feet 6 inches in height. Wall thickness is 3/16 inches. The tank is equipped with a 3-inch fill line which is attached to a segregated drain pipe from the process areas. The tank is vented to the atmosphere outside of the building and is located below ground, in a concrete vault. The tank is not set on the concrete floor of the vault and the top of the vault is covered by a steel grate (Signetics, 1980b). The vault has a total volume of 9,000 gallons, which is 192 percent of Tank 3's capacity and will contain the release of all of the tank contents and has no drainage system (EPA, 1985). The concrete is coated with chemically resistant resin. A 3-inch hose connection and suction line permits chemical unloading from the tank onto tank trucks (Signetics, 1980b).

Status

This unit is active, is a RCRA regulated unit under Signetics Part B permit, and was part of the original facility construction in 1982. The tank was replaced approximately 2 years ago, along with Tanks 4 and 5.

Waste Type

This SWMU receives and stores a waste stream designated by Signetics as waste Solvent I, a photolithographic cleaning waste with hazardous designations D001, F002, and F003. Primary constituents of the waste include methanol, acetone, ethylene glycol, ethanolamine, diethylene glycol monobutyl ether, and water. Chlorinated solvents, 1,1,1-trichloroethane and freon are also present (Signetics, 1980b).

Waste Management

Tank 3 collects liquid Solvent I waste by gravity feed from the process areas through the segregated drainage system. The level of the tank is monitored daily by measuring with a calibrated measuring pole. This information is recorded daily in the Hazardous Waste Storage Tank Log. The waste is transported to a TSDF when the waste storage volume reaches 4,700 gallons, which is the maximum storage volume allowed under Signetics 1986 hazardous waste storage permit (Signetics, 1980b and NMEID, 1986).

Environmental Releases

No environmental releases have been reported from this SWMU.

Remedial Action Taken

No remedial actions have been taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

Reasons

There have been no reported releases or spills. No visible contamination was observed during the VSI. The walls of the concrete vault appeared to be structurally sound, with no visible evidence of cracks or deterioration. The tank and vault are included in a routine inspection program.

4.3 SWMU NO. 3 - TANK 4 (Photograph Nos. 5, 10, and 12)

Description

Tank 4 is a 5,000-gallon capacity cylindrical storage tank of reinforced fiberglass construction. Orientated vertically and containing a flat top and bottom, the tank is supported by a 5/16 inch steel reinforced PVC extended jacket. The tank is 10 feet in diameter and 8 feet 6 inches in height. The tank has a synthetic corrosion barrier veil and is corrosion resistant to 10% hydrofluoric acid at 150°F or to 30% hydrofluoric acid at 100°F. The tank is equipped with a 3-inch fill line which is attached to a segregated drain pipe from the process areas. There is a 3-inch goose-neck vent with a polypropylene screen attached to the tank, which is in a below ground concrete vault. The tank is not set on the concrete floor of the vault and the top of the vault is covered by a steel grate (Signetics, 1980b). The vault has a total volume of 9,000 gallons, which is 192 percent of Tank 4's capacity and will contain the release of all of the tank contents and has no drainage system (EPA, 1985). The concrete is coated with chemically resistant resin. A 3-inch hose connection and suction line permits chemical unloading from the tank onto tank trucks (Signetics, 1980b).

Status

This unit is currently inactive but is a RCRA regulated unit under Signetics Part B Permit. Originally utilized as a temporary storage unit for waste hydrofluoric acid solution since the start up of the facility in 1982, an agreement between Signetics, and the City of Albuquerque and the State of

New Mexico in 1986, permits Signetics to discharge this waste stream into the Neutralization Wastewater Treatment System (NMEID, 1988a). Tank 4 is maintained on standby for possible future use if a change in regulations or policy should necessitate that Signetics return to its original waste management practices. All tanks in the wastewater treatment area were replaced approximately 2 years ago.

Waste Type

This SWMU was permitted for the storage of waste hydrofluoric acid. This waste stream results from the silica dioxide etching process and consists mainly of a dilute solution (0.1-15%) of hydrofluoric acid at a pH of less than 1. The waste is characterized as hazardous by characteristic of corrosivity and is assigned a D002 waste designation (Signetics, 1980b).

Waste Management

Tank 4 originally collected spent hydrofluoric acid solution by gravity feed from the process areas through the segregated drainage system. The level in the tank was monitored daily by measuring with a calibrated measuring pole. This information was recorded daily in the Hazardous Waste Storage Tank Log. The waste was transported to a TSDF when the waste storage volume reached 4,700 gallons, the maximum storage volume allowed in Signetics hazardous waste storage permit (Signetics, 1980b and NMEID, 1986). Currently, the line carrying the spent hydrofluoric acid is diverted into the Neutralization Wastewater Treatment System prior to reaching Tank 4, but could be restored to this SWMU through the opening of a valve.

Environmental Releases

No environmental releases have been reported from this SWMU.

Remedial Action Taken

No remedial actions have been taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

Reasons

There have been no reported releases or spills. No visible contamination was observed during the VSI. The walls of the concrete vault appeared to be structurally sound, with no visible evidence of cracks or deterioration. The tank and vault are included in a routine inspection program.

4.4 SWMU NO. 4 - TANK 5 (Photograph Nos. 5 and 11)

Description

Tank 5 is a 5,000-gallon capacity cylindrical storage tank of reinforced fiberglass construction . Orientated vertically and containing a flat top and bottom, the tank is supported by a 5/16 inch steel PVC extended jacket. The tank is 10 feet in diameter and 8 feet 6 inches in height. The tank has a synthetic corrosion barrier veil and is corrosion resistant to 10% hydrofluoric acid at 150°F or to 30% hydrofluoric acid at 100°F. The tank is equipped with a 3-inch fill line which is attached to a segregated drain pipe from the process areas. There is a 3-inch goose-neck vent with a polypropylene screen attached to the tank, which is in a below ground concrete vault. The tank is not set on the concrete floor of the vault and the top of the vault is covered by a steel grate (Signetics, 1980b). The vault has a total volume of 9,000 gallons, which is 192 percent of Tank 5's capacity and will contain the release of all of the tank contents and has no drainage system (EPA, 1985). The concrete is coated with chemically resistant resin. A 3-inch hose connection and suction line permits chemical unloading from the tank onto tank trucks (Signetics, 1980b).

Status

This unit is currently inactive but is a RCRA regulated unit under Signetics Part B permit. Originally utilized as a temporary storage unit for waste buffered oxide etch solution since the start up of the facility in 1982, an agreement between Signetics, and the City of Albuquerque and the State of

New Mexico in 1986, permits Signetics to discharge this waste stream into the Neutralization Wastewater Treatment System (NMEID, 1988a). Tank 5 is maintained on standby for possible future use if a change in regulations or policy should necessitate that Signetics return to its original waste management practices. All tanks in the wastewater treatment area were replaced approximately 2 years ago.

Waste Type

This SWMU was permitted for the storage of waste buffered etch solution. This waste stream results from the silica dioxide etching process and consists mainly of a dilute solution of hydrofluoric acid (0.1-15%) and ammonium fluoride (0.1-40%). The buffered oxide etch waste has a low pH and a high concentration of fluoride. The waste is characterized as hazardous by characteristic of corrosivity and is assigned a D002 waste designation (Signetics, 1980b).

Waste Management

Tank 5 originally collected spent buffered oxide etch solution by gravity feed from the process areas through the segregated drainage system. The level in the tank was monitored daily by measuring with a calibrated measuring pole. This information was recorded daily in the Hazardous Waste Storage Tank Log. The waste was transported to a TSDF when the waste storage volume reached 4,700 gallons, the maximum storage volume allowed in Signetics hazardous waste storage permit (Signetics, 1980b and NMEID, 1986). Currently, the line carrying the spent buffered oxide etch is diverted into the Neutralization Wastewater Treatment System prior to reaching Tank 5, but could be restored to this SWMU through the opening of a valve.

Environmental Releases

No environmental releases have been reported from this SWMU.

Remedial Action Taken

No remedial actions have been taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

Reasons

There have been no reported releases or spills. No visible contamination was observed during the VSI. The walls of the concrete vault appeared to be structurally sound, with no visible evidence of cracks or deterioration. The tank and vault are included in a routine inspection program.

4.5 SWMU NO. 5 - FLAMMABLE STORAGE 4 (FS-4) (Photograph Nos. 16 and 17)

Description

Flammable Storage 4 (FS-4) is one of four rooms dedicated to the storage of flammable chemical materials at the Signetics facility (Figure 2-3). FS-1, FS-2, and FS-3 are primarily used to store unused chemical product and ignitable waste is stored in FS-4. This SWMU is constructed of concrete with inside dimensions of 22 by 26 feet and contains 562 ft^2 of floor space. The floor is an 8-inch slab and the walls are 8-inch concrete masonry units with a 1 hour fire rating. The room is also equipped with makeup and exhaust air. The roof has an explosion vent rated at 600 pounds per square inch (psi). The floor has a 4-inch slope to a 4-inch drain in the center of the room. The floor drains to a line that discharges into Tank 3 (SWMU No. 2) (Signetics, 1980b).

Status

This flammable storage room was put into service at the time of plant start up in 1982. This SWMU is operational and is a RCRA regulated unit.

Waste Type

This room is used as a storage area for drummed hazardous waste that Signetics designates as waste Solvent II. This solution is a waste mixture from the process areas of vendor proprietary

formulations of positive photoresists that include cellosolve acetate, glycol esters, and acetone. This waste material is classified as hazardous by ignitability (D001) and as a non-halogenated solvent waste (F003) (Signetics, 1980b).

Waste Management

Flammable wastes stored in FS-4 are placed in 55-gallon DOT 17E metal drums. The drums are stored off the floor on pallets, with four drums per pallet, to elevate them from contact with any possible liquid releases. All drums and pallets are single stacked. The drums are marked with EPA hazardous waste and Department of Transportation (DOT) labels and each drum is assigned a number. The storage room is inspected daily to assure that drums are in good condition and inspection logs are completed and kept on file (Signetics, 1980b).

The waste Solvent II is transferred from the process areas to FS-4 in 5-gallon Nalgene carboys and transferred into drums. These wastes are accompanied by chemical manifests during transit. Each drum is opened approximately 10-20 times to add waste before it is filled. When waste additions are made, a Hazardous Waste Drum Log is updated and maintained in the area of drum storage until the drum is full. These drum logs are maintained in a permanent file (Signetics, 1980b).

Periodic shipments of these drums are made to a TSDF when sufficient drummed inventory is accumulated. The 1986 hazardous waste storage permit limits drummed hazardous waste inventory in FS-4 to 36 drums (NMEID, 1986).

Environmental Release

No environmental releases have been reported from this SWMU.

Remedial Action Taken

No remedial actions have been taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

Reasons

There have been no reported releases or spills. Any releases that might occur in this room would be contained within the confines of this area, or flow through the central floor drain and discharge into Tank 3 (SWMU No. 2). No visible contamination was observed during the VSI.

4.6 SWMU NO. 6 - CHEMICAL STORAGE 2 (CS-2) (Photograph Nos. 2, 3, and 4)

Description

Chemical Storage 2 (CS-2) is one of two rooms dedicated to general chemical storage for inventory used in process activities and general operation of the facility. A portion of CS-2, a southwest corner of the room, has been dedicated to storing drummed arsenic and mercury contaminated waste (Figure 2-3). This area is segregated from other portions of the room used for chemical storage and marked with yellow striped tape. CS-2 has 2,611 ft^2 of floor space, with 172 ft^2 available for hazardous waste storage. The floor and walls are constructed of 8 inch concrete with the roof covered by a 4 inch concrete topping and fiberglass insulation and steel beams. The floor has a 3-inch drain line that runs north into a piping trench and connects to a 6-inch acid waste drain which discharges into the wastewater treatment system. The piping trench is equipped with a sump, air pump, and level controls in case of a release. Since the hazardous waste stored in this room is in a solid form, the likelihood of hazardous waste discharging into the drains is unlikely (Signetics, 1980b).

Status

The two chemical storage rooms, including CS-2, were placed into service at the time of plant start up in 1982. CS-2 is an operational SWMU and is regulated under RCRA.

Waste Type

This room, in addition to storing general chemicals utilized in the day to day operation of the facility, is a temporary storage area for two types of drummed solid hazardous waste; arsenic- and mercury-contaminated materials.

The arsenic-contaminated materials are classified as hazardous waste by characteristics of toxicity and designated as D004 waste. This waste includes all materials that have been contaminated with arsenic from production activities, such as gloves, containers, and rags. While all materials are managed as hazardous wastes, not all would exceed the Toxicity Characteristic Leaching Procedure (TCLP) limits for arsenic (Signetics, 1980b).

The mercury-contaminated materials include mercury vapor lamps, broken mercury thermometers, and contaminated spill containment materials. This material is also characterized as hazardous by toxicity and is designated as a D009 waste (Signetics, 1980b). Since the start up of the Signetics facility, approximately one-half drum of this waste has been accumulated.

Waste Management

The hazardous wastes stored in CS-2 are placed in 55-gallon DOT 17H metal drums. The drums are stored on pallets, with four drums per pallet, to elevate them from contact with any possible liquid releases. All drums and pallets are single stacked. The drums are marked with EPA hazardous waste and DOT labels and each drum is assigned a number. The storage room is inspected daily to assure that drums are in good condition and inspection logs are completed and kept on file (Signetics, 1980b).

