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NIROP FRIDLEY
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Public Health Assessment for

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, ANOKA COUNTY, MINNESOTA
CERCLIS NO. MN3170022914
SEPTEMBER 28, 1999

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

Comment Period Ends:

PUBLIC HEALTH ASSESSMENT

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT

FRIDLEY, ANOKA COUNTY, MINNESOTA

CERCLIS NO. MN3170022914

Prepared by:

Minnesota Department of Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations - the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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Summary

This Public Health Assessment addresses contaminated media (soil, water, and air) at two National Priorities List (NPL) Superfund sites: the Fridley, Minnesota, Naval Industrial Reserve Ordnance Plant (NIROP) and FMC Superfund Site. These superfund sites are separated by United Defense Limited Partnership (UDLP) property. FMC was purchased by UDLP. There is an apparent completed groundwater pathway via the Mississippi River to the Minneapolis Water Works (MWW). For this reason, groundwater is the media most discussed in this assessment. These two Superfund properties include 2 RCRA Sites: Storage Area C and UDLP Subsurface (below building) Source Areas.

NIROP and UDLP properties are located approximately 1 mile south of Interstate 694 and East River Road on the east side of the Mississippi River. The NIROP and the UDLP properties consist of several small buildings and one large manufacturing facility that contain approximately 1.9 million square feet. The large manufacturing facility is jointly owned by the United States Navy (NAVY) and UDLP, but the Navy owns more than half. Access to NIROP and UDLP properties is limited. Land in the area is designated as industrial, excluding Anoka County Riverfront Park. The Minneapolis Water Works (MWW) drinking water intakes are located approximately one mile down stream from NIROP and UDLP/FMC on the Mississippi River. Groundwater discharges from NIROP and UDLP to the Mississippi River is not permitted to exceed 5 micrograms per liter (μg/l) of trichloroethylene (TCE). NIROP TCE groundwater monitoring wells near the river exceed the clean-up standard of 5 μg/l. Limited FMC Superfund Site monitoring data indicates detections of 5 μg/l TCE off the UDLP property.

Based on sampling data of the treated (finished) water from the MWW from 1984 to the present, MDH concludes that any impact from these sites on the MWW's treated water is not a human health hazard or concern under current (or past) conditions: people are not being exposed to NIROP or UDLP/FMC related contaminants above health-based standards. TCE has been detected in the MWW finished water 27 times in the past 16 years. However, all the TCE detections have been substantially below the Maximum Contaminant Level (MCL) of 5 μg/l. The finished water is sampled quarterly for volatile organic compounds (including TCE). No other volatile organic compounds have been detected in the finished water. The raw water has been sampled for TCE annually by UDLP for the past 8 years with no detections using the Maximum Contaminant Level for TCE (5 μg/l) or 2.1 μg/l as the detection limit. In other words, TCE may have been present at levels similar to those found in the finished water but was not detected in the raw water because the detection limit was too high.

There may be potential for TCE concentrations in drinking water to exceed health-based standards. This possibility is suggested by TCE contamination found in groundwater at the Anoka County Riverfront Park, and fluctuations in TCE concentrations in monitoring wells near the Mississippi River. These wells are indicators of what may be discharging to the river. Plume migration underground from NIROP and the FMC Superfund Sites is in the direction of the Mississippi River. A portion of the FMC Superfund Site groundwater plume has reached has reached MWW property. If and where the contaminated groundwater from the FMC Superfund Site is discharging into the Mississippi River is not known. It is generally believed that contaminated groundwater that is not captured by NIROP's groundwater extraction system (the majority is captured) or is beyond it's capture zone is discharging into the Mississippi in the southern portion of Anoka County Park. In addition, all source areas for groundwater contamination at the superfund sites need to be identified to achieve better understanding of the horizontal and vertical extent of contaminated groundwater. Increased monitoring of the MWW raw water intakes as a safety measure is also recommended.

The NIROP site contains three operable units. Operable Unit 1 (OU1) consists of facility wide contaminated groundwater, including off site contaminated groundwater in Anoka County Riverfront Park. A two-phase approach is being implemented for the extraction and treatment of OU1 groundwater. In phase one, a groundwater extraction system discharges groundwater contaminated with TCE to the sanitary sewer system for treatment at the local waste water treatment plant. The Navy has successfully implemented phase two, where a water treatment system is used to lower TCE concentrations in groundwater to 5 μg/l or less and discharge the treated water into the Mississippi River, as required by a National Pollution Discharge Elimination System (NPDES) permit. A recent cone penetrometer investigation in Anoka County Riverfront Park has found groundwater contamination ranging from not detectable to 37,300 micrograms per liter (μg/l) (see figure 4, sample W1-6). The current extraction system will not remove contaminated groundwater from Anoka County Riverfront Park. Also, there is only one Prairie du Chien monitoring well (No. 43) down gradient from the NIROP/UDLP facility which has not been adequately monitored. The Prairie du Chien is the main Twin Cities drinking water aquifer. Thus, there are groundwater issues that still need to be resolved.

Operable Unit 2 (OU2) consists of on-site subsurface source areas (unsaturated zone) outside of the NIROP manufacturing building. The source areas for OU2 include buried drums and contaminated soil containing varying amounts of solvents and poly aromatic hydrocarbons (PAHs). Completed removal actions included excavation and proper disposal of more than thirty 55 gallon drums containing spent solvents. Contaminated soil was also removed. However, during a Mississippi River sampling event in 1997, buried drums were discovered in the Anoka County Riverfront Park. The drums are part of an old NIROP/UDLP dump which has not been characterized.

Operable Unit 3 (OU3) includes on-site subsurface source areas (saturated and unsaturated zone) beneath the NIROP manufacturing building. Remedial investigation field work has been completed. A complete remedial investigation report will be available in 1999. Preliminary findings include TCE concentrations in soil up to 100,000 micrograms per kilogram (μg/kg) and 140,000 μg/l in groundwater underneath the plating shop. Other contaminants were also found in the soil.

UDLP property currently has two operating remedial systems: one for soil and another for groundwater. In 1983, the Minnesota Pollution Control Agency (MPCA) issued a Consent Order to UDLP/FMC that resulted in the cleanup and treatment of waste in a Containment and Treatment Facility (CTF). The CTF is a vault filled with TCE contaminated soil. The vault includes leachate collection and vapor extraction systems. UDLP/FMC also operates a groundwater extraction system that discharges contaminated groundwater to the sanitary sewer system for treatment at the local waste water treatment plant. The UDLP groundwater plume needs to be further investigated; the current monitoring well network does not adequately describe the horizontal and vertical extent of groundwater contamination.

Although TCE is the main contaminant of concern at both sites, other contaminants have been detected above health protective standards - Maximum Contaminant Levels (MCLs) and MDH Health Risk Limits (HRLs) - for contaminants in drinking water. Groundwater exceedances of HRLs and MCLs are listed in Appendixes D and E.

Introduction

This Public Health Assessment (PHA) evaluates potential exposures to contaminants found at the Fridley, Minnesota, Navy Industrial Reserve Ordnance Plant (NIROP) National Priority List (NPL) superfund site, United Defense Limited Partnership (UDLP [formerly FMC Corporation.]), Fridley Minnesota, NPL Site, and **two** Resource Conservation and Restoration Act Sites located on NIROP and UDLP properties. These properties are individually evaluated in this public health assessment. This document examines contaminated media (water, air and soil), transport mechanisms and routes of exposure (ingestion, inhalation and dermal contact) to determine the likelihood of individuals being exposed to contamination. Minnesota Pollution Control Agency (MPCA), United States Navy (Navy) and UDLP project files along with electronic documents provided to Minnesota Department of Health (MDH) were reviewed. These documents and a site visit, form the basis for this PHA. Health effects that might be associated with any exposures are also discussed. This Public Health Assessment discusses data and results collected prior to April 1998. Most of the recent results have not been reviewed by MDH, although some of these results are sometimes referred to when appropriate.

Background

A. Site Description and History

MDH, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), evaluated the public health significance of contamination associated with NIROP and UDLP properties. More specifically, MDH and ATSDR cooperated to determine whether health effects are possible and to make recommendations to reduce or prevent possible health effects. ATSDR, located in Atlanta, Georgia, is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; also known as Superfund) to conduct health assessments at hazardous waste sites.

The Naval Industrial Reserve Ordnance Plant (NIROP, CERCLIS number MN3170022914) and United Defense Limited Partnership (UDLP, CERCLIS number MND006481543) facilities are contiguous, and located in the northern portion of the Minneapolis/St. Paul metropolitan area within the city limits of Fridley, Minnesota. These sites are situated approximately one-quarter mile east of the Mississippi River and less than 1 mile south of Interstate 694 (Figures 1 and 2). The NIROP/UDLP plant is used for the design and manufacture of advanced naval weapons systems. The plant was the first government owned/contractor operated (GOCO) facility in the United States.

The northern portion (NIROP) of the plant is owned by the Navy but operated by UDLP. NIROP consists of approximately 80.3 acres, including approximately 36 acres under roof and an estimated 14 acres paved. NIROP property is occupied by buildings containing approximately 1,753,000 square feet of space. NIROP is contiguous to buildings/plant and property to the south owned by UDLP. The UDLP portion of the plant contains approximately 9.5 acres with 326,000

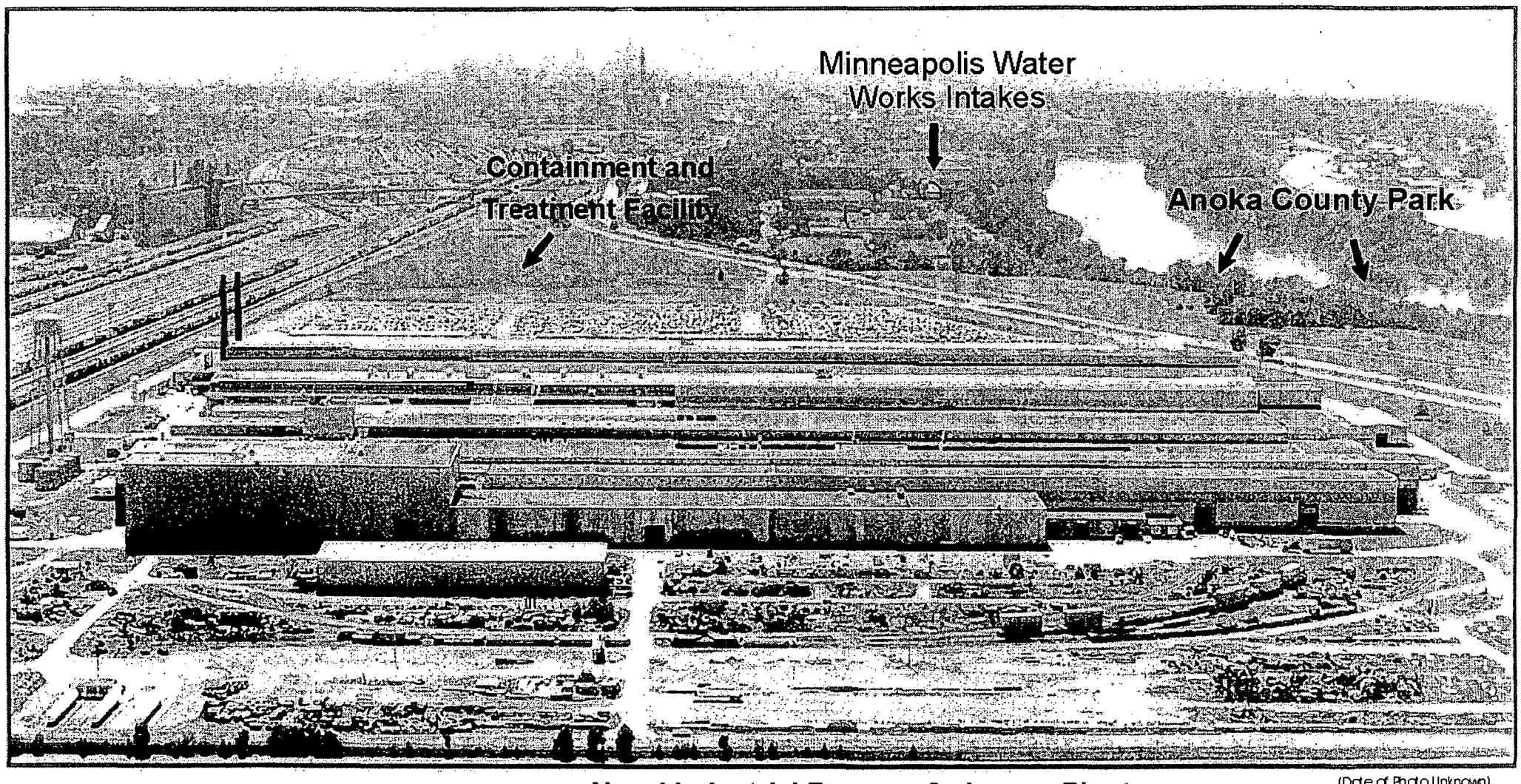

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Figure 1 **Naval Industrial Reserve Ordnance Plant**
United Defense Limited Partnership Inc.

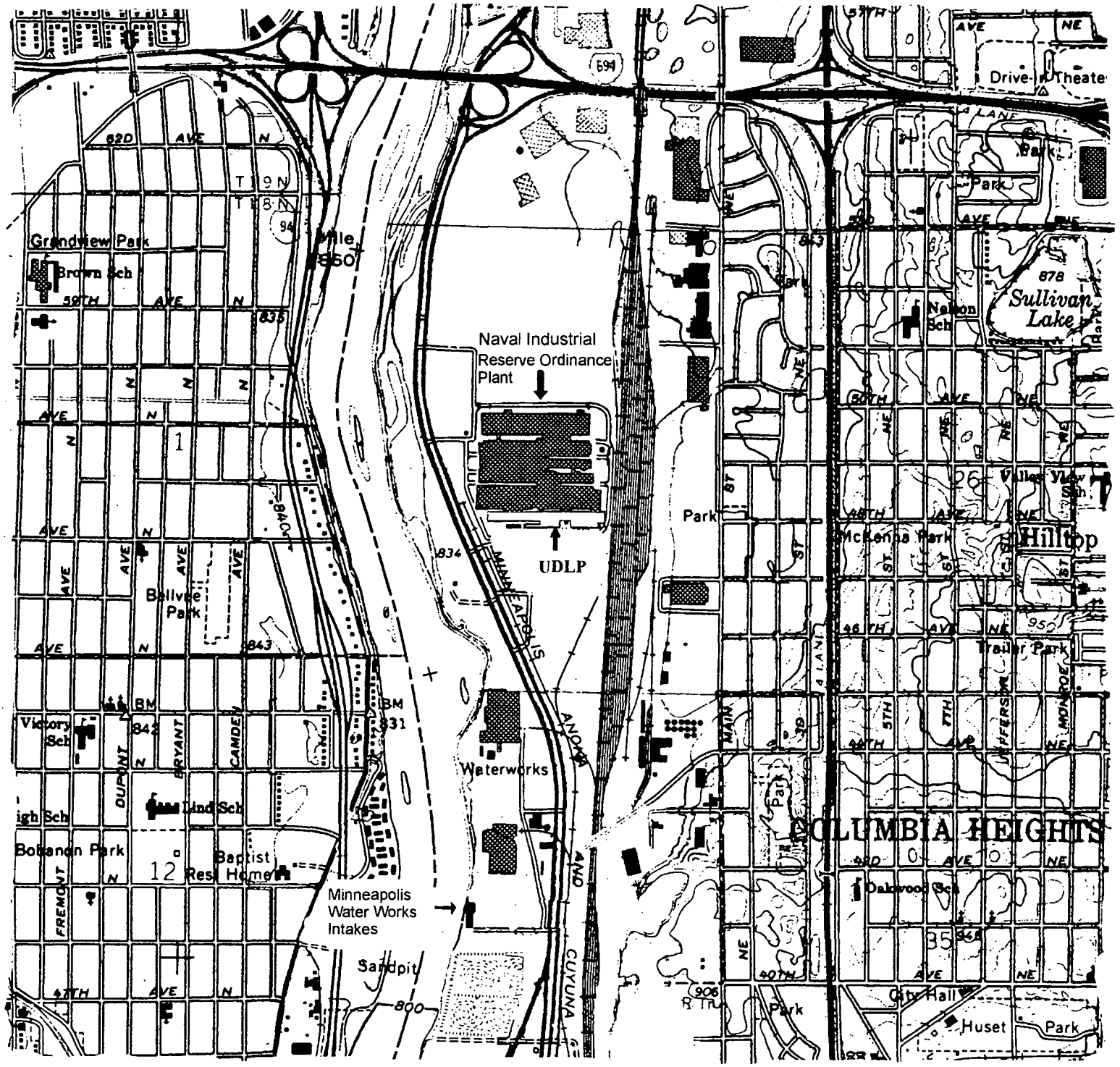
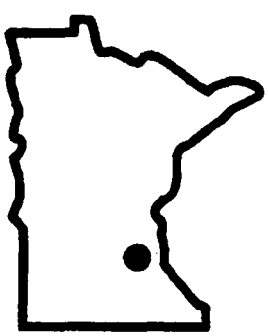
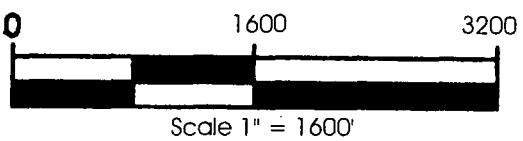


Figure 2 Site Location Map
Naval Industrial Reserve Ordnance Plant



STATE LOCATION



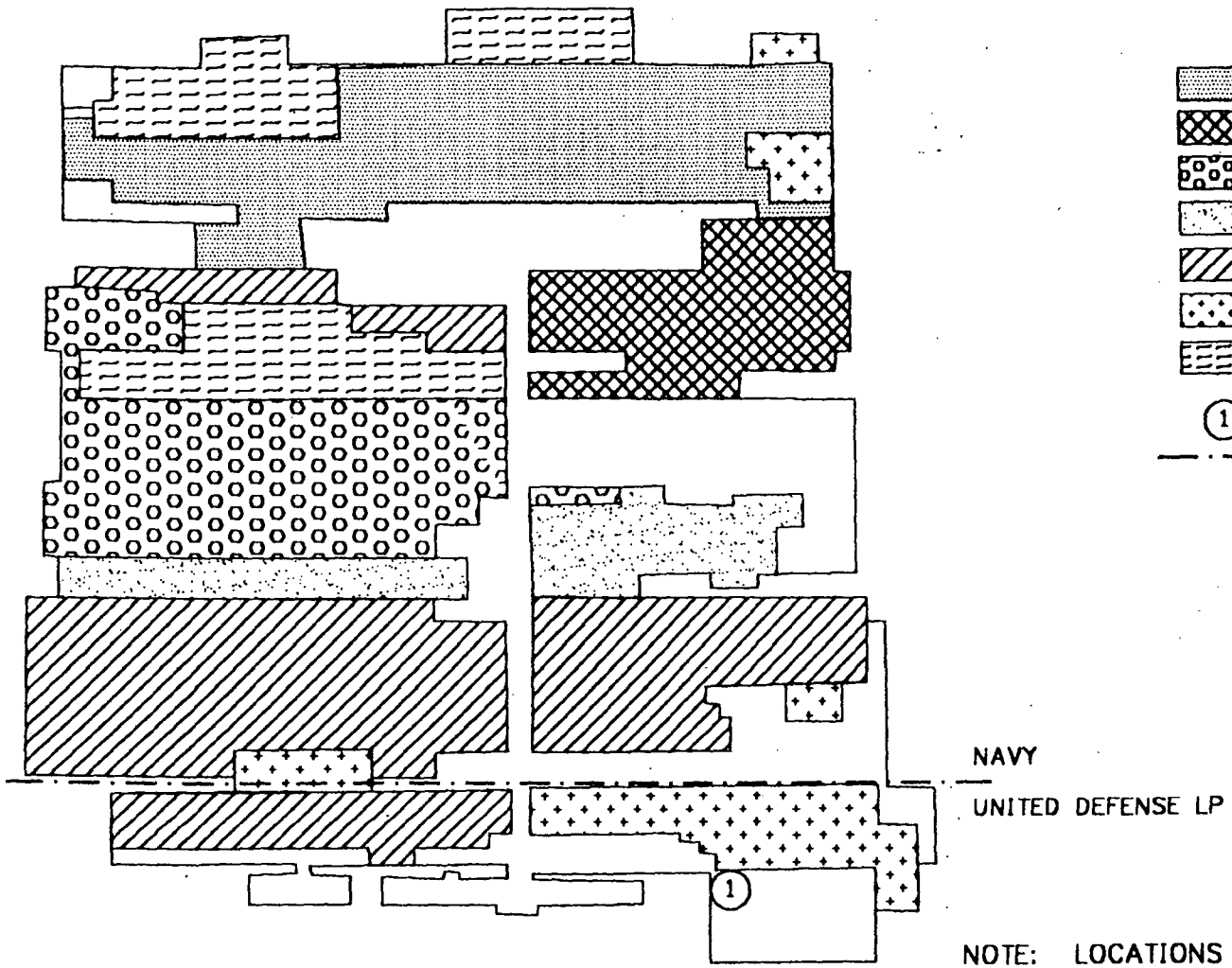
square feet under a roof. Both NIROP and UDLP are superfund sites with their respective environmental liabilities. A groundwater plume consisting mostly of trichloroethylene (TCE) emanates from under the NIROP facility. The FMC Superfund Site includes the unconfined aquifer plume and the confined aquifer plume on UDLP property south of the main facility, and any off-site areas of plume migration.

The plant was built in 1940 by the Northern Pump Company using U.S. War Department Funds. In 1941, the plant was in full production making 5 inch gun mounts. In June 1942, the Northern Pump Company established Northern Ordnance Incorporated as a subsidiary. The Navy financed additional buildings on private land for use as manufacturing facilities for Northern Ordnance Incorporated. In 1947, the U.S. acquired 80.3 acres of land underlying Navy owned buildings. During the 1950s, production changed to guided missile launching systems. In 1964, Northern Ordnance was acquired by the FMC Corporation (FMC). On January 1, 1994, FMC's defense business entered into a limited (currently 60% ownership) partnership with Harsco Corporation's defense business to form United Defense, Limited Partnership (UDLP). Currently, the Armament Systems Division of UDLP operates the facility, which continues to produce gun mounts and missile launching systems and is currently owned by the Carlyle Group (1). In this document, UDLP and FMC are considered one and the same unless otherwise noted.

The Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) have determined that past disposal practices of hazardous substances at the NIROP and UDLP facilities have resulted in releases of hazardous substances causing extensive ground water contamination on and off NIROP and UDLP properties.

For this Public Health Assessment, NIROP and UDLP are considered one site due to the close proximity and physical arrangement of the two sites, and potential for mixing of their respective groundwater plumes. Because of the long history and large size of the facility, there are numerous Areas of Concern (AOC) and Solid Waste Management Units (SWMU) that still need to be investigated. AOCs include any areas where hazardous wastes may have been stored, spilled, used or disposed (including above and below ground storage tanks). SWMUs include any areas where solid wastes (hazardous and nonhazardous) were stored, dumped or buried. State supervised site characterization has been an ongoing effort, spanning 16 years beginning with the MPCA's issuance of a Request For Response Action in 1984 under the authority of the Minnesota Environmental Response and Liability Act (MERLA)(1). Figure 3 depicts past industrial process areas within the facility and notes those production areas have changed over time. Thus, many AOC and SWMU locations have also changed over time making them beyond the scope of this report. The emphasis of this document is on recent site related activities, and any known AOCs/SWMUs that may have contributed to the groundwater contamination. NIROP's and UDLP's operable units (OU) are listed separately to aid the reader in distinguishing between the two. UDLP's hazardous waste treatment systems are also listed separately.

Figure 3 FORMER INDUSTRIAL PROCESS AREAS
WITHIN THE MAIN INDUSTRIAL PLANT BUILDING
NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA



LEGEND

- ASSEMBLY & PAINTING
- FOUNDRY
- WELDING
- HEAT TREAT & PLATING
- MACHINE SHOP
- TEST & INSPECTION & QA
- SHIPPING, RECEIVING & STORAGE
- (1) PHOTO LAB
- PROPERTY LINE

NOTE: LOCATIONS OF THE PRODUCTION AREAS HAVE VARIED OVER TIME. THE DATE OF THE PROCESS AREA LAYOUT SHOWN IS NOT KNOWN.

REFERENCE: REMEDIAL INVESTIGATION REPORT, RMT, JUNE 1987

A.1 Naval Industrial Reserve Ordnance Plant (NIROP) Superfund Site

NIROP property contains five sites that have been identified as Navy Installation Restoration Program (IRP) Sites. These sites are divided into three major work areas called Operable Units (OU1, OU2 and OU3). OU1 consists of plant wide groundwater. OU2 includes all contaminated soil and buried drum sites (1). OU3 includes source areas beneath the factory building.

A.1.a NIROP Operable Unit 1 (OU1) plant wide groundwater

A Record of Decision (ROD) for groundwater at NIROP was finalized on March 1991 (2). The ROD describes how the Navy plans to remedy the contaminated groundwater by hydraulic containment, recovery, and treatment. The proposed remedy includes installation and operation of a groundwater containment and extraction system. A two phased approach for disposal of the contaminated groundwater from the system has been implemented.

Under Phase I, the extracted groundwater was initially pretreated before being discharged directly to the existing sanitary sewer system, and treated at the Pig's Eye wastewater treatment facility. After effluent TCE concentrations dropped, the extracted groundwater was discharged directly to the sanitary sewer. This discharge is permitted by the Metropolitan Council Environmental Services (MCES) Industrial Discharge Permit (No. 2154) (1). The monitoring well system consists of 81 wells completed in the shallow, intermediate and deep surficial aquifers and the Prairie du Chien/Jordan Dolomite aquifer. Forty-four of the wells are sampled on a regular basis as part of the Remedial Action Monitoring Plan (RAMP). There is a total of six extraction wells, two of which were part of a 1995 upgrade. To date, a true zone of capture has not been firmly established (21). However, substantial capture of the groundwater plume is occurring.

In phase II, the groundwater treatment facility will lower extracted groundwater TCE concentrations to 5 micrograms per liter (μg/l) (maximum contaminant level) or less and discharge it to the Mississippi River under a National Pollutant Discharge Elimination System Permit (NPDES), (Permit No: MN0000710). The groundwater treatment facility is currently in operation . The river discharge limits (daily maximums, not averages) are listed in the following table.

Naval Industrial Reserve Ordnance Plant (NIROP) National Pollution Discharge Elimination System (NPDES) Daily Discharge Limits			
Compound	Discharge Characteristics	Monitoring Characteristics	
	Daily Max (μg/l)	Measurement Frequency	Sample Type
Methylene Chloride	5.0	Twice Monthly	Grab
Carbon Disulfide	700	Twice Monthly	Grab
1,1 dichloroethene	6.0	Twice Monthly	Grab
1,1 dichloroethane	70	Twice Monthly	Grab
1,2 dichloroethane (cis)	70	Twice Monthly	Grab
1,2 dichloroethane (trans)	100	Twice Monthly	Grab
1,1,1 Trichloroethane	200	Twice Monthly	Grab
Trichlorethylene (TCE)	5.0	Twice Monthly	Grab
Tetrachloroethene (PERC)	3.8	Twice Monthly	Grab

μg/l = micrograms per liter

It should be noted that monitoring frequency is subject to change after the first year if contaminants are consistently well below the discharge limits. A reduction in monitoring must be approved by the Commissioner of the MPCA. The groundwater remedy will continue until groundwater TCE levels reach 5 μg/l or asymptotic conditions are reached (21).

The contaminated groundwater in Anoka County Riverfront Park is included in OU1. A Cone Penetrometer Test investigation was completed in December 1997. See Figure 4 for preliminary findings of TCE concentrations from the cone penetrometer investigation in Anoka County Park. The cone penetrometer investigation was a one time sampling event that revealed TCE concentrations as high 37,300 parts per billion (ppb) in the park (21).

A. 1.b NIROP Operable Unit 2 (OU2) Unsaturated Zone Outside Building

OU2 consists of on-site subsurface source areas (unsaturated zone) outside of the NIROP manufacturing building. The source areas for OU2 included buried drums and contaminated soil containing varying amounts of solvents and polycyclic aromatic hydrocarbons (PAHs). OU2 had three completed and separate removal actions initiated in 1983, 1991 and 1996 in the North Forty. The North Forty is approximately 22 acres of land north of the main building.

