



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

APR 03 1996

REPLY TO THE ATTENTION OF:

James Warner, Manager
Ground Water and Solid Waste Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

S-6J

Re: Reilly Tar And Chemical Company, St. Louis Park, Minnesota
Five-Year Review Report

Dear Mr. Warner:

U.S. EPA has reviewed the Five-Year Review Report dated March 28, 1996 developed by the Minnesota Pollution Control Agency for the subject site. The report is hereby approved.

U.S. EPA appreciates the efforts of Jim Pennino and Miriam Horneff of your staff in conducting this review. Please feel free to contact me if you have any questions.

Sincerely,

ORIGINAL COPY
WILLIAM E. MUNO

William E. Munro, Director
Superfund Division

bcc: Jennifer Wendel ✓

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**FIVE-YEAR REVIEW REPORT
REILLY TAR AND CHEMICAL COMPANY
ST. LOUIS PARK, MINNESOTA**

**Prepared By:
Minnesota Pollution Control Agency
St. Paul, Minnesota**

March 28, 1996

FIVE YEAR REVIEW REILLY TAR & CHEMICAL COMPANY

I. BACKGROUND

A. Introduction

The Minnesota Pollution Control Agency (MPCA) conducted this Five-Year Review of the remedial actions (RA) implemented as part of the 1984 and 1986 Records of Decision (RODs) at the Reilly Tar Superfund Site (Site), St. Louis Park, Minnesota, on behalf of the United States Environmental Protection Agency (EPA).

Section 121 of the Comprehensive Environmental Response Compensation and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substance Contingency Plan require review of any RA which results in substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure. The review should occur no less often than every five years after the initiation of such RA to ensure that human health and the environment are being protective.

The EPA established a three-tier approach to conducting five-year reviews, the most basic of which provides a minimum protectiveness evaluation (Level I review). EPA determines the level of the review based on Site-specific considerations, including the nature of the response action, the status of ongoing Site response activities, and proximity to populated areas and sensitive environmental areas. A Level I review was conducted for the Site, and consisted of: (1) a review of all documents associated with the RA, and (2) a Site visit on January 17, 1996.

The Site was proposed for addition to the National Priorities List (NPL) in October 1981 and was listed as final on the NPL in September 1983. It was considered by the MPCA to be the State's top priority NPL Site.

B. Site Background

Between 1917 and 1972, Reilly Industries (Reilly) operated a coal tar distillation and wood preserving plant, known as the Republic Creosoting Company (Republic). The bulk of the plant's operations took place in the southcentral and southeastern portions of the Site. These areas contained the coal tar distillation still, wood-treating building, and the aboveground and underground storage tanks (for creosote, tars, pitch and fuel oils). It was reported in 1938 that 16,000 gallons of tar could be processed per day.

A description of the plant from May 1930 follows:

There were two plants in operation, one distilling of coal tar and the other treating the ties and timbers. The coal tar was purchased from the various gas plants such as in the Twin Cities, Faribault, Mankato, Owatonna, Albert Lea, etc. The gas

companies received from 5.5 to 5 cents a gallon for coal gas tar and 5 to 2.5 cents a gallon for water gas tar. This tar is stored in several large tanks until it is pumped into the stills in the refinery. Each still has a capacity of 5200 gallons and it takes 2 days to complete a run, one for boiling out the liquids and one for removing the carbon coke residue.

The liquids given off are graded according to boiling point, the first portion is used in the by-products plant while the last is used for the treating of wood. The distilled creosote oils are used in their own treating plant and are also sold to various other treating companies such as Page and Hill Pole Company of Minneapolis.

The By-Products department was formerly used a great deal for further refining of the light coal tar oils, but at the present time the bulk of this work is done at Indianapolis.

The Treating plant consists of 3 large steel cylinders 6 feet in diameter by 170 feet long in which 21 tram cars of ties may be treated at once. These cylinders are covered by a steel and brick building, especially insulated to prevent the escape of heat from the treating oils and cylinders. The ties are prepared for treatment by a wood working machine which surfaces the tie for the rail and also bores from 8 to 12 holes for the rail spikes. By preparing the tie in this manner, no untreated portion is open to attack by decay. A boiler room with 2 boilers, various pumps, 6 large storage tanks, several miles of railroad, standard and narrow gauge with 2 engines and 300 tram cars complete the equipment needed by this plant.

When the ties are treated they are loaded directly into the cars of the railroad for removal. The railroad companies keep a tie inspector here to check the treating depth as guaranteed by the company. At the present time 75 men are employed. The maximum employed at any one time was 175.

In 1972, the plant was dismantled and the land sold to the city of St. Louis Park (City). In 1973, a storm water runoff collection system was built which fed into a lined pond on the Site. This pond discharges into a drain which is routed to another pond off-site before it eventually discharges into Minnehaha Creek. The City monitors the discharge into the creek. Construction of a block of condominiums on the northern part of the Site began in 1976. Louisiana Avenue construction was done during 1991 and 1992.

Waste Disposal Practices

From about 1917 to 1939, wastes containing coal tar and its distillation by-products were discharged, as a matter of disposal practice, overland into a ditch that ran the length of the Site and then emptied into a peat bog south of the Site. A thick accumulation of tar was present on the sides and bottom of the ditch. The waste was milky, and contained floating oil, emulsified oil and settlable tar. The road ditch between Walker Street and the plant

contained a tar accumulation of about six inches. Oily water extended over the surface of the bog and much of the vegetation and peat was covered by tar. A 1938 report by L.L. Kemps, Assistant Public Health Engineer, noted that 6,000 gallons per week of effluent (coal tar distillates and wood treating waste) were discharged into the swamp with observed flow rates of 150-200 gallons per minute (gpm).

In 1940-41, a wastewater treatment was installed, but the effluent continued to be discharged into the bog. The values of both phenols and oil and grease in the discharge water varied typically from 100 to 1000 micrograms per liter (ug/l). This discharge into the bog continued for the duration of the facility's operation.

Chemical contaminants may have also been released from a waste pond located in the main coal tar distilling/wood preserving area in the southeast corner of the Site. Soil contamination with coal tar and creosote also occurred throughout the Site during its operational history via drips from leaky piping, precipitation wash off from stockpiled treated lumber, and spills of process materials.

Wells

The Minnesota Sugar Beet Company was located on the Site prior to 1917. They used a large well (Sugar Beet Well), which was not abandoned before Republic purchased the property. It was reportedly 955 feet deep to the Mt. Simon-Hinckley sandstone with a 16 inch casing to 58 feet, and 12 inch casing to 150 feet. Apparently, the well driller's tools were lost in the hole when it was drilled in 1898. The well must have been accessible since children habitually dropped things down the hole. In 1917, Republic cleaned out the Sugar Beet Well and added a 10 inch casing to 150 feet.