The contaminated solid wastes are transferred from the process areas to CS-2 in bags and transferred into drums. These wastes are accompanied by chemical manifests during transit. Each drum is opened approximately 10-20 times to add waste before it is filled. When waste additions are made, a Hazardous Waste Drum Log is updated and maintained in the area of drum storage until the drum is full. These drum logs are maintained in a permanent file (Signetics, 1980b).

Periodic shipments of these drums are made to a TSDF when sufficient drummed inventory is accumulated. The 1986 hazardous waste permit limits drummed hazardous waste inventory in CS-2 to 64 drums (NMEID, 1986).

Environmental Releases

No environmental releases have been reported from this SWMU.

Remedial Action Taken

No remedial actions have been taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

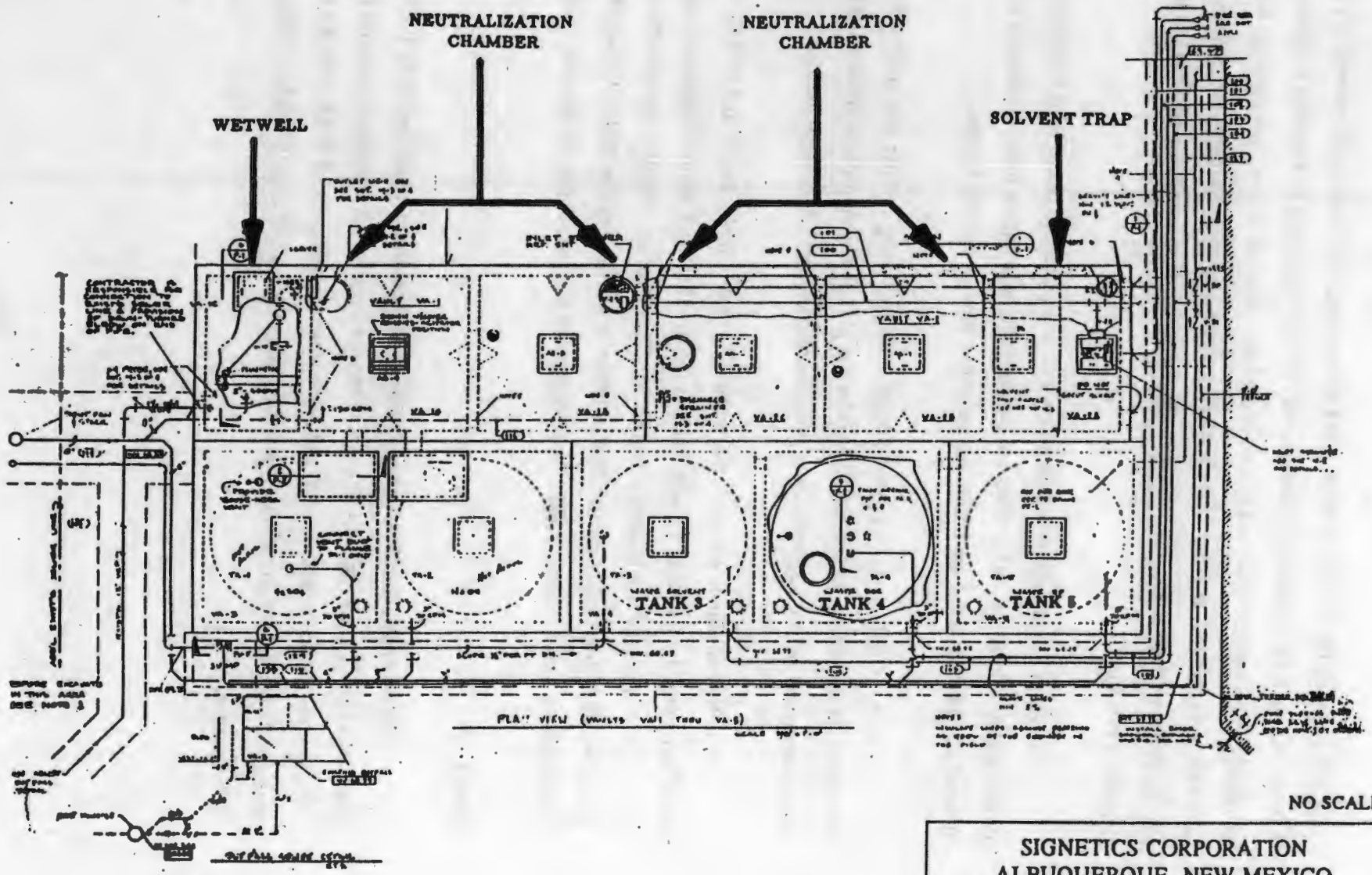
Reasons

There have been no reported releases or spills. Since the hazardous wastes stored in this room are generally solid, and the room is an enclosed structure with no signs of chemical staining or etching of the concrete, containment of any accidental releases should be readily accomplished.

4.7 SWMU NO. 7 - NEUTRALIZATION WASTEWATER TREATMENT SYSTEM (Photograph Nos. 5, 6, and 12)

Description

The wastewater treatment facility is located in the south central portion of the Systems Center building of the Signetics plant (Figure 2-3). This area of the plant includes SWMU Nos. 2, 3, and 4; and the Neutralization Wastewater Treatment System (SWMU No. 7) (Figure 4-1). The Neutralization Wastewater Treatment System consists of a solvent trap (grit chamber) at the influent end of the system, followed by two sets of pH adjustment chambers, each containing two vaults, and



NO SCALE

SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO

FIGURE 4-1
WASTE WATER TREATMENT FACILITY

PRC Environmental Management, Inc.

SOURCE: SIGNETICS, ALBUQUERQUE, NEW MEXICO

a wet well at the outfall or effluent point. The solvent trap, four vaults, and wetwell are configured in series, and each pH adjustment chamber, with its two vaults, can be bypassed to permit maintenance with no interruption of system operations. Two pH probes, one mounted in the last vault before the wetwell, and one in the wetwell provide continuous readings and control signals for pH adjustment to the wastewater. The wetwell also serves as the sampling well for the system (Signetics, 1980b).

The vaults are of concrete construction with vault interiors coated with a protective lining to protect against acid attack. The vaults are accessible through square metal hatches set in the concrete floor of the facility and the pH probes are accessible through circular hatches.

Two 5,000-gallon above ground storage tanks containing sulfuric acid and sodium hydroxide are located in the same area and are utilized for the pH adjustment process in the wastewater treatment system and for regeneration of a demineralization unit in an adjacent area.

The Neutralization Wastewater Treatment System (SWMU No. 7) and SWMU Nos. 2, 3, and 4 are surrounded by a total of 11 acid leak test wells. These dry wells are inspected every 90 days for evidence of wastewater leakage (Figure 2-3). This area was originally open to the elements at the time of the Signetics facility construction in 1980. It was enclosed in 1986 to provide better security and protection to the treatment and storage equipment from the climate (Signetics, 1986).

Status

The Neutralization Wastewater Treatment System was put into service in 1982 at the time of plant start up and is still active. The unit is exempt from RCRA regulation under 40 CFR 264.1 (g) (6) and New Mexico's Hazardous Waste Management Regulations (HWMR) 206.A.4f, but operates under a City of Albuquerque Wastewater Discharge Permit 2023A-3 (Signetics, 1980b and Albuquerque, 1991).

Waste Type

The wastewater treatment system neutralizes industrial wastewaters to a required pH discharge range prior to discharge from the facility into the Albuquerque POTW. The treatment system originally received spent hydrochloric and sulfuric acid solution from wafer cleaning activities in the process areas, cooling tower blowdown, spent sulfuric acid and sodium hydroxide solutions from demineralizer regeneration, and air scrubber fabrication waters. Subsequent to a 1986 agreement with the City of Albuquerque and the State of New Mexico, Signetics was permitted to discharge the spent hydrofluoric acid and buffered oxide etch solutions into the neutralization wastewater treatment system with the other industrial wastewaters (EPA, 1988).

Waste Management

Acidic wastewater is drained by gravity through the segregated drainage system from the process areas or is pumped from a sump in the RO/DI demineralization area into either the solvent trap or first vault of the second neutralization chamber. Sodium hydroxide and occasionally sulfuric acid are used to adjust the wastewater pH to a specified pH discharge range. Chemical feed rates are controlled by pH probes in the second neutralization chamber and the wetwell. The permitted pH range of the wastewater effluent discharged to the City of Albuquerque POTW is 5.0 - 11.0 (Albuquerque, 1991). This treatment process does not provide for the removal of fluorides or heavy metals (Signetics, 1985a).

Environmental Releases

A release that occurred on November 5, 1985 was reported to the NMEID and EPA. The leak was detected in a test well on the north side of the wastewater treatment system and the source of the release was traced to the solvent trap (grit chamber) (Figure 4-1). Collected wastewater from the test well was sent to Signetic's internal laboratory. Analysis of the water indicated a pH of 4.5 but no other analytical data associated with this sample were reported. The release report to the NMEID included analytical data from wastewater samples routinely collected from the wastewater treatment system that showed no significant levels of heavy metals. The release volume could not be

determined, but based on the less than 1/4-inch size of the hole in the vault, the estimated volume was small (Signetics, 1985b).

Remedial Action

Wastewater was pumped from the test well. No other action was requested by regulatory agencies or taken.

Suggested Action

PRC recommends no further investigation at this SWMU.

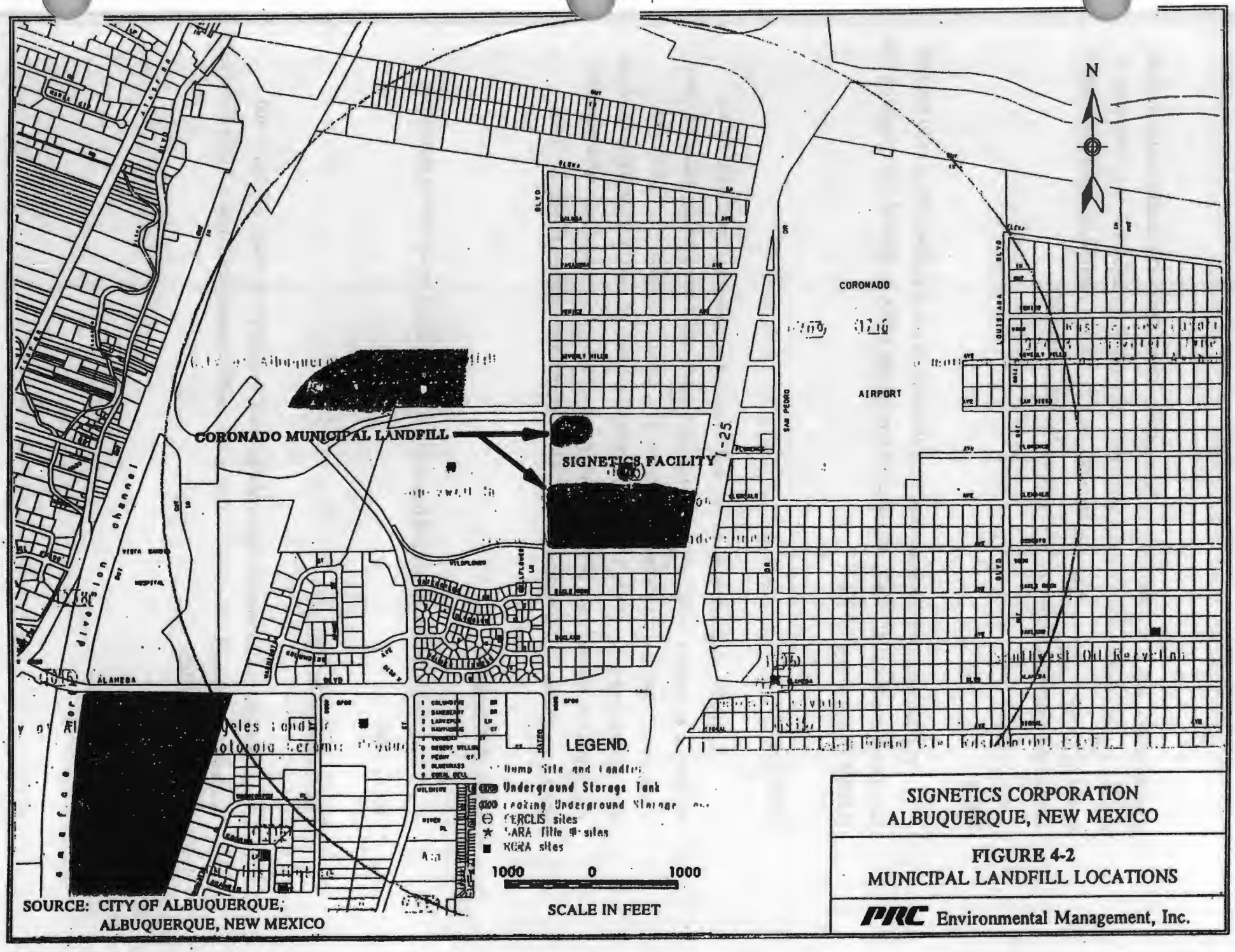
Reason

The wastewater is comprised of acidic wastewaters discharged to the Neutralization Wastewater Treatment System, of which two, the waste hydrofluoric acid and buffered oxide etch, are hazardous by characteristics of corrosivity and contain high concentrations of fluoride. The pH level of the released wastewater sample and lack of hazardous constituents in the reported wastewater analyses suggest a low risk to the environment.