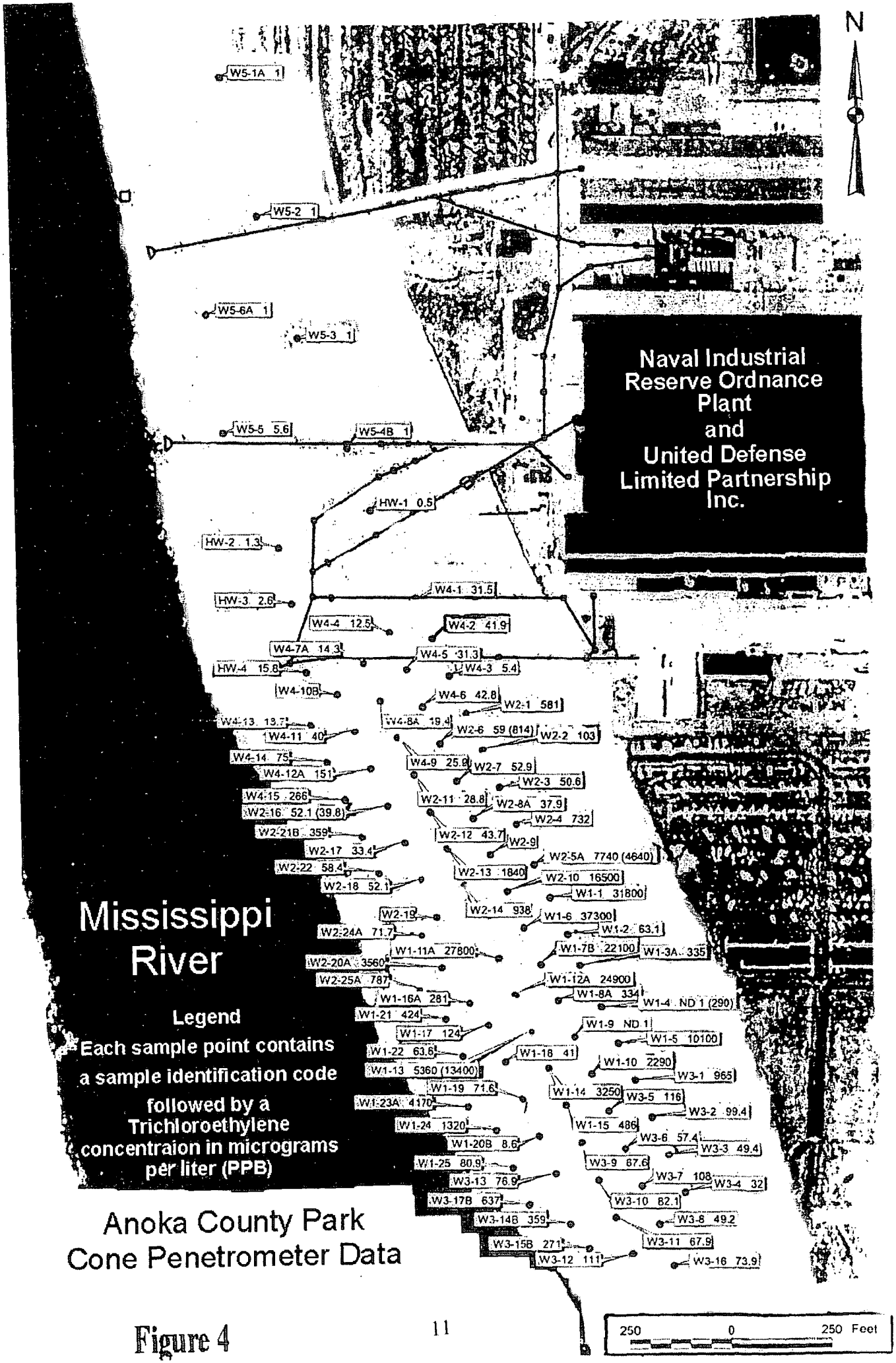

N
Naval Industrial Reserve Ordnance Plant and United Defense Limited Partnership Inc.
Mississippi River
Legend
Each sample point contains a sample identification code followed by a Trichloroethylene concentraion in micrograms per liter (PPB)
Anoka County Park Cone Penetrometer Data
W5-1A 1
W5-2 1
W5-6A 1
W5-3 1
W5-5 5.6
W5-4B 1
HW-1 0.5
HW-2 1.3
HW-3 2.6
W4-1 31.5
W4-4 12.5
W4-2 41.9
W4-7A 14.3
W4-5 31.3
HW-4 15.8
W4-3 5.4
W4-10B
W4-6 42.8
W2-1 581
W4-13 13.7
W4-8A 19.4
W4-11 40
W2-6 59 (614)
W2-2 103
W4-14 75
W4-9 25.9
W2-7 52.9
W4-12A 151
W2-3 50.6
W4-15 266
W2-11 28.8
W2-16 52.1 (39.8)
W2-8A 37.9
W2-4 732
W2-21B 359
W2-12 43.7
W2-9
W2-17 33.4
W2-5A 7740 (4640)
W2-22 58.4
W2-13 1840
W2-10 16500
W2-18 52.1
W1-1 31800
W2-14 938
W2-19
W1-6 37300
W2-24A 71.7
W1-2 63.1
W1-11A 27800
W1-7B 22100
W1-3A 335
W2-20A 3560
W2-25A 787
W1-12A 24900
W1-16A 281
W1-8A 334
W1-4 ND 1 (290)
W1-21 424
W1-9 ND 1
W1-17 124
W1-5 10100
W1-22 63.6
W1-18 41
W1-10 2290
W1-13 5360 (13400)
W3-1 965
W1-19 71.6
W1-14 3250
W3-5 116
W1-23A 4170
W3-2 99.4
W1-24 1320
W1-15 486
W3-6 57.4
W1-20B 8.6
W3-3 49.4
W1-25 80.9
W3-9 67.6
W3-13 76.9
W3-7 108
W3-4 32
W3-17B 637
W3-10 82.1
W3-14B 359
W3-8 49.2
W3-15B 271
W3-11 67.9
W3-12 111
W3-16 73.9
250 0 250 Feet

Figure 4

The area contains the following: buildings 58, 50, and 37; three 17,300 gallon propane tanks; one 90,000 gallon propane tank. Figure 5 shows the locations of all the removal actions and buildings in the North Forty.

The North Forty site was identified in 1983 during an Initial Assessment Study (IAS) conducted as part of the Navy Assessment and Control of Installation Pollutants Program. The IAS revealed that drummed wastes were disposed of in the northern portion of the NIROP in varying length trenches ranging from 8 to10 feet deep.

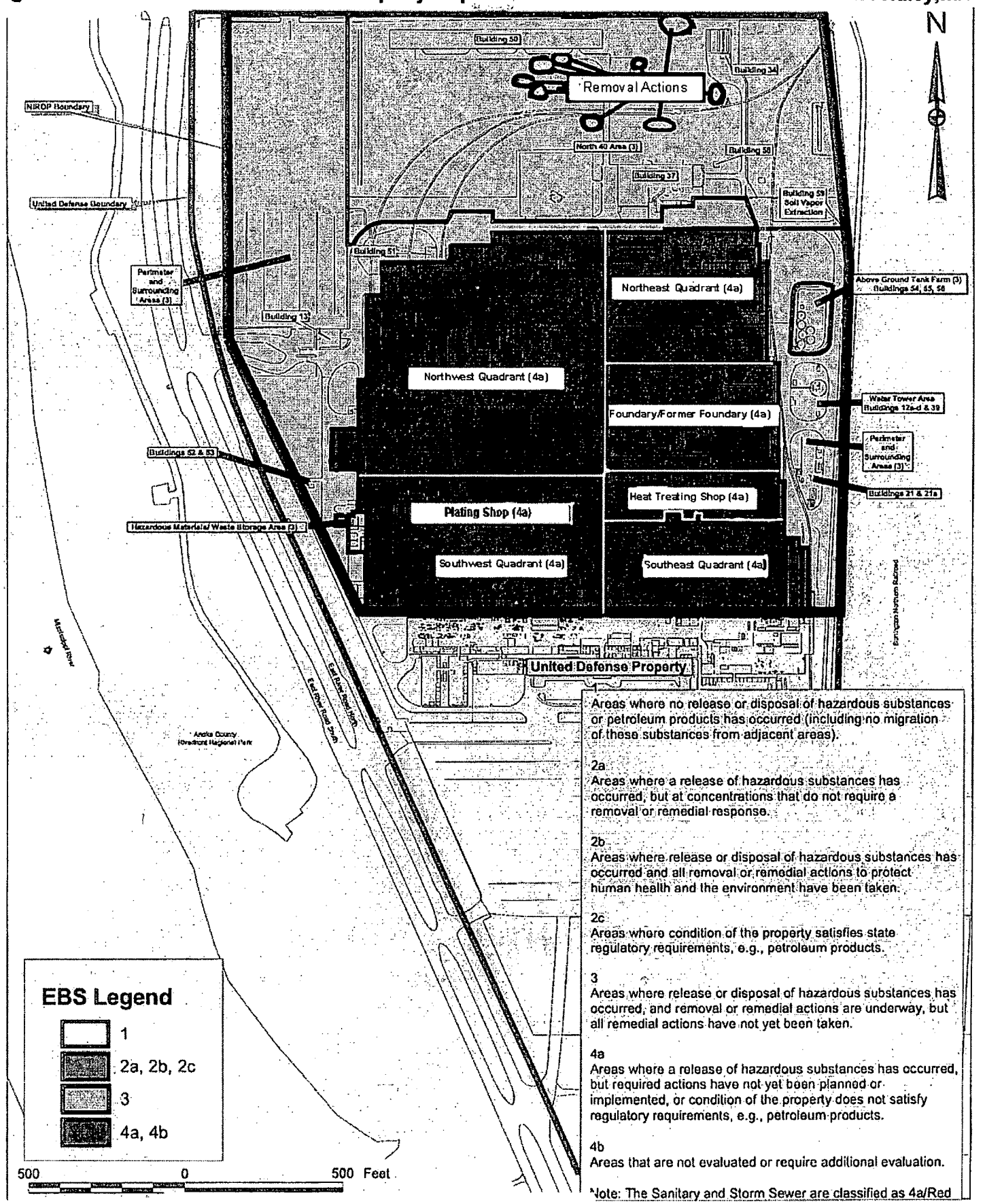
Following the completion of the IAS, a geophysical survey was conducted by the U.S. Army Corps of Engineers (USACE) in the suspected disposal areas. Based on numerous magnetic anomalies, nine areas were selected for excavation (test pits) and a total of 43 drums and 1,200 cubic yards of contaminated soil were recovered and disposed of in 1984.

Subsequent geophysical, soil gas, and soil boring investigations led to the conclusion that another drum disposal area might exist. These findings led to a removal action in 1991, which included the excavation, sampling and overpacking of 31 drums. Analysis with field screening instruments indicated that 21 of the drums were contaminated with Volatile Organic Compounds (VOCs). Approximately 900 cubic yards of soil and debris were removed during the excavation, along with the drums. The debris consisted of a mixture of trash, rubble, and demolition. Based on dated materials found at the NIROP site, it can be concluded that some of the disposal took place during the early 1970s. The soil was mechanically separated from the debris and returned to the excavation as backfill (700-750 cubic yards) (5). The drum wastes were incinerated at an Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) licensed facility. The debris disposal was either at a sanitary landfill or at a RCRA secure landfill, based on its contaminant concentrations.

The most recent removal action began in April 1996, and ended in June of the same year. A geophysical investigation consisting of an electromagnetic survey of the North Forty identified fifteen anomalies. Results suggested the presence of buried metallic materials. All 15 excavated anomalies contained scrap metal, and several had drums and debris. The debris consisted of a mixture of trash, scrap metal, tires, construction and demolition rubble, metal casting waste, equipment parts, and cast concrete structures. In all, a total of twenty-three 55-gallon drums and 12 smaller containers were excavated from four of the 15 anomalies. Contents of 13 drums and 8 containers were sampled, analyzed, and overpacked for hazardous waste disposal at the Port Arthur (Texas) incinerator (6). The remaining10 drums and 4 containers were found to have no detectable contamination using a field screening gas chromatograph with both photoionization and flame ionization detectors. The contents of these drums and containers were emptied and landfilled, and the containers were disposed of as scrap metal.

Soil contaminated with Volatile Organic Compounds (VOC) from one of the excavations was emptied into two steel overpack drums. Soil was incinerated at Port Arthur. Approximately 12 cubic yards of soil with asbestos containing siding, insulation and paraffin sludge was containerized and disposed of at the Voyager Landfill in Canyon, Minnesota. Another 100 cubic yards of soil not suitable for backfill was disposed of at Pine Bend Landfill, also in Minnesota.

Figure 5 Environmental Condition of Property Map Naval Industrial Reserve Ordnance Plant Fridley,MN



Reference 1

Soil samples were collected from the bottom of each excavation and analyzed for VOCs, semivolatile organic compounds (SVOC), total organic halides (TOH), phenolics, total cyanide, sulfur, and metals. Samples were collected from the approximate center of each 1/2 or 1/3 area comprising the bottom of the excavation.

A.1.c NIROP Building In Saturated Zone (OU3)

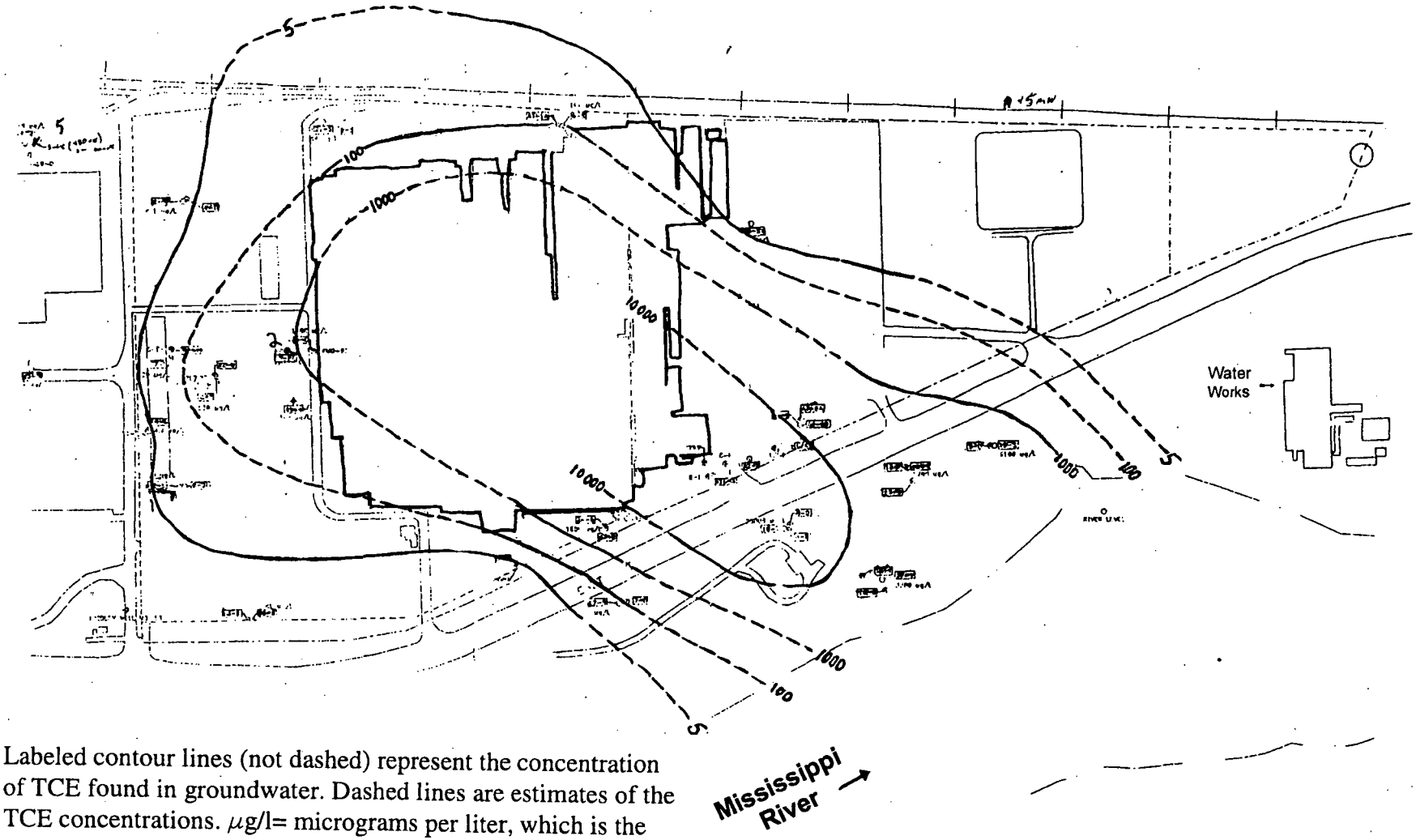
OU3 includes on-site subsurface source areas (saturated and unsaturated zone) beneath the NIROP manufacturing building, and on-site subsurface source areas (saturated zone) outside of the NIROP manufacturing building. The remedial investigation and feasibility study field work are complete pending MPCA and EPA approval. Preliminary findings include TCE concentrations in soil up to 100,000 μg/kg and 140,000 μg/l in groundwater underneath the plating shop (21). The final remedial investigation report should be complete 1999. This report will include soil boring data that will help characterize source areas located *under* the NIROP manufacturing building. In addition, 18 nested monitoring wells have been installed within the building from which groundwater samples will be collected. This operable unit is suspected to be a very prominent source area based on the TCE isoconcentration maps provided in the NIROP 1996 and 1997 Annual Monitoring Reports (Figure 6 and 7). To date, other source areas (buried drums and contaminated soil) identified and removed on NIROP and UDLP properties outside the building are much less significant. This conclusion is based on the extent and concentrations of the groundwater plume emanating from under the NIROP/UDLP facility, in comparison with other source area contamination.

A.1.d NIROP Storage Area C RCRA Site

FMC operated a Navy owned hazardous waste storage facility known as Storage Area C on NIROP property. The concrete storage area was constructed in 1972 and metal building was added in 1985. Storage Area C could house a maximum of 144 55-gallon drums. The building was dismantled in 1988. An initial excavation of the concrete pad was conducted in January 1989. During closure activities at Storage Area C, it was discovered that the sump in the pad was a "dry well". The dry well was constructed with a 48-inch concrete pipe filled with crushed rock to the depth of approximately 11 feet. The bottom of the dry well was open to the underlying soil. Soil samples from the dry well indicated the presence of VOCs, primarily TCE and tetrachloroethylene (PERC). Maximum soil concentrations associated with Storage Area C were 6,300 μg/kg for TCE and 500 μg/kg for PERC. More than 200 cubic yards of contaminated soil were excavated and disposed off site. Remaining soils with TCE concentrations of 100 μg/kg were treated with an in-situ soil vapor extraction system. The site included approximately 4,750 cubic yards of potentially contaminated soil.

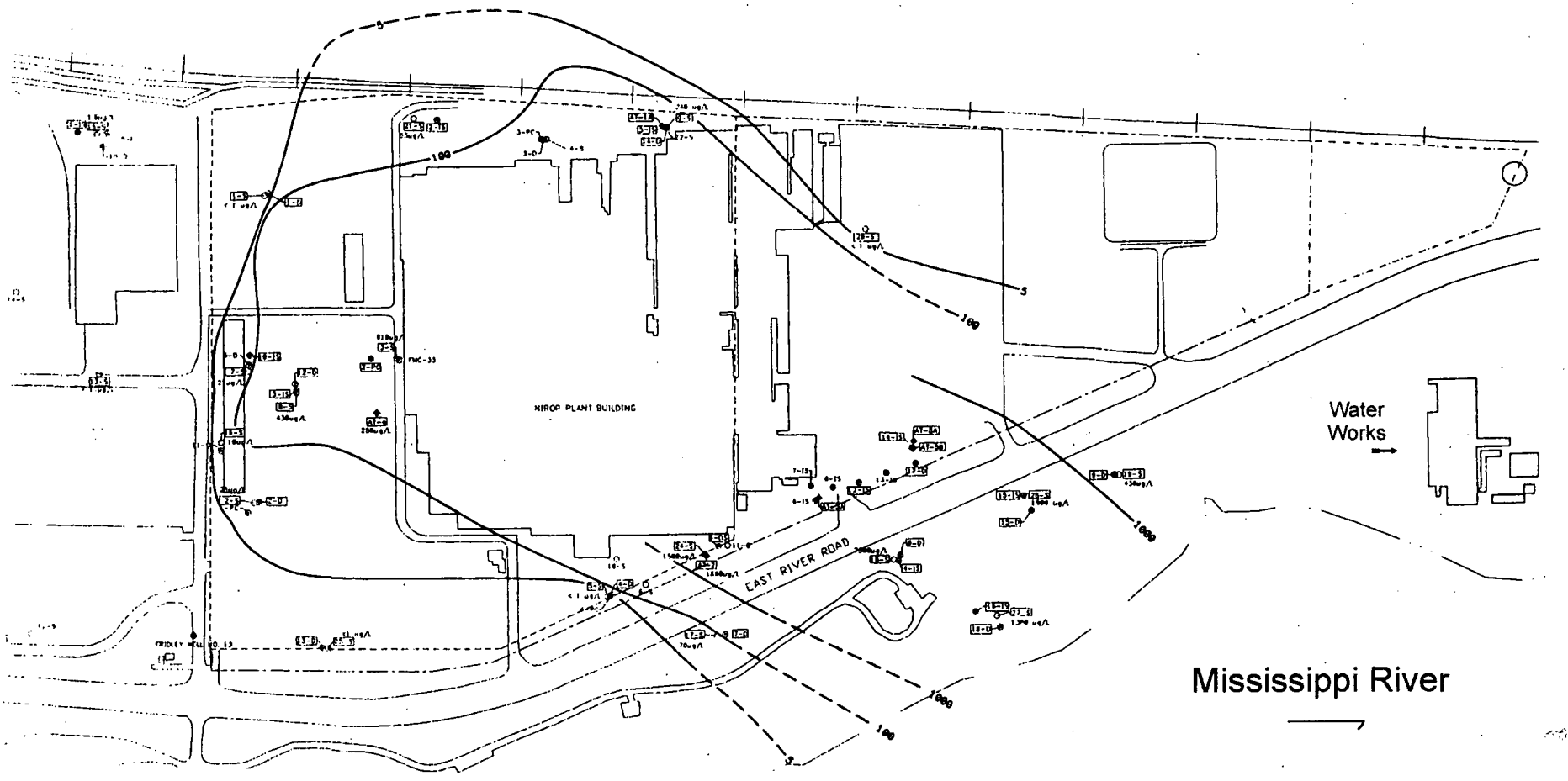
The soil gas extraction system began operating in 1993 and was deactivated in mid 1997. The system consisted of several gas wells, associated subsurface piping, and a soil vapor extraction building that housed pumps and filters. Contaminated groundwater associated with the Storage Area C site is part of the NIROP Superfund Site.

Figure 6 Naval Industrial Reserve Ordnance Plant (Fridley, MN)
1996 Annual Monitoring Report Trichloroethylene (TCE) Concentration (μg/l)
in the Shallow Drift Groundwater Regime



Labeled contour lines (not dashed) represent the concentration of TCE found in groundwater. Dashed lines are estimates of the TCE concentrations. μg/l= micrograms per liter, which is the same as parts per billion (PPB)

Figure 7 Naval Industrial Reserve Ordnance Plant (Fridley, MN) 1997 Annual Monitoring Report Trichloroethylene (TCE) Concentration (μg/l) in the Shallow Monitoring Wells



Labeled contour lines (not dashed) represent the concentration of TCE found in groundwater. Dashed lines are estimates of the TCE concentrations. μg/l= micrograms per liter, which is the same as parts per billion (PPB)

A.2 United Defense Limited Partnership (UDLP)/FMC Superfund Site

A.2.a Groundwater Remedial Action Operable Unit

This operable unit consists of 18 acres on the southern portion of the UDLP property. Thirteen acres of this land belongs to UDLP and five acres were sold to Glacier Park Company, a subsidiary of Burlington Northern Railroad (BNR) (Figure 8). The land due west of UDLP was sold to Anoka County and is now part of the Anoka County Riverfront Park. This park was developed as part of the federally funded Great River Road Project (7). The UDLP portion of the plant is privately owned and operated. In April 1981, an FMC investigation revealed historical use of the FMC and BNR lands for waste disposal. Investigators found groundwater contamination on site as well as contamination in the Minneapolis Water Works (MWW) water intakes(7).

The remedial action for this site consists of a ground water extraction system and discharge of untreated groundwater to a sanitary sewer for treatment at the Pig's Eye Water Treatment Plant, a Publicly Owned Treatment Works (POTW) (8).

The groundwater extraction system (GWS) began operating in December 1987. The GWS consists of five extraction wells (RW1-RW5), related piping, and mechanical components. Wells RW-1 and RW-2 are installed on the BNR property. These wells are completed in the upper, unconfined sand unit of the alluvial aquifer. Extraction well RW-1 has not been in service since 1987 due to a lack of groundwater recharge at the well. The MPCA questions if RW-2 provides adequate hydraulic containment (12). Extraction wells RW-3, RW-4, and RW-5 are located on the UDLP property and are completed in the lower, confined sand unit of the alluvial aquifer. According to MPCA (23), "It is expected that portions of both the unconfined and confined plumes exist beyond the capture ability of the groundwater pumping system and that the plumes are present down gradient of East River Road between the road and the Mississippi River. Given deficiencies in the current off-site monitoring network, it is difficult to evaluate the horizontal and vertical extent and concentration of the offsite plume." These deficiencies include the number and location of wells and the lack of discrete vertical aquifer characterization. Some of the monitoring wells were constructed with very long screened intervals (70-100 foot screens) which make the interpretation of data from the wells including contaminant concentrations and hydraulic heads uncertain (23). In monitoring wells nearest the Mississippi River (MW-21, MW-39), in 1996, TCE concentration data did not exceed 5μg/l. However, these two wells are sampled only once a year and data may not be representative of concentrations in the off-site confined plume in general. No appropriately screened down gradient wells exist to monitor compliance with water quality standards in the confined aquifer near the river (23). Based on groundwater flows, it is reasonable to expect ground water discharge for these plumes to be up gradient of the MWW's intakes. In addition, extraction wells RW-2 and RW-3 have consistently exceeded the MDH Health Risk Limit (HRL) (0.2 μg/l) and Environmental Protection Agency's MCL (2.0 μg/l) for vinyl chloride (see Appendix E). The HRL is an MDH standard entirely based on health considerations that is used to give advice to government agencies and private citizens, concerning safe levels of contaminants in drinking water. The MCL is a regulatory standard for public water supplies. It is meant to protect public health, but other factors may also be considered, such as cost, best available technology, and so forth. Figures 9 and 10 show the 1996 TCE

Figure 8
Location of Sanitary Sewer, Watermain, and Property Boundaries

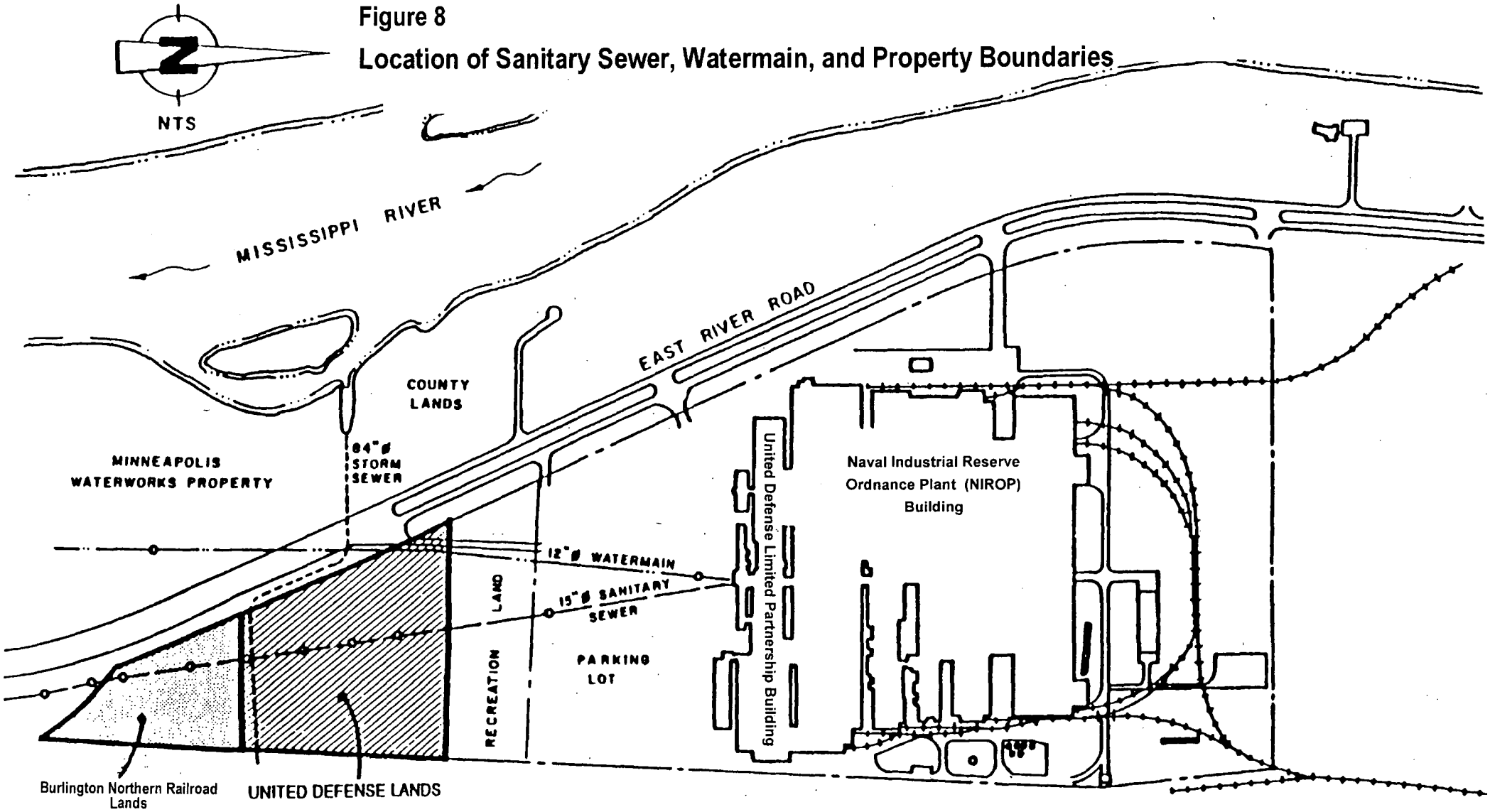
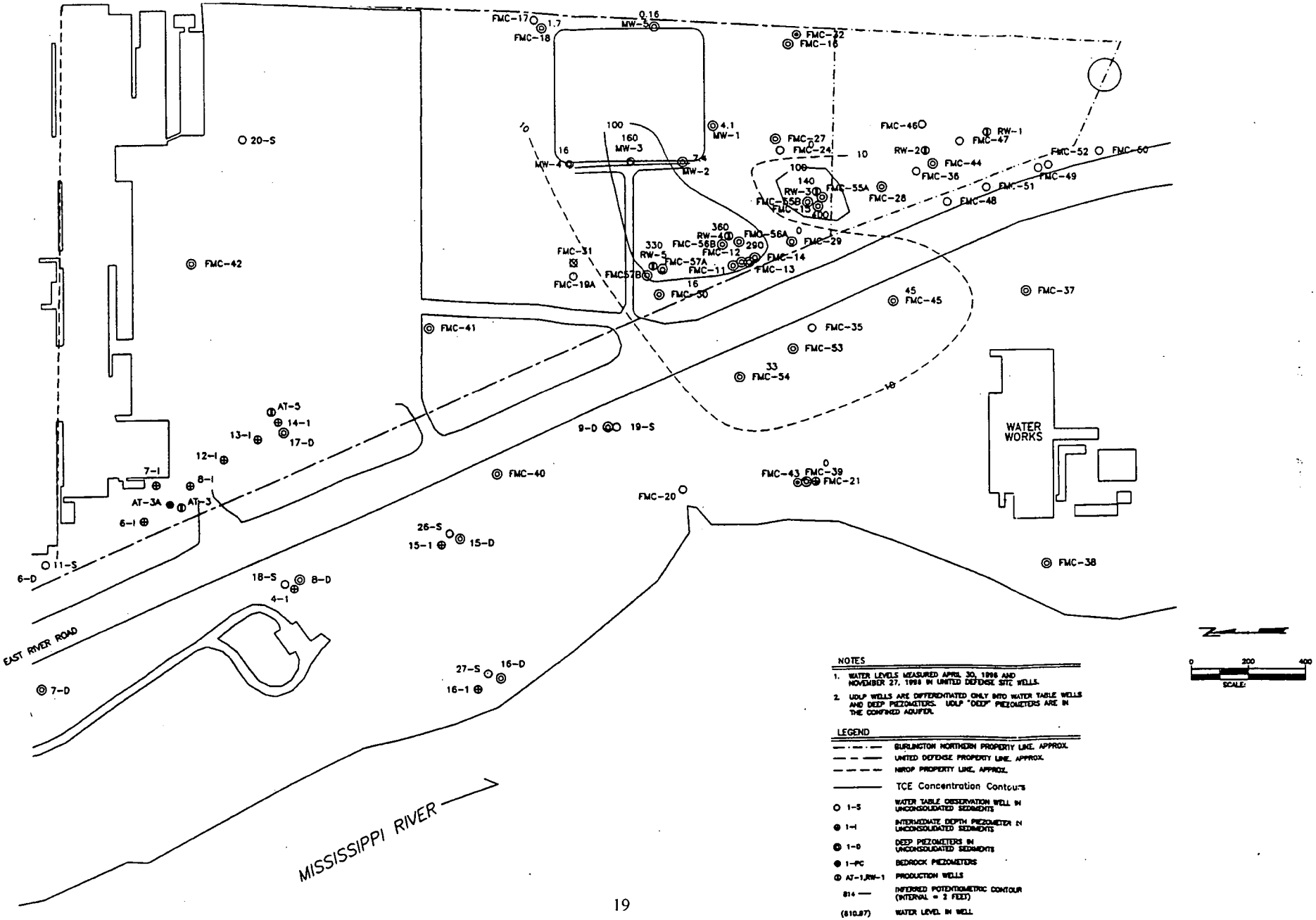