There were 12 additional wells on the Site from the time of the sugar beet factory, some of which were 50-60 feet deep, and others 100-200 feet deep. Based on the clogging information, the wells were probably located in the middle and lower drift aquifers. It does not seem these wells were abandoned by Republic. Investigations to locate and seal these wells have been completed.

An additional deep well (W23) was drilled by Republic in 1918, 909 feet into the Mt. Simon-Hinckley sandstone. In 1933, 10 inch casing was added to a depth of 73 feet, 8 inch casing to 260 feet and 4.5 inch casing to 373 feet. Waste materials were apparently dumped into or flowed into this well. One document from the 1930s stated that Reilly had a waste well into which they ran their refuse oil. A letter from McCarthy Well Company stated that two old abandoned wells were found at the Republic plant which were being used to drain creosote down to the ground. A 1940 letter states that this well water was never used for drinking purposes due to taste and odor.

Ground water contamination

The creosote and waste products resulting from the processes polluted the surface of the Site and four aquifers. The deep aquifers were polluted by direct migration of contaminants within the aquifers via W23. Consequently, many private wells and eventually municipal supplies became contaminated with polynuclear aromatic hydrocarbons (PAHs).

By 1932, water in the Prairie du Chien-Jordan Aquifer, the region's source of ground water, was contaminated 3,500 feet from the facility. The City drilled its first municipal well, W112, in 1932 to the Prairie du Chien-Jordan Aquifer at 393 feet (and cased the entire depth). The water in the well had a "very pronounced creosote taste and odor", so the City extended the well down another 150 feet through the St. Lawrence confining bed. This did not alleviate the taste problem, however, and a trace of phenol was reported. This well was closed within two weeks of its startup. One of the two deep wells at the Reilly plant was discussed as being the source of the contamination of W112. Also at this time, the Reilly facility cased W23 to 373 feet.

During the 1930s and 1940s, several private wells near the Site complained of contamination in water drawn from the Drift-Platteville Aquifer. The first written complaint from a resident in the vicinity, about a phenol taste in his well water, occurred in 1938. Users of commercial wells in the St. Peter and Prairie du Chien-Jordan also commented on the presence of phenolic tastes in their well water.

St. Louis Park (SLP) well-10 and SLP-15, which are contiguous, were closed in November 1978 due to elevated levels of PAHs in the untreated water. SLP-7 and SLP-9 were also closed due to their proximity to the contaminated plume and due to the concern that, with SLP-10 and SLP-15 shut down, the hydraulic gradient would be controlled by SLP-7 and SLP-9 and thus, those wells would quickly become more contaminated. In December 1979, SLP-4 and SLP-5 were also closed due to elevated PAH concentrations. The amount of water supply lost to the City due to the closure of six wells was approximately 35% of the capacity existing prior to 1978. Consequently, the City instituted a water conservation program during the summer, increased pumping rates at uncontaminated wells, and drilled SLP-17 to the deeper Mt. Simon-Hinckley Aquifer. The City also purchased a limited amount of water from the neighboring city of Plymouth. Since 1978 the Reilly and the City have constructed treatment plants for wells SLP-4, SLP-10, and SLP-15. Water from these wells is now treated and added to the distribution system so that special conservation measures are normally no longer necessary.

In 1979, 28 multi-aquifer wells were abandoned or reconstructed to prevent the spread of contamination. A plan for a gradient control well system was drawn up in 1981.

C. Remedial Objectives

Operable Unit 1

Restoration of drinking water supply to St. Louis Park

Operable Unit 2

1. Containment or treatment of ground water in contaminated aquifers
2. Source control of the bog and contaminated soil at the Site. Because of the large volume of soils remaining at the site, this source could not be cost effectively addressed. The focus of the RA has been the maintenance of a site soil cover and containment and removal of contaminated ground water.

Operable Unit 3

The interception and containment of contaminants by use of gradient control wells which will prevent the further spread of contaminated ground water in the Northern Area of the Drift Aquifer. Continued water level and water quality monitoring of the aquifer.

Operable Unit 4

The interception and containment of contaminants by pumping well number W410 in the St. Peter Aquifer. Also included in this operable unit is continued water level and water quality monitoring of the aquifer

Operable Unit 5

The interception and containment of contaminants by use of a gradient control well which will prevent the further spread of contaminated ground water in the Northern Area of the Platteville Aquifer. Also included in this operable unit is continued water level and water quality monitoring of the aquifer.

D. Summary of RAs

This 5-year review will cover all RAs at the Site. The Site has been broken up into five operable units. Operable Unit 1 consists of the RA selected in the June 6, 1984, ROD. Operable Unit 2 consists of 11 RAs contained in the May 30, 1986, Enforcement Decision Document (EDD). Two of the RAs in the EDD called for additional Remedial Investigation/Feasibility Study (RI/FS) work in portions of the Drift/Platteville and St. Peter Aquifers. This RI/FS work resulted in three additional Operable Units. RAs for Operable Unit 3 were contained in a ROD issued September 30, 1992. RAs for Operable Unit 4 were contained in a ROD issued September 30, 1990. RAs for Operable Unit 5 were contained in a ROD issued June 30, 1995.

It was determined to not be cost-effective to address the contaminated soils at the Site because of the large volume of soils that would have to be removed. The EPA and MPCA instead focused their efforts on ground water containment.

Operable Unit 1 RA

1. Restoration of the drinking water supply and water quality by construction of a Granulated Activated Carbon (GAC) treatment system for SLP-10 and SLP-15.

On December 27, 1985, Calgon Corporation, under contract to Reilly, completed the construction of the GAC treatment plant to filter contaminants from water from SLP-10 and SLP-15. After a period of testing and adjustment to eliminate potential backflow problems, the plant began full operation on July 9, 1986. The system consists of two tanks or columns filled with powdered carbon which filters out the contaminants in the well water. The water is obtained from the Prairie du Chien Aquifer. The flow of water from the wells is split between the two tanks and the filtered water is discharged to the City's distribution system.