4.8 SWMU NO. 8 - CORONADO MUNICIPAL LANDFILL (Photograph Nos. 18 and 19)

Description

The Signetics Albuquerque facility is situated on a portion of the former Coronado Municipal Landfill site. The landfill was operated by the City of Albuquerque from 1963 to 1965 and received mainly household and commercial trash. Historical evidence suggests that it was a relatively small landfill that was comprised of two sections and occupied an area of approximately 7.5 acres (Figure 4-2). The larger section of the landfill was partially excavated during the construction of the Signetics facility and moved to the Los Angeles Municipal Landfill. The estimated depth of this landfill section was 30 to 40 feet. The smaller section, in the vicinity of the northwest corner of the



SOURCE: CITY OF ALBUQUERQUE, ALBUQUERQUE, NEW MEXICO

SIGNETICS CORPORATION
ALBUQUERQUE, NEW MEXICO

FIGURE 4-2
MUNICIPAL LANDFILL LOCATIONS

PRC Environmental Management, Inc.

Signetics facility, had an estimated depth of 20 to 30 feet (EPA, 1986). The landfill site is vented for methane and subsidence was evident during the VSI. Signetics has installed four monitoring wells at its facility to monitor ground-water conditions (Figure 2-2). Depth to ground water is between 190 to 220 feet and the overlying alluvium is very permeable (Signetics, 1992).

Status

The Coronado landfill was operated from 1963 to 1965 and is inactive. The landfill has EPA identification number NMD980622708 and is not regulated by RCRA or included in the Signetics Part B Permit (Albuquerque, 1992c).

Waste Type

The landfill reportedly received household trash and possibly some commercial refuse. Sampling of an exposed section of fill indicated significant levels of heavy metals, pesticides, and hydrocarbons. Reported substances included lead, zinc, dieldrin, chlordane, naphthalene, and bis(2-ethylhexyl)phthalate (EPA, 1986). Ground-water samples collected by Signetics indicated the presence of low concentrations of volatile organic compounds (VOCs), including tetrachloroethene and 1,1,2 trichloro-1,2,2-trifluoroethane in collected ground-water samples (ENSECO, 1992).

Waste Management

The landfill is uncontained and leaching of any contaminants into the soil is unrestricted (EPA, 1986).

Environmental Release

Exposed landfill material contained significant levels of heavy metals, pesticides, and hydrocarbons. Ground water in the vicinity of the landfill contained low levels of VOCs (EPA, 1986 and ENSECO, 1992).

Remedial Action Taken

An unknown quantity of landfill material was removed from the larger section of the landfill during construction of the Signetics facility and disposed of in the Los Angeles Landfill. No other remedial action has been taken.

Suggested Action

PRC recommends that an RFI be performed to investigate the presence of hazardous constituents in the landfill material and surrounding soil, and the extent of any ground-water contamination.

Reasons

Evidence exists that hazardous materials are present in the landfill. Ground-water sampling indicated the presence of harmful contaminants in the ground water, suggesting that a release from the landfill may have occurred. Potential receptors exist; ground-water in the proximity of the facility may be contaminated (EPA, 1986 and NMSE, 1992).

5.0 AREAS OF CONCERN

PRC identified no areas of concern (AOC) during the VSI.

6.0 HUMAN AND ENVIRONMENTAL TARGETS

This section discusses the potential human and environmental targets of any release of hazardous material into the environment from the SWMUs at the Signetics facility in Albuquerque, New Mexico. Potential pathways include air, soil, subsurface gas, surface water, and ground water.

6.1 AIR

The Signetics facility has a permit with the City of Albuquerque for all its air emissions. Air Quality Permit number 166 was issued to the facility on December 15, 1986 and has since been amended one time in 1987, to raise the levels of permitted VOC and arsenic emissions, and the maximum annual silicon wafer processing volume. The permit requires air quality monitoring of VOCs, arsenic, and acid emissions from the Signetics facility. The air quality permit limits are 1.16 pounds per hour (lbs/hr) (5.015 tons/year) combined VOC stack emissions, 0.00020 lbs/hr (0.0009 tons/year) combined arsenic stack emissions, and a maximum wafer utilization quantity of 1,300,000 per year. Acid emissions have no set limits (Albuquerque, 1992a).

Signetics is required to submit quarterly reports on stack discharges to the City of Albuquerque, Engineering/Air Monitoring Section, Air Pollution Control Division. An April 1990 quarterly report contained combined stack emission measurements of 0.041 lbs/hr (0.184 tons/year) VOCs, 0.00015 lb/hr (0.006 tons/year) arsenic, and 1.418 lb/hr (6.64 tons/year) hydrochloric acid (Albuquerque, 1992a).

Since the 1986 issuance of the original air permit, no notices of violations have been issued in response to submitted quarterly reports or facility inspections. The City has routinely received submitted notifications of stack air scrubber equipment upgrades and modifications from Signetics (Albuquerque, 1992a).

Therefore, based on the information above, the threat posed to the air by Signetics, as a result of plant emissions, is estimated to be low.

6.2 SOIL

The Signetics facility was constructed on a portion of an abandoned and uncontained municipal landfill. The landfill was constructed in 1963 and operated from 1963 to 1965 and received mainly residential and possibly some commercial refuse. Analysis of exposed landfill refuse indicated significant levels of heavy metals, pesticides, and hydrocarbons (EPA, 1986). The detected presence of VOCs in ground-water samples collected by Signetics, and the permeable nature of the

overlying alluvium, indicated that a release of landfill wastes into the underlying soils and ground water may have occurred (ENSECO, 1992).

The Neutralization Wastewater Treatment System had a documented one-time release of wastewater into the surrounding soil in 1985. The wastewater detected in a leak detection test well was removed and the pH measured. The pH measurement combined with analytical data from routinely collected wastewater treatment samples suggest that the released material was not hazardous. No subsequent record of an analysis of released wastewater or investigation of the site was found (Signetics, 1985b).

The presence of the uncontained landfill under the Signetics facility, with an unknown volume of hazardous material, makes the likelihood of a release to soil high. The other SWMUs storing hazardous waste within the Signetics facility have had no reported releases and the containment systems in place make the likelihood of release from these units low.

6.3 SURFACE WATER

Surface water runoff from the Signetics facility is drained to the north and south side of the property where it is discharged to storm water channels constructed to manage runoff from the La Cueva Arroyo. These concrete channels discharge into the AMAFCA North Diversion Channel, approximately 500 feet to the west of the facility (Figure 3-1). This 100-year flood control channel diverts surface water runoff from most of Albuquerque along the east side of the Rio Grande and has discharge points at both the north and south ends of the city. The direction of channel flow is north in the vicinity of Signetics, with the point of discharge into the Rio Grande approximately 3 miles to the northwest. The Rio Grande is the closest surface water body to the facility and is about 3.5 miles west, with a flow direction from north to south. Water use from the Rio Grande River can be generally classified as irrigation, livestock and wildlife watering, some limited warm water fishery, and secondary contact recreation (EPA, 1986). The Rio Grande also serves as a source of ground-water recharge in the Rio Grande Valley (Bjorklund, 1961). Between the AMAFCA North Diversion Channel and the Rio Grande, there is an extensive network of irrigation channels and water ways serving private residences and small farms in the river valley.

There are currently no endangered or threatened species in the vicinity of Signetics. There is, however, one proposed candidate species, the Rio Grande Silvery Minnow, for threatened status, whose habitat includes the Rio Grande in the Albuquerque area. The New Mexico Jumping Mouse, found in riparian habitats, is under consideration as a candidate 2 (C2) level threatened species (Donahue, 1992).

With the possible exception of the abandoned Coronado Municipal Landfill, all hazardous waste generation and storage on the Signetics property, occurs within the confines of the Fabrication and Systems Center buildings (Figure 2-2). The likelihood of hazardous waste release to surface water from these buildings is deemed low. The most likely potential pathway would be the wastewater treatment facility which is routinely monitored and receives only acidic wastewater. The likelihood of release to surface water from the landfill is unknown, but the close proximity of the Rio Grande, approximately 3.5 miles to the west, makes this potential pathway a concern. During the VSI, no visible evidence of landfill material was observed. However, a previous report references collection of exposed landfill material containing hazardous constituents (EPA, 1986).

6.4 SUBSURFACE GAS

The abandoned Coronado Municipal Landfill is the only SWMU of concern regarding the potential release of subsurface gas. There are 35 existing methane vents in the landfill and methane emissions are monitored regularly. Therefore, the potential for release of subsurface gas in the vicinity of the Signetics facility can be described as high. In 1 year of reported monitoring, methane concentrations from 35 vents never exceeded 10% lower explosive limit (LEL) (EPA, 1986).

6.5 GROUND WATER

The Signetics facility is located on valley fill, which is composed mostly of unconsolidated and loosely consolidated gravel, sand, silt, and clay; and includes two geological units, the Santa Fe group and the alluvium (Bjorklund, 1961). The Santa Fe group and alluvium serve as the principal aquifer in the Albuquerque area and are interconnected hydraulically, and water moves from one formation into the other in accordance with the local hydraulic gradient. Ground water in the vicinity of the Signetics facility is reported at depths of 190 to 220 feet (Figure 3-1) (Signetics, 1992). The

high hydraulic conductivity of this unconsolidated alluvium makes the release of any contamination at the facility a potential threat to ground water.

Information on 32 wells that are located within a 3-mile radius of the facility is listed in Table 6-1 (EPA, 1986 and NMSE, 1992). The closest well is located approximately 2,000 feet up gradient of the facility. These wells are utilized for either commercial, irrigation or domestic water consumption. This list of wells may not be current and cannot be considered inclusive of all wells in the vicinity of the facility. Many of the well permits filed in the New Mexico State Engineer Office were incomplete, and it was reported that wells are sometimes completed without a permit being filed. Additionally, the City of Albuquerque has introduced a potable water supply to the area and many of the wells previously used for domestic consumption may be relegated to irrigation of lawns and gardens (EPA, 1986 and NMSE, 1992). Table 6-1 provides a summary of the recorded wells located in the area of the Signetics facility.

Finally, no contamination of ground-water wells has been documented in the communities surrounding the Signetics facility. However, four ground-water monitoring wells installed by Signetics on its property in 1987 (Figure 2-2) and sampled regularly since, have revealed ground-water contamination from low levels of VOCs (EMCON, 1987). The well construction logs for the four monitoring wells; designated MW-1, MW-2, MW-3, and MW-4; are included as Attachment C and a summary of the ground-water contaminants are presented in Table 6-2 (Enseco, 1988 through 1993). The ground-water samples were analyzed for halogenated volatile organics by EPA Methods 601 or 8010 and only the compounds 1,1,2,2-tetrachloroethane, and tetrachloroethene have been detected. Considering the uncontained construction of the landfill, the high permeability of the underlying soils, and general hydraulic interconnection between the main aquifer zones, the alluvium and Santa Fe group, the potential for ground-water contamination is high.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The PA/VSI identified 8 SWMUs and no AOCs at the Signetics facility in Albuquerque, New Mexico. Background information on the facility's location, operations, waste generating processes, history of documented releases, regulatory status, and receptors is presented in Section 2.0. The

TABLE 6-1

Water Wells in a Three Mile Radius of Signetics Corporation Facility

Well Location No.	Owner	Depth (Ft.)	Water Use
11.3.2.223	T. Benson	47	Commercial
11.3.2.140	Southwest Aggregate Co.	102	Commercial
11.3.3.334	Nazareth Sanatorium	245	Commercial
11.3.3.442	J. Crowder	46	Commercial
11.3.9.331	C. Bachechi	100	Irrigation
11.3.9.323	Southern Union Gas	200	Commercial
11.3.10.413	J. Torres	60	Irrigation
11.3.10.432	C. Moore	70	Irrigation
11.3.10.444	Nazareth Sanatorium	160	Irrigation
11.3.10.	M. Caudill	176	Unknown
11.3.10.	M. Montano	80	Unknown
11.3.10.122	G. Garcia	105	Domestic
11.3.11.334	Nazareth Sanatorium	810	Irrigation
11.3.12.444	Sandia Memory Garden	501	Commercial/Irrigation
11.3.12.430	Sandia Memory Garden	550	Exploration
11.3.15.112	E. Christ	65	Irrigation
11.3.15.440	C. Davis	255	Unknown
11.3.15.121	J. Canilli	223	Unknown
11.3.15.	D. Brink	260	Unknown
11.3.15.	C. Smoot	175	Unknown
11.3.15.	Cambro Construction Inc.	220	Unknown
11.3.16.312	Yonemoto Brothers	75	Irrigation
11.3.21.132	Ranchos School	-	Unknown
11.3.22.122	A. Montoya	96	Domestic
11.3.22.220	Wylie Brothers	158	Commercial
11.3.23.112	Public Service Company of NM	303	Commercial
11.3.23.210	American Gypsum	236	Commercial
11.3.24.221	City of Albuquerque (Tracy)	1194	Commercial
	Alameda Well No. 2		
	Walker Well No. 2		
	Walker Well No. 1		
11.3.26.342	A. Simms	302	Irrigation