Figure 9 United Defense Limited Partnership Inc. Trichloroethylene Concentration (ug/l) Contours
1996 Annual Monitoring Report Confined Aquifer



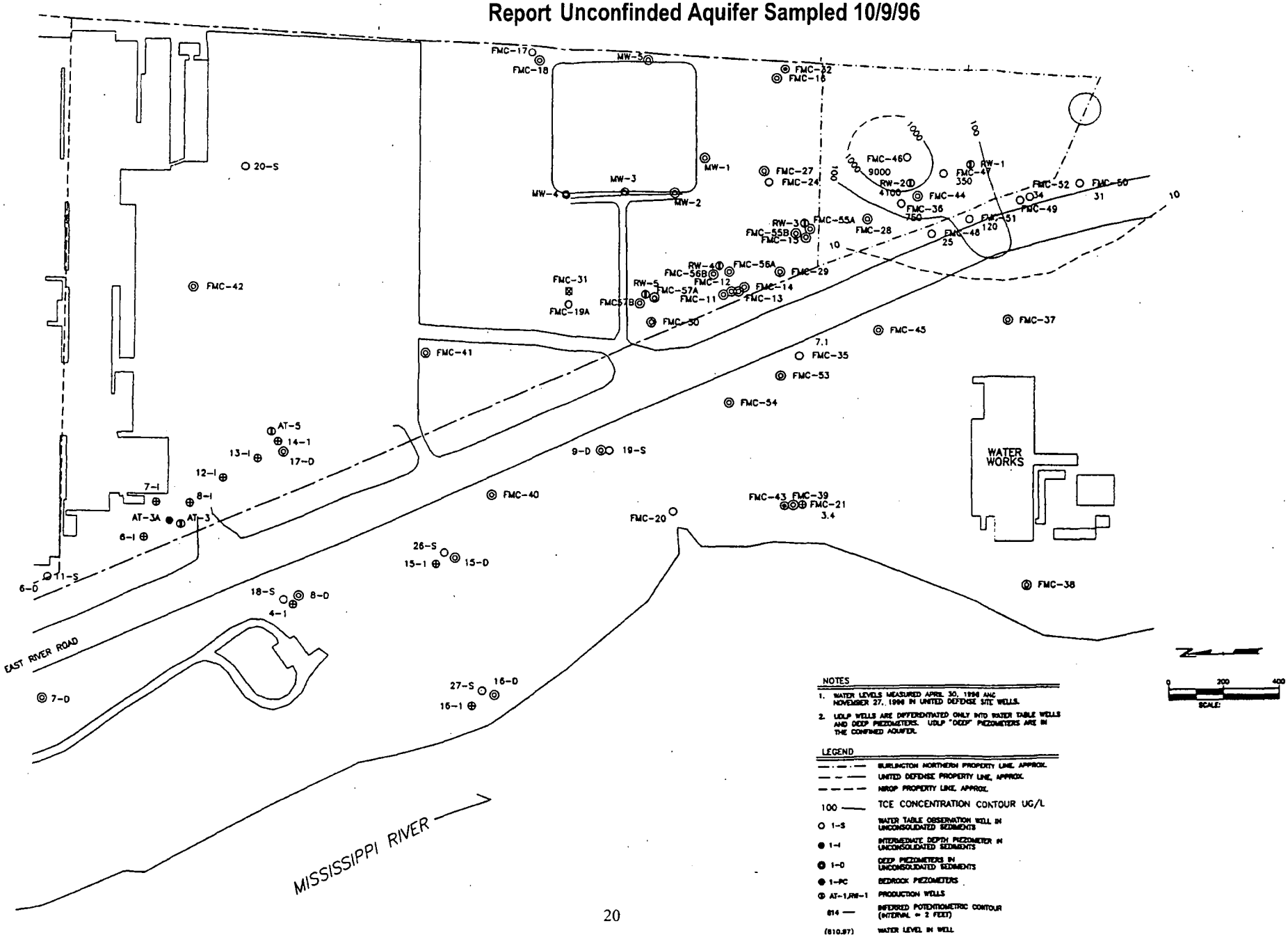
NOTES

1. WATER LEVELS MEASURED APRIL 30, 1996 AND NOVEMBER 27, 1996 IN UNITED DEFENSE SITE WELLS.
2. UDLP WELLS ARE DIFFERENTIATED ONLY INTO WATER TABLE WELLS AND DEEP PIEZOMETERS. UDLP "DEEP" PIEZOMETERS ARE IN THE CONFINED AQUIFER.

LEGEND

— · — · —	BURLINGTON NORTHERN PROPERTY LINE, APPROX.
— — —	UNITED DEFENSE PROPERTY LINE, APPROX.
— — —	NIROP PROPERTY LINE, APPROX.
———	TCE Concentration Contours
○ 1-S	WATER TABLE OBSERVATION WELL IN UNCONSOLIDATED SEDIMENTS
⊕ 1-I	INTERMEDIATE DEPTH PIEZOMETER IN UNCONSOLIDATED SEDIMENTS
◎ 1-D	DEEP PIEZOMETERS IN UNCONSOLIDATED SEDIMENTS
● 1-PC	BEDROCK PIEZOMETERS
⊕ AT-1,RW-1	PRODUCTION WELLS
814 —	INFERRED POTENTIOMETRIC CONTOUR (INTERVAL = 2 FEET)
(810.97)	WATER LEVEL IN WELL

Figure 10 United Defense Limited Partnership Trichloroethylene Concentration Contours 1996 Annual Monitoring Report Unconfinded Aquifer Sampled 10/9/96



isoconcentration contours for the unconfined and confined aquifers. The piping system conveys extracted groundwater to a combined gravity drain system and discharges it into a 15-inch diameter sanitary sewer (Figure 11). The sewer line traverses the site and discharges into an existing manhole along the southern site boundary.

Groundwater discharge to the sanitary sewer is monitored by UDLP and regulated by the Metropolitan Council Environmental Services. Treatment of extracted groundwater is accomplished at the POTW. The Metropolitan Environmental Council Service (MECS) Special Discharge Permit 2020 restricts VOC effluent concentrations greater than 10 parts per million (ppm) total, with no greater than 3 ppm for any one VOC (16).

The United States Environmental Protection Agency (USEPA) and the MPCA has set the boundary of compliance for groundwater remediation at UDLP at the property boundary (8). The cleanup standard for groundwater in the ROD was set at the MCL of 5 μg/l for TCE (13). The HRL for TCE is 30 μg/l.

Long term monitoring and implementation of institutional controls assure that ground water between the site and the Mississippi River will not be used until the groundwater plume has sufficiently dissipated (8). These institutional controls consist of Minnesota Well Code (MWC) restrictions on the placement of wells near contaminant sources (MWC 4725.4450), and the City of Fridley ordinance requiring connection to municipal water system when feasible (Rule 207.13). See Figure 8 for the location of the water main. Institutional controls for soil include zoning restrictions for industrial land use.

A.2.b UDLP/FMC Containment and Treatment Facility (CTF) Site

FMC excavated 38,625 cubic yards of soil contaminated with Volatile Organic Compounds (VOCs) (source areas for groundwater TCE) from waste burning and disposal pits (7). The soil was placed in an on-site RCRA designed Containment and Treatment Facility (CTF), (Figure 12). Soils contaminated with 1 mg/kg of VOCs were excavated and deposited in the CTF. VOCs detected in the soils included: 1,1- dichloroethane; 1,2-dichloroethane; 1,1,1-trichloroethane; 1,1,2-trichlorothane; 1,1-dichloroethylene; 1,2-dichloroethylene; tetrachloroethylene (PERC); benzene; toluene; xylene; and trichloroethylene (TCE), (8). TCE accounts for 98% of the contaminant loading to the groundwater under the site (7). In addition, 44 drums of hazardous waste were excavated, overpacked, and disposed of off site in a RCRA approved landfill.

The CTF is double lined, has a leachate collection, leak detection, and gas collection/treatment system. Components of the CTF include: 1) clay floors and walls, 2) high density polyethylene (HDPE) liner, 3) sand drainage liner, 4) Supac 6WM filter fabric above the top sand drainage blanket and below the contaminated soils, 5) leachate collection system with a leak detection system underneath, 6) nine gas collection wells, 7) gas treatment system with activated carbon filters (Figures 13-16), (7). The following table lists amounts of leachate removed from the CTF.

Figure 11 Groundwater Remediation System

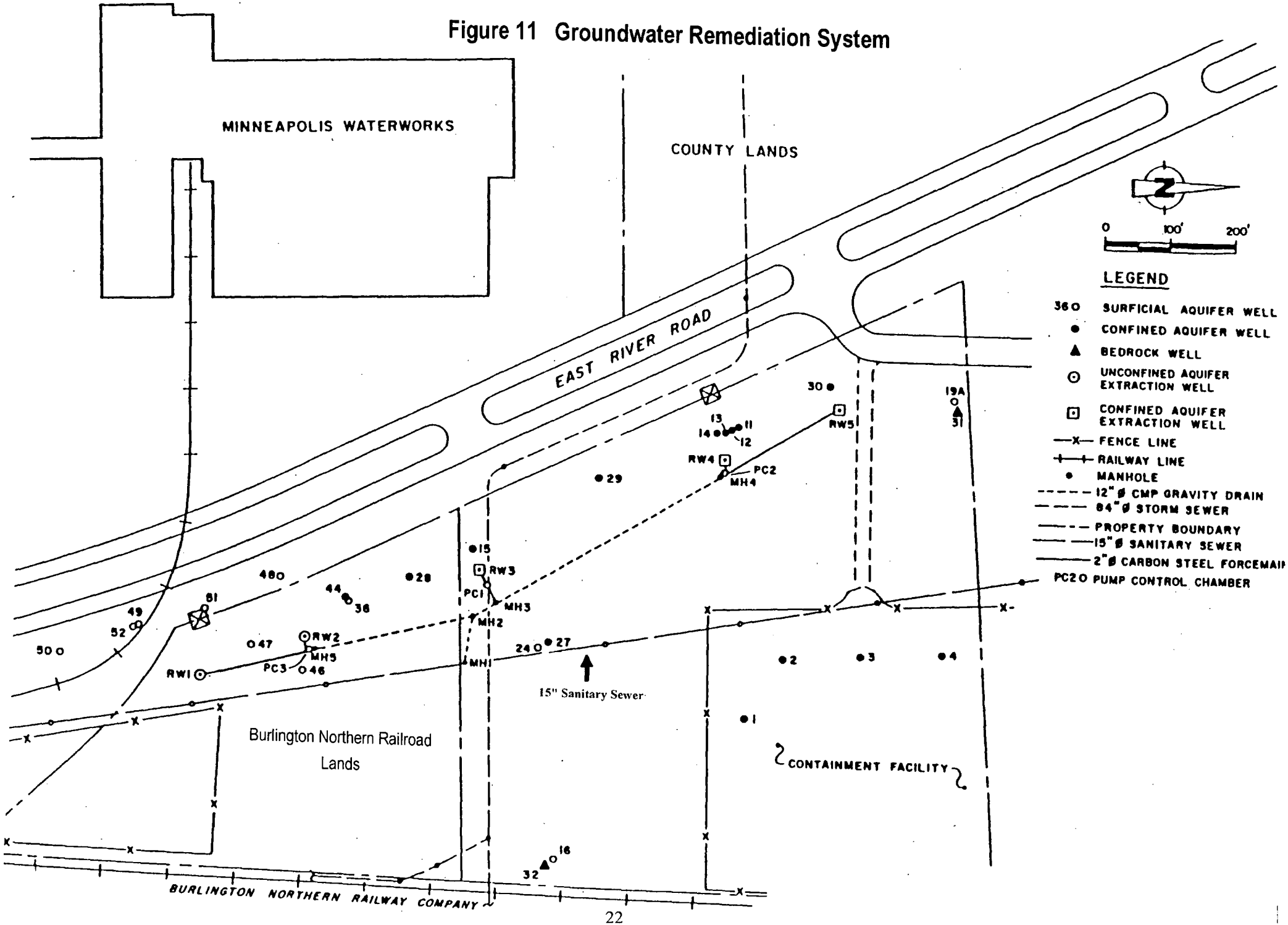


Figure 12 Location of Containment and Treament Facility

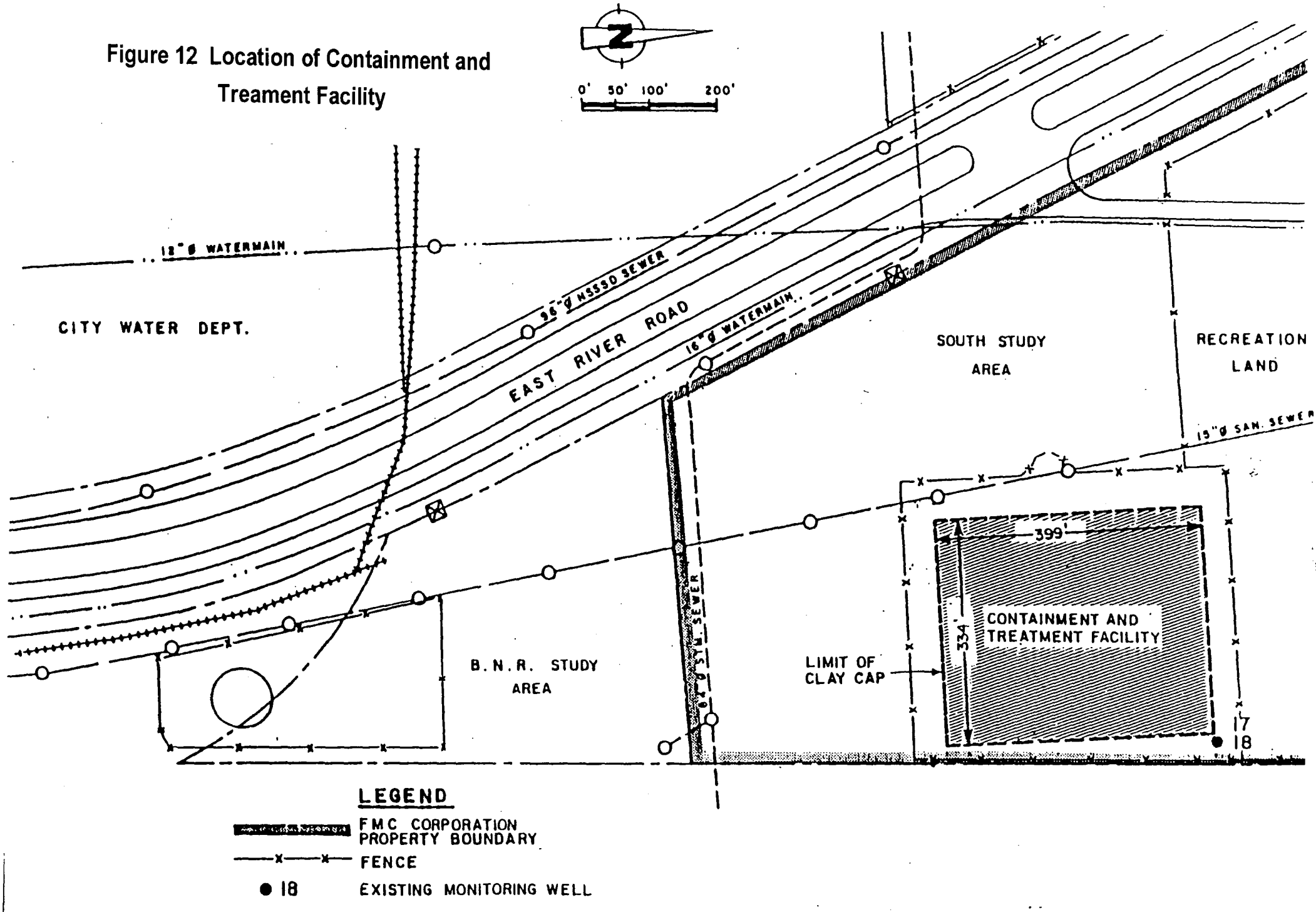


Figure 13 Final Cover Containment and Treatment Facility

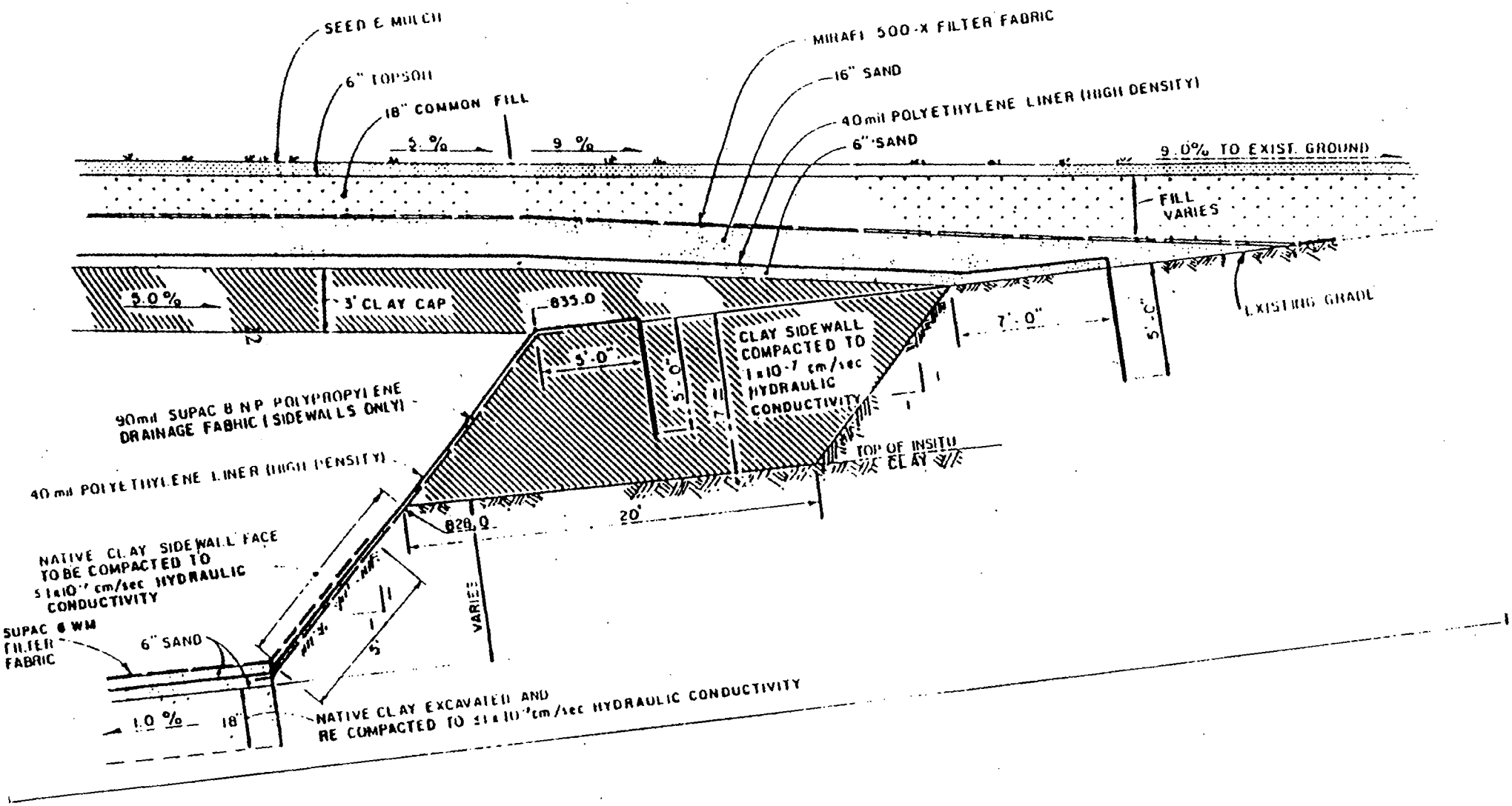


Figure 14 Synthetic Underliner for the Containment and Treatment Facility

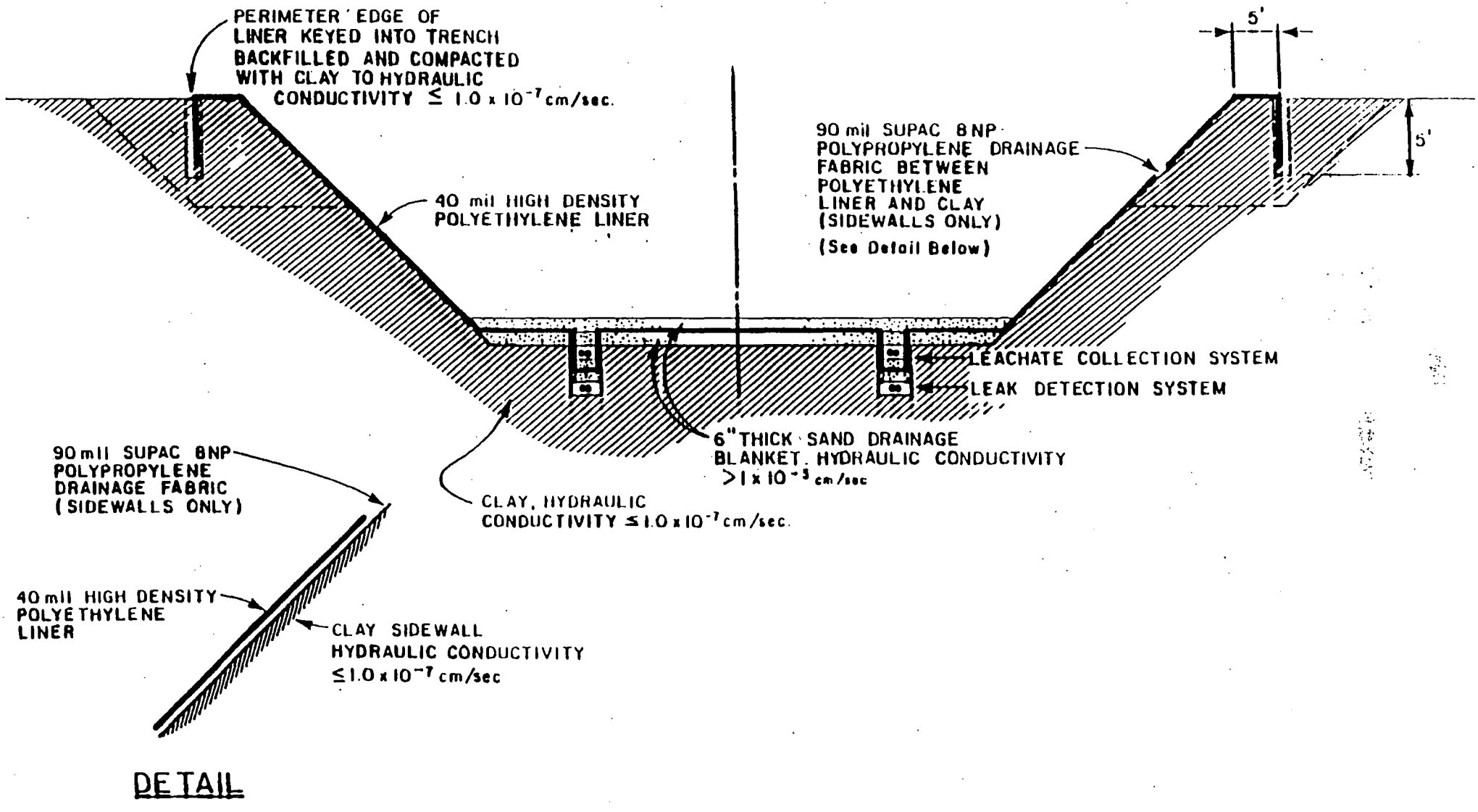
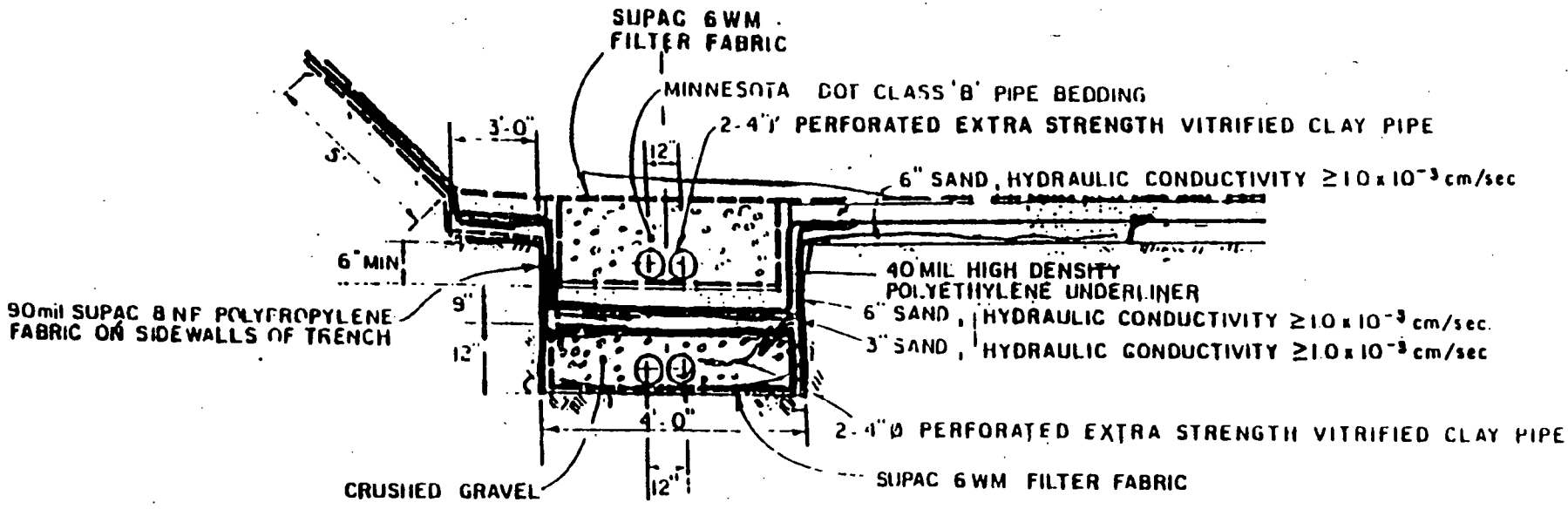


Figure 15 Leachate Collection and Leak Detection Piping Details for the Containment and Treatment Facility



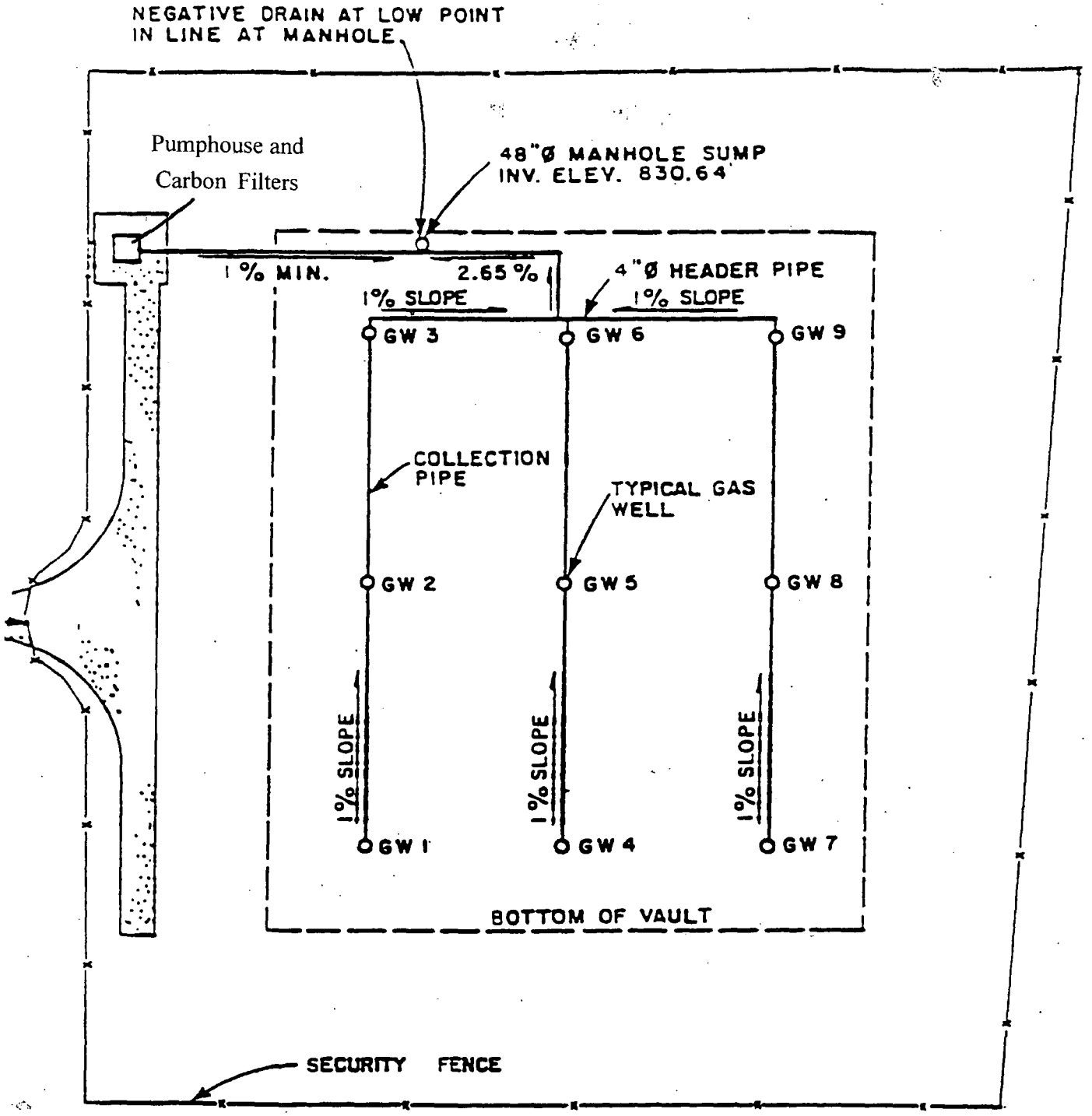


Figure 16
Design Configuration of Gas Collection System
Containment and Treatment Facility
FMC Northern Ordnance Plant

Containment and Treatment Facility Leachate Collection Summary	
Year	**Quantity Removed In Gallons**
1985	35530
1986	21173
1987	11006
1988	6665
1989	4738
1990	3977
1991	9057
1992	4745
1993	7821
1994	4602
1995	4271
1996	2575
1997	7696

Adapted from reference (12)

To put the leachate numbers into perspective, (MPCA calculations based on 1991 Annual Monitoring Report for CTF) (22), the leachate collection system removed 40 milliliters of TCE for the year and the gas extraction system removed 2 gallons of TCE for the year. The TCE emission rate from the gas extraction system is well below the MPCA Emission Screening Rate for TCE of 26,247 (μg/sec) (22). Leachate is discharged to the sanitary sewer under a MCES issued a Special Industrial Discharge Permit (#2049) and treated at the Pig's Eye Treatment Plant. The discharge limitations are listed in the following table.