The City analyzes the quality of the water being discharged to the water supply on a quarterly basis. If the analyses indicate that the concentration of the chemicals or groups of chemicals listed in Table 1 are exceeded, or are approaching the drinking water criteria, sampling frequency is increased to confirm the need for replacing the GAC. When concentrations approach or exceed the criteria in Table 1, the treated water is discharged to Twin Lakes, a surface water body which discharges to Cedar Lake. This is done to maintain control of contaminant migration in the Prairie du Chien Aquifer. The City is required by the Consent Decree (CD) to pump a minimum of 10 million gallons of water from these two wells combined in each calendar month to ensure control of contaminant migration. When sampling data indicate a need to change the GAC, the City shuts the wells down for a few weeks while fresh GAC is obtained and replaced in the treatment columns. However, the City maintains pumping and treatment at higher rates during the remainder of the month in which the GAC is replaced. This allows the City to maintain the minimum pumping volume required by the CD/Response Action Plan (RAP) for the month without discharging to surface water during GAC replacement. The City plans to continue to improve the efficiency of this method and implement it on a regular basis in order to completely eliminate the need for a discharge to surface water.

Operable Unit 2 RA

1. Monitoring and contingency treatment of the Mt. Simon-Hinckley Aquifer to maintain drinking water quality.

Under the requirements of the CD/RAP section 5, the City is required to monitor the water quality in the Mt. Simon-Hinckley Aquifer and to provide contingent remediation if the aquifer becomes contaminated. The City currently monitors four wells screened in this

aquifer: SLP-11, SLP-12, SLP-13 and SLP-17. These are all water supply production wells. In addition, the City is required to monitor any new wells developed in this aquifer within one mile of the Site. As of 1993, no contamination has been detected in this aquifer. After 30 years of monitoring, the City will submit a plan to determine whether continued monitoring is necessary and whether assurances should be provided that, should contamination occur after 30 years, remediation would be implemented.

The location of the St. Louis Park wells in this aquifer are shown on Figure 1.

2. Monitoring, pumping and treatment of the Ironton-Galesville Aquifer to protect the deeper Mt. Simon-Hinckley Aquifer.

The Sugar Beet Well is also known as W105. W105 was reconstructed by the MPCA in 1984 to serve as a source control well to remove coal tar contaminants in the Ironton-Galesville Aquifer beneath the Site. Pumping of this well began in 1988, with discharge to the sanitary sewer. However, concentrations of PAH contaminants were low and in 1991, the City requested that pumping cease. On December 4, 1991, the EPA and the MPCA approved the request and pumping was terminated on December 31, 1991.

The location of the area of contamination in the Ironton-Galesville Aquifer is shown on Figure 2.

In 1993, the City rerouted the discharge piping for well W23 and W105 to a treatment plant located on Lake and Louisiana Streets south of the Site. If future pumping of W105 is necessary, the water will be treated and discharged to surface water under an existing National Pollutant Discharge Elimination System (NPDES) permit for this treatment system. Monitoring of the water quality in W105 is ongoing.

3. Monitoring, pumping and treatment of the Prairie du Chien-Jordan Aquifer until such time that drinking water quality is uniformly established within the area of gradient control.

Twenty-six wells are presently included in this RA. These include municipal production wells in Edina, Hopkins, Minnetonka, and St. Louis Park (including wells SLP-10 and SLP-15 discussed elsewhere in this document); source control wells to remove contamination beneath and in the vicinity of the Site; and gradient control wells in the vicinity of the Site installed to prevent the further migration of contaminated ground water.

The location of the area of contamination in the Prairie du Chien-Jordan Aquifer is shown on Figure 3.

At least one well (W23) was used by Reilly. During the environmental investigation of the Site, W23 was found to be partly filled with coal tar. When drilled in 1917, it was 909 feet deep and may have permitted the flow of water out of the Prairie du Chien-Jordan

Aquifer and into the underlying Iron-ton-Galesville and Mount Simon-Hinckley Aquifers. By early 1977, water was moving into the Prairie du Chien-Jordan Aquifer from the overlying St. Peter Aquifer. A downhole television camera survey and geophysical logging in 1978 showed that the well was 595 feet deep, visibly contaminated, and that water was entering the well bore through holes in the casing adjacent to the St. Peter sandstone. About 150 gpm water was leaking into the well bore, flowing downward, and entering the Prairie du Chien through another hole in the casing (United States Geological Service Report January 1981). In 1981, the MPCA cleaned out both W23 (to a depth of 866 feet) and W-105. Coal tar was removed down to a depth of 740 feet in W23, which was then reconstructed as a Prairie du Chien-Jordan well for use as a pump-out well.

The CD/RAP requires that W23 be pumped at an average 50 gpm and to continue for at least five years or until concentrations in the well water decline to 10,000 parts per trillion (ppt) total PAH. A review of Annual Progress Reports from 1987 through 1994 indicates that W23 was pumped such that the annual average monthly pumping rate of 50 gpm was maintained except during 1993, when the well was down for discharge main repair and other maintenance and only four months of continuous pumping were possible. Review of the 1993 Annual Monitoring Report indicates that the water quality for total PAH concentration is still well above the cessation criteria. Water from this well is discharged to the same treatment plant and must meet the same requirements for discharge as W105.

The CD/RAP requires that SLP-4 be pumped at 900 gpm as a gradient control well until water quality in this well and monitoring wells in the vicinity are each less than the drinking water standard. Pumping of this well began in August 1992. Currently, concentrations are slightly above the total PAH criteria for drinking water.

The treatment plant for SLP-4 is operated similarly to the SLP-10/SLP-15 plant. Water is pretreated with a pressurized sand filter to remove iron. The sand filter is periodically backwashed to remove iron and manganese buildup on the sand and the iron laden wastewater from the backwash is settled in a tank. The supernatant is recycled to the carbon treatment and is placed in the City's distribution system with the other treated water. Sludge from the settling tank is discharged to the sanitary sewer. Sanitary sewer discharges are sampled as at SLP-10/SLP-15.

W48, the Methodist Hospital well, is no longer pumping because the hospital does not use it anymore as a source of cooling water. The City and MPCA are currently evaluating the need to retain this well as a gradient control well.

4. Monitoring and contingent action for the maintenance of drinking water quality in the St. Peter Aquifer.

Additional details concerning the remedial action in the St. Peter Aquifer are provided below under the sections pertaining to Operable Unit 4.

Twelve wells are used to meet the requirements of this RA. Municipal well SLP-3 and well W410 are pumping wells. Most of the wells are monitoring wells installed as a result of the RI work performed in 1988. Only one well is used as a gradient control well, W410.

Since 1988, samples for PAH compounds have been collected from selected monitoring wells in the St. Peter Aquifer, generally twice per year. During each round of sampling, water level measurements are also collected. The RI work confirmed the presence of contaminants in several wells above the CD drinking water criteria.

The location of the area of contamination in the St. Peter Aquifer is shown on Figure 4.

5. Monitoring, pumping and treatment of the Drift and Platteville Aquifers to protect the downgradient use of the aquifer and the deeper St. Peter Aquifer.