TABLE 6-2

Signetics Ground-Water Monitoring Well Analytical Results

Sample Date	Parameter	Monitoring Well Numbers				Trip Blank	Reporting Limit (µg/L)
		MW-1 (µg/L)	MW-2 (µg/L)	MW-3 (µg/L)	MW-4 (µg/L)		
September 19 & 20, 1988	1,1,2,2-Tetrachlorethane	30	14	30	—	ND	1.0
	Tetrachloroethene	30	14	30	—	ND	0.5
May 16 & 17, 1989	1,1,2,2-Tetrachloroethane	25	14	—	9.2	—	1.0
	Tetrachloroethene	25	14	—	9.2	—	0.5
September 13 & 14, 1989	Tetrachloroethene	15	9.9	—	6.8	ND	0.5
	Chloroform	ND	ND	—	ND	1.0	0.5
December 6, 1989	1,1,2,2-Tetrachloroethane	17	—	ND	17	—	1.0
	Tetrachloroethene	17	—	ND	17	—	0.5
March 28, 1990	Tetrachloroethene	— —	— 13	— —	— —	ND —	0.5 3.3
June 12 & 13, 1990	Tetrachloroethene	20	13	ND	8.1	—	0.5
September 12 & 13, 1990	Tetrachloroethene	17 —	— 11	ND —	7.6 —	ND —	0.5 1.2
December 5 & 6, 1990	Tetrachloroethene	24	15	ND	11	—	0.5
April 9 & 10, 1991	Tetrachloroethene	11	4.7	ND	5.7	ND	0.5
June 12 & 13, 1991	Tetrachloroethene	14	9.2	ND	6.5	—	0.5
September 11, 1991	Tetrachloroethene	12	11	ND	7.0	—	0.5
December 4 & 17, 1991	Tetrachloroethene	13	9.3	6.2	ND	ND	0.5
March 25 & 26 1992	Tetrachloroethene	13	9.5	ND	4.7	ND	0.5
May 19 & 20, 1992	Tetrachloroethene	9.0	8.7	ND	4.8	ND	0.5
	1,1,2 Trichloro-1,2,2-trifluoroethane	—	—	—	—	4.6	1.0
September 22 & 23, 1992	Tetrachloroethene	11	10	ND	5.5	—	0.5
January 6 & 7, 1993	Tetrachloroethene	6.2	7.1	ND	5.4	ND	0.5

~/L = Micrograms per Liter
= Not Detected
.alyses performed by EPA Method Number 601 or 8010

environmental setting of the Albuquerque area is presented in Section 3.0. SWMU-specific information, such as the unit's description, dates of operation, wastes managed, release controls, history of documented releases, and observed condition, are discussed in Section 4.0. AOCs are discussed in Section 5.0. Human and environmental targets as related to potential pathways, are presented in Section 6.0. Following are PRC's conclusions and recommendations for each SWMU. Table 7-1 summarizes the information on all the SWMUs at the Signetics facility and recommended actions.

Eight SWMUs were identified at the Signetics facility as a result of the PR and VSI. Five of these units are active. Of the inactive units, two are permitted units that are maintained for possible future use and one has undergone closure.

With the exception of some minor excursions from the provisions of the wastewater permit granted by the City of Albuquerque, there has been only one reported release from the Signetics facility, which was reported on November 5, 1985. This release from the Neutralization Wastewater Treatment System constituted a release of wastewater with high concentrations of fluorides and a low pH to adjacent soils. All incidences of wastewater treatment plant pH excursions have been promptly reported to the City of Albuquerque's Wastewater Utility Division. The Southside Wastewater Treatment Plant release, which occurred on November 5, 1985, was reported to both state and federal regulators. No citations or notices of violation have been issued to the facility as a consequence of this release.

An RFI has been recommended for SWMU No. 8, the abandoned Coronado Municipal Landfill. This SWMU is an area of potential subsurface contamination due to the unknown nature of disposed wastes, the recorded presence of hazardous constituents, the uncontained nature of the landfill, the high permeability of local soils, and the presence of VOCs in the ground water at the facility.

Table 7-1 summarizes the status, waste type, waste management, releases, migration pathways, and remedial action for all the SWMUs.

Overall, the facility is not judged to pose a significant threat to the environment. With the exception of the abandoned Coronado Municipal Landfill, the waste management practices of Signetics have been exemplory, as indicated by three environmental waste management awards

TABLE 7-1
SWMU Summary

Sheet 1 of 3

Unit	SWMU No. 1	SWMU No. 2	SWMU No. 3
Unit Name	Segregated Drains	Tank 3	tank 4
Description	System of 4- to 6-inch pvc pipes suspended from ceiling of floor under process areas or in accessible concrete trench pipe gallery in floor of System Center.	5,000-gallon cylindrical steel tank of 10 foot by 8.5 foot dimensions in a below grade 11 foot by 11 foot by 13 foot 10 inch concrete vault. The concrete has chemical resistant coating and vaults are covered with steel grating.	5,000-gallon cylindrical reinforced fiberglass tank of 10 foot by 8.5 foot dimensions, in below grade 11 foot by 11 foot by 13 foot 10 inch concrete vault. The concrete has chemical resistant coating and vaults are covered with steel grating.
Operating Status	Active	Active	Inactive
Regulatory Status	Unregulated	Regulated	Regulated
Waste Type	Process area acidic and solvent waste solutions (D001, D002, F002, and F003 wastes).	Waste Solvent I, a mixed photolithographic solvent cleaning waste (D001, F002, and F003).	Spent hydrofluoric acid solution (D002).
Waste Management	Process area wastes are collected in dedicated pipes in a segregated drainage system and transported to the Neutralization Wastewater Treatment System (SWMU No. 7) or Tank 3 (SWMU No. 2).	Process waste is transported to Tank 3 through segregated drainage system from process areas. Waste Solvent I is stored in tank until transported to a TSDF.	Process waste was transported to Tank 4 through the segregated drainage system from process areas. Spent hydrofluoric acid solution originally stored in tank until transported to TSDF. Currently waste hydrofluoric acid bypasses this SWMU and is treated in SWMU No. 7, the wastewater treatment system, prior to discharge to the POTW.
Release History	No reported releases	No reported releases	No reported releases
Release Pathway	N/A	N/A	N/A
Remedial Action Taken	N/A	N/A	N/A
Release Potential	Low	Low	Low
Potential Pathway	None	None	None
Reason for Release Potential Rating	No reported releases or spills. No visible contamination during VSI. Piping is visible, easily accessible, and potential releases contained within Fabrication and Systems Center buildings.	No reported releases or spills. No visible contamination during VSI and concrete vault appeared to have good structural integrity. No drains or sumps in vault area, completely contained.	No reported releases or spills. No visible contamination during VSI and concrete vault appeared to have good structural integrity. No drains or sumps in vault area, completely contained. Unit is inactive.
Need for RFI	No	No	No

TABLE 7-1
SWMU Summary

Sheet 2 of 3

Unit	SWMU No. 4	SWMU No. 5	SWMU No. 6
Unit Name	Tank 5	Flammable Storage 4 (FS-4)	Chemical Storage 2 (CS-2)
Description	5,000-gallon cylindrical reinforced fiberglass tank of 10 foot by 8.5 foot dimensions, in below grade 11 foot by 11 foot by 13 foot 10 inch concrete vault. The concrete has chemical resistant coating and vaults are covered with steel grating.	One of four rooms dedicated to storage of flammable materials. FS-4 is used for hazardous flammable waste storage. FS-4 is a concrete room, with floor dimensions of 22 by 26 feet and 8 inch thick walls and flooring. The floor is sloped to a central drain that discharges into Tank 3. The concrete roof has an explosion vent and the room is vented.	One of two rooms dedicated to general chemical storage of process and facility chemicals. CS-2 has a portion of its floor space specifically dedicated to drummed toxic hazardous waste storage. CS-2 has 2,611 ft^2 of floor space of which the southwest corner, containing 172 ft^2 has been dedicated to the storage of drummed toxic waste. The room is constructed of concrete floors, walls, and roof. The floor has a drainage system connected to the wastewater treatment system.
Operating Status	Inactive	Active	Active
Regulatory Status	Regulated	Regulated	Regulated
Waste Type	Spent buffered oxide etch solution (hydrofluoric acid and ammonium fluoride) (D002 waste).	Waste Solvent II, a mixed solution of proprietary vendor formulations of photoresist (D001 and F003 waste).	Materials contaminated with arsenic from process activities (D004 waste) and materials contaminated with mercury (D009 waste).
Waste Management	Process waste was transported to Tank 5 through the segregated drainage system from process areas. Spent buffered oxide etch solution originally stored in tank until transported to TSDF. Currently, spent buffered oxide etch bypasses this SWMU and is treated in SWMU No. 7, the wastewater treatment system, prior to discharge to the POTW.	Process area generated waste is transported daily to FS-4 in 5-gallon carboys and transferred to 55-gallon steel drums. Drums are stored off of floor on wooden pallets. Drums are periodically transported by permitted transporter to TSDF.	Arsenic and mercury contaminated materials are transported in sealed bags to CS-2 and placed in separate 55-gallon steel drums. Drums are stored by waste type, off the floor, on wooden pallets. Periodic shipments by permitted transporters are made to TSDFs.
Release History	No reported releases	No reported releases	No reported releases
Release Pathway	N/A	N/A	N/A
Remedial Action Taken	N/A	N/A	N/A
Release Potential	Low	Low	Low
Potential Pathway	None	None	None
Reason for Release Potential Rating	No reported releases or spills. No visible contamination during VSI and concrete vault appeared to have good structural integrity. No drains or sumps in vault area, completely contained. Unit is inactive.	No visible contamination during VSI. Unit is well contained with no easily accessible pathways for potential release, except from fire.	No visible contamination during VSI. Unit is well contained with only potential pathway through drains system to wastewater treatment system, to POTW, and to Rio Grande. Stored hazardous waste is in solid form and release through this pathway is unlikely.
Need for RFI	No	No	No

TABLE 7-1
SWMU Summary

Sheet 3 of 3

Unit	SWMU No. 7	SWMU No. 8
Unit Name	Neutralization Wastewater Treatment System	Coronado Municipal Landfill
Description	A wastewater treatment system with six below ground concrete vaults configured in series. Vaults are covered by concrete slabs and accessible through metal hatches. The concrete is coated with corrosion resistant material. The neutralization system has an influent grit chamber, two neutralization chambers of two vaults each, and one outfall vault. Both neutralization chambers are typically utilized, but can operate alone during maintenance cycles. The treatment area is surrounded by a grid of 11 acid leak test wells.	Abandoned uncontained municipal landfill located on portions of Signetics facility. Landfill has two sections of approximately 7.5 acres of area and has a reported depth of 20 to 40 feet. There are 35 methane vents and four ground-water monitoring wells in the area.
Operating Status	Active	Inactive
Regulatory Status	Unregulated	Unregulated
Waste Type	Spent acidic wastewater solutions including nitric/sulfuric acid, spent hydrofluoric acid (D002), and spent buffered oxide etch (D002). Additional wastewaters include demineralizer regeneration wastewater, cooling tower blowdown, and process scrubber wastewater.	Household and commercial refuse
Waste Management	Acid wastewaters from the process areas are transported through the segregated drainage system and discharged into the wastewater neutralization system. The pH of the wastewater is adjusted to meet a permit required pH range prior to combination with general facility wastewater and discharge to the POTW.	Received residential and commercial refuse in an uncontained landfill from 1962 to 1965.
Release History	One reported release of acidic wastewater in 1985 from a small leak in grit chamber. Occasional short pH excursions in neutralization process.	Collected fill from the landfill contained heavy metals, pesticides, and hydrocarbons. Ground-water samples from Signetics facility contain low levels of VOCs. Landfill is currently vented for methane.
Release Pathway	Soil and surface water	Soil, surface water, ground water, and subsurface gas.
Remedial Action Taken	None. Recovered leaking wastewater from test well. Plant pH excursions are short term and are corrected to normal operating conditions.	A portion of landfill material was relocated to the Los Angeles Municipal Landfill during facility construction. Methane vents have been installed.
Release Potential	Low	High
Potential Pathway	Surface water	Soil, surface water, ground water, and subsurface gas.
Reason for Release Potential Rating	Combined acidic wastewater is generally nonhazardous. Vault leak was an anomaly. Wastewater constituents of concern are typically low pH and high concentrations of fluoride.	Contents of the landfill are unknown. Hazardous constituents have been detected in collected fill material and ground-water samples.
Need for RFI	No	Yes

received from the EPA in 1988, 1989, and 1991. The generation and storage of all hazardous wastes associated with IC manufacturing are contained within the facility's Fabrication and Systems Center buildings. The plant has instituted an aggressive waste recycling and minimization program. Quarterly wastewater discharge and air quality reports to the City of Albuquerque indicate that the facility is not releasing excessive levels of hazardous constituents to the POTW and atmosphere.