Containment and Treatment Facility Discharge Limitations Local Pretreatment Standards:	
Parameter	Standard (mg/l)
Cadmium (Cd)	2.0
Chromium-Total (Cr)	8.0
Copper (Cu)	6.0
Cyanide-Total (CN)	4.0
Lead (Pb)	1.0
Mercury (Hg)	0.1
Nickel (Ni)	6.0
Zinc (Zn)	8.0
pH-Maximum (Units)	11.0
pH-Maximum (Units)	5.0
Additional Limitations: For Leachate and Contaminated Groundwater	
Parameters*	Standard (mg/l)
Any (individual) toxic organic	3.0
Combined total toxic organics	10.0
Total hydrocarbons (petroleum discharges)	100.0
*Parameters: TCE, trans-1,2-dichloroethylene, 1,1,1-trichloroethane, Tetrachloroethylene, 1,1-dichloroethane.	

mg/l = milligram per liter
*Adapted from Reference (15).

A.2.c Resource Conservation and Recovery Act (RCRA) Subsurface Source Area Investigation (Under UDLP's Portion of Building)

An RCRA Permit modification dated November 5, 1997, (number MN3170022914) requires permittee UDLP to characterize the nature and extent of contamination under UDLP's portion of the main industrial building. (1) The permit also requires the permittees to identify and locate all known Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) located within the facility boundary, identify releases or potential releases from these units, and submit an Investigative Work Plan proposing investigative activities at each of the SWMUs and AOCs. (1)

A subsurface source area investigation under UDLP's portion of the main facility is critical to understanding and characterizing the large TCE plume emanating from under the NIROP/UDLP facility. UDLP has begun an investigation under its portion of the main building.

B. Site Visit

A site visit was conducted on April 22, 1997, by representatives from MDH, Southern Division Naval Facilities Engineering Command, NAVSEA Department of the Navy, Navy Environmental Health Center, and ATSDR. The purpose of the visit was for MDH and ATSDR representatives to meet with Navy staff to discuss current site conditions, tour the site, briefly discuss various site related topics, and identify any potential health hazards. Topics included drum storage removal operations, groundwater model, site history, sampling well locations, and groundwater treatment plant design. Information obtained from this site visit is used throughout this document to provide history, physical descriptions, and spatial perspective about the areas of concern. The following observations were made on the site tour:

- Access to the NIROP/UDLP facilities is restricted by a chain-link fence on all sides of the property boundary, with two main guarded entries (one each for NIROP and UDLP). Access is granted only with employee picture identification cards or by an appointment with picture identification card.

- The "North Forty" (property north of the main building), is where drum removal actions occurred. The area consists of a 40 acres weed-covered field with two of concrete pads, several scattered storage buildings, and some railroad tracks.

- A large portion of the NIROP/UDLP properties is covered with a 47-acre building. This building houses both the Navy and UDLP operations. Most of the building consists of one floor. This is a manufacturing area with large open spaces and approximately 50 foot ceilings. Office space in the plant has two floors.

- There were no standing pools of water or wetlands on the Site.

- On the east side of the Plant there is an air sparging system for pretreatment of groundwater discharge to the sanitary sewer that is no longer operating. The pipes are broken and are filled with a reddish colored sediment appearing to contain iron. This

system was in use for about three years from 1992-95 to lower contaminant levels to meet discharge permit levels.

- We also walked past several monitoring wells and well 13 (City of Fridley municipal backup well).

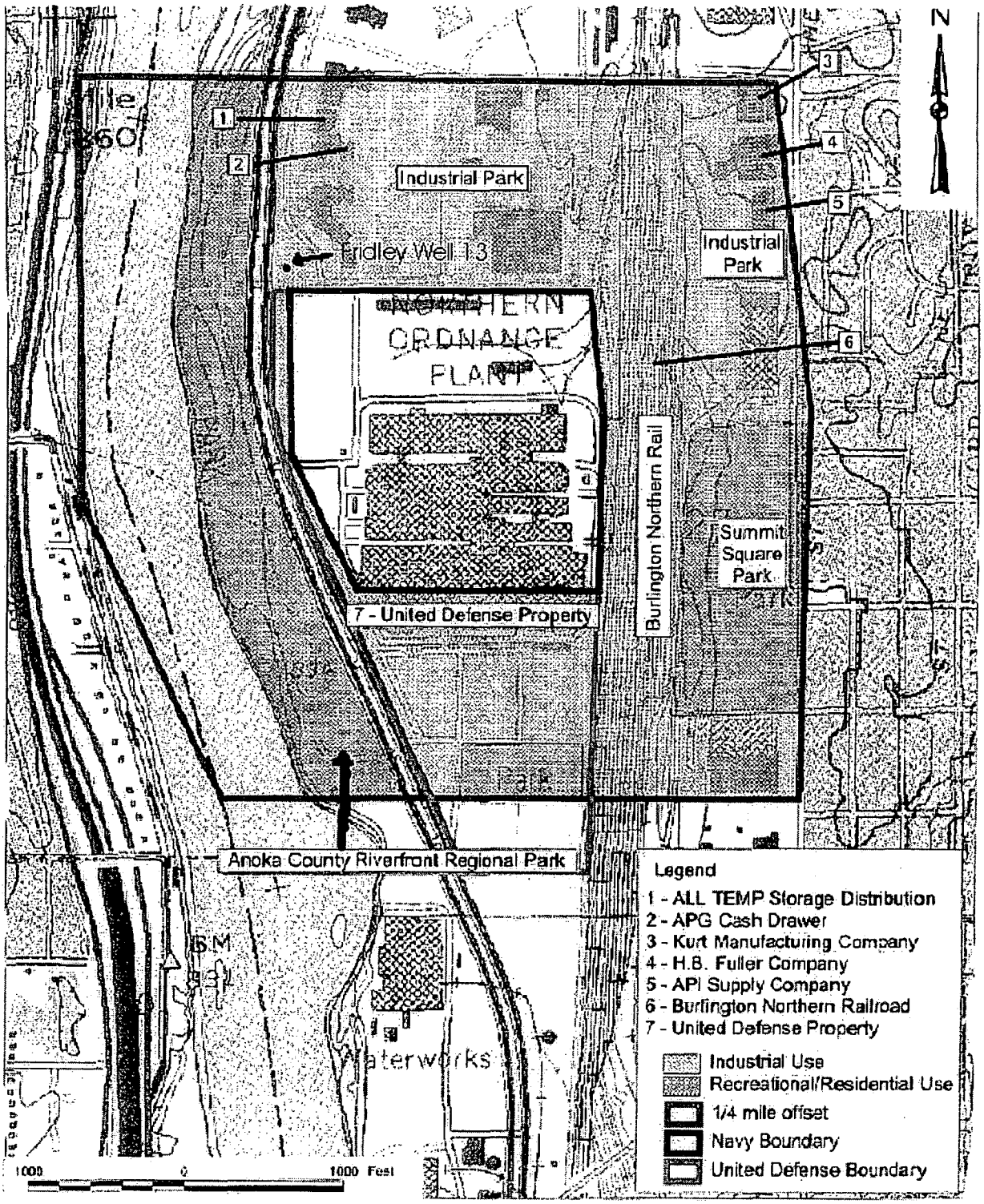
C. Demographics, Land Use, and Natural Resources Use

The nearest residential neighborhoods are located approximately 1200 feet east of the NIROP/UDLP site (Fridley, population 28,267 and Columbia Heights, population 18,683). The next nearest residential neighborhood (in Brooklyn Center, population 28,502) is approximately 1800 feet from NIROP/UDLP on the west side of the Mississippi River. The designated land use for the Site, land use to the south past the Minneapolis Water Works (MWW), and land use north to highway 694 is all industrial. The land to the east of the Site next to the Mississippi River is designated park land (Figure 17). Most of Anoka County Park was originally 20-30 ft. lower in elevation and has been back filled with NIROP/UDLP foundry sand and construction debris. Materials used for backfill have come under scrutiny because three buried drums have been discovered in the area. This discovery may lead to further investigation to determine if more drums are present and if they may be another source for groundwater contamination (see section A.1.a).UDLP has agreed to provide the EPA with historical information about this dump area in Anoka County Park.

The NIROP plant had two bedrock wells (Wells 2 and 3), and UDLP had one bedrock well (Well 1) that were constructed in the 1940's. These wells were used as a potable water source and for all of the industrial water needs. Currently, there are no ground water drinking wells on these two Superfund sites and municipal water is used for all industrial water needs (1). MDH has no records of these wells being sealed according to Minnesota Well Code. Across the street, in the northwest corner of the Plant property, is the City of Fridley municipal well 13 (see Figure 17).

Directly west of the NIROP facility is the Mississippi River, and approximately one mile down river is the Minneapolis Water Works (MWW). This is of special concern because MWW processes river water into drinking water. This water is the sole source of drinking water for much of the Minneapolis Metropolitan area, serving approximately 500,000 people. MWW has five water intakes measuring approximately 5 feet by 5 feet which screen out large debris and allow an average of approximately 70,000,000 gallons of river water to pass into the MWW treatment system per day. The system operates 24 hours/day. It is important to note that MWW has only one day reservoir supply of treated water, with no other backup supply. Furthermore, the treatment system at the MWW was not specifically designed to remove VOCs. However, there are several stages in the treatment process where water is aerated, thereby causing VOCs to volatilize (See letter from MWW Laboratory Supervisor, Appendix B). In addition, VOCs are removed in the treatment process when a slurry of activated carbon is used to treat for color and taste. Both the NIROP and FMC/UDLP RODs acknowledged that site related contaminants were impacting the MWW's water supply intakes. Data collected for the FMC Record of Decision dated from 1981 to 1983 listed 26 detects for TCE out of 40 samples (the highest TCE concentration = 3.1 μg/l) at the MWW raw water intake (7).

Figure 17 Surrounding Land Use Navel Industrial Ordnance Plant



The MWW is required by the Federal Safe Drinking Water Act (FSDWA) to collect data for finished water (treated). Quarterly Trihalomethane (i.e. trichloromethane, chloroform) analyses are performed on distribution system water to meet some of the SDWA requirements. These tests also analyze for approximately 62 other organic compounds including TCE. The water samples are analyzed at the MDH laboratory and results are stored in MDH's County Well Index Data Base. A review of this data is listed in Figure 18, which lists 27 detections of TCE a 16-year period, all below the MCL (Figure19). Note that most of the detections occur during cold weather months when an ice cover may be present on the Mississippi River.

Figure 20 contains data from the annual monitoring of the MWW's intakes by UDLP. The samples are collected every October or November. MDH observed a recent sampling event to determine where and how samples were collected. A sample was collected at a grate just inside of the water intake building. Collecting the sample required removal of a grate (4ft.x2ft.) from the floor and dropping a bailer down approximately 15 ft. to reach the water. All the samples collected in this manner by UDLP personnel, have had no detectable TCE at a detection limit ranging from 2.1 to 5 μg/l. In other words, TCE could have been present at concentrations less than 2.1 μg/l. For example, a raw water sample could contain 1.5 μg/l TCE and it could be listed as nondetect. MDH and the MPCA have collected samples up stream from the MWW in the Mississippi River containing TCE below the 2.1 μg/l detection limits. Figure 21 lists the TCE levels found in the Mississippi River with a detection limit of 0.1 μg/l.

D. General Regional Issues

The general area surrounding the NIROP Plant contains commercial/light industrial properties. To the north are several commercial and industrial businesses, including a print shop and other light industry. Kurt Manufacturing Company is responsible for a ground water plume northeast of NIROP. It manufactured precision computer components. COCs associated with the Kurt include solvents tetrachloroethylene (PERC), 1,1,1-trichloroethane (TCA), and 1,2-dichloroethane (DCE) (10). Kurt Manufacturing is on the federal National Priorities List (NPL). The City of Fridley has an auxiliary well (Well 13), used for high demand periods, that has been impacted with TCE and PERC (the City of Fridley well field has recently been added to the NPL and will be the subject of a separate Public Health Assessment). The source of these contaminants has not been ascertained; however, both of the contaminants have been identified in Kurt and NIROP plumes (9, 2). Fridley Well 13 is located across the street from the northwest corner of NIROP property and up gradient to known NIROP source areas. The east side of NIROP is flanked by a Burlington Northern Railroad Yard (BNR) that consists of numerous tracks laid in a north and south direction. There have been some releases of chemicals on the BNR property. However, there are no apparent impacts of these releases to the NIROP property.

NIROP is bordered on the west by the East River Road, Anoka County Riverfront Park, and the Mississippi River. South of the facility on the Mississippi River is the MWW. Part of the MWW property is directly west of UDLP property. Figure 17 depicts the spacial relationship of these landmarks.

Figure 18

TCE Levels In Finished Water At Minneapolis Water Works

Dates	Concentration ug/l	Sample point
9/17/1982	<0.2	MPLS, TAP #10 43rd and Upton Ave South
2/25/1983	0.5	MPLS, TAP #10 43rd and Upton Ave South
5/27/1983	<0.2	MPLS, TAP #10 43rd and Upton Ave South
8/19/1983	<0.2	MPLS, TAP #10 43rd and Upton Ave South
12/9/1983	0.2	MPLS, TAP #10 43rd and Upton Ave South
2/24/1984	0.6	MPLS, TAP #10 43rd and Upton Ave South
6/1/1984	0.3	MPLS, TAP #10 43rd and Upton Ave South
11/24/1984	0.3	MPLS, TAP #10 43rd and Upton Ave South
12/28/1984	0.7	Treatment Plant Effluent Tap ??
2/15/1985	1.3	MPLS, TAP #10 43rd and Upton Ave South
5/17/1985	<0.2	MPLS, TAP #10 43rd and Upton Ave South
8/16/1985	<0.2	MPLS, TAP #10 43rd and Upton Ave South
11/27/1985	<0.2	MPLS, TAP #10 43rd and Upton Ave South
3/7/1986	0.8	MPLS, TAP #10 43rd and Upton Ave South
5/14/1986	<4.0	MPLS, TAP #10 43rd and Upton Ave South
8/25/1986	<0.2	MPLS, TAP #10 43rd and Upton Ave South
12/8/1986	<0.2	MPLS, TAP #10 43rd and Upton Ave South
2/23/1987	0.8	MPLS, TAP #10 43rd and Upton Ave South
5/20/1987	0.4	MPLS, TAP #10 43rd and Upton Ave South
8/24/1987	0.5	MPLS, TAP #10 43rd and Upton Ave South
3/4/1988	0.7	MPLS, TAP #10 43rd and Upton Ave South
5/31/1988	<0.2	MPLS, TAP #10 43rd and Upton Ave South
8/26/1988	<0.2	MPLS, TAP #10 43rd and Upton Ave South
9/21/1988	<0.2	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
11/28/1988	0.5	MPLS, TAP #10 43rd and Upton Ave South
3/3/1989	0.5	MPLS, TAP #10 43rd and Upton Ave South
12/8/1989	<0.1	MPLS, 43rd and Upton Ave South
1/12/1990	0.7	Treatment Plant Effluent Tap
5/11/1990	<0.1	MPLS Water Supply
8/10/1990	<0.1	Treatment Plant Effluent Tap
11/19/1990	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
2/15/1991	0.4	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
5/6/1991	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
8/9/1991	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
11/8/1991	<0.1	Treatment Plant Effluent Tap
1/31/1992	0.2	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
5/8/1992	0.3	Treatment Plant Effluent Tap
8/3/1992	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
5/24/1993	<0.1	MPLS, TAP #10 43rd and Upton Ave South
8/9/1993	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
2/3/1994	0.7	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
5/6/1994	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
8/8/1994	0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
11/10/1994	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
2/6/1995	0.9	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
5/5/1995	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
8/4/1995	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
11/6/1995	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
2/2/1996	0.2	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
5/6/1996	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
11/15/1996	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
1/31/1997	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38
3/14/1997	<0.1	Treatment Plant
5/5/1997	<0.1	MPLS.CITY TAP 13 (FIRE STA,21) 3209 E38

Figure 19 **TCE In Finished Water At MWW**

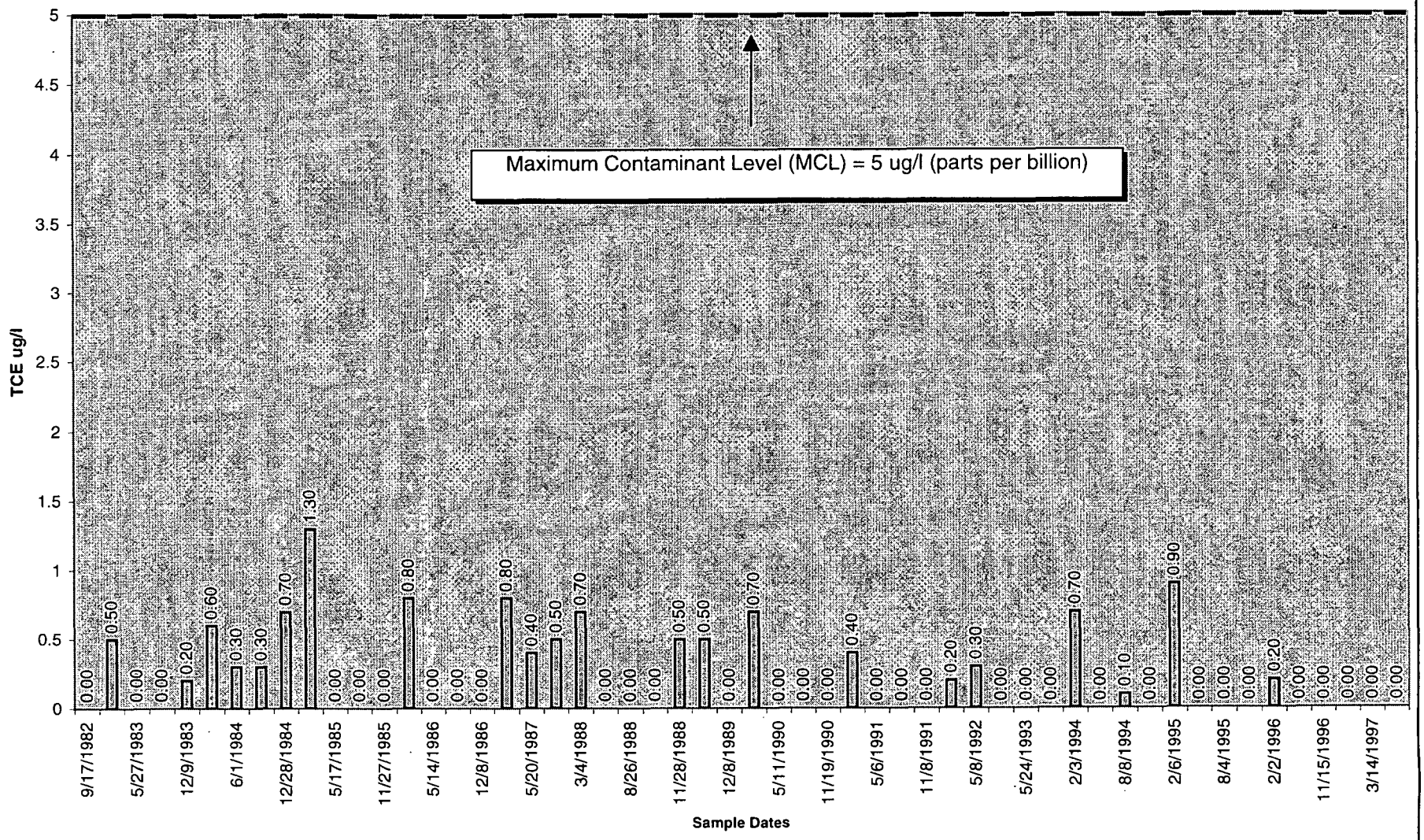


Figure 20

FMC TCE Data For The MWW Intakes		
Dates	Concentration	Sample point
11/3/1988	ND= less than 5 ug/l	MWW Intakes
11/8/1989	ND= less than 5 ug/l	MWW Intakes
10/9/1990	ND= less than 5 ug/l	MWW Intakes
10/10/1991	ND= less than 5 ug/l	MWW Intakes
10/14/1992	ND= less than 5 ug/l	MWW Intakes
10/14/1993	ND= less than 2.1 ug/l	MWW Intakes
10/12/1994	ND= less than 2.1 ug/l	MWW Intakes
10/13/1995	ND= less than 2.1 ug/l	MWW Intakes
10/8/1996	ND= less than 2.1 ug/l	MWW Intakes

MWW=Minneapolis Water Works

Figure 21

TCE River Samples			
Sample	Concentration ug/l	Detection Limit ug/l	Date
SPI	Not Detected <0.1	0.1	11/10/1997
SP2	Not Detected <0.1	0.1	11/10/1997
SP3	0.2	0.1	11/10/1997
MWW Distr. System	Not Detected <0.1	0.1	11/10/1997
MWW Raw Water	0.1	0.1	11/10/1997
SPI	Not Detected <0.1	0.1	12/10/1997
SP2	Not Detected <0.1	0.1	12/10/1997
SP3	0.3	0.1	12/10/1997
MWW Distr. System	Not sampled		12/10/1997
MWW Raw Water	0.2	0.1	12/10/1997
MWW Raw Water	0.2	0.1	1/12/1998

SP1 = approximately due east of Fridley Well 13
SP2 = approximately due east of NIROP Well 18S
SP3 = approximately at MWW northern border (just north of outfall)
MWW Raw H2O = Tap located in Lab at MWW
MWW Distr. System = Tap 13 (appr. 15 mile from MWW)

The MWW and NIROP are located along a section of the Mississippi River that is regionally classified as a Class 1 B (drinking water) Surface Water by Minnesota Rules Chapter 7050 (19). This classification stretches from Fort Ripley in the north to the upper lock of Saint Anthony Falls south of NIROP in Minneapolis (approximately 120 miles of river). As a result of this classification, and the close proximity of the MWW to NIROP, the MPCA has set the applicable water quality standard for TCE at 5 μg/l as specified in Minn. Rule parts 7050.0220, subpart 4; 7050.0221, subpart 4; and 7050.0222, subpart 3 (19). The 5 μg/l standard is applied at the wells nearest the Mississippi River to protect the river as public water supply. The contaminated groundwater from the NIROP site flowing into the river exceeds the 5μg/l standard and must be reduced to 5μg/l according to the MPCA staff. NIROP's nearest well to the river is 27S and UDLP's nearest wells are FMC-39 and FMC-21. See figures 22 and 23 for TCE concentrations in these wells. In well 27S, TCE concentrations fluctuate from 1000 to 16000 μg/l in 1993. From 1997-98, TCE concentrations appear to have leveled off at 1000 μg/l in well 27S. TCE concentrations in FMC well 39 were undetectable from 1993-96. In 1997, well FMC-39 had a TCE concentration of 15 μg/l. FMC-21 had a TCE concentration of 3.4 μg/l in 1996 and a TCE concentration of 72 μg/l in 1997. The MPCA is responsible for the interpretation and enforcement of Minn. Rule 7050 and 7060 as they pertain to this section of the Mississippi River (see Appendix A).

E. Community Involvement

NIROP has an active Restoration Advisory Board (RAB) that meets quarterly. The RAB members consist of anyone who has an interest in the remediation activities occurring on NIROP. RAB members consist of concerned citizens, city, state, and federal representatives. The purpose of the RAB is to serve as a platform for voicing community concerns about the investigation and cleanup of NIROP. The RAB meetings are an important means of exchanging information among all parties involved. For example, state regulators and Navy representatives have learned of important plant operations and practices from RAB members. This information has aided in the identification and remediation of hazardous waste on site.

F. Agency For Toxic Substances and Disease Registry (ATSDR) Involvement

ATSDR is mandated by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by Superfund Amendments and Reauthorization Act (SARA 1986); to conduct a public health assessment at each site proposed for or listed on the National Priorities List (NPL). In cooperation with ATSDR, the Minnesota Department of Health (MDH) has evaluated the public health significance of NIROP/UDLP.

Evaluation of Contamination and Exposure

On the basis of MDH's evaluation of environmental information collected during the site characterization and remedial process, MDH concludes that the current contaminant exposure levels from drinking water do not pose a public health hazard or concern. Based on observations made during an April 1997, site tour and review of environmental data reports, MDH has determined that a complete exposure pathway via drinking water exists for TCE. NIROP and UDLP properties are the closest known sources of TCE contamination up stream from the MWW raw water intakes. TCE concentrations are monitored along with 125 other analytes at Minneapolis Water Works as part of their water quality monitoring program. After the raw water (river water) is treated, it is distributed to approximately 500,000 people in the greater

Figure 22

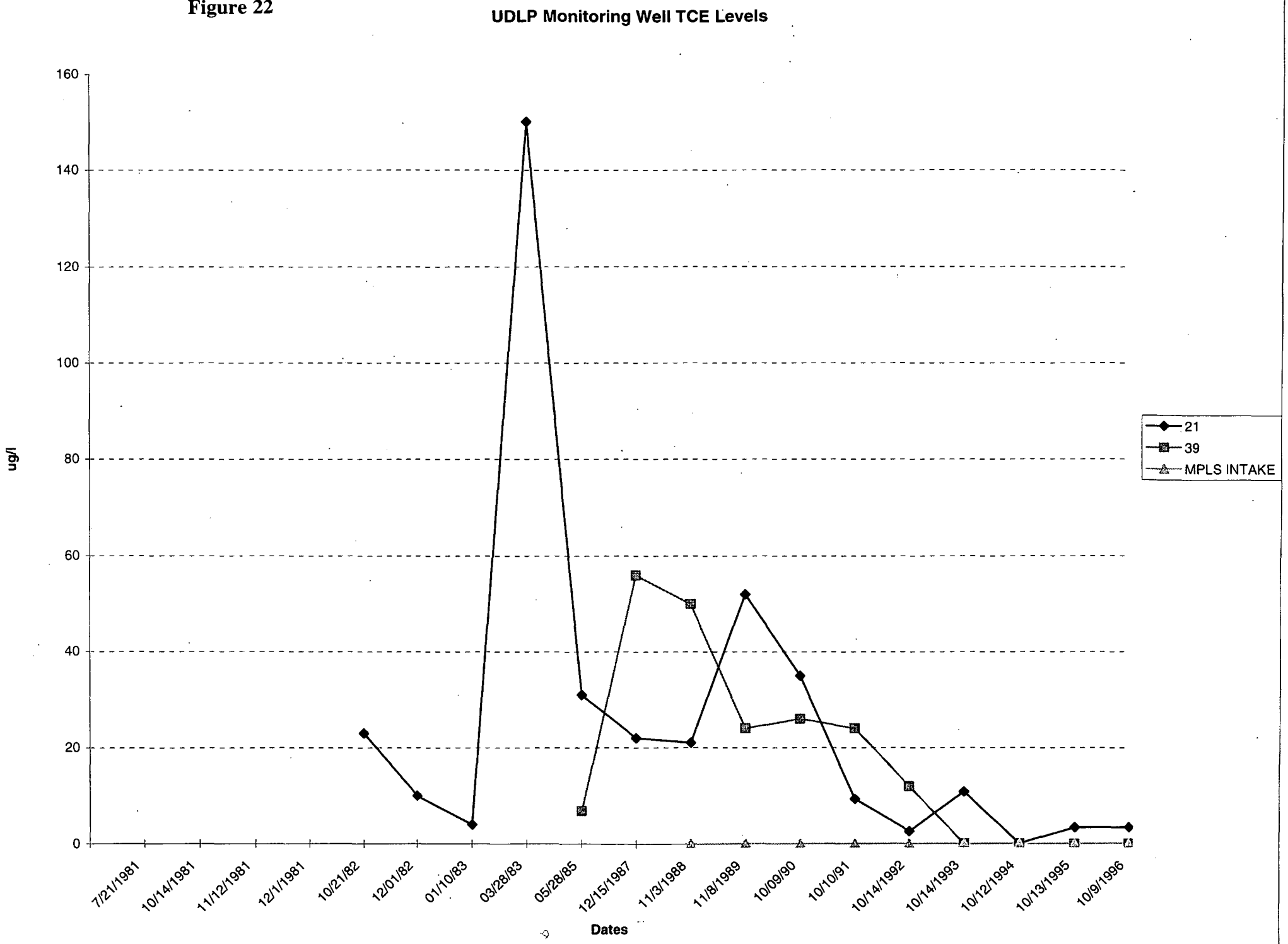
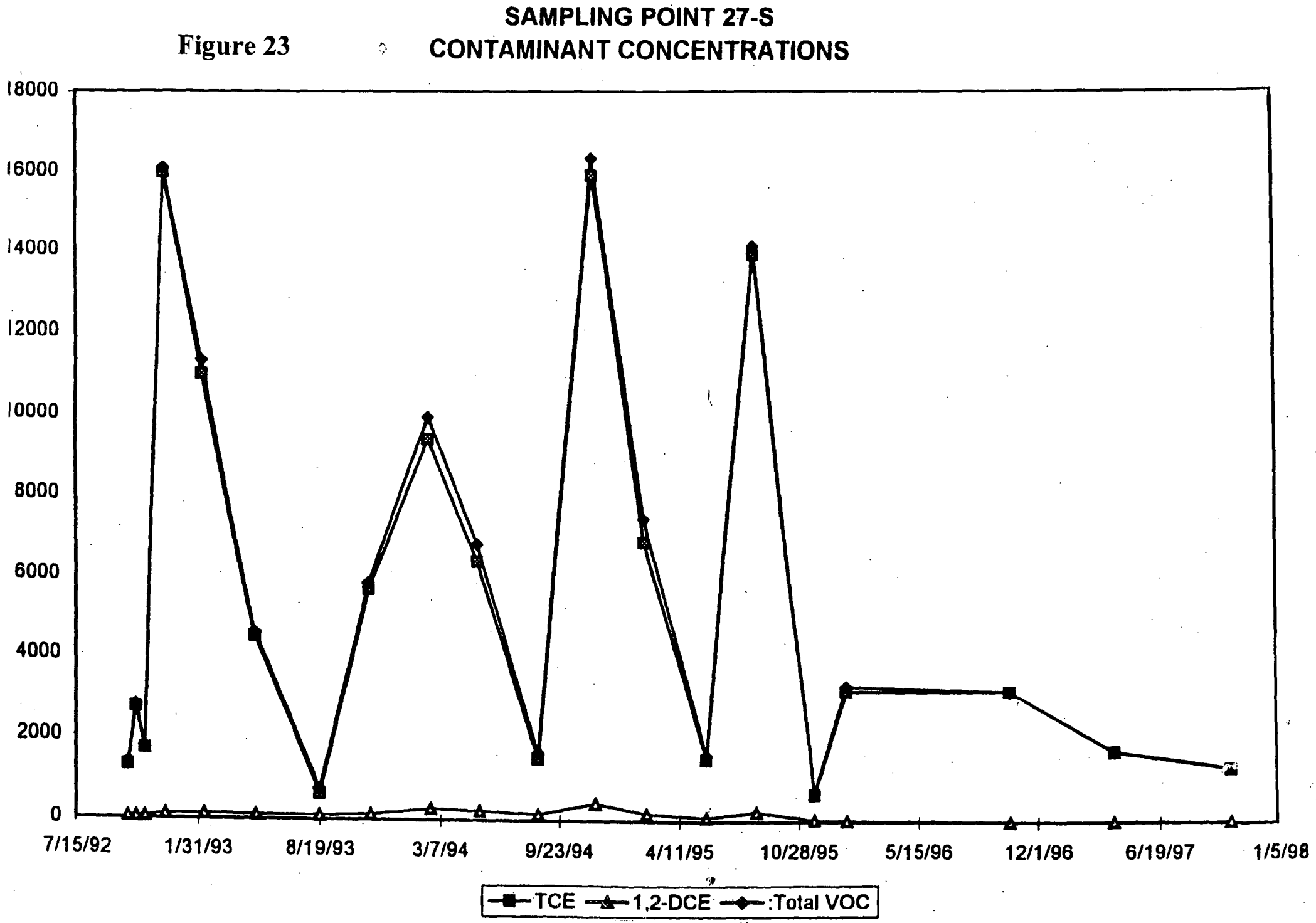

UDLP Monitoring Well TCE Levels
160
140
120
100
80
60
40
20
0
ug/l
7/21/1981
10/14/1981
11/12/1981
12/1/1981
10/21/82
12/01/82
01/10/83
03/28/83
05/28/85
12/15/1987
11/3/1988
11/8/1989
10/09/90
10/10/91
10/14/1992
10/14/1993
10/12/1994
10/13/1995
10/9/1996
Dates
21
39
MPLS INTAKE

Figure 23


SAMPLING POINT 27-S
CONTAMINANT CONCENTRATIONS
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
7/15/92
1/31/93
8/19/93
3/7/94
9/23/94
4/11/95
10/28/95
5/15/96
12/1/96
6/19/97
1/5/98
TCE
1,2-DCE
:Total VOC

Minneapolis-St. Paul metropolitan area. This water that has been treated to meet all the Federal Safe Drinking Water Act's requirements is called finished water.