The purpose of this RA is to control migration of contaminants in the Drift and Platteville Aquifers outside the Northern Area. RAs in the Northern Area are discussed under Operable Unit 3, Drift Aquifer of the Northern Area, and Operable Unit 5, Platteville Aquifer of the Northern Area. The contaminants in the Drift and Platteville Aquifers may have originated from Site discharges to surface water bodies which then leached to the underlying soil and Platteville. In addition, downgradient (to the southeast) migration of contaminants from the Drift and Platteville could result in contamination of the St. Peter via an erosional trough (also known as a buried valley) through the Platteville and Glenwood Shale which normally protect the St. Peter from the downward migration of contaminants.

The location of the area of contamination in the Drift and Platteville Aquifers is shown on Figure 5

This RA consists of a gradient control well in the Drift Aquifer, W422, and a source control well, W420. The Platteville Aquifer has a source control well, W421. These wells have been monitored quarterly since 1987 when pumping began.

The water treatment system for these three wells includes prefiltering with a continuous backwashing sand filter. Periodically, the sand filter is aerated by hand to enhance iron and manganese removal. A small portion (about 10 to 15 gpm) of the raw water is diverted from the sand filter to the sanitary sewer without carbon treatment. This water meets sanitary sewer water quality standards while reducing treatment costs. The remainder of the water, about 120 gpm, is treated and discharged to the storm sewer and is required under an NPDES permit to meet drinking water criteria. Wastewater from sand filter backwashing is recycled through the system and settled iron sludge is discharged to the sanitary sewer. Sampling of the sanitary sewer and storm sewer discharge is performed as at SLP-10/SLP-15.

The City has initiated a contingent action to protect the St. Peter Aquifer by preventing the migration of contaminated ground water in the Drift and Platteville into the buried valley southeast of the site. Contaminants entering the buried valley, which is filled with drift deposits, could migrate downward and laterally into the St. Peter Aquifer. This contingent RA consists of the installation of a gradient control well, W434, in the Platteville Aquifer. The well has been installed but has not yet started pumping. Pumping should begin in 1996. This well will initially discharge to the sanitary sewer.

In addition to the above RAs, a well search and survey was conducted to locate previously undiscovered multi-aquifer wells in the area of the Drift and Platteville Aquifers which have become contaminated since the previous well survey or in contaminated areas which were not covered in previous surveys. The results of this survey were provided in a 1995 report which indicates that no additional multi-aquifer wells could be located.

6. Monitoring, pumping and treatment of the source material in the Glacial Drift Aquifer and in well W23 in the Prairie du Chien-Jordan Aquifer.

An evaluation of W23, which is located in the Prairie du Chien-Jordan Aquifer, is discussed under Operable Unit 2, Item 3.

A discussion of the RA for the Glacial Drift Aquifer is included under Operable Unit 2, Item 5.

7. Capping and filling of exposed hazardous wastes in the vicinity of the bog, south of the Site, in accordance with the U.S. Fish and Wildlife and EPA regulations.

The bog and wetland areas are located adjacent to the southeast corner of the Site, south of Walker Street and north of Highway 7. A U. S. Fish and Wildlife Service biologist inspected the area in question on January 6, 1987, and determined that requirements of the RAP and Work Plan for the wetlands had been met. The Work Plan for this project had been prepared in accordance with Sections 11.3.1 and 11.3.1.3 of the CD/RAP and had been approved by the MPCA, EPA, and the Department of the Interior.

The location of the wetland filling areas are shown on Figure 6.

8. Discharge of hazardous wastes to a sanitary sewer for any contaminated material excavated and dewatered for the purposes of construction of an intersection in the vicinity of the bog.

A memorandum of understanding (MOU) between the Minnesota Department of Transportation, MDH and MPCA was entered into in 1978 to prevent construction of the intersection at Highway 7 and Louisiana Avenue, because construction would interfere with the RI. The MOU was redrafted in 1984 to allow for construction of the intersection subject to the following restrictions: 1) the peat should be surcharged to permit it to support a roadway, in lieu of massive excavation of peat; 2) water removed from the peat

during surcharging should be collected and discharged to the sanitary sewer; 3) any contaminated soil which is excavated must be handled in accordance with State and federal hazardous waste rules and regulations, if applicable; and 4) monitoring wells and piezometers which are in the path of construction must be closed in accordance with MDH requirements, and other monitoring wells and piezometers located near the proposed roadway must be either properly closed or protected, as directed by MPCA and MDH staff.

In 1991 and 1992 the road construction work was completed. As a result of this work, 400 cubic yards of contaminated soil was generated. This soil was disposed of at the U.S. Pollution Control Inc. landfill in Rosemount, Minnesota.

No information was located indicating that contaminated water was generated during this work.

9. Further subsurface investigation in the vicinity of the Site, to implement deed restrictions for current and future land use in the areas of contamination.

The purpose of this RA was to investigate soil conditions in the vicinity of the Site in order to identify areas of contamination that may affect future development near the Site and to provide a basis for institutional controls that may be necessary if and when development occurs. The work consisted of at least 20 borings to minimum depth of 35 feet in an area bounded by Lake Street on the north, Monitor Street and an imaginary line connecting Monitor Street and Methodist Hospital on the east, Minnehaha Creek on the south, and Taft Avenue and an imaginary line connecting Taft Avenue and Minnehaha Creek on the west. The location of this area is the shaded area on Figure 6.

10. Further RI/FS to determine the areal extent of, and remedy for, the contamination in the Northern area of the Glacial Drift Aquifer adjacent to the Site.

In the past, the Drift and Platteville aquifers were considered to be part of the same aquifer system, and were treated as such in the CD/RAP. However, further investigations have shown that the Drift and Platteville aquifers have distinctly different hydrogeologic properties. The MPCA and EPA have determined that, for purposes of remediation, the two aquifers should be considered separately. For this reason, the goals and alternatives defined in the CD/RAP for the Drift-Platteville aquifer are now applied independently to the two aquifers and have been organized into separate operable Units. Operable Unit 3 is the Northern Area Drift Aquifer and Operable Unit 5 is the Northern Area Platteville Aquifer. The remaining areas of the Drift and Platteville aquifers are covered by Operable Unit 2.

The CD/RAP required an investigation and response action in the Drift and Platteville Aquifers in the northern area. The CD/RAP called for six monitoring wells in this area and an evaluation of the need for gradient and source control of contaminants. The Northern Area of the Drift-Platteville Aquifer is an area east of the Site, bounded by west

32nd Street to the north, Alabama Avenue to the east, Highway 7 to the south, and Louisiana Avenue to the west.