The contribution of the abandoned Coronado Municipal Landfill to soil and ground-water contamination represents a potential threat to the environment and neighboring communities. The population within a 1 mile radius, downgradient from the facility is relatively low, but increases in the river valley near the Rio Grande. No ground-water contamination has been documented downgradient of the landfill but the unknown domestic ground-water use in the area, combined with the high permeability of the subsurface sediments, make this potential release a concern.

REFERENCES

Sheet 1 of 2

Albuquerque, 1991. City of Albuquerque (Albuquerque) Wastewater Discharge Permit Number: 2023A-3. Public Utility Division, Industrial Pretreatment Section, August 1

Albuquerque, 1992a. City of Albuquerque Air Quality Permit 166 File. Engineering/Air Monitoring Section, Air Pollution Division, Notes taken by Frank Robinson of PRC Environmental Management Inc., October 5

Albuquerque, 1992b. City of Albuquerque Wastewater Discharge Permit 2023A-3 File. Public Utility Division, Industrial Pretreatment Section, October 2

Albuquerque, 1992c. City of Albuquerque Site Environmental Audit (SEA) Database - Signetics Corporation. Environmental Health Department, September 18

Anderholm, S., 1988. Ground-Water Geochemistry of the Albuquerque - Belen Basin, Central New Mexico. U.S. Geological Survey, Water-Resources Investigation Report 86-4094

Anderson, C., 1992. Albuquerque Metropolitan Arroyo and Flood Control Administration (AMAFCA), Albuquerque, New Mexico. Personal communication with Frank Robinson, PRC Environmental Management, Inc., October 14

Bjorklund, L. and B. Maxwell, 1961. Availability of Ground Water in the Albuquerque Area, Bernalillo and Sandoval Counties, New Mexico. New Mexico State Engineer Technical Report 21.

Donahue, M., 1992. United States Fish and Wildlife Services, Ecological Services Field Office, Albuquerque, New Mexico. Personal communication with Frank Robinson, PRC Environmental Management, Inc., October 14

Emcon, 1987. Baseline Ground-water Investigation, Signetics Corporation, Albuquerque, New Mexico. Emcon Associates, Project 377-16.01, June

Enseco 1988 through 1993. Enseco Rocky Mountain Analytical Laboratory results prepared for Signetics

Environmental Protection Agency (EPA), 1983a. Letter from Craig Campbell to W. Dana, Signetics Corporation, March 17

EPA, 1983b. Settlement Agreement and Final Order. United States Environmental Protection Agency Region VI, June 29

EPA, 1985. Preliminary Assessment Facility Checklist. September 2

EPA, 1986. Potential Hazardous Waste Site, Site Inspection Report. September

EPA, 1988. Compliance Evaluation Inspection (CEI) Report. August 30

Federal Emergency Management Agency (FEMA), 1983. Flood Insurance Study, City of Albuquerque, New Mexico, Bernalillo County. FEMA, Community Number 350002, Final, September 15

REFERENCES

Sheet 2 of 2

GEMS, 1992. Geographical Exposure Modelling System (GEMS) Database. July 22

New Mexico Environment Division (NMED), 1991. Signetics Inspection Report. January 10

New Mexico Environmental Improvement Division (NMEID), 1986. Letter from unnamed author to Gary Mavrakis, Signetics Corporation, April 1

NMEID, 1988a. Inspection Report. August 30

NMEID, 1988b. Letter from Kirkland Jones to Gary Mavrakis, Signetics, September 1

New Mexico State Engineer's Office (NMSE), 1992. Ground-water well permit file. October 1 and 2

Reeder, H., L. Bjorklund, and G. Dinwiddie, 1967. Quantitative Analysis of Water Resources in the Albuquerque Area, New Mexico. NMSE, Technical Report 33

Signetics, 1980a. RCRA Part A Permit Application, August 14

Signetics, 1980b. RCRA Part B Permit Application, August 14

Signetics, 1985a. Letter from Gary Mavrakis to Jamie Wright, EPA, May 14

Signetics, 1985b. Letter from Gary Mavrakis to Maxine Goad, NMEID, November 18

Signetics, 1986. Letter from Gary Mavrakis to Denise Fort, NMED, April 14

Signetics, 1988. Letter from Gary Mavrakis to Kelly Crossman, NMEID, August 16

Signetics, 1990. 1989 Hazardous Waste Report. State of New Mexico Health and Environment Department, No date

Signetics, 1991. 1991 Hazardous Waste Report, Off-Site Identification. U.S. Environmental Protection Agency, No Date

Signetics, 1992. Letter from Gary Mavrakis to Frank Robinson, PRC Environmental Management, Inc. (PRC), September 28

United States Department of Agriculture (USDA), 1977. Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico. Soil Conservation Service, Forest Service, and United States Department of Interior (USDI) in cooperation with New Mexico Agriculture Experiment Station, No Date

Williams, J., 1986. New Mexico in Maps. University of New Mexico Press, Albuquerque, Second Edition, No Date

ATTACHMENT A

VISUAL SITE INSPECTION SUMMARY

VISUAL SITE INSPECTION SUMMARY

Signetics Corporation
9201 Pan American Freeway, N.E.
Albuquerque, New Mexico 87113

Date:	August 24, 1992
Facility Representatives:	Gary Mavrakis, Material/Environmental Compliance Manager, Signetics Corporation
Inspection Team:	Frank Robinson, PRC Environmental Management, Inc. Cynthia McNulty, PRC Environmental Management, Inc. Joan Middleton, PRC Environmental Management, Inc.
Photographer:	Cynthia McNulty
Weather Conditions:	Overcast and cloudy, wind direction was due north, temperature was 62°F

Summary of Activities:

An introductory meeting, lasting approximately 1 1/2 hours, was held with Gary Mavrakis at 8:20 AM on August 24, 1992. During the meeting, the purpose of the RFA and site visit was reviewed by Frank Robinson, the PRC site inspection team leader. Discussion was also held on the on going activities of a parallel EPA investigation being performed by Fluor Daniels. The meeting then focused on the history of the facility, regulatory permit requirements, the processes, and operations of the facility. Also discussed were the wastes generated and various waste management practices at the facility. A review of the planned site inspection itinerary was made with Gary Mavrakis at the conclusion of the meeting.

The visual site inspection (VSI) began at 9:50 AM from the reception area at the entrance to the Signetics Fabrication building. The first area inspected was the facility's Compliance and Product Testing Laboratories where wastewater samples are tested for compliance and incoming photolithographic chemicals are tested for quality. Drains were inspected, and chemical handling and storage practices reviewed.

We then proceeded south to the process areas within the Fabrication building where the blank silicon wafers are processed into semiconductor integrated circuits (IC). At 10:00 AM we were shown the first process area, Fab 22, a "Class 100" clean room that we were able to view from an adjacent corridor. Proceeding down the corridor we were able to view the newest process area, Fab 23, a "Class 10" clean room. We were able to view the automated manufacturing equipment and operators in clean room attire. Areas of construction were evident in the building, where a new production area is being built.

From the process area, we proceeded west to the basement of the Fabrication building at approximately 10:15 AM and were shown the segregated drainage pipes that transport the bulk of the process area wastes to the storage areas. We were able to see that the pipes were designed to allow easy inspection and observation of any releases.

From the Fabrication building we proceeded west to the Systems Center building to inspect the waste storage areas and wastewater treatment system. The Chemical Storage 2 (CS-2) toxic hazardous waste storage room was our next stop on the inspection tour at 10:20 AM. The drum storage practices were noted. The next area was the wastewater treatment area that includes the wastewater neutralization system and the three waste storage tanks in below ground concrete vaults. We inspected the vaults from the top of the tanks with a flashlight. At 11:00 AM the inspection moved to the Flammable Storage 4 (FS-4) ignitable hazardous waste storage area. Drum storage and waste management practices were reviewed. From the FS-4 area, we returned to the chemical storage area at 11:15 AM and inspected Chemical Storage 1 (CS-1); the other chemical storage room adjacent to CS-2.

At 11:20 AM we left the Systems Center building from the southwest side of the building and inspected the facility loading areas and the approximate site of the abandoned Coronado Municipal Landfill. Areas of subsidence were evident and notice made of methane vents and ground-water monitoring wells installed by Signetics.

We returned to the office of Gary Mavrakis at 11:40 AM and held a debriefing meeting. Gary indicated that he never received the letter requesting a site visit or the requested additional site information. Frank Robinson will address this with a follow up letter. The inspection team left the facility at 12:20 AM.

ATTACHMENT B

VISUAL SITE INSPECTION PHOTOGRAPHS

PHOTOGRAPH NO. 1

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: East

Picture Description: SWMU No. 1 - Segregated drain pipes used to transport waste streams from process areas. Piping is transitioning from ceiling to concrete trenches in System Center.

PHOTOGRAPH NO. 2

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: East
Picture Description: SWMU No. 6 - Chemical Storage 2 (CS-2): drummed chemicals used at Signetics stored on wood pallets. Toxic hazardous wastes are stored in a separate area to the left.

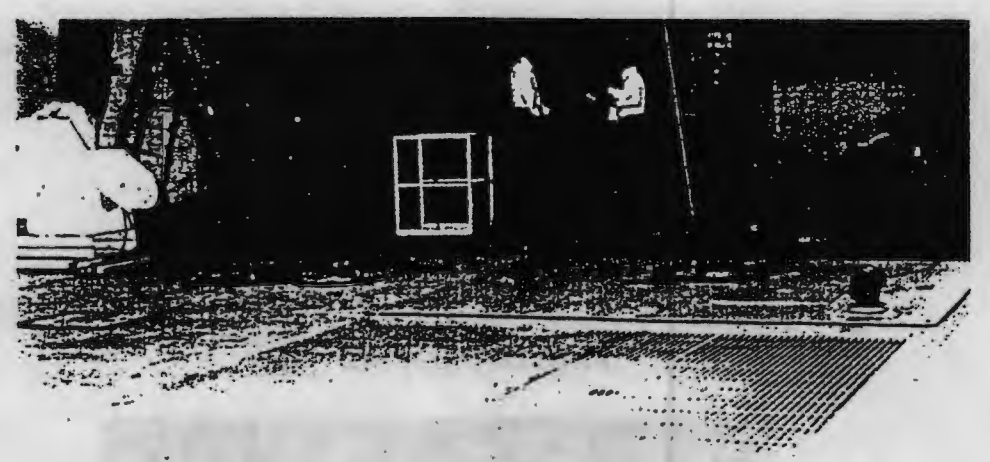
PHOTOGRAPH NO. 3

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: West
Picture Description: SWMU No. 6 - CS-2: chemical products used at Signetics stored on wood pallets and cold storage room for photoresist material.

PHOTOGRAPH NO. 4

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: Southwest
Picture Description: SWMU No. 6 - CS-2: drummed toxic solid waste stored on wooden pallets in dedicated waste storage area.

PHOTOGRAPH NO. 5

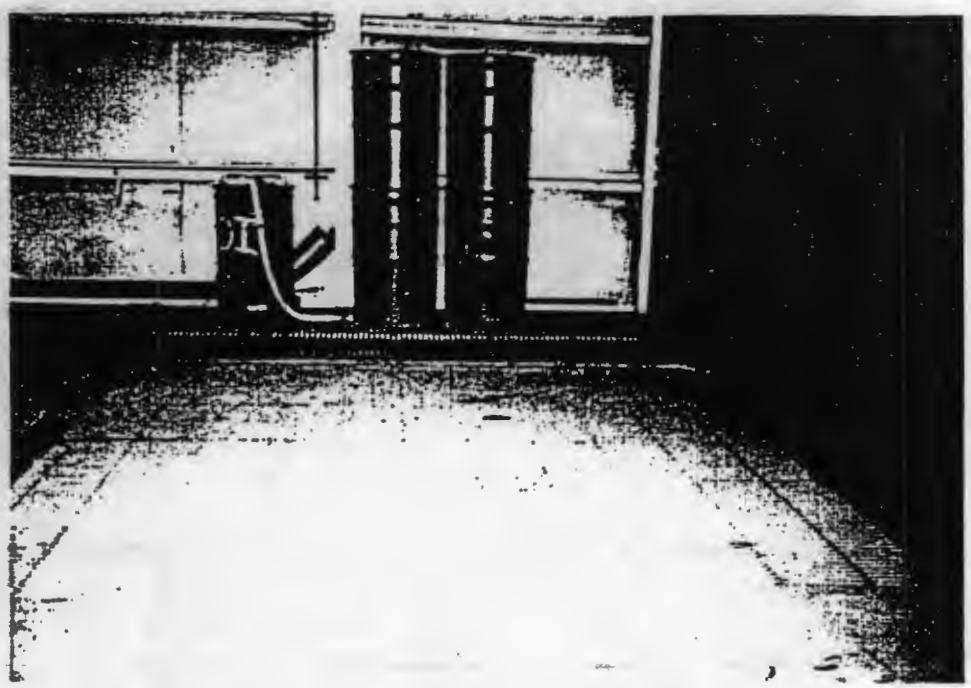


Date 8/24/92 Picture Taken by: C. McNulty Direction Facing: Northeast
Picture Description: SWMU Nos. 2, 3, 4 and 7 - Wastewater treatment system is left of the metal grates. Grated and solid covers are over vaults for Tanks 3, 4, and 5, and two empty vaults.