The earliest know detection of NIROP/UDLP related contamination in the MWW intakes was in raw water samples collected between 1981 and 1983 for the FMC Record of Decision. Based on 40 samples collected during this time the following contaminants were identified: TCE found 25 times ranging from 0.2 to 3.1 μg/l; 1,1,1-trichloroethylene detected twice at 1.2 and 1.4 μg/l; 1,2-dichloroethylene detected five times all approximating 0.6 μg/l; and 1,1-dichloroethylene detected twice at 0.3 μg/l. (7) Because the exact sampling locations for this data set has not been identified and the data is limited to 40 samples all of which may not be from the same location, this data is being not used for the tables and charts. Instead the more extensive MDH data base for VOC contamination in finished and raw water was used for the tables and charts. The TCE concentrations in the two data sets are similar.

MDH records show low levels of TCE in the MWW finished water 27 times ranging from 0.1 to 1.3 μg/l in the past 16 years (see tables 18 and 19). The highest TCE concentration detected in finished water (1.3 μg/l) is 1/4 the MCL of 5μg/l. Any concentration of TCE below the MCL is considered acceptable for a lifetime of exposure. No other site related contaminants have been detected in the finished water.

As required by the Federal Safe Drinking Water Act, the MCLs are maximum permissible concentrations of a contaminant in water delivered to any user of a public water system. The MCLs are based on health as well as the economic and technical feasibility of detection and treatment. This is in contrast to the Minnesota Department Health HRLs which are based only on human health effects. HRLs are health-based criteria for drinking water contaminants. HRLs are used for four general purposes: advice for private wells, environmental review, and site assessment criteria. For contaminants with a non-cancer endpoint, the HRL is a concentration that is thought to be safe for ingestion over a lifetime. For a contaminant that is a suspected carcinogen, the HRL is a concentration where the cancer risk from ingestion of the contaminated water is considered negligible. MDH considers an incremental addition to a lifetime cancer risk of one in 100,000 to be negligible. This means that if 100,000 people were to ingest water with a contaminant concentration at the HRL for a lifetime, no more than one individual would be expected to develop cancer as a result. To keep this in perspective, the HRL for TCE is 30 μg/l, the MCL for TCE is 5 μg/l and the highest TCE concentrations found in the finished water is 1.3 μg/l in 1985.

Because contamination remains in the soil and groundwater at the NIROP and UDLP sites, an evaluation of potential pathways at each of the waste sites is presented below.

B.1 Naval Industrial Reserve Ordnance Plant (NIROP) Superfund Site

The identification and characterization of all potential Areas of Concern (AOCs), source areas, and Solid Waste Management Units (SWMUs) on NIROP property is ongoing and beyond the scope of this evaluation. The following sections will evaluate contamination on site and the potential for receptors to be exposed.

B.1.a Ground Water Contamination Operable Unit 1 (OU1)
OU1 consists of plant wide groundwater. OU1 has exceeded HRLs and MCLs in groundwater for TCE and other VOCs. Appendix C show TCE concentrations for monitoring and shallow drift wells from 1993-1997. Appendix D tables list HRL and MCL exceedances for each well at NIROP from first time the well was sampled to 1997. The remedial response for this site is pump and treat. Figure 4 lists TCE concentrations found in Anoka County Park groundwater.

Current Pathways

Air (outdoor): Air is not likely to be an exposure pathway because most of the site is covered with pavement or buildings. To date, no outdoor air quality impact studies from contaminated groundwater vapor migration have been conducted. Should soil vapor gas reach the surface, it would likely be diluted with ambient air to levels below health concern. A study may not be warranted based on ambient air dilution factors and the lack of long term exposure to receptors.

Air (indoor): Under current conditions indoor exposure via soil vapor migration is not known to be occurring. In the case of indoor construction, the foundation may be opened potentially allowing soil vapor to infiltrate the building. In such cases, the Navy must first grant written consent to a contractor to open the foundation. Before permission is granted a work plan, which includes worker safety procedures are submitted to the Navy. To date no soil vapor gas migration studies have been conducted.

Soil: Soil is not likely to be an exposure pathway because most of the site is covered with pavement or buildings and small grassy areas. Dermal contact is not likely to occur on site under present conditions except when the foundation is opened for construction and excavations. In such cases, the soil is not likely to be contaminated from groundwater unless a free product is present directly below soil of concern.

Groundwater: Although a completed pathway exists via groundwater to surface water to drinking water, it is not a human health risk under current conditions, based on the limited raw water and more thorough finished water data collected at the MWW. A more comprehensive sampling plan is needed to assess the impact of Site related contamination on the MWW intakes. Based on the finished water data, winter appears to be the season when the water supply is most affected (see figures 18 and 19). There are no drinking water wells on site or down gradient before groundwater discharges to the river.

Potential Future Pathways
If future activities at NIROP include excavation within the contaminant plume (saturated and unsaturated zones), exposures may occur via inhalation of soil gases and/or dermal contact. A future exposure scenario could occur from the volatilization of soil gases into nearby buildings and sewer system. Because the effluent from the extraction system is was recently being discharged to the sewer system, a potential exposure pathway exists for a sewer system worker via inhalation and dermal contact with contaminated water and vapors.

Once the groundwater treatment plant is in use, there will be emissions from its exhaust stake to the ambient air. However, based on modeling projections, the groundwater treatment plant is expected to be well below the MPCA screening emissions rate and as such is not a health concern. (27) However, if the groundwater treatment system (Phase II) is reconfigured, the outdoor air pathway will have to be re-evaluated for emissions.

Use of contaminated groundwater prior to treatment may result in ingestion, inhalation and/or dermal exposure that could pose a public health hazard. Based on the large TCE fluctuations in well 27S (see figure 23, for TCE concentrations in wells closest to the river), and the new findings from the cone penetrometer investigation in Anoka County Park, it is possible that higher levels of TCE could impact MWW.

B.1.b On Site Subsurface Source Areas In Unsaturated Zone Outside Naval Industrial Reserve Ordnance Plant Building Operable Unit 2 (OU2)

All known sources (buried drums and contaminated soil) for this operable unit have been removed/remediated; however, contaminated water remains at each of these sites. Based on the extent and concentrations of contaminants in the groundwater plume at each removal site, other contaminant sources may remain.

Current Pathways

Air (outdoor): Exposure to identified site subsurface source area contamination is not likely because all **known** sources have been removed.

Soil: Exposure to identified site subsurface source area contamination is not likely because known source areas have been removed.

Groundwater: For this operable unit, groundwater is not a current pathway by definition (unsaturated zone).

Potential Future Pathways

If future activities at NIROP include excavation within any contaminant source areas, exposures may occur via inhalation of soil gases and/or dermal contact. Another future exposure scenario is the volatilization of soil gases into nearby buildings. There is also potential for any remaining contamination in this operable unit to leach into groundwater. Use of contaminated groundwater prior to treatment may result in ingestion, inhalation and/or dermal exposure that could pose a public health hazard. However, the institutional controls including future land use (industrial), and private well limitations on site should prevent exposures in the future.

B.1.c On Site Subsurface Source Areas in Saturated and Unsaturated Zone Beneath the Naval Industrial Reserve Ordnance Plant (NIROP) Building and on Site Subsurface Areas Outside the NIROP Building in Saturated Zone Operable Unit 3 (OU3)

Data for this operable unit will be available in late 1998, and will be reviewed by MDH in late 1999. The data will help characterize potential source areas under the NIROP building. Based on the isoconcentration maps for TCE in the shallow drift in the 1996 and 1997 Annual Monitoring

reports, it appears that source areas exist under the building. Soil data for this operable unit will be available in late 1998.

Current Pathways

Air (outdoor): Outdoor air is not an exposure pathway because most of the site is covered with pavement or buildings. In addition, the extraction system is removing source contamination in the groundwater.

Air (indoor): No indoor air soil vapor gas data appear to exist for groundwater related contamination. The operation of the extraction system limits the migration of soil vapor gas into the building. Furthermore, the large open spaces in the facility would greatly reduce contaminant concentrations.

Soil: This is not a pathway because most of the site is covered with pavement or buildings. Dermal contact is not likely to occur on site under current conditions as long as foundation remains intact.

Groundwater: Contaminated groundwater is being captured by the extraction system as it exits from under the facility. However, residual contamination from this operable unit is present in Anoka County Riverfront Park beyond the capture zone of the extraction system. This contamination appears to be discharging into the Mississippi.

Potential Future Pathways:

If future activities at NIROP include excavation within the contaminant plume, exposures may occur via inhalation of soil gases and/or dermal contact. Another future exposure scenario is via volatilization of soil gases into the facility. Use of contaminated groundwater prior to treatment may also result in ingestion, inhalation and/or dermal exposure that could pose a public health hazard. However institutional controls, including an excavation safety plan, and private well limitations on site should prevent exposures in the future.

B.2 United Defense Limited Partnership (UDLP)

The identification and characterization of all Areas of Concern (AOCs), source areas, and Solid Waste Management Units (SWMUs) on UDLP property is on going and beyond the scope of this evaluation. The following sections will evaluate contamination pertaining to UDLP property and the potential for receptors to be exposed.

B.2.a Groundwater Remedial Action (FMC Superfund Site)

Groundwater contamination above MCLs and HRLs remains on site. See Appendix E for tables listing exceedances of MCLs and HRLs. This data set is a historical record of what groundwater contaminants have been identified on site. Appendix F contains a graph illustrating the amounts of TCE extracted with the groundwater system.

Air (outdoor): Outdoor air exposure via soil vapor gas from contaminated groundwater is not of health concern. Any gases that migrate to the surface would be diluted with ambient air to levels below health concern. In addition, the site is isolated away from buildings and foot traffic.

Soil: Although residual soil contamination remains on site, under current site conditions exposure to soil contamination is not probable.

Groundwater: There are no groundwater receptors on site. Contaminated groundwater is being captured by the extraction system and discharged to the sanitary sewer and is treated at the local waste water treatment plant. However, it is difficult to ascertain if the plume has been completely contained based on the current monitoring network. Contaminated groundwater not captured by the extraction system will likely discharge to the Mississippi River up gradient to the MWW's intakes.

Potential Future Pathways
Should future site conditions include excavations, dermal and inhalation exposures to groundwater contaminants are possible. Another potential exposure pathway scenario is to a sewer system worker who could be exposed via inhalation and dermal contact with contaminated water.

B.2.b Containment Treatment Facility (CTF)

Air (outdoor): Exposure to the gas extraction system effluent is a remote possibility because the site is isolated. Furthermore, the concentrations of the effluent gas are low to start with and would be diluted further by ambient air (see section A.2.b).

Soil: Exposure to site related soils is not possible unless the CTF was excavated.

Groundwater: Under current site conditions exposure to CTF leachate is not likely. There are no groundwater receptors on site, and if the CTF was to leak, the contaminants would likely be captured by the groundwater extraction system.

Potential Future Pathways
A potential exposure pathway exists for workers in the sewer system.

B.2.c RCRA Subsurface Source Area Investigation Under UDLP Portion of Building
Based on the 1996 and 1997 Annual Monitoring Reports and TCE isoconcentration maps, investigation of source areas under UDLP's portion of the main building is warranted.

Air (outdoor): To be determined.

Soil: To be determined.

Groundwater: To be determined.

Potential Future Pathways
To be determined.

CONCLUSIONS

On the basis of MDH's evaluation of available environmental information collected during the site characterization and remedial process, MDH reached the following conclusions and assigned public health conclusion categories.

MDH determined that NIROP/UDLP sites pose *no apparent human health hazard based on data reviewed.*

1. Groundwater under the site is contaminated with VOCs, primarily TCE. Other contaminants have also been identified above HRLs and MCLs in the groundwater the NIROP and UDLP sites. Some VOCs have migrated with the groundwater to off-property areas. A MPCA surface water assessment has determined that groundwater discharge from the NIROP Site exceeds surface water quality standards designed to protect the Mississippi River as a public water supply. The only known drinking water receptor to the NIROP and UDLP sites is the Minneapolis Water Works (MWW) that distributes to 500,000 people is located less than 1 mile down stream. NIROP off property plume migration is in the direction of the MWW and discharges into the Mississippi River from Anoka County Park.. The discharge point for the UDLP ground water plume is not known. TCE has been detected in the MWW finished water (27 times) but all the TCE detects have been below the Maximum Contaminant Level (MCL) of 5 μg/l). Finished water is sampled quarterly for volatile organic compounds (including TCE). The raw water has been sampled for TCE annually by UDLP for the past eight years with no detections. However, the method detection limit was too high to detect the concentrations found in the finished water. MDH and MPCA sampling efforts have detected TCE in river water just north of the MWW in low concentrations.

2. Groundwater contaminant source areas underneath the NIROP/UDLP facilities are being investigated. There is only one Prairie du Chien monitoring well (well 43) down gradient of the NIROP/UDLP facilities. This well has not been monitored adequately to determine the extent which this regionally important bedrock aquifer is impacted from the NIROP/UDLP past operations. UDLP has not adequately characterized its off-property groundwater plumes at the FMC Superfund Site. Based on groundwater flow directions, portions of this plume may discharge to the Mississippi River immediately up river to the MWW's intakes.

3. Anoka County Park groundwater is contaminated with TCE with concentrations up to 37,300 μg/l. The contamination is beyond the capture zone of the groundwater remedy at NIROP. The buried drums found in Anoka County Park next to the Mississippi River are part of an old dump site that has not been characterized.

4. The mass and concentrations of contaminated groundwater discharging to the Mississippi River from the NIROP/UDLP sites have not been determined. Annual fluctuations of TCE concentrations in the wells nearest the river at the NIROP Site have been considerable.

The off-property groundwater plume migration and concentrations at FMC Superfund Site have not been well characterized.

5. The treatment system at the MWW was not specifically designed to treat for VOCs. However, there are several stages in the treatment process where water is aerated thereby allowing VOCs to volatilize. In addition, VOCs may be removed in the treatment process when a slurry of activated carbon is used to treat for color and taste. (2) (7) The MWW does not have a back up water supply; it has only a day reserve supply. The MWW intakes draw water from the Mississippi River for treatment and distribution to approximately 500,000 people in the Twin Cities Metro area. The raw water is monitored once a year by UDLP. For monitoring purposes, the raw water tap in the MWW laboratory appears to be a safe and practical way to sample raw river water.

6. Based on available information, MDH concludes that contamination in the MWW water supply from the NIROP/UDLP sites pose no apparent public health hazard under current conditions since there is no indication that the public is being exposed to site-related contaminants above health-based standards. However, TCE has been detected in finished water 27 times (see table 1 and graph 1) all below the MCL. The potential for TCE concentrations in drinking water to exceed drinking water standards needs further evaluation. This is because there are fluctuations in TCE concentrations in the wells nearest the Mississippi River, TCE has been found in groundwater at Anoka County Riverfront Park, and volume and concentrations of contaminated groundwater discharging to the river are not known. Access to NIROP and UDLP properties is limited. There are no well receptors. Future land use will likely remain industrial.

7. MDH has no records of NIROP wells 2 and 3 and UDLP well 1 being sealed according to Minnesota Well Code.

Public Health Action Plan

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, requires ATSDR to perform public health actions needed at hazardous waste sites. No public health actions are currently needed because there are no exposures at NIROP and UDLP at levels that pose a public health hazard; however, MDH/ATSDR recommend the following actions to further characterize potential public health hazards at the two Superfund sites:

1. All source areas for the groundwater contamination need to be identified, and a better understanding of the horizontal and vertical extent of contaminated groundwater is needed. For example, increased efforts to monitor the Prairie du Chien aquifer down gradient of the NIROP and FMC sites, and delineation of off-property groundwater plume migration for all groundwater plumes related to the NIROP and FMC Superfund Sites are needed.

2. Consideration should be given for the collection of raw water at the raw water tap in the MWW laboratory as a more practical way to sample raw river water. Present sample collection practices require removal of a floor grate (4ft.x2ft.) and dropping a bailer down approximately 15 ft. to reach the water. Samples collected in the winter of 1997 at the raw water tap in the MWW laboratory contained TCE at 0.2 μg/l with a detection limit of 0.1 μg/l and this corresponded with another sample collected up stream from the MWW in the Mississippi River. The river sample also contained 0.2 μg/l with a detection limit of 0.1 μg/l.

3. Increased monitoring of the MWW raw water intakes is warranted. MDH recommends that the raw water be sampled monthly using MDH method 465 and MDH Low Level Vinyl chloride method 560 for two years to take into account seasonal variations. The detection limit should be 0.1 μg/l for TCE and 0.2 μg/l for vinyl chloride. After the 2-year sampling period the sampling plan should be reassessed.

4. Wells 1, 2, and 3 should be sealed according to Minnesota Well Code.

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GLOSSARY

Areas of Concern	(AOC)
Air Soil and Water	(A,S,W)
Agency for Toxic Substances and Disease Registry	(ATSDR)
Burlington Northern Railroad	(BNR)
Comprehensive Environmental Response, Compensation, and Liability Act	(CERCLA)
Contaminants of concern	(COC)
Containment and Treatment Facility	(CTF)
County Well Index	(CWI)
1,2-dichloroethane	(DCE)
Department of Defense	(DOD)
U. S. Environmental Protection Agency	(EPA)
Federal Safe Drinking Water Act	(FSDWA)
government owned/contractor operated	(GOCO)
Groundwater extraction System	(GWS)
High Density Polyethylene	(HDPE)
Health Risk Limits	(HRLs)
Installation Restoration Program	(IRP)
Maximum Contaminant Levels	(MCL)
Minnesota Department of Health	(MDH)
Metropolitan Environmental Council Service	(MECS)
Microgram per Liter	(μg/l)
Minnesota Environmental Response And Liability Act	(MERLA)
Minnesota Pollution Control Agency	(MPCA)
Minimal Risk Levels	(MRL)
Minnesota Well Code	(MWC)
Minneapolis Water Works	(MWW)
National Pollutant Discharge Elimination System Permit	(NPDES)
Navy Industrial Reserve Ordnance Plant	(NIROP, Fridley MN)
National Priority List	(NPL)
tetrachloroethylene	(PERC)
Public Health Assessment	(PHA)
Publicly Owned Treatment Works	(POTW)
Parts Per Million	(ppm)
Restoration Advisory Board	(RAB)
Remedial Action Monitoring Plan	(RAMP)
Resource Conservation And Recovery Act	(RCRA)
Record of Decision	(ROD)
Superfund Amendments and Reauthorization Act	(SARA 1986)
Soil Reference Values	(SRVs)
Solid Waste Management Units	(SWMU)
semivolatile organic compounds	(SVOC)
Trichloroethylene	(TCE)
total organic halides	(TOH)
United Defense Limited Partnership	(UDLP; formerly FMC Inc.,Fridley MN)
U.S. Army Corps of Engineers	(USACE)
Volatile Organic Compounds	(VOCs)

REFERENCES

Bibliography

1) Minnesota Pollution Control Agency, Correspondence to Douglas Hildre (UDLP Environmental Control Manager) RE: RCRA Permit Modifications MN317022914. November 5, 1997.

2) Basewide Environmental Survey For Transfer (Draft) For Naval Industrial Reserve Ordnance Plant Fridley Minnesota Southern Division Naval Facilities Engineering Command August 1997 Brown & Root Environmental.

3) Record of Decision For Ground Water Remediation Naval Industrial Reserve Ordnance Plant Fridley, Minnesota. September 28, 1990.

4) Site Management Plan NIROP Fridley, Southern Division Naval Facilities Engineering Command North Carolina 29419-9010. Minnesota January 1998.

5) Authorization to Discharge And to Construct, Install And Operate A Wastewater Disposal System Under The National Pollutant Discharge Elimination System (NPDES)And State Disposal System Permit Program. Permit No. MN0000710., October 31, 1996.

6) Remedial Investigation Report For The Soils Operable Unit at The NIROP Fridley, Minnesota. RMT Inc. Madison ,WI. September 1996

7) Completion Report for Removal Action at North 40, NIROP, Fridley, MN., Morrison Knudson Corporation. North Charleston, South Carolina, October 1996.

8) United States Environmental Protection Agency, Superfund Record of Decision For FMC Corporation., Minnesota . September 1987.

9) United States Environmental Protection Agency, Five Year Review Report, FMC Corporation Site, Fridley, Minnesota. September 30, 1992.

10) Agency For Toxic Substances And Disease Registry, Kurt Manufacturing Company; Site Review And Update, Fridley, Anoka County, Minnesota. CERCLIS NO. MND059680165. January 1997.

11) Agency For Toxic Substances And Disease Registry, Health Assessment For Kurt Manufacturing Company; , Fridley, Anoka County, Minnesota., CERCLIS NO. MND059680165. April 1989.

12) United Defense/FMC, Annual Monitoring Report For 1996 Groundwater Extraction System, June 1997.

13) United Defense/FMC, Hazardous Facility Annual Waste Report - 1997 Containment Treatment Facility. Armament Systems Division of United Defense. Groundwater Extraction System, June 1997.

14) Minnesota Pollution Control Agency, Correspondence to Mr. Douglas Hildre Environmental Control Manager United Defense Limited Partnership (FMC Corporation Superfund Site), RE: FMC Corporation Superfund Site, Attachment 1, Idem 5, December 2, 1994.

15) Minnesota Pollution Control Agency, Correspondence to Mr. Douglas Hildre Environmental Control Manager United Defense Limited Partnership (FMC Corporation Superfund Site), RE: FMC Corporation Superfund Site, Attachment 1, Idem 10, December 18, 1995.

16) Metropolitan Council Environmental Services, Industrial Discharge Permit Number 2020 For Site Located at: Armament Systems Division (FMC), February 11, 1997.

17) United Defense (FMC/UDLP), 1997 Hazardous Waste Annual Report For The Containment Treatment Facility. February 1998.

18) Environmental Protection Agency, Ambient Water Quality Criteria For Trichloroethylene, EPA 440/5-80-077, October 1980.

19) Minneapolis Water Works (MWW), Correspondence to Mr. Whitaker (MWW Engineer) Pertaining to Supplemental Groundwater Resources In Anoka County Park. November 22, 1980.

20) Pollution Control Agency, Assessment of impacts to Mississippi River from a contaminant groundwater plume from the Naval Industrial Reserve Ordnance Superfund Site, David Maschwitz Memorandum, July 9, 1997.

21) U.S. Navy Covenant Deferral Request For The Naval Industrial Ordnance Plant Fridley, Minnesota Draft, Version March 31, 1998.

22) John Pollock, CTF Project Manager. Minnesota Pollution Control Agency Phone Conversation. April 8, 1998.1998.

23) FMC Corporation Naval Systems Division: Closure Alternatives Study For Area C at The Naval Industrial Reserve Ordnance Plant, RMT Inc. Madison, Wisconsin, October 1991.

24) United Defense Limited Partnership, Former Storage Area C Naval Industrial Reserve Ordnance Plant, Wenck Associates Inc., July 1997.

25) Minnesota Pollution Control Agency Five Year Report: FMC Corporation Site Fridley, Minnesota. March 30, 1999.

26) Minnesota Pollution Control Agency Five Year Report: FMC Corporation Site Fridley, Minnesota. March 30, 1999.

27) Morrison Knudsen Corporation, Calculation of Site Specific Allowable Emission Rates Groundwater Treatment Facility, NIROP Fridley Minnesota. September 1998.

28) Naval Industrial Reserve Ordnance Plant: 1996 Annual Monitoring Report Fridley Minnesota. Brown and Root Environmental. April 1997

29) Naval Industrial Reserve Ordnance Plant: 1997 Annual Monitoring Report Fridley. Brown and Root Environmental. Minnesota. March 1998

Appendix A
Surface Water Impact Memorandum

ATTACHMENT 1

SF-00006-05(4/86)

DEPARTMENT: POLLUTION CONTROL AGENCY

STATE OF MINNESOTA

Office Memorandum

DATE: July 9, 1997

TO: David Douglas - GWSR
John Betcher
Caroline Voelkers

FROM: David Maschwitz
Dann White
THRU: Duane Anderson
PHONE: 296-7255, 296-7237

SUBJECT: Assessment of impacts to Mississippi River from a contaminated ground water plume from the Naval Industrial Reserve Ordnance Superfund Site

The purpose of this memorandum is to provide you with an assessment of the impacts to the Mississippi River from a contaminated ground water plume from the Naval Industrial Reserve Ordnance (NIROP) Superfund Site in Fridley, Minnesota.

The groundwater in the shallow drift aquifer along the Mississippi River at the NIROP Site is contaminated with trichloroethylene (TCE). The contaminated portion of this aquifer fronts a total of about 2000 feet of the river. The concentrations of TCE in this shallow aquifer are characterized by the monitoring results from wells MS 18-S, 26-S, 19-S, and 27-S on the NIROP Site. Wells 18-S and 27-S appear to be in the center of the contamination plume, in line with the direction of groundwater flow. Well 27-S, which is roughly 200 feet from the river's edge, is the closest monitoring well to the Mississippi River. Also, deeper aquifers are carrying TCE and other contaminants to the river.

Concentrations of TCE are the highest in well 18-S, and are highly variable in both well 18-S and 27-S. Values in 18-S peaked at about 25,000 ug/L TCE in the last year and a half. In well 27-S, TCE values ranged from a few hundred ug/L to over 16,000 ug/L, over about a 44 month period ending in May, 1996. Except for one sampling in May, 1995, TCE concentrations in wells 27-S and 18-S generally track the same variable, "high/low" pattern over time. There is no downward trend in TCE concentrations in either well over time. TCE is the primary pollutant of concern.

The contaminated ground water in this area is outside the capture zone of the remediation pump-out wells located further "inland" on the NIROP Site. It is estimated that the portion of the ground water plume contaminated with 10,000 ug/L TCE, or more, is moving down gradient to the river at the rate of about 22 gallons per minute (32,000 gallons per day). Given the proximity of the contaminated ground water to the river and the high concentrations of TCE, we must conclude that the levels of TCE reaching the river exceed applicable water quality standards.

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MPCA, GWSW,
Site Response Section

2. the magnitude of the TCE concentrations, the apparent size of the plume and flow rate of the ground water indicate a high probability of a significant loading of TCE to the Mississippi River;
3. peak concentrations of TCE have remained high over time; and
4. the Minneapolis drinking water intake is immediately downstream from the Site on the same side of the river
5. Concentrations of TCE in the ground water plume should be reduced so that water quality standards are met and the beneficial uses of the Mississippi River are protected (Minn. Rules ch. 7050).
6. Concentrations of TCE should meet 5 ug/L in the well(s) closest to the Mississippi River as a 30-day average.

If you have questions, please contact Dave Maschwitz (296-7255) or Dann White (296-7237).