RI work plans for the Northern Area of the Drift-Platteville Aquifer were first submitted in 1986, and the RI completed in 1992. A ROD was issued for the Northern Area of the Drift Aquifer on September 30, 1992. A ROD was issued for the Northern Area of the Platteville Aquifer on June 30, 1995.

These RAs are further discussed below: Operable Unit 3 for the Northern Area Drift Aquifer and Operable Unit 5 for the Northern Area Platteville Aquifer.

Operable Unit 3 RA

This remedy addresses only the Northern Area of the Drift Aquifer, and is intended to contain the spread of PAH-contaminated ground water in this aquifer.

The major components of the selected remedy include:

- The interception and containment of contaminants by use of gradient control wells which will prevent the further spread of contaminated ground water in the Northern Area of the Drift Aquifer.
- The discharge from the new wells will initially be routed to the sanitary sewer for treatment at the Metropolitan Council Environmental Services (MCES) wastewater treatment plant to remove contaminants from the collected ground water.
- Continued water level and water quality monitoring of the ground water contaminant plume during remediation activities.
- Within three to five years, MPCA anticipates that the water quality of the ground water will be improved sufficiently to meet NPDES limits. This would allow the City to route the ground water pumped from the gradient control wells to a storm sewer for eventual discharge to Minnehaha Creek. If necessary, an on-site treatment facility will be built to ensure that the ground water meets NPDES limits.

The Drift Aquifer lies between zero and 90 feet below the surface. There are no wells in the area that use the Drift Aquifer for drinking water. However, the contamination in this aquifer has the potential to spread to other drinking water supplies and/or aquifers. This RA is intended to limit the further spread of contamination in an area called the Northern Area of the Drift aquifer, which is an area east of the Site, bounded by west 32nd Street to the north, Alabama Avenue to the east, Highway 7 to the south, and Louisiana Avenue to the west.

Section 9 of the CD/RAP specifies the installation and operation of one or more gradient control wells to prevent the further spread of ground water in the Northern Area

exceeding the drinking water criteria defined in Section 2.2 of the RAP. The gradient control well will capture ground water flow from the source and limit the spread of contamination.

The gradient control system for the Northern Area Drift Aquifer, which currently consists of Well 439 (W439), was inspected and approved by the agencies on January 3, 1995. W439 was screened in the lower one-third of the Drift Aquifer to maximize available drawdown. The well has a 30 foot screen and is 90 feet deep.

W439 pumps at an average monthly rate of 25 gpm and discharges to the sanitary sewer manhole on Gorham Avenue. The discharge will be monitored quarterly for carcinogenic PAHs, other PAHs, and phenolics.

Operable Unit 4 RA

This remedy addresses only the St. Peter Aquifer, and is intended to contain the spread of PAH-contaminated ground water in this aquifer.

The major components of the selected remedy include:

- The interception and containment of contaminants by pumping well W410 at a rate of 65 to 100 gpm.
- The discharge from the well will initially be routed to the sanitary sewer for treatment at the MCES wastewater treatment plant to remove contaminants from the collected ground water.
- Continued water level and water quality monitoring of the ground water contaminant plume during pumping remediation activities. This is not only to document the effectiveness of the remedy but also to determine the need for on-site treatment.
- Within three to five years, MPCA anticipates that the water quality of the ground water pumped from W410 will be improved sufficiently to meet NPDES limits. This would allow the City to route the ground water pumped from W410 to a storm sewer for eventual discharge to Minnehaha Creek. If necessary, an on-site treatment facility will be built to ensure that the ground water meets NPDES limits.

Under provisions of the Section 8 of the CD/RAP, a RI of the St. Peter Aquifer was completed in 1989. Five new St. Peter Aquifer monitoring wells were installed and a total of 13 wells were monitored for water quality as part of the RI. Two rounds of ground water monitoring were completed during the RI and a third afterwards. Since 1988 two rounds of samples for PAH compounds have been collected from selected monitoring wells in the St. Peter Aquifer. During each round of sampling, water level measurements are also collected. The RI work confirmed the presence of contaminants in several wells above the CD drinking water criteria.

The results of the RI indicated that a gradient control well was needed, and, after a FS was performed in 1990, monitoring well W410 was reconstructed and placed into service on May 30, 1991. This well is required to pump at a rate of 65 to 100 gpm. Since 1991, this well has been pumped at an average monthly rate of at least 70 gpm. The water from well W410 is discharged to the sanitary sewer.

The location of the area of contamination in the St. Peter Aquifer is shown on Figure 4.

Operable Unit 5 RA

This remedy addresses only the Northern Area of the Platteville Aquifer, and is intended to contain the spread of PAH-contaminated ground water in this aquifer.

The major components of the selected remedy include:

- The interception and containment of contaminants by use of a gradient control well which will prevent the further spread of contaminated ground water in the Northern Area of the Platteville Aquifer.
- The discharge from the new well will initially be routed to the sanitary sewer for treatment at the MCES wastewater treatment plant to remove contaminants from the collected ground water.
- Continued water level and water quality monitoring of the ground water contaminant plume during remediation activities.
- Within three to five years, MPCA anticipates that the water quality of the ground water will be improved sufficiently to meet NPDES limits. This would allow the City to route the ground water pumped from the gradient control well to a storm sewer for eventual discharge to Minnehaha Creek. If necessary, an on-site treatment facility will be built to treat the ground water discharged from the gradient control well.

Contamination in the Northern Area of the Platteville Aquifer exists in the form of dissolved concentrations of PAHs in the ground water. Dissolved PAHs in the Drift Aquifer may have leaked downward into the Platteville. The Platteville may have also been contaminated by sources such as former leaking multi-aquifer wells and direct contact between the aquifer and source areas such as the wetlands where surface runoff had carried contaminants from the former Reilly facility.

The Platteville Aquifer lies between 70 and 100 feet below the surface. There are no wells in the area that use the Platteville for drinking water. However, the contamination in this aquifer has the potential to spread to other drinking water supplies and/or aquifers. This RA is intended to limit the further spread of contamination in an area east of the Site,

bounded by west 32nd Street to the north, Alabama Avenue to the east, Highway 7 to the south, and Louisiana Avenue to the west.

Section 9 of the CD/RAP specifies the installation and operation of one or more gradient control wells to prevent the further spread of ground water in the Northern Area of the Platteville Aquifer exceeding the drinking water criteria defined in Section 2.2 of the RAP. The gradient control well will capture ground water flow from the source and limit the spread of contamination.