PHOTOGRAPH NO. 6

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: East
Picture Description: SWMU No. 7 - Influent point of wastewater treatment system at top center. The metal hatches give access to neutralization chambers. The circular hatch accesses pH probe.

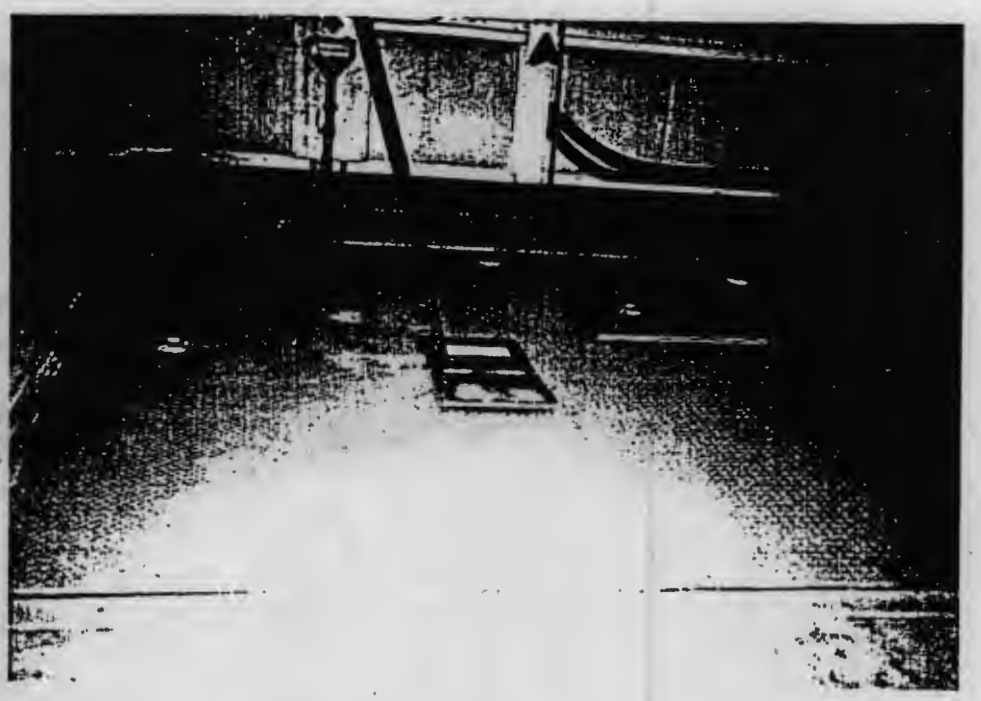
PHOTOGRAPH NO. 7



Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: South
Picture Description: A grate cover to one of two empty concrete vaults west of Tank 3. The empty vault was previously used for bulk storage of sulfuric acid. Salvage drums are empty.

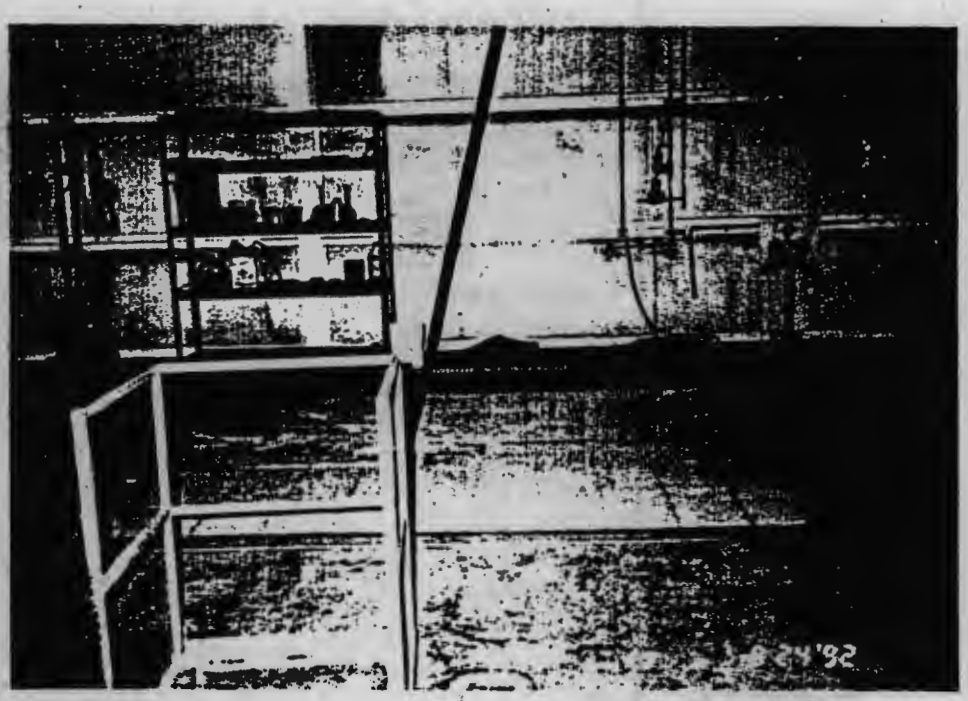
PHOTOGRAPH NO. 8

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: South
Picture Description: A grate cover to one of two empty concrete vaults west of Tank 3. The empty vault was previously used for bulk storage of caustic. Concrete pipe trench in background.



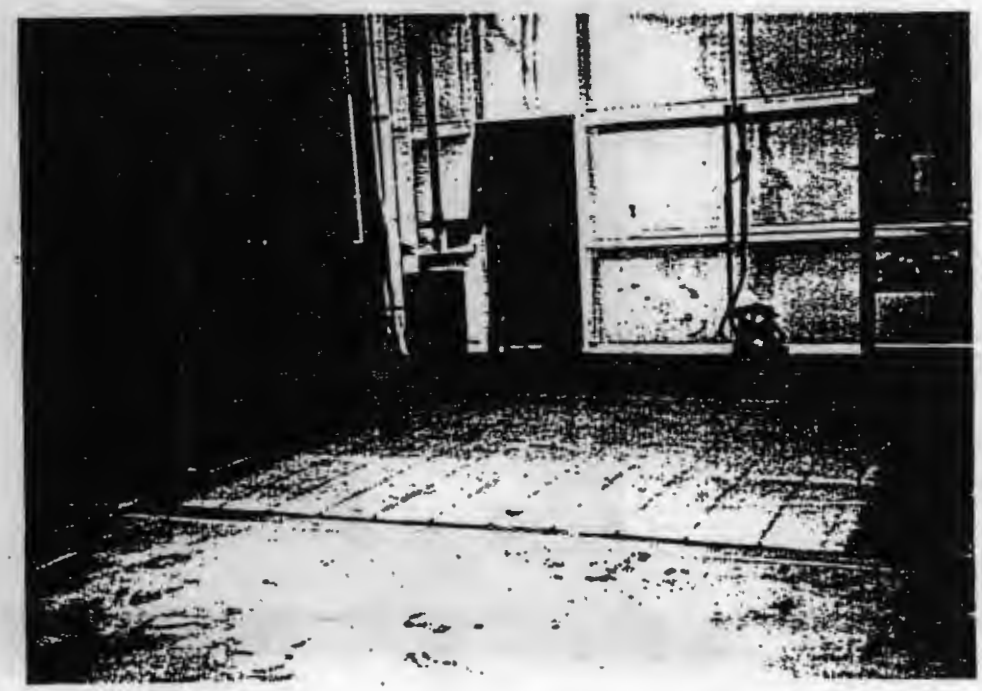
Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: South
Picture Description: SWMU No. 2 - Metal cover over concrete vault holding Tank 3. Note vent and metered stick used for tank gauging. Concrete pipe trench in background.

PHOTOGRAPH NO. 10



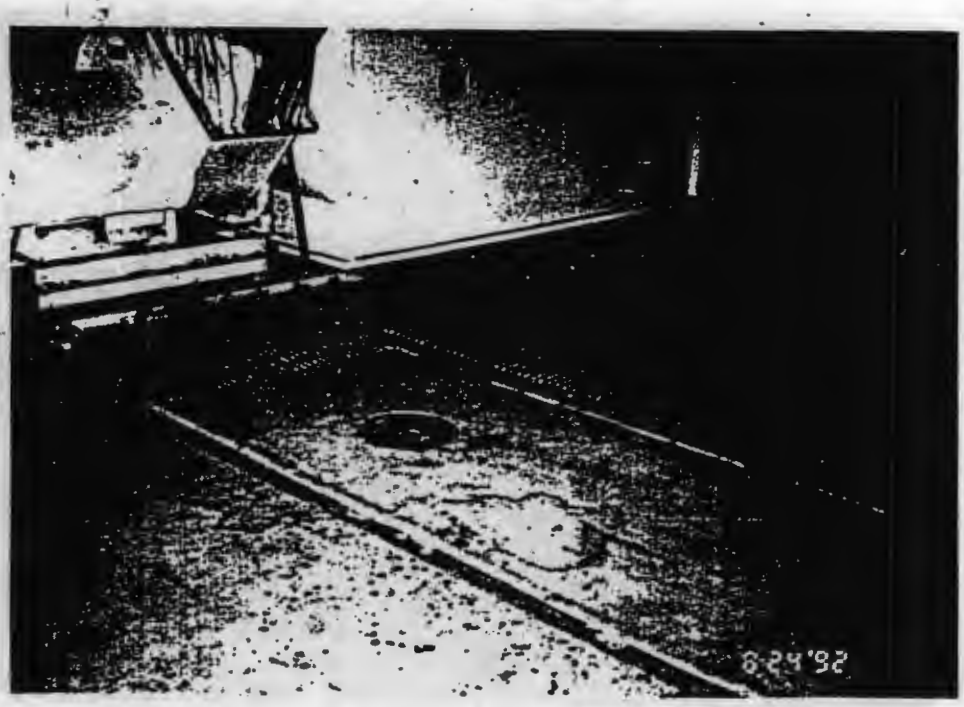
Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: South
Picture Description: SWMU No. 3 - Metal grate cover over concrete vault holding Tank 4. Note metered stick used for tank gauging in center of picture.

PHOTOGRAPH NO. 11



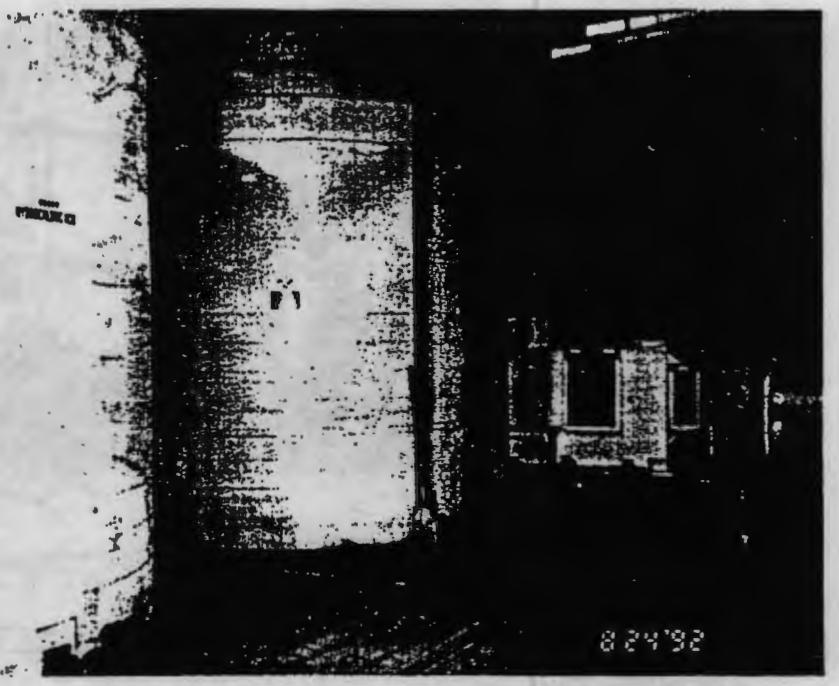
Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: Southeast
Picture Description: SWMU No. 4 - Metal grate cover over concrete vault holding Tank 5. Note concrete pipe trench for segregated drainage system around periphery of area.

PHOTOGRAPH NO. 12



Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: Northeast
Picture Description: SWMU No. 7 - Steel cover over one of 11 acid leak test wells surrounding the wastewater treatment system and Tanks 3, 4, and 5. Note floor drain to wastewater plant.