ATTACHMENT II

DEPARTMENT: POLLUTION CONTROL AGENCY

SF-00006-06(4/88)
STATE OF MINNESOTA

Office Memorandum

DATE: March 25, 1998

TO: David Douglas
John Betcher
Ground Water Site Response

FROM: David E. Maschwitz DEM
Monitoring and Assessment Section
Water Quality Division

PHONE: 296-7255

SUBJECT: Surface Water Criteria in the Navy-NIROP Record of Decision

It has come to my attention that the acute and chronic surface water criteria cited in the September 28, 1990, Record of Decision for Ground Water Remediation, Naval Industrial Reserve Ordnance Plant (the Navy-NIROP ROD) do not address all the beneficial uses for which the Mississippi River is protected, and all the potential environmental concerns to the river emanating from this site.

The ambient water quality criteria numbers for Trichloroethylene (TCE) cited on page 24 of the ROD are:

Chronic,	21.9 mg/L
Acute,	45 mg/L (parts per million)

The above numbers are Environmental Protection Agency (EPA) aquatic life "criteria", taken from, *Ambient Water Quality Criteria for Trichloroethylene*, EPA 440/5-80-077, October, 1980. While not the main issue here, it is worth noting that these numbers are not full EPA criteria but are "as low as" values. This means there was insufficient toxicity data for TCE to satisfy the data requirements of EPA's criteria calculation method. In such cases the EPA criteria documents would cite the lowest acute and chronic values available and conclude, "that acute [chronic] toxicity to freshwater aquatic life occurs at concentrations as low as ___."

The two values, 45 and 21.9 mg/L, relate to the direct toxicity of TCE to fish and other aquatic organisms. TCE is not very toxic to aquatic life, but it does pose a greater threat to humans. These "criteria" do not address the human health aspects of the beneficial uses for which the Mississippi River is protected in the reach adjacent to the Navy-NIROP site. Human health-related uses include drinking water and human consumption of sport caught fish from the river. When these uses are factored into the criteria determinations, numbers about 1000 times more stringent result. The EPA criteria document cited above includes a human health-related criterion of 27 ug/L which was not mentioned in the ROD. It is the consideration of these human health-related uses of the surface waters that the ROD should have addressed.

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The following tables list the EPA and Minnesota Pollution Control Agency (MPCA) criteria and standards, including those pertaining to the human health uses, that were applicable at the time the ROD was published, and those that are in place now. In this context, the term "criterion" refers to concentrations of a pollutant in water determined to be safe or protective of a specific beneficial use (e.g., drinking water, fisheries and recreation) that has not been adopted into a state's water quality rules; and the term "standard" refers to a criterion that has been adopted into a state's water quality rules. Criteria can be of federal (EPA) or state (MPCA) origin, standards are the Minnesota water quality standards found in Minn. R. ch. 7050.

Criteria and Standards for TCE in Effect on September 28, 1990

Use	Acute or Chronic	EPA ug/L	Standard or Criterion	MPCA ug/L	Standard or Criterion
drinking water (HH)	chronic	5	standard	5	standard
drinking water + fish consumption (HH)	chronic	27	criterion	25	criterion
aquatic life	chronic	21,900	criterion	na	criterion
aquatic life	acute, maximum	na	criterion	5,088	criterion
aquatic life	final acute value	45,000	criterion	10,175	criterion

Criteria and Standards for TCE in Effect Currently

Use	Acute or Chronic	EPA ug/L	Standard or criterion	MPCA ug/L	Standard or criterion
drinking water (HH)	chronic	5	standard	5	standard
drinking water + fish consumption (HH)	chronic	27	criterion	25	standard
aquatic life	chronic	21,900	criterion	na	criterion
aquatic life	acute, maximum	na	criterion	2500*	standard
aquatic life	final acute value	45,000	criterion	5000**	standard

Notes: na = none available; HH = human health-related

*For carcinogenic (or bioaccumulative) chemicals, the maximum standard is the toxicity-based value (6,988 ug/L) or 100 times the chronic standard, which ever is lower.
**For carcinogenic (or bioaccumulative) chemicals, the final acute value standard is the toxicity-based value (13,976 ug/L) or 200 times the chronic standard, which ever is lower.

These tables show that the critical human health-related criteria and standards in effect at the time the ROD was prepared are essentially the same as those in effect now.

To reiterate the Water Quality Division position with regard to the Navy-NIROP site, due to its unique aspects discussed in our memo to you dated July 9, 1997, the chronic drinking water standard (5 ug/L) is applicable and should be met in the wells closest to the river. In other words, to protect downstream drinking water supplies, the contaminated ground water plume presumed to be entering the river is not given the benefit of dilution by the river.

Appendix B
Minneapolis Water Works Treatment Process

DEPARTMENT OF PUBLIC WORKS
WATER WORKS DIVISION
MINNEAPOLIS, MINNESOTA

MEMORANDUM

TO: Dan Pena
Minnesota Department of Health
FAX 215-0975

FROM: Larry Cole
Minneapolis Water Works

DATE: March 11, 1998

SUBJECT: VOC Removal by the Treatment Process

The Minneapolis Water Works (MWW) currently uses powdered activated carbon (PAC) for taste and odor removal. The normal dosage range is 4 to 8 mg/L. This level of PAC treatment may remove some VOC's. This is not the preferred form of carbon treatment to remove VOC's. The preferred method is to use deep bed carbon contactors packed with granular activated carbon (GAC).

Some VOC's may be lost at the water/air interface. The treatment process contains a number of steps where the water covers a large surface area or receives some cascade aeration by falling down a small distance. Since the treatment steps were not designed for dissolved gas removal and do not have a large air/water ratio VOC removal would be very small.

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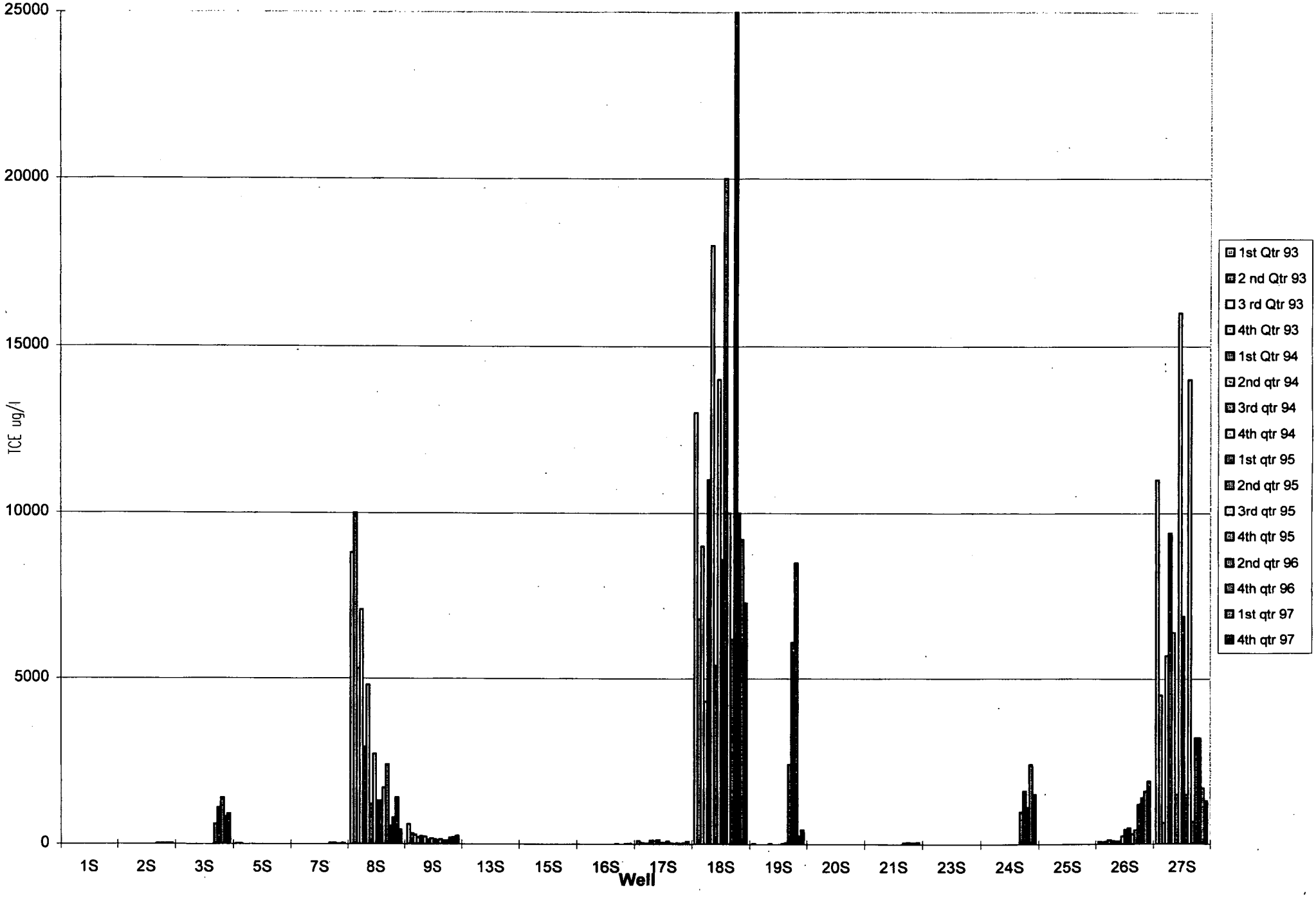
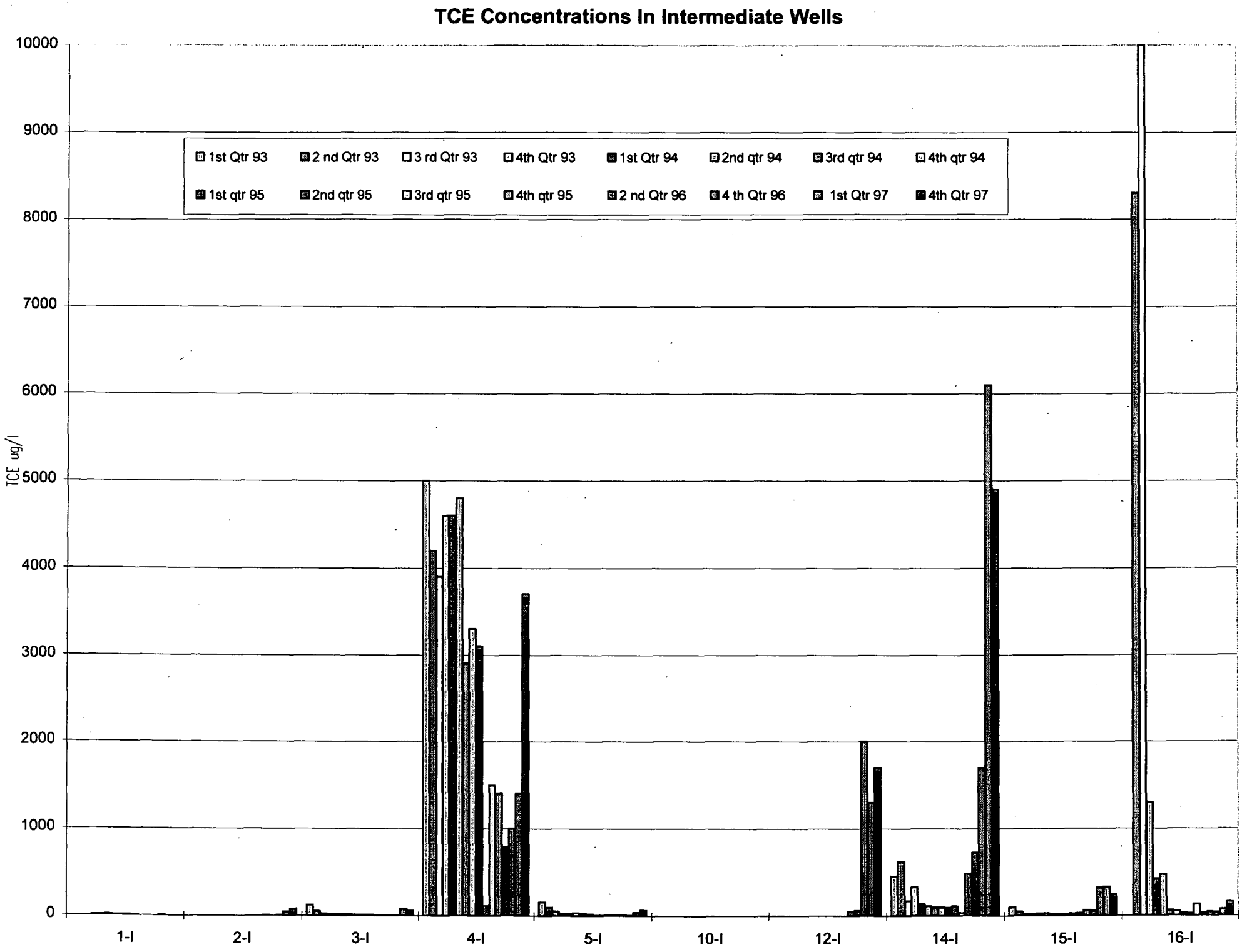
Appendix C
NIROP TCE Concentrations In Monitoring And Shallow Drift Wells From 1993-1997

TCE Concentrations In NIROP Monitoring Wells From 1993-1997




TCE Concentrations In Intermediate Wells
TCE ug/l
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1st Qtr 93
2 nd Qtr 93
3 rd Qtr 93
4th Qtr 93
1st Qtr 94
2nd qtr 94
3rd qtr 94
4th qtr 94
1st qtr 95
2nd qtr 95
3rd qtr 95
4th qtr 95
2 nd Qtr 96
4 th Qtr 96
1st Qtr 97
4th Qtr 97
1-I
2-I
3-I
4-I
5-I
10-I
12-I
14-I
15-I
16-I

Appendix D
Exceedances of HRLs and MCLs in NIROP Wells

ORGANIC DATA QUALIFIER DEFINITIONS

For the purpose of defining the flagging nomenclature used in this document, the following code letters and associated definitions are provided:

VALUE - when/if the result of a value is greater than or equal to the Contract Required Quantitation Limit (CRQL).

U Indicates that the compound was analyzed for, but not detected. The sample quantitation limit corrected for dilution and percent moisture is reported.

J Indicates an estimated value. This flag is used either when estimating a concentration for a tentatively identified compound or when the data indicates the presence of a compound where the result is less than the sample quantitation limit, but greater than zero. The flag is also used to indicate a reported result having an associated QC problem.

R Indicates the data are unusable. (NOTE: The analyte may or may not be present.)

N Indicates presumptive evidence of a compound. This flag is only used for a tentatively identified compound, where the identification is based on a mass spectral library search.

P Indicates a pesticide/Aroclor target analyte when there is greater than 25% difference for the detected concentrations between the two GC columns. The lower of the two results is reported.

C Indicates pesticide results that have been confirmed by GC/MS.

B Indicates the analyte is detected in the associated blank as well as in the sample.

E Indicates compounds whose concentrations exceed the calibration range of the instrument.

D Indicates an identified compound in an analysis has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analysis.

A Indicates tentatively identified compounds that are suspected to be aldol condensation products.

G Indicates the TCLP Matrix Spike Recovery was greater than the upper limit of the analytical method.

L Indicates the TCLP Matrix Spike Recovery was less than the lower limit of the analytical method.

T Indicates the analyte is found in the associated TCLP extraction blank as well as in the sample.

Q X,Y,Z are reserved for laboratory defined flags.

WELL		parameter ug/l		
CD01		ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **700 ug/l**
CD01-[94_R10]	2/7/95	12	QB	
CD01-[92_R11]	2/14/95	92	Q	
CD01-[94_R10]	1/15/96	50	Q	
CD01-[94_R10]	1/15/96	40	QB	
CD01-[94_R10]	1/15/96	60	QB	

WELL		parameter ug/l		
CD01		1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
CD01	8/18/92	110		
CD01	9/21/92	14000		
CD01-[92_R08]	10/20/94	180		
CD01-[92_R08]	11/18/94	170		
CD01-[92_R08]	12/21/94	180		
CD01-[92_R08]	2/7/95	160		
CD01-[92_R08]	2/14/95	160		
CD01-[92_R11]	2/14/95	140	Q	
CD01-[92_R08]	4/13/95	180		
CD01-[92_R08]	5/25/95	190		
CD01-[92_R08]	6/29/95	230		
CD01-[92_R08]	7/19/95	120		
CD01-[92_R08]	8/17/95	130		
CD01-[92_R08]	9/26/95	110		
CD01-[92_R08]	10/27/95	120		
CD01-[92_R08]	11/20/95	110		
CD01-[92_R08]	12/20/95	120		
CD01-[92_R09]	1/15/96	100		
CD01-[92_R09]	1/15/96	120		
CD01-[92_R09]	1/15/96	130		
CD01-[92_R09]	1/24/96	12		
CD01-[92_R10B]	1/24/97	52	J	
CD01-[92_R09]	2/26/97	140		
CD01-[92_R09]	3/21/97	100		
CD01-[92_R09]	4/3/97	150		
CD01-[92_R09]	- -	140		

WELL		parameter ug/l		
CD01		CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
CD01	- -	75		
CD01-[92_R09]	10/31/96	91		
CD01-[92_R09]	11/25/96	75		

WELL		parameter ug/l		
CD01		TRANS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **100 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **100 ug/l**
CD01	- -	73		
CD01-[92_R09]	10/31/96	110		
CD01-[92_R09]	11/25/96	73		

WELL		parameter ug/l		
CD01		1,1,1-TRICHLOROETHANE		Maxium Contaminant level (MCL)= **200 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **600 ug/l**
CD01	8/18/92	5		
CD01-[92_R10B]	9/21/92	170	Q	
CD01-[92_R10C]	2/7/95	0.4	Q	
CD01-[92_R11]	2/14/95	0.4	Q	
CD01-[92_R12]	7/19/95	0.6	Q	

WELL		parameter ug/l		
CD01		TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
CD01	- -	1500		
CD01-[92_R09]	8/18/92	11000	D	
CD01-[92_R10B]	9/21/92	16000	DB	
CD01-[92_R09]	10/20/94	2400	D	
CD01-[92_R08]	11/18/94	2400		
CD01-[92_R09]	12/21/94	2200	D	
CD01-[92_R09]	2/7/95	2100	D	
CD01-[92_R08]	2/14/95	2000		
CD01-[92_R09]	2/14/95	2000	D	
CD01-[92_R08]	4/13/95	1700		
CD01-[92_R08]	5/25/95	1900		
CD01-[92_R08]	6/29/95	1400		
CD01-[92_R09]	7/19/95	1100	D	
CD01-[92_R08]	8/17/95	1000		
CD01-[92_R08]	9/26/95	1000		
CD01-[92_R09]	10/27/95	1200	D	
CD01-[92_R09]	11/20/95	1400	D	
CD01-[92_R08]	12/20/95	1200		
CD01-[92_R09]	1/15/96	1400		
CD01-[92_R09]	1/15/96	1500		
CD01-[92_R09]	1/15/96	1600		
CD01-[92_R09]	1/24/96	120		
CD01-[92_R09]	10/31/96	1400		
CD01-[92_R09]	11/25/96	1500		
CD01-[92_R10B]	1/24/97	1200	J	
CD01-[92_R09]	2/26/97	1400		
CD01-[92_R09]	3/21/97	1500		
CD01-[92_R09]	4/3/97	1700		
CD01-[92_R09]	- -	1200		

WELL		parameter ug/l		
CD01		TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
CD01	8/18/92	18		
CD01	9/21/92	840		
CD01-[92_R10C]	10/20/94	3	Q	
CD01-[92_R10C]	12/21/94	3	Q	
CD01-[92_R10C]	2/7/95	4	Q	
CD01-[92_R12]	2/14/95	4	Q	
CD01-[92_R12]	7/19/95	2	Q	
CD01-[94_R10]	10/27/95	4	Q	
CD01-[94_R10]	11/20/95	3	Q	
CD01-[92_R09]	10/31/96	3.1		
CD01-[92_R09]	2/26/97	2.5		
CD01-[92_R09]	3/21/97	3		

WELL AT01A		parameter ug/l 1,1,1-TRICHLOROETHANE		Maxium Contaminant level (MCL)= **200 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **600 ug/l**
AT01A-[92_R08]	8/18/92	18		
AT01A-[92_R09]	9/21/92	9	Q	
AT01A-[92_R09]	9/21/92	11	Q	
AT01A-[92_R10A]	10/8/92	8	QB	
AT01A-[92_R10C]	10/22/92	11		
AT01A-[92_R11]	11/4/92	9	Q	
AT01A-[93_R03]	3/17/93	7	Q	
AT01A-[93_R05]	5/6/93	4	J	
AT01A-[93_R08]	8/18/93	2	Q	
AT01A-[93_R11]	11/10/93	2	Q	
AT01A-[94_R02B]	2/24/94	1	Q	
AT01A-[94_R05]	5/12/94	1	J	
AT01A-[94_R11A]	11/18/94	2	Q	
AT01A-[95_R02B]	2/16/95	0.7	Q	
AT01A-[95_R05]	5/25/95	0.7	J	
AT01A-[95_R11]	11/20/95	0.7	Q	

WELL AT01A		parameter ug/l 1,1-DICHLOROETHANE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **70 ug/l**
AT01A-[92_R08]	8/18/92	21		
AT01A-[92_R09]	9/21/92	9	Q	
AT01A-[92_R10B]	10/12/92	7	Q	
AT01A-[92_R10C]	10/22/92	6	Q	
AT01A-[92_R11]	11/4/92	6	Q	
AT01A-[93_R03]	3/17/93	6	Q	
AT01A-[93_R05]	5/6/93	4	J	
AT01A-[93_R08]	8/18/93	3	Q	
AT01A-[93_R11]	11/10/93	4	Q	
AT01A-[94_R02B]	2/24/94	3	Q	
AT01A-[94_R05]	5/12/94	3	J	
AT01A-[94_R08]	8/17/94	2	Q	
AT01A-[94_R11A]	11/18/94	2	Q	
AT01A-[95_R02B]	2/16/95	2	Q	
AT01A-[95_R05]	5/25/95	2	J	
AT01A-[95_R08]	8/17/95	2	Q	
AT01A-[95_R11]	11/20/95	2	Q	
AT01A-[96_R01]	1/15/96	1.4		
AT01A-[96_R11]	11/25/96	1.6		
AT01A-[97_R04]	4/3/97	1.2		

WELL AT01A		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
AT01A-[92_R08]	8/18/92	810	D	
AT01A-[92_R09]	9/21/92	290		
AT01A-[92_R09]	9/21/92	300		
AT01A-[92_R10A]	10/8/92	180		
AT01A-[92_R10B]	10/12/92	250		
AT01A-[92_R10C]	10/22/92	280		
AT01A-[92_R11]	11/4/92	230		
AT01A-[93_R03]	3/17/93	230		
AT01A-[93_R05]	5/6/93	150		
AT01A-[93_R08]	8/18/93	97		
AT01A-[93_R11]	11/10/93	120		
AT01A-[94_R02B]	2/24/94	84		
AT01A-[94_R05]	5/12/94	75		
AT01A-[94_R08]	8/17/94	66		
AT01A-[94_R11A]	11/18/94	68		
AT01A-[95_R02B]	2/16/95	52		
AT01A-[95_R05]	5/25/95	44		
AT01A-[95_R08]	8/17/95	56		
AT01A-[95_R11]	11/20/95	47		
AT01A-[96_R01]	1/15/96	38		
AT01A-[96_R11]	11/25/96	42		
AT01A-[97_R04]	4/3/97	36		

WELL AT01A		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
AT01A-[92_R08]	8/18/92	70		
AT01A-[92_R09]	9/21/92	30		
AT01A-[92_R09]	9/21/92	35		
AT01A-[92_R10A]	10/8/92	18	Q	
AT01A-[92_R10B]	10/12/92	25	Q	
AT01A-[92_R10C]	10/22/92	23		
AT01A-[92_R11]	11/4/92	21		
AT01A-[93_R03]	3/17/93	25		
AT01A-[93_R05]	5/6/93	13		
AT01A-[93_R08]	8/18/93	8	Q	
AT01A-[93_R11]	11/10/93	11		
AT01A-[94_R02B]	2/24/94	8	Q	
AT01A-[94_R05]	5/12/94	7	J	
AT01A-[94_R08]	8/17/94	6	Q	
AT01A-[94_R11A]	11/18/94	6	Q	
AT01A-[95_R02B]	2/16/95	4	Q	
AT01A-[95_R05]	5/25/95	3	J	
AT01A-[95_R08]	8/17/95	4	Q	
AT01A-[95_R11]	11/20/95	4	Q	
AT01A-[96_R01]	1/15/96	2.5		
AT01A-[96_R11]	11/25/96	3.4		
AT01A-[97_R04]	4/3/97	2.6		

WELL AT01A		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT01A-[92_R08]	8/18/92	340	D	
AT01A-[92_R09]	9/21/92	120		
AT01A-[92_R10A]	10/8/92	58		
AT01A-[92_R10B]	10/12/92	57		
AT01A-[92_R10C]	10/22/92	54		
AT01A-[92_R11]	11/4/92	52		
AT01A-[93_R03]	3/17/93	55		
AT01A-[93_R05]	5/6/93	22		
AT01A-[93_R08]	8/18/93	14		
AT01A-[93_R11]	11/10/93	20		
AT01A-[94_R02B]	2/24/94	14		
AT01A-[94_R05]	5/12/94	12		
AT01A-[94_R08]	8/17/94	10		
AT01A-[94_R11A]	11/18/94	10		
AT01A-[95_R02B]	2/16/95	6	Q	
AT01A-[95_R05]	5/25/95	5	J	
AT01A-[95_R08]	8/17/95	7.2		
AT01A-[95_R11]	11/20/95	6.2		
AT01A-[96_R01]	1/15/96	4		
AT01A-[97_R04]	4/3/97	3.9		

WELL AT01		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **700 ug/l**
AT01A-[93_R05]	5/6/93	2	BJ	
AT01A-[93_R08]	8/18/93	2	QB	
AT01A-[93_R11]	11/10/93	6	QB	
AT01A-[94_R02B]	2/24/94	4	QB	
AT01A-[94_R05]	5/12/94	8	BJ	
AT01A-[95_R11]	11/20/95	21		
AT01A-[96_R01]	1/15/96	5	Q	

WELL AT02		parameter ug/l 1,1,1-TRICHLOROETHANE		Maxium Contaminant level (MCL)= **200 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **600 ug/l**
AT02-[93_R05]	5/6/93	3	J	
AT02-[94_R11A]	11/18/94	22	Q	

WELL AT02		parameter ug/l 1,1-DICHLOROETHANE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT02-[92_R08]	8/18/92	3	Q	
AT02-[92_R09]	9/21/92	9		
AT02-[92_R09]	9/21/92	13		
AT02-[92_R10A]	10/8/92	14		
AT02-[92_R10B]	10/12/92	12		
AT02-[92_R10C]	10/22/92	11		
AT02-[92_R11]	11/4/92	15		
AT02-[92_R12]	12/8/92	19		
AT02-[93_R01]	1/5/93	21		
AT02-[93_R02]	2/10/93	26		
AT02-[93_R03]	3/17/93	38	Q	
AT02-[93_R05]	5/6/93	36	J	
AT02-[93_R08]	8/18/93	33	Q	
AT02-[93_R11]	11/10/93	38	Q	
AT02-[94_R02B]	2/24/94	38	Q	
AT02-[94_R05]	5/12/94	41	J	
AT02-[94_R08]	8/17/94	26	Q	
AT02-[94_R11A]	11/18/94	26	Q	
AT02-[95_R02B]	2/16/95	22	Q	
AT02-[95_R05]	5/25/95	12	J	
AT02-[95_R08]	8/17/95	10	Q	
AT02-[95_R11]	11/20/95	10	Q	
AT02-[96_R01]	1/15/96	9	Q	

WELL AT02		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **700 ug/l**
AT02-[93_R03]	3/17/93	44	QB	
AT02-[93_R08]	8/18/93	44	QB	
AT02-[94_R02B]	2/24/94	65	QB	
AT02-[94_R05]	5/12/94	940		

WELL AT02		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
AT02-[92_R08]	8/18/92	45		
AT02-[92_R09]	9/21/92	93		
AT02-[92_R09]	9/21/92	140		
AT02-[92_R10A]	10/8/92	140		
AT02-[92_R10B]	10/12/92	130		
AT02-[92_R10C]	10/22/92	120		
AT02-[92_R11]	11/4/92	130		
AT02-[92_R12]	12/8/92	220	D	
AT02-[93_R01]	1/5/93	410	D	
AT02-[93_R02]	2/10/93	790	D	
AT02-[93_R03]	3/17/93	1100		
AT02-[93_R05]	5/6/93	1400		
AT02-[93_R08]	8/18/93	1300		
AT02-[93_R11]	11/10/93	1700		
AT02-[94_R02B]	2/24/94	1800		
AT02-[94_R05]	5/12/94	3000		
AT02-[94_R08]	8/17/94	1700		
AT02-[94_R11A]	11/18/94	2000		
AT02-[95_R02B]	2/16/95	2100		
AT02-[95_R05]	5/25/95	1600		
AT02-[95_R08]	8/17/95	1500		
AT02-[95_R11]	11/20/95	1700		
AT02-[96_R01]	1/15/96	1600		
AT02-[96_R11]	11/25/96	1500		
AT02-[97_R04]	4/3/97	3800		

WELL AT02		parameter ug/l CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT02-[96_R11]	11/25/96	260		

WELL AT02		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
AT02-[92_R10B]	10/12/92	0.6	Q	
AT02-[92_R12]	12/8/92	0.8	Q	
AT02-[93_R02]	2/10/93	1	Q	

WELL AT02		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT02-[92_R08]	8/18/92	5		
AT02-[92_R09]	9/21/92	98		
AT02-[92_R09]	9/21/92	120		
AT02-[92_R10A]	10/8/92	91		
AT02-[92_R10B]	10/12/92	70		
AT02-[92_R10C]	10/22/92	60		
AT02-[92_R11]	11/4/92	90		
AT02-[92_R12]	12/8/92	140		
AT02-[93_R01]	1/5/93	150		
AT02-[93_R02]	2/10/93	160		
AT02-[93_R03]	3/17/93	170		
AT02-[93_R05]	5/6/93	160		
AT02-[93_R08]	8/18/93	100		
AT02-[93_R11]	11/10/93	120		
AT02-[94_R02B]	2/24/94	190		
AT02-[94_R05]	5/12/94	240	J	
AT02-[94_R08]	8/17/94	180		
AT02-[94_R11A]	11/18/94	230		
AT02-[95_R02B]	2/16/95	250		
AT02-[95_R05]	5/25/95	230		
AT02-[95_R08]	8/17/95	260		
AT02-[95_R11]	11/20/95	260		
AT02-[96_R01]	1/15/96	260		
AT02-[97_R04]	4/3/97	330		