A RI of the Drift-Platteville Northern Area was conducted in 1989 with supplemental work done in 1990 and 1991. On October 12, 1994 the Agencies approved an amended FS for the Northern Area Platteville Aquifer and a ROD was signed on June 30, 1995. The ROD called for the drilling of a gradient control well, W440, and pump and control equipment to be installed in an existing building in 1996. The pumping rate for well W440 will depend on the extent of contamination evidenced by the results of ground water monitoring.

For the first five years following the signing of the ROD, ground water samples will be collected on a semiannual basis from 24 Drift and Platteville wells in and adjacent to the Northern Area. These wells will be sampled for carcinogenic and other PAHs, and the sampling results will be reported in the Annual Monitoring Report. After five years, the number of wells sampled and the frequency of sampling will be reevaluated. Water level measurements will be taken at all the above wells on a quarterly basis for the first year and semiannually thereafter.

W440 will initially discharge to the MCES wastewater treatment plant for treatment of the contaminated ground water. The discharge may be routed to the storm sewer for eventual discharge to a surface water body. If necessary, an on-site treatment plant will be constructed to treat the ground water to meet NPDES permit requirements.

E. Applicable or Relevant And Appropriate Requirements (ARARs)

The RAs implemented at this Site must meet all identified ARARs. Specifically, the remedy must be evaluated to determine that it meets any newly promulgated or modified federal and state environmental laws. The ARARs that generally apply to this Site are listed below:

Drinking Water Supply

1. Safe Drinking Water Act (SDWA). 40 CFR Parts 141-143. Establishes maximum contaminant levels.
2. Minnesota Rules chapter 4720. Minnesota public water supply code. Establishes standards for construction, treatment, and monitoring of public water supplies.

3. Minnesota Rules chapter 4725. Water well code. Establishes standards for the construction, maintenance and sealing of wells.
4. Minnesota Rules pts. 4717.7100 - 4717.7650. Establishes Minnesota Health Risk Limits (HRLs).
5. Resource Conservation and Recovery Act (RCRA). Applies to disposal of carbon used to treat contaminated ground water prior to discharge of the treated water to the City's distribution system.
6. Minnesota Rules pt. 7001.050. Establishes terms and conditions of NPDES permits.
7. Clean Water Act. NPDES permit for surface water discharge.

Ground Water Remedial Action and Monitoring

1. Minnesota Rules 4725. Water well code. Establishes standards for the construction, maintenance and sealing of wells.
2. Minnesota Statutes Section 115.063. Establishes protecting ground water as a potable water source.
3. Minnesota Statutes Section 115.44. Classifies surface waters of the state.
4. Minnesota Rules 7001.050. Establishes terms and conditions of NPDES permits.
5. Clean Water Act. NPDES permit for surface water discharge. Pretreatment requirements for discharge to Publicly Owned Treatment Works.

Capping of Bog

1. Fish and Wildlife Regulations.

ANALYSIS OF ARARS

Operable Unit 1

The following ARAR analysis applies to restoration of the drinking water supply and water quality by construction of a GAC treatment system for SLP-10 and SLP-15.

1. Evaluation of Drinking Water ARARs

This remedy meets all ARARs listed. The remedy has not previously been evaluated in terms of the new Minnesota Department of Health (MDH) HRL. Table 1 lists the original drinking water criteria listed in the CD and compares them to the new HRLs where available.

TABLE 1
Drinking Water Criteria

	CD/RAP/ROD	HRLs
Sum of benzo(a)pyrene and dibenzo(a,h)anthracene	5.6 ng/l	NONE
Carcinogenic PAHs	28.0 ng/l	56.6 ng/l
Other PAHs	280.0 ng/l	35,000,000 ng/l

ng/l = nanograms/liter

A comparison of the values in Table 1 indicates that the remedy will meet the new HRL requirements for total carcinogenic and other PAHs. However, since there is no HRL for dibenzo(a, h)anthracene, it is not possible to compare the new sum for these two carcinogenic compounds with the CD criteria. The MDH has established a calculation for the additivity effects of chemicals when there is exposure to more than one compound. The MPCA toxicologist compared the criteria above with the additivity calculation and determined that the additivity calculation would not result in more protective criteria than those established in the CD.

2. Evaluation of Surface Water Quality ARARs

When water pumped from SLP-10 and SLP-15 cannot be discharged to the drinking water distribution system due to contaminant concentrations which approach or exceed drinking water criteria, it is discharged to surface water. Water continues to pass through the GAC before it is discharged to surface water. Although the quality of the discharge water may exceed drinking water standards, contaminant concentrations are well below surface water standards. The discharge to surface water must comply with the surface water standards. The standards in existence at the time of the CD, as was the case of the drinking water criteria, were incorporated into the CD. Table 2 lists the surface water discharge criteria in section 2.5 of the CD/RAP. Current requirements for discharge to surface waters are established under NPDES permits issued by the MPCA Water Quality Division (WQD). The discharge from treatment of water from SLP-10/SLP-15 (Plant 1) is managed under permit number MN G640084. Table 3 lists the discharge standards for this permit.

TABLE 2
Consent Decree Surface Water Criteria

	<u>Daily Max.</u>	<u>30 day Avg.</u>
Carcinogenic PAHs	none	0.311 ug/l
Other PAHs	34 ug/l	17 ug/l
Phenanthrene	2 ug/l	1 ug/l
Phenolics	none	10 ug/l

TABLE 3
Effluent Limitations

Total Suspended Solids	30 mg/l monthly average
pH	between 6 and 9
mg/l = milligrams per liter	

Comparison of concentrations from analyses of grab samples of treated water with the daily maximum column in Table 2 indicates that daily maximum concentrations have not been exceeded. Occasional samples were collected of the raw water (before treatment) and analyzed for other PAHs. These results never exceeded the daily maximum values listed above.

The MPCA WQD staff evaluated the discharge from the GAC plant submitted by the City and have determined that the discharge has met the standards imposed by the NPDES permit.

3. Evaluation of RCRA ARARs

Treatment of the well water using GAC results in the generation of spent carbon when the absorption capacity of the carbon is reached. The carbon is regenerated at an off-site facility and is not disposed of in a land disposal facility. Spent carbon from the treatment of well water is periodically tested for Toxicity Characteristic Leaching Procedure (TCLP) parameters and has not been found to be hazardous, but it is shipped to a facility permitted for the regeneration of hazardous spent carbon. The last TCLP test was in 1995.

Operable Unit 2

1. Monitoring and contingency treatment of the Mt. Simon-Hinckley Aquifer to maintain drinking water quality.

ARARs for this response action are being met. Review of the most recent available annual monitoring report indicates that ground water quality remains suitable for drinking.