PHOTOGRAPH NO. 13

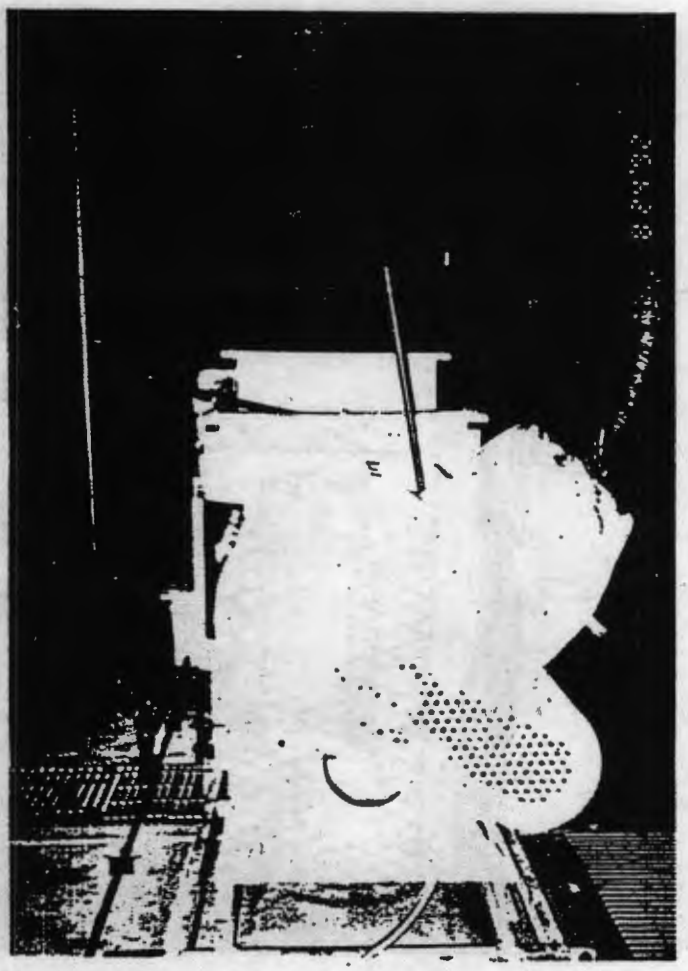


Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: Northeast
Picture Description: Bulk hydrochloric acid, sulfuric acid, and caustic storage tanks in wastewater treatment area. The white air scrubber is in background.

PHOTOGRAPH NO. 14

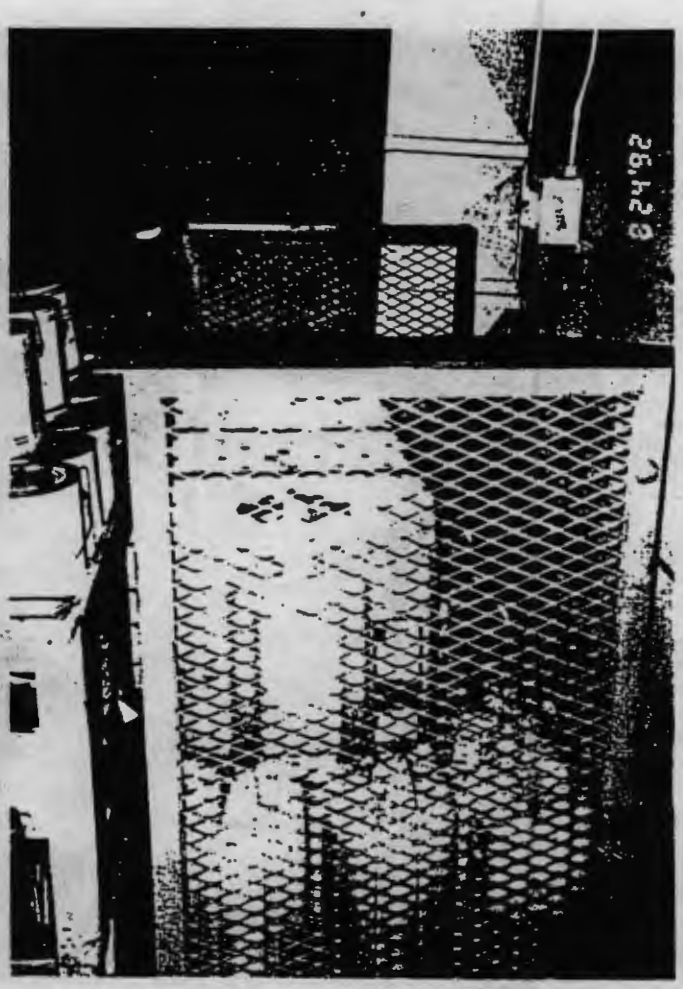
Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: East
Picture Description: SWMU No. 4 - East wall of concrete vault with top of steel Tank 3 in foreground. No evidence of spills or cracks in walls. The vault is inspected daily.

PHOTOGRAPH NO. 15



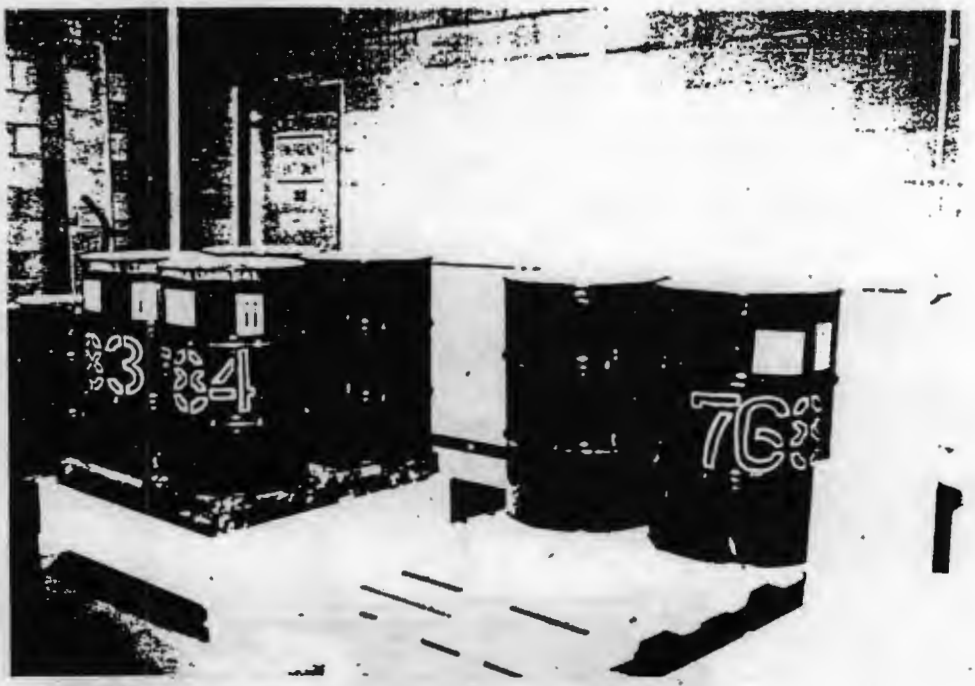
Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: North
Picture Description: This is an air scrubber unit in the wastewater treatment area used to remove hydrochloric acid and caustic fumes.

PHOTOGRAPH NO. 16



Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: West
Picture Description: SWMU No. 5 - Flammable Storage 4 (FS-4): waste Solvent II storage room with 5-gallon Nalgene carboy containers in a cart prior to transfer of contents to 55-gallon drums.

PHOTOGRAPH NO. 17



Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: South
Picture Description: SWMU No. 5 - FS-4: drummed Solvent II waste stored on wooden pallets. Note the spill/leak containment containers under the pallets.

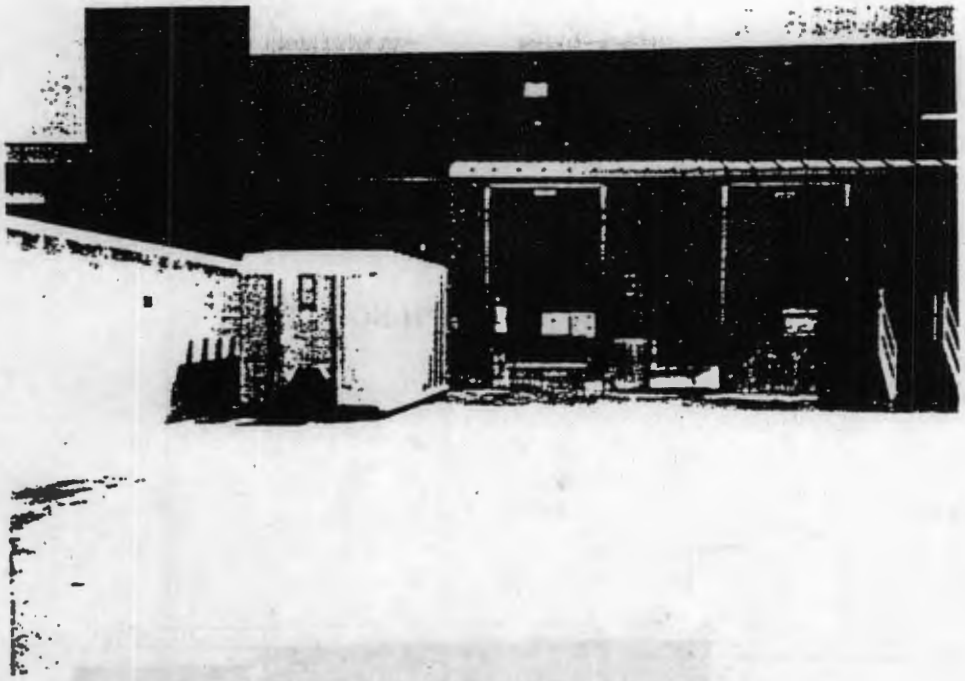
PHOTOGRAPH NO. 18

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: Northwest
Picture Description: SWMU No. 8 - Ground-water monitoring well located in vicinity of abandoned Coronado Municipal Landfill on Signetics facility.

PHOTOGRAPH NO. 19

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: West
Picture Description: SWMU No. 8 - Approximate site of Coronado Municipal Landfill on Signetics facility. Two methane vents in foreground and ground subsidence evident in area.

PHOTOGRAPH NO. 20



Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: East
Picture Description: Municipal trash bin and nonchemical loading dock on west side of Signetics Fabrication building.

PHOTOGRAPH NO. 21

Date: 8/24/92 Picture Taken by: C. McNulty Direction Facing: North
Picture Description: Chemical receiving/loading dock on south side of Signetics Systems Center building. No materials are permitted to be stored on the dock.

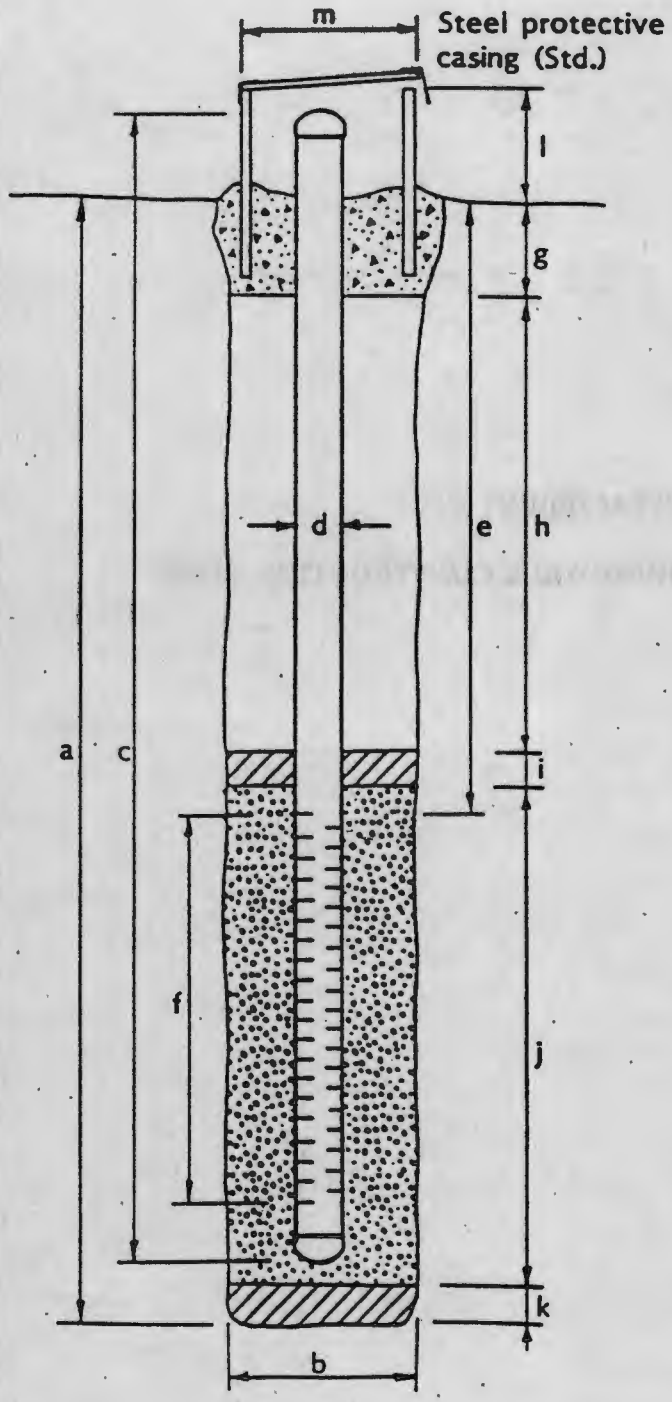
ATTACHMENT C

SIGNETICS MONITORING WELL CONSTRUCTION LOGS

WELL DETAILS

PROJECT NUMBER 377-16.01
PROJECT NAME Signetics
COUNTY Bernalillo Co., NM
WELL PERMIT NO. N/A

BORING / WELL NO. MW-1
TOP OF CASING ELEV. 5168.70
GROUND SURFACE ELEV. 5168.17
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total depth 247 ft.
b. Diameter 7 7/8 in.
Drilling method Air/Mud Rotary