WELL AT03		parameter ug/l 1,1,1-TRICHLOROETHANE		Maxium Contaminant level (MCL)= **200 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **600 ug/l**
AT03A-[93_R05]	5/6/93	49	J	
AT03A-[94_R11A]	11/18/94	42	Q	

WELL AT03		parameter ug/l 1,1-DICHLOROETHANE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT03A-[92_R08]	8/18/92	0.3	Q	
AT03A-[97_R04]	4/3/97	1.4		
AT03A-[92_R08]	8/18/92	4	Q	

WELL AT03		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **700 ug/l**
AT03A-[93_R02]	2/10/93	280	QB	
AT03A-[93_R03]	3/17/93	600	QB	
AT03A-[93_R08]	8/18/93	61	QB	
AT03A-[93_R11]	11/10/93	62	QB	
AT03A-[94_R02B]	2/24/94	180	QB	
AT03A-[95_R02B]	2/16/95	200	Q	
AT03A-[96_R01]	1/15/96	100	QB	

WELL AT03		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT03A-[92_R08]	8/18/92	62		
AT03A-[92_R10B]	10/12/92	220	Q	
AT03A-[92_R11]	11/4/92	270	Q	
AT03A-[92_R12]	12/8/92	300	Q	
AT03A-[93_R01]	1/5/93	250	Q	
AT03A-[93_R02]	2/10/93	290	Q	
AT03A-[93_R03]	3/17/93	280	Q	
AT03A-[93_R05]	5/6/93	200	J	
AT03A-[93_R08]	8/18/93	14	Q	
AT03A-[93_R11]	11/10/93	140	Q	
AT03A-[94_R02B]	2/24/94	100	Q	
AT03A-[94_R08]	8/17/94	56	Q	
AT03A-[94_R11A]	11/18/94	64	Q	
AT03A-[95_R02B]	2/16/95	95	Q	
AT03A-[95_R05]	5/25/95	92	J	
AT03A-[95_R08]	8/17/95	80	Q	
AT03A-[95_R11]	11/20/95	98		
AT03A-[96_R01]	1/15/96	110		
AT03A-[97_R04]	4/3/97	140		

WELL AT03		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
AT03A-[92_R08]	8/18/92	26000	D	
AT03A-[92_R09]	9/21/92	14000		
AT03A-[92_R09]	9/21/92	15000		
AT03A-[92_R10A]	10/8/92	13000		
AT03A-[92_R10B]	10/12/92	11000		
AT03A-[92_R11]	11/4/92	11000		
AT03A-[92_R12]	12/8/92	9500		
AT03A-[93_R01]	1/5/93	8400		
AT03A-[93_R02]	2/10/93	8500		
AT03A-[93_R03]	3/17/93	8000		
AT03A-[93_R05]	5/6/93	6200		
AT03A-[93_R08]	8/18/93	2000		
AT03A-[93_R11]	11/10/93	4700	D	
AT03A-[94_R02B]	2/24/94	3800		
AT03A-[94_R05]	5/12/94	3800		
AT03A-[94_R08]	8/17/94	2800		
AT03A-[94_R11A]	11/18/94	2900		
AT03A-[95_R02B]	2/16/95	3000		
AT03A-[95_R05]	5/25/95	2800		
AT03A-[95_R08]	8/17/95	2300		
AT03A-[95_R11]	11/20/95	1800		
AT03A-[96_R01]	1/15/96	2200		
AT03A-[96_R11]	11/25/96	2200		
AT03A-[97_R04]	4/3/97	1200		

WELL AT03		parameter ug/l CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT03A-[96_R11]	11/25/96	63		

WELL AT03		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
AT03A-[92_R10B]	10/12/92	63	Q	
AT03A-[97_R04]	4/3/97	3.3		

WELL AT04		parameter ug/l 1,1,1-TRICHLOROETHANE		Maxium Contaminant level (MCL)= 200 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = 600 ug/l
AT04-[92_R08]	8/18/92	21		
AT04-[93_R05]	5/6/93	23	J	

WELL AT03		parameter ug/l 1,1-DICHLOROETHANE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 70 ug/l
AT04-[92_R08]	8/18/92	24		
AT04-[93_R08]	8/18/93	8	Q	
AT04-[94_R02B]	2/24/94	10	Q	
AT04-[94_R05]	5/12/94	15	J	
AT04-[94_R08]	8/17/94	16	Q	
AT04-[94_R11A]	11/18/94	13	Q	
AT04-[95_R02B]	2/16/95	7	Q	
AT04-[95_R05]	5/25/95	11	J	
AT04-[95_R08]	8/17/95	7	Q	
AT04-[95_R11]	11/20/95	4	Q	
AT04-[96_R01]	1/15/96	3.9		
AT04-[97_R04]	4/3/97	3.5	J	

WELL AT04		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 70 ug/l
AT04-[93_R03]	3/17/93	140	QB	
AT04-[93_R08]	8/18/93	130	QB	
AT04-[93_R11]	11/10/93	100	QB	
AT04-[94_R02B]	2/24/94	68	QB	
AT04-[94_R05]	5/12/94	25	J	
AT04-[95_R02B]	2/16/95	45	QB	
AT04-[95_R08]	8/17/95	10	QB	
AT04-[96_R01]	1/15/96	10	QB	

WELL AT04		parameter ug/l CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= 70 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 70 ug/l
AT04-[96_R11]	11/25/96	240		

WELL AT04		parameter ug/l BENZENE		Maxium Contaminant level (MCL)= 5 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 10 ug/l
AT04-[95_R02B]	2/16/95	1	QB	
AT04-[95_R08]	8/17/95	2	Q	

WELL AT04		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
AT04-[92_R08]	8/18/92	75		
AT04-[92_R09]	9/21/92	140	Q	
AT04-[92_R10B]	10/12/92	26	Q	
AT04-[92_R10C]	10/22/92	11	Q	
AT04-[92_R12]	12/8/92	14	Q	
AT04-[93_R03]	3/17/93	22	Q	
AT04-[93_R05]	5/6/93	17	J	
AT04-[93_R08]	8/18/93	18	Q	
AT04-[93_R11]	11/10/93	17	Q	
AT04-[94_R02B]	2/24/94	17	Q	
AT04-[94_R05]	5/12/94	17	J	
AT04-[94_R08]	8/17/94	18	Q	
AT04-[94_R11A]	11/18/94	16	Q	
AT04-[95_R02B]	2/16/95	10	Q	
AT04-[95_R05]	5/25/95	11	J	
AT04-[95_R08]	8/17/95	10	Q	
AT04-[95_R11]	11/20/95	9		
AT04-[96_R01]	1/15/96	7.8		
AT04-[96_R11]	11/25/96	7.4		
AT04-[97_R04]	4/3/97	7.8		

WELL AT04		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
AT04-[92_R08]	8/18/92	75		
AT04-[92_R09]	9/21/92	140	Q	
AT04-[92_R10B]	10/12/92	26	Q	
AT04-[92_R10C]	10/22/92	11	Q	
AT04-[92_R12]	12/8/92	14	Q	
AT04-[93_R03]	3/17/93	22	Q	
AT04-[93_R05]	5/6/93	17	J	
AT04-[93_R08]	8/18/93	18	Q	
AT04-[93_R11]	11/10/93	17	Q	
AT04-[94_R02B]	2/24/94	17	Q	
AT04-[94_R05]	5/12/94	17	J	
AT04-[94_R08]	8/17/94	18	Q	
AT04-[94_R11A]	11/18/94	16	Q	
AT04-[95_R02B]	2/16/95	10	Q	
AT04-[95_R05]	5/25/95	11	J	
AT04-[95_R08]	8/17/95	10	Q	
AT04-[95_R11]	11/20/95	9		
AT04-[96_R01]	1/15/96	7.8		
AT04-[96_R11]	11/25/96	7.4		
AT04-[97_R04]	4/3/97	7.8		

WELL MS01Dtable		parameter ug/l 1,1,1-TRICHLOROETHANE		Maxium Contaminant level (MCL)= 200 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = 600 ug/l
MS01D-[97_R10]	10/9/96	10	UJ	

WELL MS01Dtable		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 70 ug/l
MS01D-[95_R11]	11/20/95	17		
MS01D-[97_R10]	10/9/96	2000	J	
MS01D-[97_R02]	2/3/97	3400	J	
MS01D-[97_R03]	3/31/97	140		

WELL MS01Dtable		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 70 ug/l
MS01D-[97_R02]	2/3/97	1.2	J	
MS01D-[97_R03]	3/31/97	2.2		

WELL MS01Dtable		parameter ug/l CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= 70 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 70 ug/l
MS01D-[97_R10]	10/9/96	10	UJ	

WELL MS01Dtable		parameter ug/l TRANS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= 100 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= 100 ug/l
MS01D-[97_R10]	10/9/96	10	UJ	

WELL MS01Dtable		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= 5 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = 30 ug/l
MS01D-[95_R11]	11/20/95	2	Q	
MS01D-[96-R01]	1/15/96	1.2		
MS01D-[97_R10]	10/9/96	10	UJ	

WELL MS01Dtable		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= 5 ug/l
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = 7 ug/l
MS01D-[97_R10]	10/9/96	10	UJ	
MS01D-[97_R02]	2/3/97	1.5		
MS01D-[97_R03]	3/31/97	15		

WELL AT04		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT04-[92_R08]	8/18/92	360	D	
AT04-[92_R09]	9/21/92	360	Q	
AT04-[92_R09]	9/21/92	410		
AT04-[92_R10A]	10/8/92	320		
AT04-[92_R10C]	10/22/92	310		
AT04-[92_R11]	11/4/92	350		
AT04-[92_R12]	12/8/92	390		
AT04-[93_R01]	1/5/93	460		
AT04-[93_R02]	2/10/93	460		
AT04-[93_R03]	3/17/93	580		
AT04-[93_R05]	5/6/93	470		
AT04-[93_R08]	8/18/93	690		
AT04-[93_R11]	11/10/93	1200		
AT04-[94_R02B]	2/24/94	1000		
AT04-[94_R05]	5/12/94	800		
AT04-[94_R08]	8/17/94	720		
AT04-[94_R11A]	11/18/94	610		
AT04-[95_R02B]	2/16/95	450		
AT04-[95_R05]	5/25/95	410		
AT04-[95_R08]	8/17/95	380		
AT04-[95_R11]	11/20/95	360		
AT04-[96_R01]	1/15/96	250		
AT04-[97_R04]	4/3/97	220		

WELL AT05A		parameter ug/l 1,1-DICHLOROETHANE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT05A-[95_R08]	8/17/95	2	Q	
AT05A-[95_R08]	8/17/95	1	Q	

WELL AT05A		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT05A-[95_R08]	8/17/95	100		
AT05A-[95_R11]	11/20/95	140		
AT05A-[96_R01]	1/15/96	100		
AT05A-[97_R04]	4/3/97	66		

WELL AT05A		parameter ug/l CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT05A-[96_R11]	11/25/96	51		

WELL AT05A		parameter ug/l TRANS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **100 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **100 ug/l**
AT05A-[96_R11]	11/25/96	50		

WELL AT05A		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
AT05A-[95_R08]	8/17/95	1	Q	

WELL AT05A		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
AT05A-[95_R08]	8/17/95	560	D	
AT05A-[95_R11]	11/20/95	1600		
AT05A-[96_R01]	1/15/96	1800		
AT05A-[96_R11]	11/25/96	1400		
AT05A-[97_R04]	4/3/97	1100		

WELL AT05A		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT05B-[96_R01]	1/15/96	30	QB	

WELL AT05A		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT05B-[97_R04]	4/3/97	22		
AT05B-[95_R08]	8/17/95	8	Q	
AT05B-[95_R11]	11/20/95	6	Q	
AT05B-[96_R01]	1/15/96	8	Q	

WELL AT05A		parameter ug/l CIS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
AT05B-[96_R11]	11/25/96	15		

WELL AT05A		parameter ug/l TRANS-1,2-DICHLOROETHENE		Maxium Contaminant level (MCL)= **100 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **100 ug/l**
AT05B-[96_R11]	11/25/96	22		

WELL AT05A		parameter ug/l TETRACHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **7 ug/l**
AT05B-[95_R08]	8/17/95	3	Q	
AT05B-[95_R11]	11/20/95	2	Q	
AT05B-[97_R04]	4/3/97	3.5		

WELL AT05A		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
AT05B-[95_R08]	8/17/95	430		
AT05B-[95_R11]	11/20/95	510		
AT05B-[96_R01]	1/15/96	710		
AT05B-[96_R11]	11/25/96	920		
AT05B-[97_R04]	4/3/97	560		

WELL MS02i table		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS02I-[96-R01]	1/15/96	10	Q	
MS02I-[96_R10]	10/10/96	190		
MS02I-[97_R02]	2/4/97	470	J	
MS02I-[97_R04]	4/1/97	53		

WELL MS02i table		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS02I-[97_R02]	2/4/97	10		
MS02I-[97_R04]	4/1/97	1.7		

WELL MS02i table		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
MS02I-[95_R11]	11/21/95	5.1		
MS02I-[96-R01]	1/15/96	1		
MS02I-[96_R10]	10/10/96	4.9		
MS02I-[97_R02]	2/4/97	3.2	J	
MS02I-[97_R04]	4/1/97	43	J	

WELL MS02i table		parameter ug/l 1,1-DICHLOROETHANE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **700 ug/l**
MS02I-[97_R04]	4/1/97	1.6		

WELL MS02PC table		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS02PC-[97_R02]	2/4/97	980	J	
MS02PC-[97_R10]	10/10/97	3700	J	

WELL MS02PC table		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS02PC-[97_R02]	2/4/97	0.8	J	
MS02PC-[97_R04]	4/1/97	2.4		

WELL MS02PC table		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
MS02PC-[97_R02]	2/4/97	1.2		

WELL MS02S		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
MS02S-[95_R11]	11/21/95	15		
MS02S-[96-R01]	1/15/96	10		
MS02S-[96_R10]	10/10/96	15		
MS02S-[97_R04]	4/2/97	12	J	

WELL MS12i table		parameter ug/l 2-BUTANONE		HRL= Not Available
nsample	samp_date	result	Qualifier	MCL= Not Available
MS12I-[95_R11]	11/22/95	71		

WELL MS12i table		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS12I-[95_R11]	11/22/95	70		
MS12I-[96-R01]	1/15/96	18		

WELL MS12i table		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS12I-[95_R11]	11/22/95	2	Q	
MS12I-[96-R01]	1/15/96	10		
MS12I-[97_R04]	4/3/97	210		

WELL MS12i table		parameter ug/l TRICHLOROETHENE		Maximum Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
MS12I-[95_R11]	11/22/95	53		
MS12I-[96-R01]	1/15/96	62		
MS12I-[96_R10]	10/14/96	2000		
MS12I-[97_R04]	4/3/97	1300		

WELL MS12i table		parameter ug/l TRANS-1,2-DICHLOROETHENE		Maximum Contaminant level (MCL)= **100 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **100 ug/l**
MS12I-[96_R10]	10/14/96	300		

WELL MS12i table		parameter ug/l CIS-1,2-DICHLOROETHENE		Maximum Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS12I-[96_R10]	10/14/96	210		

WELL MS12i table		parameter ug/l 2-BUTANONE		HRL= Not Available MCL= Not Available
nsample	samp_date	result	Qualifier	
MS12I-[95_R11]	11/22/95	71		

WELL MS12i table		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS12I-[95_R11]	11/22/95	70		
MS12I-[96-R01]	1/15/96	18		

WELL MS12i table		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS12I-[95_R11]	11/22/95	2	Q	
MS12I-[96-R01]	1/15/96	10		
MS12I-[97_R04]	4/3/97	210		

WELL MS12i table		parameter ug/l TRICHLOROETHENE		Maximum Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
MS12I-[95_R11]	11/22/95	53		
MS12I-[96-R01]	1/15/96	62		
MS12I-[96_R10]	10/14/96	2000		
MS12I-[97_R04]	4/3/97	1300		

WELL MS12i table		parameter ug/l TRANS-1,2-DICHLOROETHENE		Maximum Contaminant level (MCL)= **100 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **100 ug/l**
MS12I-[96_R10]	10/14/96	300		

WELL MS12i table		parameter ug/l CIS-1,2-DICHLOROETHENE		Maximum Contaminant level (MCL)= **70 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS12I-[96_R10]	10/14/96	210		

WELL MS14i table		parameter ug/l TRICHLOROETHENE		Maxium Contaminant level (MCL)= **5 ug/l**
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL) = **30 ug/l**
MS14I-[92_R10A]	10/6/92	5000	D	
MS14I-[92_R10C]	10/20/92	4600		
MS14I-[92_R11]	11/5/92	3800	B	
MS14I-[92_R12]	12/10/92	3100		
MS14I DUP-[93_R02]	2/11/93	4700		
MS14I-[93_R02]	2/11/93	450		
MS14I-[93_R05]	5/6/93	620		
MS14I DUP-[93_R05]	5/6/93	750	D	
MS14I-[93_R08]	8/18/93	170		
MS14I DUP-[93_R08]	8/18/93	200	D	
MS14I DUP-[93_R11]	11/10/93	240		
MS14I-[93_R11]	11/10/93	330	D	
MS14I-[94_R02A]	2/17/94	140	B	
MS14I-[94_R05]	5/11/94	110		
MS14I-[94_R08]	8/17/94	100		

WELL MS14i table		parameter ug/l ACETONE		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS14I-[92_R12]	12/10/92	100	QB	
MS14I-[93_R02]	2/11/93	71	B	
MS14I DUP-[93_R02]	2/11/93	110	Q	
MS14I DUP-[93_R05]	5/6/93	18	BDJ	
MS14I DUP-[93_R08]	8/18/93	3	QB	
MS14I-[93_R08]	8/18/93	4	QB	
MS14I-[93_R11]	11/10/93	4	QB	
MS14I-[94_R05]	5/11/94	37		
MS14I-[94_R08]	8/17/94	16		
MS14I-[94_R11A]	11/18/94	17	QB	

WELL MS14i table		parameter ug/l 1,2-DICHLOROETHENE (TOTAL)		
nsample	samp_date	result	Qualifier	Health Risk Limit (HRL)= **70 ug/l**
MS14I-[92_R10A]	10/6/92	160		
MS14I-[92_R10C]	10/20/92	220	Q	
MS14I-[92_R11]	11/5/92	210	Q	
MS14I-[92_R12]	12/10/92	75	Q	
MS14I DUP-[93_R02]	2/11/93	450		
MS14I-[93_R02]	2/11/93	51		
MS14I DUP-[93_R05]	5/6/93	85		
MS14I-[93_R05]	5/6/93	82		
MS14I DUP-[93_R08]	8/18/93	32		
MS14I-[93_R08]	8/18/93	27		
MS14I DUP-[93_R11]	11/10/93	39		
MS14I-[93_R11]	11/10/93	41		
MS14I-[94_R02A]	2/17/94	24	Q	
MS14I-[94_R05]	5/11/94	26		
MS14I-[94_R08]	8/17/94	49		
MS14I-[94_R11A]	11/18/94	48		

Appendix E
Exceedances of HRLs and MCLs in UDLP Wells

ORGANIC DATA QUALIFIER DEFINITIONS

For the purpose of defining the flagging nomenclature used in this document, the following code letters and associated definitions are provided:

VALUE - when/if the result of a value is greater than or equal to the Contract Required Quantitation Limit (CRQL).

U Indicates that the compound was analyzed for, but not detected. The sample quantitation limit corrected for dilution and percent moisture is reported.

J Indicates an estimated value. This flag is used either when estimating a concentration for a tentatively identified compound or when the data indicates the presence of a compound where the result is less than the sample quantitation limit, but greater than zero. The flag is also used to indicate a reported result having an associated QC problem.

R Indicates the data are unusable. (NOTE: The analyte may or may not be present.)

N Indicates presumptive evidence of a compound. This flag is only used for a tentatively identified compound, where the identification is based on a mass spectral library search.

P Indicates a pesticide/Aroclor target analyte when there is greater than 25% difference for the detected concentrations between the two GC columns. The lower of the two results is reported.

C Indicates pesticide results that have been confirmed by GC/MS.

B Indicates the analyte is detected in the associated blank as well as in the sample.

E Indicates compounds whose concentrations exceed the calibration range of the instrument.

D Indicates an identified compound in an analysis has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analysis.

A Indicates tentatively identified compounds that are suspected to be aldol condensation products.

G Indicates the TCLP Matrix Spike Recovery was greater than the upper limit of the analytical method.

L Indicates the TCLP Matrix Spike Recovery was less than the lower limit of the analytical method.

T Indicates the analyte is found in the associated TCLP extraction blank as well as in the sample.

Q X,Y,Z are reserved for laboratory defined flags.

Extraction Well RW2			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Carbon tetrachloride	Health Risk Limit (HRL)= **3 ug/l**
Interpoll	3/17/94	4-019-RW2	120	

Extraction Well RW2			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
WADS.	6/28/90	0-062(A)	2,200	
Interpoll	6/6/91	1-081b	93	
Interpoll	9/23/97	7068-RW2	150	

Extraction Well RW2			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	1,2-Dichloroethane	Health Risk Limit (HRL)= **4 ug/l**
Interpoll	6/6/91	1-081b	8	
Interpoll	9/10/91	1-120d	3.8	
Interpoll	12/13/91	1-145b	3.4	
Interpoll	3/6/92	2-033d	5.2	
Interpoll	7/10/92	2-079a	3.1	
Interpoll	9/9/93	3-103d	3.3	
Interpoll	3/20/97	7021-rw2	19	
Interpoll	7/18/97	7044-R	2.7	
Interpoll	9/23/97	7068-RW2	7.6	
Interpoll	12/10/97	7099-RW2	5.3	

Extraction Well RW2			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Methylene Chloride	Health Risk Limit (HRL)=**50 ug/l**
Interpoll	6/6/91	1-081b	90	

Extraction Well RW2			Parameter ug/l	Maxium Contaminant level (MCL)= **70 ug/l**
LAB	DATE	SAMPLE #	cis-1,2-Dichloroethylene	Health Risk Limit (HRL)= **70 ug/l**
Interpoll	9/23/97	7068-RW2	4,200	
Interpoll	12/10/97	7099-RW2	4,900	

Extraction Well RW2			Parameter ug/l	Maxium Contaminant level (MCL)= **2.0 ug/l**
LAB	DATE	SAMPLE #	Vinyl Chloride	Health Risk Limit (HRL) = **0.2 ug/l**
Interpoll	3/28/91	1-050b	26	
Interpoll	6/6/91	1-081b	77	
Interpoll	9/10/91	1-120d	58	
Interpoll	12/13/91	1-145b	67	
Interpoll	3/6/92	2-033d	76	
Interpoll	9/16/92	2-121d	86	
Interpoll	12/10/92	2-144c	36	
Interpoll	3/5/93	3-022a	15	
Interpoll	6/11/93	3-075e	13	
Interpoll	9/9/93	3-103d	34	
Interpoll	12/10/93	3-135-RW2	84	
Interpoll	3/17/94	4-019-RW2	15	
Interpoll	9/13/94	4064-RW2	41	
Interpoll	3/16/95	5017-RW2	19	
Interpoll	6/16/95	5048-Rw2	28	
Interpoll	10/10/95	5091-RW2	62	
Interpoll	12/7/95	5107-RW2	58	
Interpoll	3/22/96	6021-RW2	58	
Interpoll	6/28/96	6053-RW2	26	
Interpoll	9/25/96	6075-RW2	28	
Interpoll	12/12/96	6106-RW2	40	
Interpoll	3/20/97	7021-rw2	48	
Interpoll	7/18/97	7044-R	110	
Interpoll	9/23/97	7068-RW2	89	
Interpoll	12/10/97	7099-RW2	120	

Extraction Well RW2

Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**

LAB	DATE	SAMPLE #	Trichloroethylene
WADS.	12/15/87	7-235	25,000
WADS.	12/28/87	7-240	19,000
WADS.	12/28/87	7-244	7,600
WADS.	1/13/88	8-009	19,000
WADS.	1/13/88	8-009	20,000
WADS.	1/13/88	8-009	20,000
WADS.	1/27/88	8-030	18,000
WADS.	1/27/88	8-030	17,000
WADS.	1/27/88	8-030	18,000
WADS.	2/10/88	8-047	16,000
WADS.	2/23/88	8-059	20,000
WADS.	3/8/88	8-078	26,000
WADS.	4/5/88	8-103	21,000
WADS.	5/3/88	8-119	24,000
WADS.	6/14/88	8-147(a)	25,000
WADS.	9/13/88	8-183(a)	24,000
WADS.	12/9/88	8-230(a)	8,300
WADS.	3/16/89	9-018(a)	32,000
WADS.	6/7/89	9-053(a)	23,000
WADS.	9/8/89	9-098(a)	49,000
WADS.	12/6/89	9-132(a)	44,000
WADS.	3/7/90	0-030(a)	23000
WADS.	6/28/90	0-062(A)	91000
WADS.	9/13/90	0-0116b	28000
Wads.	12/17/90	0-142 g	30000
WADS.	12/17/90	0-0142B	30000
Interpoll	3/28/91	1-050b	27000
Interpoll	6/6/91	1-081b	44000
Interpoll	9/10/91	1-120d	31000
Interpoll	12/13/91	1-145b	40000
Interpoll	3/6/92	2-033d	30,000
Interpoll	7/10/92	2-079a	26000
Interpoll	9/16/92	2-121d	20000
Interpoll	12/10/92	2-144c	14000
Interpoll	3/5/93	3-022a	12,000
Interpoll	6/11/93	3-075e	16,000
Interpoll	9/9/93	3-103d	16,000
Interpoll	12/10/93	3-135-RW2	20,000
Interpoll	3/17/94	4-019-RW2	6,900
Interpoll	6/17/94	4054-RW2	7400
Interpoll	9/13/94	4064-RW2	4000
Interpoll	12/15/94	4132-RW2	2600
Interpoll	3/16/95	5017-RW2	6100
Interpoll	6/16/95	5048-Rw2	5100
Interpoll	10/10/95	5091-RW2	6400
Interpoll	12/7/95	5107-RW2	6800
Interpoll	3/22/96	6021-RW2	5700
Interpoll	6/28/96	6053-RW2	4200
Interpoll	9/25/96	6075-RW2	4100
Interpoll	12/12/96	6106-RW2	4600
Interpoll	3/20/97	7021-rw2	6100
Interpoll	7/18/97	7044-R	9100
Interpoll	9/23/97	7068-RW2	14000
Interpoll	12/10/97	7099-RW2	9900

Extraction Well RW2			Parameter ug/l	Maxium Contaminant level (MCL)= **7 ug/l**
LAB	DATE	SAMPLE #	1,1-Dichloroethylene	Health Risk Limit (HRL) = **6 ug/l**
Interpoll	3/28/91	1-050b	11	
Interpoll	6/6/91	1-081b	26	
Interpoll	9/10/91	1-120d	11	
Interpoll	12/13/91	1-145b	18	
Interpoll	3/6/92	2-033d	26	
Interpoll	7/10/92	2-079a	14	
Interpoll	9/16/92	2-121d	16	
Interpoll	12/10/92	2-144c	9.5	
Interpoll	3/5/93	3-022a	9.3	
Interpoll	6/11/93	3-075e	9.9	
Interpoll	9/9/93	3-103d	12	
Interpoll	12/10/93	3-135-RW2	14	
Interpoll	3/17/94	4-019-RW2	5.8	
Interpoll	9/13/94	4064-RW2	8.8	
Interpoll	12/15/94	4132-RW2	6.1	
Interpoll	3/16/95	5017-RW2	27	
Interpoll	6/16/95	5048-Rw2	11	
Interpoll	10/10/95	5091-RW2	29	
Interpoll	12/7/95	5107-RW2	15	
Interpoll	3/22/96	6021-RW2	12	
Interpoll	6/28/96	6053-RW2	9.4	
Interpoll	9/25/96	6075-RW2	30	
Interpoll	12/12/96	6106-RW2	120	
Interpoll	3/20/97	7021-rw2	150	
Interpoll	7/18/97	7044-R	78	
Interpoll	9/23/97	7068-RW2	50	
Interpoll	12/10/97	7099-RW2	110	

Extraction Well RW2

LAB	DATE	SAMPLE #	Parameter ug/l Tetrachloroethylene	Maxium Contaminant level (MCL)= **5 ug/l** Health Risk Limit (HRL) = **7 ug/l**
WADS.	3/7/90	0-030(a)	300	
WADS.	6/28/90	0-062(A)	1,700	
WADS.	9/13/90	0-0116b	560	
Interpoll	3/28/91	1-050b	280	
Interpoll	6/6/91	1-081b	260	
Interpoll	9/10/91	1-120d	230	
Interpoll	3/6/92	2-033d	350	
Interpoll	7/10/92	2-079a	190	
Interpoll	9/16/92	2-121d	54	
Interpoll	12/10/92	2-144c	230	
Interpoll	6/11/93	3-075e	210	
Interpoll	9/9/93	3-103d	230	
Interpoll	12/10/93	3-135-RW2	450	
Interpoll	3/17/94	4-019-RW2	180	
Interpoll	6/17/94	4054-RW2	150	
Interpoll	9/13/94	4064-RW2	110	
Interpoll	12/15/94	4132-RW2	85	
Interpoll	3/16/95	5017-RW2	100	
Interpoll	6/16/95	5048-Rw2	37	
Interpoll	10/10/95	5091-RW2	110	
Interpoll	12/7/95	5107-RW2	120	
Interpoll	3/22/96	6021-RW2	96	
Interpoll	6/28/96	6053-RW2	76	
Interpoll	9/25/96	6075-RW2	73	
Interpoll	12/12/96	6106-RW2	140	
Interpoll	3/20/97	7021-rw2	89	
Interpoll	7/18/97	7044-R	180	
Interpoll	9/23/97	7068-RW2	280	
Interpoll	12/10/97	7099-RW2	200	