2. Monitoring, pumping and treatment of the Ironton-Galesville Aquifer to protect the deeper Mt. Simon-Hinckley Aquifer.

The agencies have agreed to allow cessation of pumping of well W105. Therefore, there are no applicable ARARs to meet with respect to discharges from this well. Review of the most recent available annual monitoring report indicates that ground water quality remains below the 10,000 ppt criteria established in section 6 of the CD/RAP.

3. Monitoring, pumping and treatment of the Prairie du Chien-Jordan Aquifer until such time that drinking water quality is uniformly established within the area of gradient control.

Of the 26 wells monitored as part of this RA, seven have exceeded drinking water criteria during recent years. However, no municipal drinking water was affected by these exceedances since the water from the municipal wells is treated by carbon filtration. Source control and gradient control wells continue to operate since monitoring wells show exceedances of drinking water criteria. Discharges from these wells to the MCES are in compliance with the MCES pretreatment requirements under the Clean Water Act. Those wells that discharge directly to surface water are in compliance with the NPDES permit.

Spent carbon from the treatment of well water is periodically tested for TCLP parameters and has not been found to be hazardous, but it is shipped to a facility permitted for the regeneration of hazardous spent carbon. The last TCLP test was in 1995.

4. Monitoring and contingent action for the maintenance of drinking water quality in the St. Peter Aquifer.

Drinking water ARARs apply to well SLP-3. This well is occasionally used for drinking water by the City during peak demand. Available monitoring data indicates that the water quality from this well is suitable for drinking when mixed with water from other Prairie du Chien well water. There is no discharge from this well to surface water or to the sanitary sewer.

Other wells in the St. Peter Aquifer remain above drinking water criteria, although some are showing decreasing concentration trends. Most of these wells are within the capture of the gradient control well W410. W410 discharges to the sanitary sewer. Cessation criteria for this well will be established when a request is made by the City. The recommendations section below addresses those wells that lie outside the influence of the gradient control well.

5. Monitoring, pumping and treatment of the Drift and Platteville Aquifers to protect the downgradient use of the aquifer and the deeper St. Peter Aquifer.

There are three wells currently used as gradient control or source control wells in these two aquifers outside the Northern Area. The discharges for these wells are treated and discharged to surface water under standards established under NPDES permit number MN 0045489. The current permit effluent limitations are listed in Table 4 below. This permit expired in 1995 and the City has applied for a new permit which is being processed by the MPCA. The new standards, if any, have not yet been established.

A fourth gradient control well for the Platteville Aquifer (W434) is planned for operation in 1996. Discharge from this well will be to the sanitary sewer under an MCES permit.

TABLE 4
Effluent Limitations for Treated Water from Wells W23, W420, W421

PARAMETER	QUARTERLY AVERAGE	MONTHLY AVERAGE
Total Carcinogenic PAHs	0.070	0.311
Total Other PAHs	12.0	17.0
Phenanthrene	1.0	2.0
Phenolic Compounds	10.0	--
Iron	1000	--
Manganese	1000	--
pH	--	between 6 and 9
All values in micrograms per liter		

The MPCA WQD staff evaluated well water quality data for the discharge from the treatment of these wells and has determined that the discharge has met the standards imposed by the NPDES permit. MCES discharge requirements have also been met.

Some of the wells in the Drift and Platteville Aquifers exceed drinking water criteria established in the CD/RAP. Most of these wells are within the influence of a existing or planned gradient control or source control wells. The recommendations will address those wells which may be outside the control of these pumping wells.

There are also some monitoring wells in the Drift and Platteville Aquifers that are no longer needed and do not meet the standards of the water well code, MN. Rules 4725. These wells will be abandoned in accordance with Minn. Rules 4725.

6. Monitoring, pumping and treatment of the source material in the Glacial Drift Aquifer and in well W23 in the Prairie du Chien-Jordan Aquifer.

An evaluation of well W23 in the Prairie du Chien-Jordan Aquifer was done under Operable Unit 2, Item 3. This well is used as a source control well and will continue to be

pumped until the total PAH concentration in the well water is reduced to 10 ug/l. Discharge from this well is treated and is required to meet standards established under the NPDES permit described under Item 5 above.

A discussion of the Glacial Drift Aquifer ARARs is included under Operable Unit 2, Item 5.

7. Capping and filling of exposed hazardous wastes in the vicinity of the bog, south of the Site, in accordance with the U.S. Fish and Wildlife regulations.

The ARARs that apply to this RA are regulations of the U. S. Fish and Wildlife Service. These ARARs were satisfied by the completion of this RA.

8. Discharge of hazardous wastes to a sanitary sewer for any contaminated material excavated and dewatered for the purposes of construction of an intersection in the vicinity of the bog.

No contaminated water was generated during this work. Approximately 400 cubic yards of soil were excavated but were determined by TCLP testing not to be hazardous. Most of the soils were, however, disposed of in an industrial containment facility in Rosemount, Minnesota, in December 1993. During the effort to find an alternative to landfilling of the 400 cubic yards of soil, some of the more contaminated soil was separated out. Although this soil was not tested for TCLP, the decision was made to send it to a RCRA facility. Therefore, 45 drums of soil were sent to Chemical Waste Management in Fort Wayne, Indiana.

9. Further subsurface investigation in the vicinity of the Site, to implement deed restrictions for current and future land use in the areas of contamination.

The ARARs that apply to this RA include only those MDH well code ARARs involving test borings. Test borings were sealed immediately after soil samples were retrieved. This work was completed according to MDH requirements in effect at the time of the investigation.

Operable Unit 3

Because the gradient control system was installed in late 1994, data on the effectiveness of the system has not yet been compiled. Monitoring wells in the Northern Area of the Drift Aquifer currently indicate that contaminant concentrations exceed the drinking water criteria. The water from gradient control well W439 is discharged to the sanitary sewer and is required to meet the MCES discharge limitations. In addition, PAH analytical data obtained for this well are provided to the MCES. There is no surface water discharge from this well. Surface water discharge criteria specified in the CD/RAP or a specific NPDES permit would apply in the event that the discharge is diverted to a surface water body or the storm sewer.

Operable Unit 4

Monitoring wells in the St. Peter Aquifer currently indicate that ground water contaminant concentrations exceed the drinking water criteria. Most of this contaminant plume is captured by gradient control well W410. However, monitoring of wells outside the influence of W410 have shown concentrations exceeding the drinking water criteria. This issue is addressed in the recommendations section.

The water from gradient control well W410 is discharged to the sanitary sewer and is required to meet the MCES discharge limitations of no floating oil. In addition, PAH analytical data obtained for this well are provided to the MCES. There is no surface water discharge from this well.