WELL CONSTRUCTION

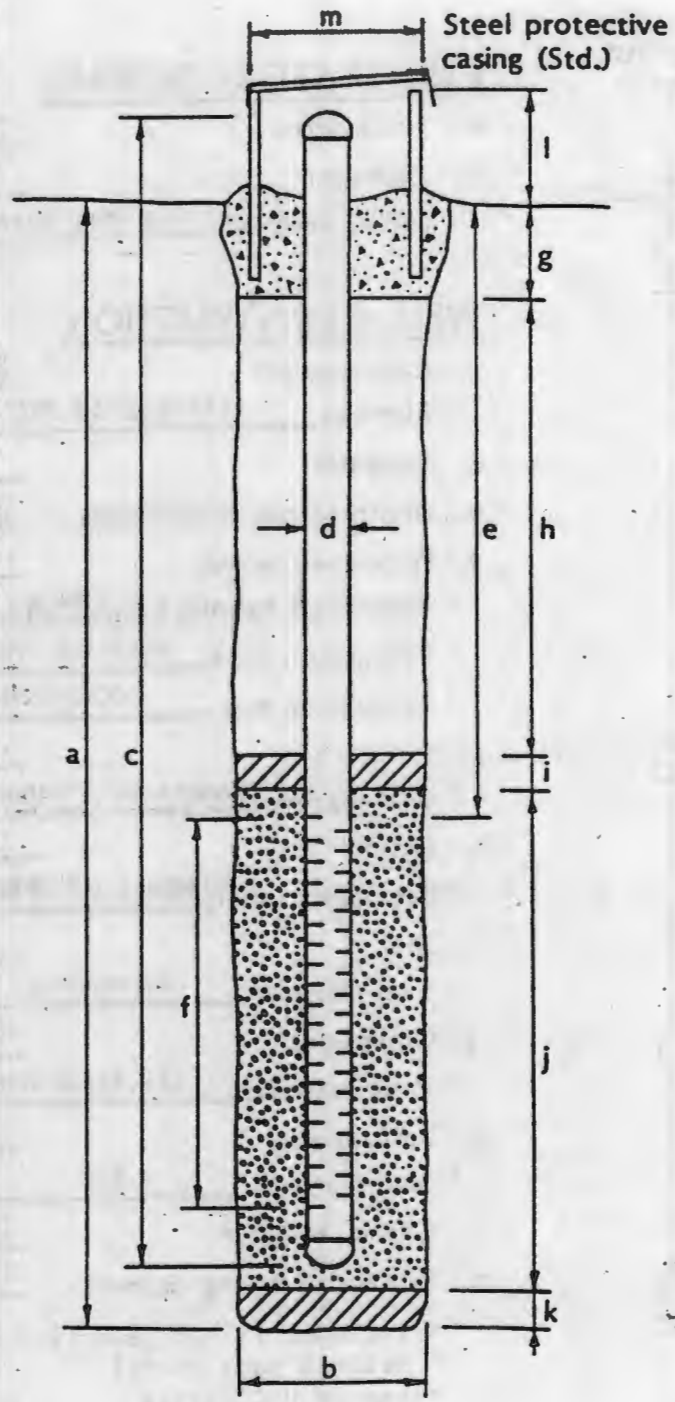
c. Casing length 230 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 199.5 ft.
f. Perforated length 30 ft.
Perforated interval from 199.5 to 229.5 ft.
Perforation type Machine Slotted
Perforation size 0.02 inch
g. Surface seal 3 ft.
Seal material Cement w/ 3% Bentonite
h. Backfill 171 ft.
Backfill material Cement w/ 3% Bentonite
i. Seal 5 ft.
Seal material Bentonite
j. Gravel pack ± 68 ft.
Pack material CSSI 8x12 Sand
k. Bottom seal N/A ft.
Seal material N/A
l. Casing height * .5 ft.
m. Protective casing diameter 10 in.

± includes filter pack
* top of PVC casing

WELL DETAILS

PROJECT NUMBER 377-16.01
PROJECT NAME Signetics
COUNTY Bernalillo Co., NM
WELL PERMIT NO. N/A

BORING / WELL NO. MW-2
TOP OF CASING ELEV. 5159.36
GROUND SURFACE ELEV. 5158.15
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total depth 245 ft.
b. Diameter 7 7/8 in.
Drilling method Air/Mud Rotary

WELL CONSTRUCTION

c. Casing length 240 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 200 ft.
f. Perforated length 30 ft.
Perforated interval from 200 to 230 ft.
Perforation type Machine Slot
Perforation size 0.02 inch
g. Surface seal 6 ft.
Seal material Grout w/ 3% Bentonite
h. Backfill 174 ft.
Backfill material Grout w/ 3% Bentonite
i. Seal 8.5 ft.
Seal material Volclay Bentonite
j. Gravel pack ± 56.5 ft.
Pack material CSSI 8x12 Sand
k. Bottom seal N/A ft.
Seal material N/A
l. Casing height * 1.0 ft.
m. Protective casing diameter 10 in.

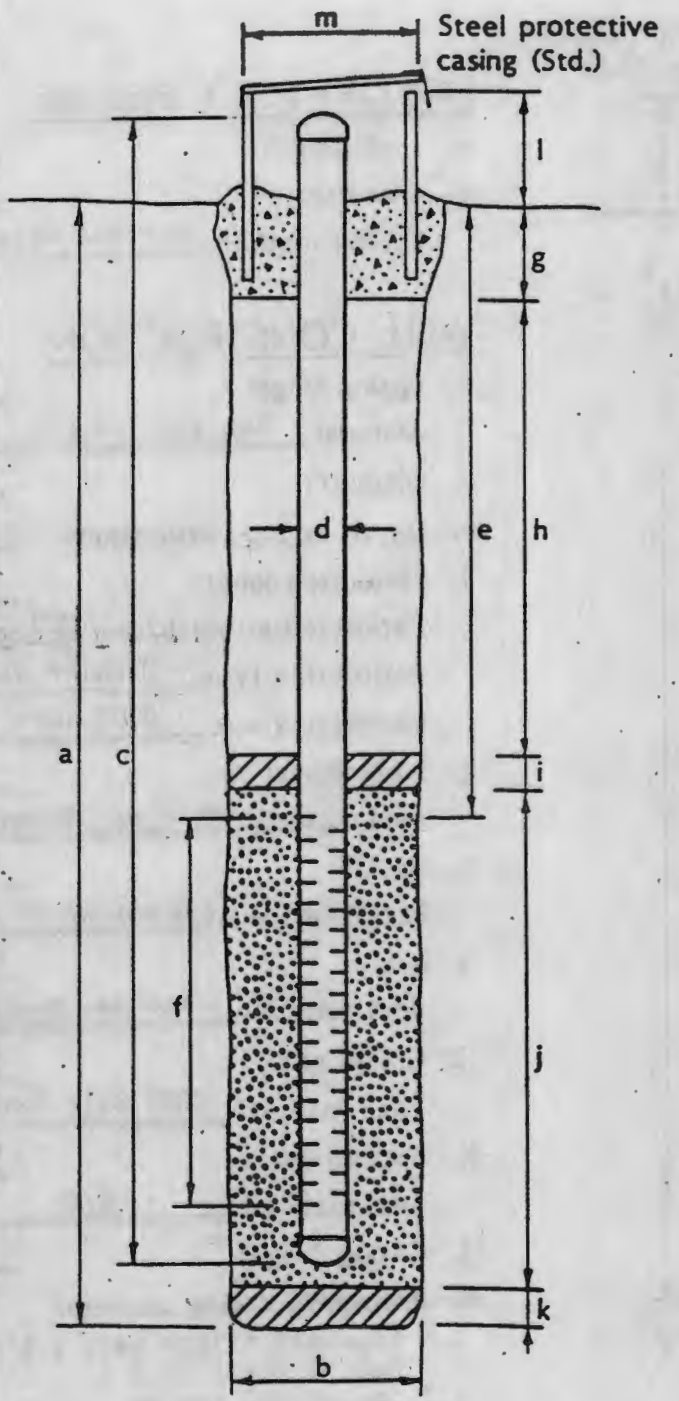
± includes filter pack (.5') and natural pack (9.5')
* top of PVC casing

WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 377-16.01
PROJECT NAME Signetics
COUNTY Bernalillo Co., NM
WELL PERMIT NO. N/A

BORING / WELL NO. MW-3
TOP OF CASING ELEV. 5186.4
GROUND SURFACE ELEV. 5185.48
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total depth 260 ft.
b. Diameter 7 7/8 in.
Drilling method Air/Mud Rotary

WELL CONSTRUCTION

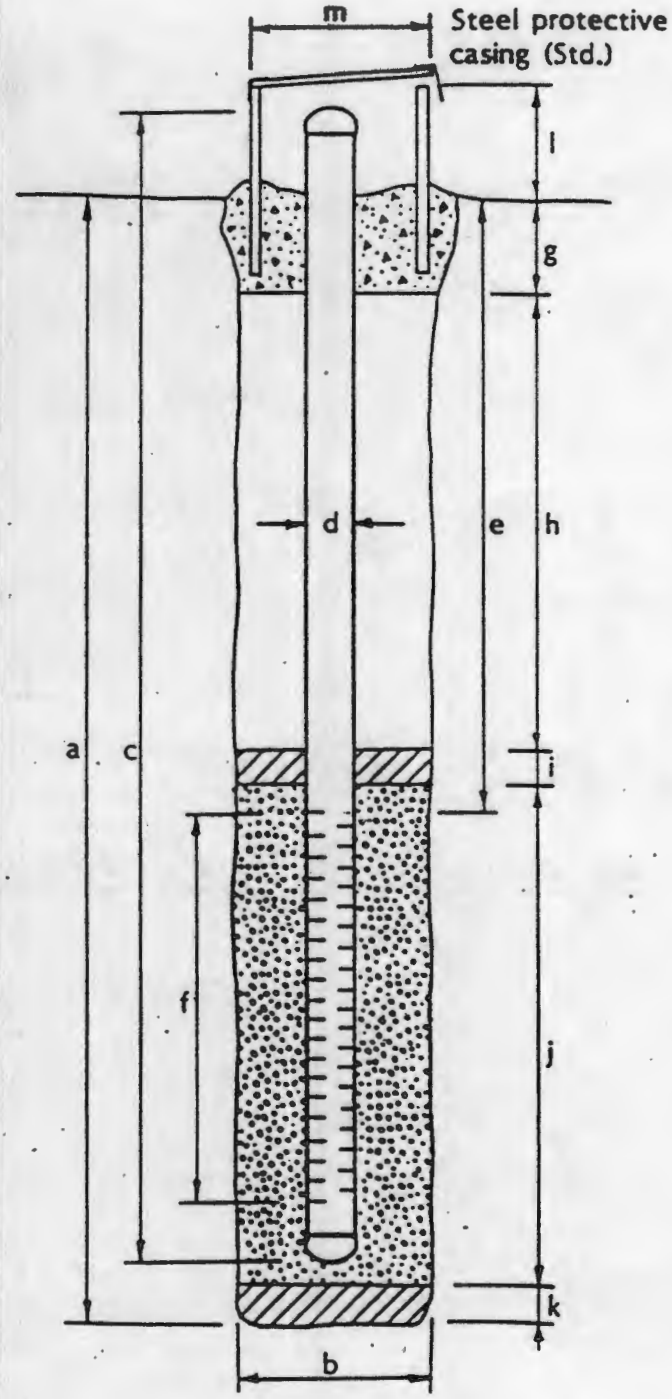
c. Casing length 240.5 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 209.5 ft.
f. Perforated length 30 ft.
Perforated interval from 209.5 to 239.5 ft.
Perforation type Machine Slotted
Perforation size 0.02 inch
g. Surface seal 8 ft.
Seal material Cement w/ 3% Bentonite
h. Backfill 172 ft.
Backfill material Cement w/ 3% Bentonite
i. Seal 14 ft.
Seal material Bentonite
j. Gravel pack ± 66 ft.
Pack material CSSI 8x12 Sand
k. Bottom seal N/A ft.
Seal material N/A
l. Casing height * 1.0 ft.
m. Protective casing diameter 10 in.

± includes filter pack (2.5 ft) and natural pack (6 ft)
* top of PVC casing

WELL DETAILS

PROJECT NUMBER 377-16.01
PROJECT NAME Signetics
COUNTY Bernalillo Co., NM
WELL PERMIT NO. N/A

BORING / WELL NO. MW-4
TOP OF CASING ELEV. 5182.94
GROUND SURFACE ELEV. 5182.46
DATUM Mean Sea Level



EXPLORATORY BORING

a. Total depth 260 ft.
b. Diameter 7 7/8 in.
Drilling method Air/Mud Rotary

WELL CONSTRUCTION

c. Casing length 240 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 209.5 ft.
f. Perforated length 30 ft.
Perforated interval from 209.5 to 239.5 ft.
Perforation type Machine Slotted
Perforation size 0.02 inch
g. Surface seal 19 ft.
Seal material Cement w/ 3% Bentonite
h. Backfill 169.5 ft.
Backfill material Cement w/3% Bentonite
i. Seal 10 ft.
Seal material Bentonite
j. Gravel pack± 61.5 ft.
Pack material CSSI 8x12 Sand
k. Bottom seal N/A ft.
Seal material N/A
l. Casing height * .5 ft.
m. Protective casing diameter 10 in.

± includes filter pack
* top of PVC casing