Extraction Well RW2

LAB	DATE	SAMPLE #	Parameter ug/l 1,1,1-Trichloroethane	Maxium Contaminant level (MCL)= **200 ug/l** Health Risk Limit (HRL) = **600 ug/l**
WADS.	12/15/87	7-235	2,200	
WADS.	12/28/87	7-244	600	
WADS.	1/13/88	8-009	2,300	
WADS.	1/13/88	8-009	1,400	
WADS.	1/13/88	8-009	1,500	
WADS.	1/27/88	8-030	1,600	
WADS.	1/27/88	8-030	1,500	
WADS.	1/27/88	8-030	1,600	
WADS.	2/10/88	8-047	1,200	
WADS.	2/23/88	8-059	1,500	
WADS.	3/8/88	8-078	1,700	
WADS.	4/5/88	8-103	1,500	
WADS.	5/3/88	8-119	1,600	
WADS.	6/14/88	8-147(a)	1,300	
WADS.	9/13/88	8-183(a)	1,100	
WADS.	12/9/88	8-230(a)	590	
WADS.	3/16/89	9-018(a)	2,100	
WADS.	3/7/90	0-030(a)	1,200	
WADS.	9/13/90	0-0116b	1,300	
Interpoll	3/28/91	1-050b	820	
Interpoll	6/6/91	1-081b	1,700	
Interpoll	9/10/91	1-120d	1000	
Interpoll	12/13/91	1-145b	1800	
Interpoll	3/6/92	2-033d	1300	
Interpoll	7/10/92	2-079a	1200	
Interpoll	9/16/92	2-121d	1100	
Interpoll	12/10/92	2-144c	570	
Interpoll	3/5/93	3-022a	790	
Interpoll	6/11/93	3-075e	630	
Interpoll	9/9/93	3-103d	1100	
Interpoll	12/10/93	3-135-RW2	1,000	
Interpoll	6/17/94	4054-RW2	630	
Interpoll	3/16/95	5017-RW2	490	
Interpoll	6/16/95	5048-Rw2	430	
Interpoll	10/10/95	5091-RW2	470	
Interpoll	12/7/95	5107-RW2	470	
Interpoll	3/22/96	6021-RW2	410	
Interpoll	7/18/97	7044-R	780	
Interpoll	9/23/97	7068-RW2	1,100	
Interpoll	12/10/97	7099-RW2	870	

Extraction Well RW3

Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
Trichloroethylene	Health Risk Limit (HRL)= **30 ug/l**

LAB	DATE	SAMPLE #	Trichloroethylene
WADS.	12/15/87	7-233	610
WADS.	12/15/87	7-236	790
WADS.	12/28/87	7-241	760
WADS.	12/28/87	7-241	830
WADS.	12/28/87	7-241	770
WADS.	1/13/88	8-010	670
WADS.	1/13/88	8-013	550
WADS.	1/27/88	8-031	360
WADS.	1/27/88	8-034	360
WADS.	2/10/88	8-048	260
WADS.	2/23/88	8-060	250
WADS.	3/8/88	8-079	320
WADS.	4/5/88	8-104	210
WADS.	5/3/88	8-120	180
WADS.	6/14/88	8-147(b)	200
WADS.	9/13/88	8-183(b)	190
WADS.	12/9/88	8-230(b)	100
WADS.	3/16/89	9-018(b)	250
WADS.	6/7/89	9-053(b)	200
WADS.	9/8/89	9-098(b)	170
WADS.	12/6/89	9-132(b)	180
WADS.	3/7/90	0-030(b)	72
WADS.	6/28/90	0-062(B)	210
WADS.	9/13/90	0-0116c	230
WADS.	12/17/90	0-142C	140
Interpoll	3/28/91	1-050c	150
Interpoll	3/28/91	1-050g	160
Interpoll	6/6/91	1-081c	200
Interpoll	9/10/91	1-120c	230
Interpoll	9/10/91	1-120f	240
Interpoll	12/13/91	1-145c	280
Interpoll	3/6/92	2-033c	240
Interpoll	7/10/92	2-079b	190
Interpoll	9/16/92	2-121c	190
Interpoll	12/10/92	2-144b	170
Interpoll	3/5/93	3-022b	140
Interpoll	3/5/93	3-022e dup.	140
Interpoll	6/11/93	3-075d	170
Interpoll	9/9/93	3-103c	220
Interpoll	12/10/93	3-135-RW3	320
Interpoll	3/17/94	4-019-RW3	230
Interpoll	6/17/94	4054-RW3	230
Interpoll	9/13/94	4064-RW3	65
Interpoll	9/13/94	4064-Dup	69
Interpoll	12/15/94	4132-RW3	51
Interpoll	3/16/95	5017-RW3	130
Interpoll	6/16/95	5048-RW3	120
Interpoll	10/10/95	5091-RW3	90
Interpoll	12/7/95	5107-RW3	88
Interpoll	3/22/96	6021-RW3	140
Interpoll	6/28/96	6053-RW3	110
Interpoll	9/25/96	6075-RW3	82
Interpoll	12/12/96	6106-RW3	65
Interpoll	3/20/97	7021-rw3	160
Interpoll	7/18/97	7044-R	200
Interpoll	9/23/97	7068-RW3	130
Interpoll	12/10/97	7099-RW3	110

Extraction Well RW3

LAB	DATE	SAMPLE #	Parameter ug/l 1,1-Dichloroethylene	Maxium Contaminant level (MCL)= **7 ug/l** Health Risk Limit (HRL) = **6 ug/l**
Interpoll	12/7/95	5107-RW3	7.8	
Interpoll	9/25/96	6075-RW3	7.3	

Extraction Well RW3

LAB	DATE	SAMPLE #	Parameter ug/l trans-1,2-Dichloroethylene	Maxium Contaminant level (MCL)= **100 ug/l** Health Risk Limit (HRL)= **100 ug/l**
WADS.	12/15/87	7-233	120	
WADS.	12/15/87	7-236	170	
WADS.	12/28/87	7-241	150	
WADS.	12/28/87	7-241	120	
WADS.	12/28/87	7-241	120	

Extraction Well RW3

LAB	DATE	SAMPLE #	Parameter ug/l Tetrachloroethylene	Maxium Contaminant level (MCL)= **5 ug/l** Health Risk Limit (HRL) = **7 ug/l**
WADS.	4/5/88	8-104	8	
WADS.	6/14/88	8-147(b)	5	
WADS.	9/13/88	8-183(b)	5	
WADS.	3/16/89	9-018(b)	11	
WADS.	6/7/89	9-053(b)	7	
WADS.	3/7/90	0-030(b)	2	
WADS.	6/28/90	0-062(B)	6	
WADS.	9/13/90	0-0116c	9	
Interpoll	6/6/91	1-081c	6.5	
Interpoll	12/13/91	1-145c	11	
Interpoll	3/6/92	2-033c	9.7	
Interpoll	7/10/92	2-079b	11	
Interpoll	9/16/92	2-121c	5.6	
Interpoll	6/11/93	3-075d	6	
Interpoll	9/9/93	3-103c	8.2	
Interpoll	12/10/93	3-135-RW3	11	
Interpoll	3/17/94	4-019-RW3	11	
Interpoll	12/7/95	5107-RW3	3.5	
Interpoll	3/22/96	6021-RW3	6.6	
Interpoll	9/23/97	7068-RW3	5.5	
Interpoll	12/10/97	7099-RW3	3.0	

Extraction Well RW3

			Parameter ug/l	Maxium Contaminant level (MCL)= **2.0 ug/l**
LAB	DATE	SAMPLE #	Vinyl Chloride	Health Risk Limit (HRL) = **0.2 ug/l**
Interpoll	6/6/91	1-081c	3.3	
Interpoll	9/10/91	1-120c	2	
Interpoll	9/10/91	1-120f	2.1	
Interpoll	12/13/91	1-145c	1.8	
Interpoll	7/10/92	2-079b	1.8	
Interpoll	9/16/92	2-121c	2.5	
Interpoll	12/10/92	2-144b	1.6	
Interpoll	9/9/93	3-103c	1.7	
Interpoll	9/13/94	4064-RW3	1.9	
Interpoll	9/13/94	4064-Dup	2	
Interpoll	3/16/95	5017-RW3	1.7	
Interpoll	6/16/95	5048-RW3	2.5	
Interpoll	10/10/95	5091-RW3	3.2	
Interpoll	12/7/95	5107-RW3	1.9	
Interpoll	3/22/96	6021-RW3	2.1	
Interpoll	6/28/96	6053-RW3	2.6	
Interpoll	9/25/96	6075-RW3	2.4	
Interpoll	12/12/96	6106-RW3	2.0	
Interpoll	3/20/97	7021-rw3	2.6	
Interpoll	7/18/97	7044-R	3.4	
Interpoll	9/23/97	7068-RW3	4.0	
Interpoll	12/10/97	7099-RW3	3.4	

Extraction Well RW4			Parameter ug/l	Maxium Contaminant level (MCL)= **100 ug/l**
LAB	DATE	SAMPLE #	Bromodichloromethane	Health Risk Limit (HRL)= **6 ug/l**
Interpoll	3/20/97	7021-rw4	20	

Extraction Well RW4			Parameter ug/l	Maxium Contaminant level (MCL)= **75 ug/l**
LAB	DATE	SAMPLE #	1,4-Dichlorobenzene	Health Risk Limit (HRL)= **10 ug/l**
WADS.	9/13/88	8-183(c)	39	

Extraction Well RW4			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
WADS.	9/13/88	8-183(f)	27	
WADS.	9/8/89	9-098(c)	10	
WADS.	9/8/89	9-098(f)	ND	
WADS.	3/7/90	0-030(c)	8	
WADS.	3/7/90	0-030(e)	8	
WADS.	9/13/90	0-116d	17	
Interpoll	3/28/91	0-050	18	
Interpoll	9/10/91	1-120b	21	
Interpoll	3/6/92	2-033b	14	
Interpoll	9/16/92	2-121b	14	
Interpoll	9/16/92	2-121e	13	
Interpoll	9/9/93	3-103b	12	
Interpoll	3/16/95	5017-RW4	10	
Interpoll	10/10/95	5094-RW4	16	
Interpoll	3/22/96	6021-RW4	10	
Interpoll	9/25/96	6075-RW4	10	
Interpoll	3/20/97	7021-rw4	9.4	
Interpoll	9/23/97	7068-rw4	13	

Extraction Well RW4			Parameter ug/l	Maxium Contaminant level (MCL)= **2.0 ug/l**
LAB	DATE	SAMPLE #	Vinyl Chloride	Health Risk Limit (HRL) = **0.2 ug/l**
Interpoll	9/23/97	7068-rw4	0.56	

Extraction Well RW4			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL)= **30 ug/l**
WADS.	12/27/87	7-245	680	30
WADS.	2/10/88	8-049	760	
WADS.	2/10/88	8-049	750	
WADS.	2/10/88	8-049	730	
WADS.	2/10/88	8-052	660	
WADS.	3/8/88	8-080	360	
WADS.	3/8/88	8-083	960	
WADS.	5/3/88	8-121	690	
WADS.	5/3/88	8-124	780	
WADS.	9/13/88	8-183(c)	840	
WADS.	9/13/88	8-183(f)	790	
WADS.	3/16/89	9-018(c)	470	
WADS.	3/16/89	9-018(e)	510	
WADS.	9/8/89	9-098(c)	300	
WADS.	9/8/89	9-098(f)	340	
WADS.	3/7/90	0-030(c)	160	
WADS.	3/7/90	0-030(e)	150	
WADS.	9/13/90	0-116d	260	
Interpoll	3/28/91	0-050	290	
Interpoll	9/10/91	1-120b	380	
Interpoll	3/6/92	2-033b	380	
Interpoll	9/16/92	2-121b	850	
Interpoll	9/16/92	2-121e	1000	
Interpoll	3/5/93	3-122c	510	
Interpoll	9/9/93	3-103b	600	
Interpoll	3/17/94	4-019-RW4	700	
Interpoll	9/13/94	4094-RW4	290	
Interpoll	3/16/95	5017-RW4	730	
Interpoll	10/10/95	5094-RW4	340	
Interpoll	3/22/96	6021-RW4	290	
Interpoll	9/25/96	6075-RW4	360	
Interpoll	3/20/97	7021-rw4	310	
Interpoll	9/23/97	7068-rw4	390	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Carbon tetrachloride	Health Risk Limit (HRL)= **3 ug/l**
Interpoll	12/10/93	3-135-Dup	16	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **7 ug/l**
LAB	DATE	SAMPLE #	1,1-Dichloroethylene	Health Risk Limit (HRL) = **6 ug/l**
Interpoll	12/13/91	1-145d	4.6	
Interpoll	6/5/92	2-079c	4.4	
Interpoll	12/10/92	2-144d	5.6	
Interpoll	12/10/92	2-144d	5.7	
Interpoll	6/11/93	3-075c	2.4	
Interpoll	6/11/93	3-075f	6.8	
Interpoll	12/10/93	3-135-Dup	2.9	
Interpoll	12/10/93	3-135-RW5	11	
Interpoll	12/15/94	4132-RW5	3.4	
Interpoll	7/16/95	5048-rw5	5.1	
Interpoll	12/7/95	5107-RW5	6.5	
Interpoll	6/28/96	6053-RW5	3	
Interpoll	12/12/96	6106-RW5	26	
Interpoll	7/18/97	7044-R	8.9	
Interpoll	12/10/97	7099-RW5	11	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
WADS.	2/23/88	8-061	110	
WADS.	2/23/88	8-061	110	
WADS.	2/23/88	8-061	110	
WADS.	2/23/88	8-064	130	
WADS.	4/5/88	8-105	90	
WADS.	4/5/88	8-108	95	
WADS.	6/14/88	8-147(c)	32	
WADS.	6/14/88	8-147(f)	30	
WADS.	12/9/88	8-230(c)	39	
WADS.	12/9/88	8-230(e)	52	
WADS.	6/7/89	9-053(c)	60	
WADS.	6/7/89	9-053(f)	65	
WADS.	12/6/89	9-132(c)	59	
WADS.	12/6/89	9-132(f)	51	
WADS.	6/28/90	0-062(C)	44	
WADS.	12/17/90	0-142D	27	
Interpol	6/7/91	0-081d	44	
Interpoll	12/13/91	1-145d	64	
Interpoll	6/5/92	2-079c	58	
Interpoll	12/10/92	2-144d	70	
Interpoll	12/10/92	2-144d	57	
Interpoll	6/11/93	3-075c	36	
Interpoll	6/11/93	3-075f	80	
Interpoll	12/10/93	3-135-Dup	85	
Interpoll	12/10/93	3-135-RW5	250	
Interpoll	6/17/94	4054-RW5	71	
Interpoll	12/15/94	4132-RW5	71	
Interpoll	7/16/95	5048-rw5	92	
Interpoll	12/7/95	5107-RW5	82	
Interpoll	6/28/96	6053-RW5	76	
Interpoll	12/12/96	6106-RW5	68	
Interpoll	7/18/97	7044-R	62	
Interpoll	12/10/97	7099-RW5	80	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL)= **30 ug/l**
WADS.	12/28/87	7-246	2000	
WADS.	2/23/88	8-061	1300	
WADS.	2/23/88	8-061	1500	
WADS.	2/23/88	8-061	1400	
WADS.	2/23/88	8-064	1600	
WADS.	4/5/88	8-105	1100	
WADS.	4/5/88	8-108	1300	
WADS.	6/14/88	8-147(c)	500	
WADS.	6/14/88	8-147(f)	500	
WADS.	12/9/88	8-230(c)	520	
WADS.	12/9/88	8-230(e)	730	
WADS.	6/7/89	9-053(c)	800	
WADS.	6/7/89	9-053(f)	860	
WADS.	12/6/89	9-132(c)	1100	
WADS.	12/6/89	9-132(f)	890	
WADS.	6/28/90	0-062(C)	510	
WADS.	9/13/90	0-116e	0	
WADS.	12/17/90	0-142D	510	
Interpol	6/7/91	0-081d	220	
Interpoll	12/13/91	1-145d	740	
Interpoll	6/5/92	2-079c	620	
Interpoll	12/10/92	2-144d	830	
Interpoll	12/10/92	2-144d	970	
Interpoll	6/11/93	3-075c	1000	
Interpoll	6/11/93	3-075f	1300	
Interpoll	12/10/93	3-135-Dup	710	
Interpoll	12/10/93	3-135-RW5	700	
Interpoll	6/17/94	4054-RW5	770	
Interpoll	12/15/94	4132-RW5	410	
Interpoll	7/16/95	5048-rw5	210	
Interpoll	12/7/95	5107-RW5	620	
Interpoll	6/28/96	6053-RW5	410	
Interpoll	12/12/96	6106-RW5	330	
Interpoll	7/18/97	7044-R	320	
Interpoll	12/10/97	7099-RW5	320	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Carbon tetrachloride	Health Risk Limit (HRL)= **3 ug/l**
Interpoll	12/10/93	3-135-Dup	16	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **7 ug/l**
LAB	DATE	SAMPLE #	1,1-Dichloroethylene	Health Risk Limit (HRL) = **6 ug/l**
Interpoll	12/13/91	1-145d	4.6	
Interpoll	6/5/92	2-079c	4.4	
Interpoll	12/10/92	2-144d	5.6	
Interpoll	12/10/92	2-144d	5.7	
Interpoll	6/11/93	3-075c	2.4	
Interpoll	6/11/93	3-075f	6.8	
Interpoll	12/10/93	3-135-Dup	2.9	
Interpoll	12/10/93	3-135-RW5	11	
Interpoll	12/15/94	4132-RW5	3.4	
Interpoll	7/16/95	5048-rw5	5.1	
Interpoll	12/7/95	5107-RW5	6.5	
Interpoll	6/28/96	6053-RW5	3	
Interpoll	12/12/96	6106-RW5	26	
Interpoll	7/18/97	7044-R	8.9	
Interpoll	12/10/97	7099-RW5	11	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
WADS.	2/23/88	8-061	110	
WADS.	2/23/88	8-061	110	
WADS.	2/23/88	8-061	110	
WADS.	2/23/88	8-064	130	
WADS.	4/5/88	8-105	90	
WADS.	4/5/88	8-108	95	
WADS.	6/14/88	8-147(c)	32	
WADS.	6/14/88	8-147(f)	30	
WADS.	12/9/88	8-230(c)	39	
WADS.	12/9/88	8-230(e)	52	
WADS.	6/7/89	9-053(c)	60	
WADS.	6/7/89	9-053(f)	65	
WADS.	12/6/89	9-132(c)	59	
WADS.	12/6/89	9-132(f)	51	
WADS.	6/28/90	0-062(C)	44	
WADS.	12/17/90	0-142D	27	
Interpol	6/7/91	0-081d	44	
Interpoll	12/13/91	1-145d	64	
Interpoll	6/5/92	2-079c	58	
Interpoll	12/10/92	2-144d	70	
Interpoll	12/10/92	2-144d	57	
Interpoll	6/11/93	3-075c	36	
Interpoll	6/11/93	3-075f	80	
Interpoll	12/10/93	3-135-Dup	85	
Interpoll	12/10/93	3-135-RW5	250	
Interpoll	6/17/94	4054-RW5	71	
Interpoll	12/15/94	4132-RW5	71	
Interpoll	7/16/95	5048-rw5	92	
Interpoll	12/7/95	5107-RW5	82	
Interpoll	6/28/96	6053-RW5	76	
Interpoll	12/12/96	6106-RW5	68	
Interpoll	7/18/97	7044-R	62	
Interpoll	12/10/97	7099-RW5	80	

Extraction Well RW5			Parameter ug/l	Maxium Contaminant level (MCL)= **200 ug/l**
LAB	DATE	SAMPLE #	1,1,1-Trichloroethane	Health Risk Limit (HRL) = **600 ug/l**
WADS.	12/28/87	7-246	530	
WADS.	2/23/88	8-061	380	
WADS.	2/23/88	8-061	420	
WADS.	2/23/88	8-061	430	
WADS.	2/23/88	8-064	440	
WADS.	4/5/88	8-105	350	
WADS.	4/5/88	8-108	380	
WADS.	6/14/88	8-147(c)	110	
WADS.	6/14/88	8-147(f)	100	
WADS.	12/9/88	8-230(c)	91	
WADS.	12/9/88	8-230(e)	130	
WADS.	6/7/89	9-053(c)	150	
WADS.	6/7/89	9-053(f)	160	
WADS.	12/6/89	9-132(c)	150	
WADS.	12/6/89	9-132(f)	160	
WADS.	6/28/90	0-062(C)	89	
WADS.	9/13/90	0-116e	0	
WADS.	12/17/90	0-142D	78	
Interpol	6/7/91	0-081d	91	
Interpoll	12/13/91	1-145d	94	
Interpoll	6/5/92	2-079c	150	
Interpoll	12/10/92	2-144d	240	
Interpoll	12/10/92	2-144d	240	
Interpoll	6/11/93	3-075c	95	
Interpoll	6/11/93	3-075f	0	
Interpoll	12/10/93	3-135-Dup	160	
Interpoll	12/10/93	3-135-RW5	550	
Interpoll	6/17/94	4054-RW5	190	
Interpoll	12/15/94	4132-RW5	120	
Interpoll	7/16/95	5048-rw5	120	
Interpoll	12/7/95	5107-RW5	120	
Interpoll	6/28/96	6053-RW5	57	
Interpoll	12/12/96	6106-RW5	51	
Interpoll	7/18/97	7044-R	54	
Interpoll	12/10/97	7099-RW5	45	

Extraction Well QCD01			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	12/7/95	6079-QCD01	39	

Extraction Well QCD01			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	12/7/95	6079-QCD01	2.6	

Extraction Well MW14			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw14	290	

Extraction Well MW14			Parameter ug/l	Maxium Contaminant level (MCL)= **200 ug/l**
LAB	DATE	SAMPLE #	1,1,1-Trichloroethane	Health Risk Limit (HRL) = **600 ug/l**
Interpoll	10/8/96	6079mw14	34	

Extraction Well MW14			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
Interpoll	10/8/96	6079mw14	60	

Extraction Well MW15			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw15	400	

Extraction Well MW15			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	10/8/96	6079mw15	46	

Extraction Well MW15			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
Interpoll	10/8/96	6079mw15	11	

Extraction Well MW15			Parameter ug/l	Maxium Contaminant level (MCL)= **100 ug/l**
LAB	DATE	SAMPLE #	trans-1,2-Dichloroethylene	Health Risk Limit (HRL)= **100 ug/l**
Interpoll	10/8/96	6079mw15	3.4	

Extraction Well MW15			Parameter ug/l	Maxium Contaminant level (MCL)= **200 ug/l**
LAB	DATE	SAMPLE #	1,1,1 Trichloroethane	Health Risk Limit (HRL)= **600 ug/l**
Interpoll	10/8/96	6079mw15	3.8	

Extraction Well MW21			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw21	3.4	

Extraction Well MW21			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	10/8/96	6079mw21	1.7	

Extraction Well MW21			Parameter ug/l	
LAB	DATE	SAMPLE #	Acetone	Health Risk Limit (HRL)= **600 ug/l**
Interpoll	10/8/96	6079mw21	1400	

Extraction Well MW30			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw30	16	

Extraction Well MW30			Parameter ug/l	
LAB	DATE	SAMPLE #	Acetone	Health Risk Limit (HRL)= **600 ug/l**
Interpoll	10/8/96	6079mw30	69	

Extraction Well MW35			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw35	7.1	

Extraction Well MW35			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	10/8/96	6079mw35	1.7	

Extraction Well MW36			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw36	750	

Extraction Well MW36			Parameter ug/l	Maxium Contaminant level (MCL)= **7 ug/l**
LAB	DATE	SAMPLE #	1,1-Dichloroethylene	Health Risk Limit (HRL) = **6 ug/l**
Interpoll	10/8/96	6079mw36	12	

Extraction Well MW36			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
Interpoll	10/8/96	6079mw36	85	

Extraction Well MW36			Parameter ug/l	Maxium Contaminant level (MCL)= **100 ug/l**
LAB	DATE	SAMPLE #	trans-1,2-Dichloroethylene	Health Risk Limit (HRL)= **100 ug/l**
Interpoll	10/8/96	6079mw36	50	

Extraction Well MW36			Parameter ug/l	Maxium Contaminant level (MCL)= **200 ug/l**
LAB	DATE	SAMPLE #	1,1,1 Trichloroethane	Health Risk Limit (HRL)= **600 ug/l**
Interpoll	10/8/96	6079mw36	97	

Extraction Well MW45

LAB	DATE	SAMPLE #	Parameter ug/l Trichloroethylene	Maxium Contaminant level (MCL)= **5 ug/l** Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw45	41	

Extraction Well MW46			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw46	9000	

Extraction Well MW46			Parameter ug/l	Maxium Contaminant level (MCL)= **2.0 ug/l**
LAB	DATE	SAMPLE #	Vinyl Chloride	Health Risk Limit (HRL) = **0.2 ug/l**
Interpoll	10/8/96	6079mw46	800	

Extraction Well MW14			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
Interpoll	10/8/96	6079mw14	60	

Extraction Well MW47			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw47	34	

Extraction Well MW47			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	10/8/96	6079mw47	6	

Extraction Well MW47			Parameter ug/l	Maxium Contaminant level (MCL)= **100 ug/l**
LAB	DATE	SAMPLE #	trans-1,2-Dichloroethylene	Health Risk Limit (HRL)= **100 ug/l**
Interpoll	10/8/96	6079mw47	6	

Extraction Well MW47			Parameter ug/l	Maxium Contaminant level (MCL)= **200 ug/l**
LAB	DATE	SAMPLE #	1,1,1 trichloroethane	Health Risk Limit (HRL) = **600 ug/l**
Interpoll	10/8/96	6079mw47	31	

Extraction Well MW47			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
Interpoll	10/8/96	6079mw47	18	

Extraction Well MW47			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw47	350	

Extraction Well MW48			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw48	25	

Extraction Well MW48			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	10/8/96	6079mw48	4.4	

Extraction Well MW50

			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw50	31	

Extraction Well MW51			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw51	120	

Extraction Well MW51			Parameter ug/l	Maxium Contaminant level (MCL)= **2.0 ug/l**
LAB	DATE	SAMPLE #	Vinyl Chloride	Health Risk Limit (HRL) = **0.2 ug/l**
Interpoll	10/8/96	6079mw51	14	

Extraction Well MW51			Parameter ug/l	
LAB	DATE	SAMPLE #	Acetone	Health Risk Limit (HRL)= **600 ug/l**
Interpoll	10/8/96	6079mw51	79	

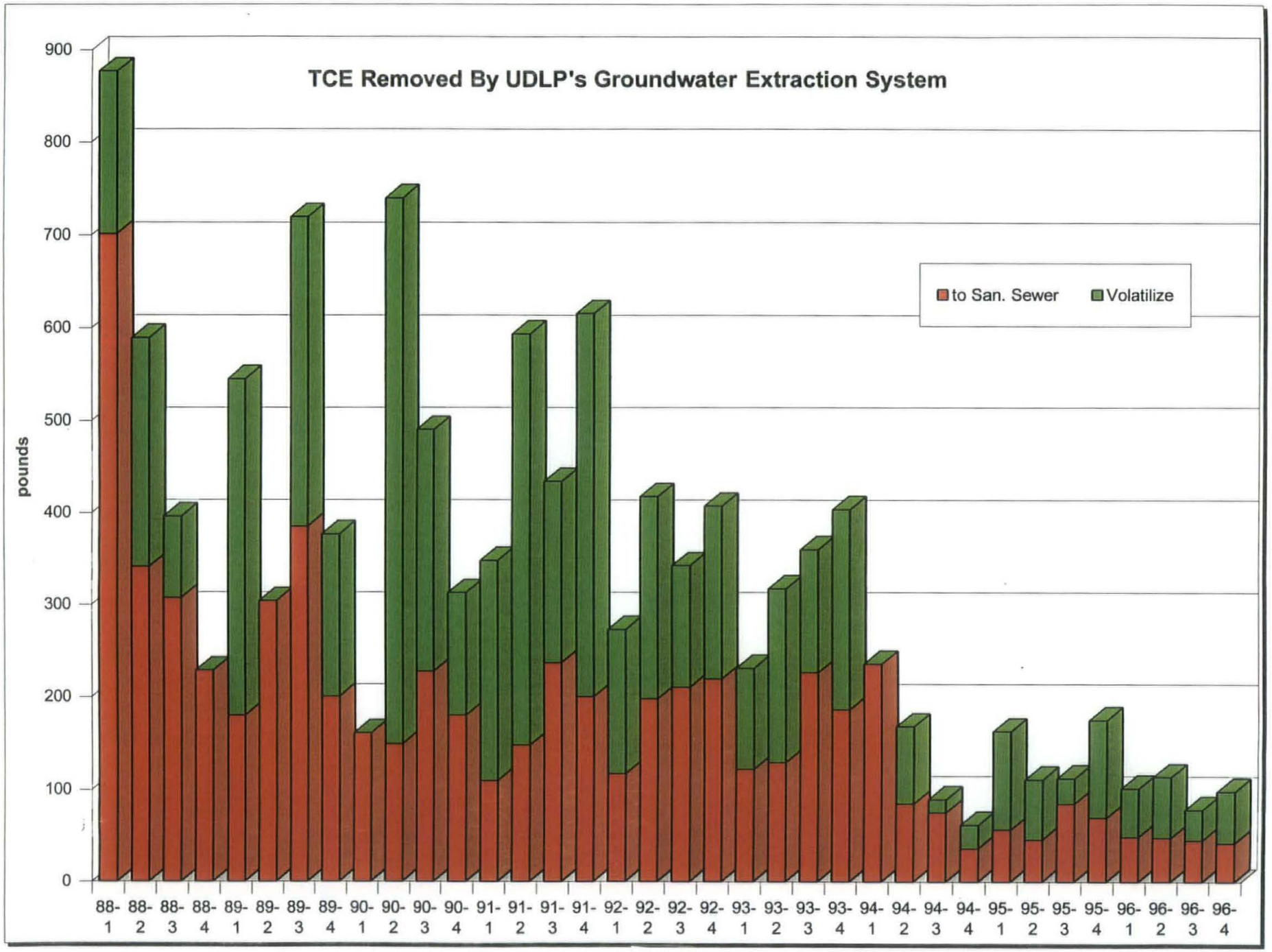
Extraction Well MW51			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Tetrachloroethylene	Health Risk Limit (HRL) = **7 ug/l**
Interpoll	10/8/96	6079mw51	13	

Extraction Well MW52			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw52	34	

Extraction Well MW54			Parameter ug/l	Maxium Contaminant level (MCL)= **5 ug/l**
LAB	DATE	SAMPLE #	Trichloroethylene	Health Risk Limit (HRL) = **30 ug/l**
Interpoll	10/8/96	6079mw54	33	

Extraction Well MW54			Parameter ug/l	
LAB	DATE	SAMPLE #	1,1-Dichloroethane	Health Risk Limit (HRL) = **70 ug/l**
Interpoll	10/8/96	6079mw54	2.1	

Appendix F
TCE Removed From UDLP Groundwater Extraction System


TCE Removed By UDLP's Groundwater Extraction System
pounds
900
800
700
600
500
400
300
200
100
0
to San. Sewer
Volatilize
88-1 88-2 88-3 88-4 89-1 89-2 89-3 89-4 90-1 90-2 90-3 90-4 91-1 91-2 91-3 91-4 92-1 92-2 92-3 92-4 93-1 93-2 93-3 93-4 94-1 94-2 94-3 94-4 95-1 95-2 95-3 95-4 96-1 96-2 96-3 96-4