Operable Unit 5

Monitoring wells in the Northern Area of the Platteville Aquifer currently indicate that ground water contaminant concentrations exceed the drinking water criteria. A gradient control well, W440, will be installed in 1996.

The water from gradient control well W440 will be discharged to the sanitary sewer and is required to meet the MCES discharge limitations. In addition, PAH analytical data obtained for this well will be provided to the MCES. There will be no surface water discharge from this well. Surface water discharge criteria specified in the CD/RAP or a specific NPDES permit would apply in the event that the discharge is diverted to a surface water body or the storm sewer.

II. SITE CONDITIONS

Operable Unit 1

The following discussion applies to the restoration of the drinking water supply and water quality by construction of a GAC treatment system for SLP-10 and SLP-15.

The treatment plant is located near SLP-10 and SLP-15, north of Minnetonka Boulevard, between Idaho and Jersey Streets. The Site is underlain by a series of geologic formations, the uppermost of which consists of glacial deposits (clay, silt, sand, and gravel), which may contain useable amounts of ground water. These deposits are also called drift, and where useable amounts of water are contained in them, they are called the Drift Aquifer. Beneath these deposits lie several layers of sedimentary bedrock. The uppermost bedrock layer at a depth of roughly 90 feet is the Platteville Limestone. This layer contains small quantities of ground water, but, in some areas, it is capable of supplying sufficient quantities of water for residential needs. Beneath the Platteville lies the thin layer of Glenwood Shale, which is not an aquifer and which often provides a barrier to downward migration of ground water. Beneath this is the St. Peter sandstone, which is a significant

source of ground water. The average thickness of the St. Peter Aquifer is 100 feet. Beneath the St. Peter, at a depth of about 260 feet, is the Prairie du Chien, which combined with the Jordan formation extends to a depth of roughly 470 feet. The Prairie du Chien is a limestone and Jordan is a sandstone. The Prairie du Chien is contaminated by former Reilly activities. Beneath these formations are the Ironton-Galesville and Mt. Simon-Hinckley formations. These are also important sources of ground water. These deposits are found at 660 and 800 feet below the surface, respectively. They are separated from the Jordan and from each other by thick layers of shale and other rocks that do not contain significant amounts of water, and are not contaminated in this area.

A Site visit was conducted on January 17, 1996, to examine the water treatment system. This system operates continuously. Carbon is backwashed whenever it is changed to remove carbon dust from the fresh carbon, and the water discharged to the storm sewer (surface water). Contaminated carbon is not backwashed; it is changed about once per year. Two carbon columns run parallel, treating water combined from the two wells. Iron is removed with a sand filter before the ground water is treated by the carbon. The iron filter is backwashed to remove iron and manganese and may have minor contamination from the ground water. This is settled in a belowground tank next to the treatment plant. The supernatant is discharged to the surface water and the settled iron sludge is discharged to the sanitary sewer. All storm sewer discharges are monitored for total suspended solids and pH as a minimum on an annual basis under an NPDES permit. The sanitary sewer discharge is sampled for the above two parameters and Chemical Oxygen Demand, PAHs and phenols on a monthly basis. The WQD has checked the storm sewer discharge within the past year and determined that the NPDES permit requirements are being met.

A review of the Annual Performance Reports for the Granular Activated Carbon Treatment System for 1987, 1988, 1990, 1991, 1993, and 1994, indicates that the GAC must be replaced about once per year, although the design called for replacement once every two years. The City contracted with Calgon Corporation to perform a study to evaluate the rapid breakthrough of PAH compounds. The study indicated that the variation in pumping rates from month to month due to demand fluctuations may be a cause of the problem. Based on these results, the City has been maintaining a full-time pumping schedule as much as possible. This effort has not yet increased carbon life appreciably. Despite this problem, the system is in compliance with the CD.

Operable Unit 2

1. Monitoring and contingency treatment of the Mt. Simon-Hinckley Aquifer to maintain drinking water quality.

The RA consists of four wells which are located at widely separated locations in St. Louis Park. The subsurface conditions are described under the Site conditions discussion for Operable Unit 1.

Routine visits to the site and vicinity and annual reporting indicate that this RA is effective.

2. Monitoring, pumping and treatment of the Iron-ton-Galesville Aquifer to protect the deeper Mt. Simon-Hinckley Aquifer.

W105 is located on the Site, and has been used to remove contaminated ground water from this aquifer. A Site visit to this RA was conducted on August 2, 1995.

As previously indicated, this well was shut off after EPA and MPCA agreed that the cleanup levels or cessation criteria specified in the CD/RAP had been met. Based on annual monitoring data submitted by the City, the cessation criteria are still being met.

3. Monitoring, pumping and treatment of the Prairie du Chien-Jordan Aquifer until such time that drinking water quality is uniformly established within the area of gradient control.

A visit was made at the SLP-4 treatment plant on January 17, 1996. This plant is operated similarly to the SLP-10/SLP-15 plant. Water is pretreated with a pressurized sand filter to remove iron. The sand filter is periodically backwashed to remove iron and manganese buildup on the sand and the iron laden wastewater from the backwash is settled in a tank. The supernatant is recycled to the carbon treatment and is placed in the City's distribution system with the other treated water. Sludge from the settling tank is discharged to the sanitary sewer. Sanitary sewer discharges are sampled as at SLP-10/SLP-15.

W23 is located on the Site and is one of the key source control wells. Other wells used for gradient control or monitoring are located southeast of the Site in St. Louis Park. The Prairie du Chien-Jordan Aquifer is an important aquifer in the region. The subsurface conditions are described under Operable Unit 1.

A visit to the treatment plant for well W23 was conducted on January 17, 1996. This system includes prefiltering with a continuous backwashing sand filter. Periodically, the sand filter is aerated by hand to enhance iron and manganese removal. A small portion (about 10 to 15 gpm) of the raw water is diverted from the sand filter to the sanitary sewer without carbon treatment. This water meets sanitary sewer pretreatment water quality standards. The remainder of the water, about 120 gpm, is treated and discharged to the storm sewer and is required under an NPDES permit to meet drinking water criteria. Wastewater from sand filter backwashing is recycled through the system and settled iron sludge is discharged to the sanitary sewer. Sampling of the sanitary sewer and storm sewer discharge is performed as at SLP-10/SLP-15.

An evaluation of the possible spread of contaminants in the Prairie du Chien is being conducted. Occasionally, trace concentrations of PAH compounds have been detected in the city of Edina water supply wells. These concentrations are below drinking water

criteria, but they may indicate the leading edge of a plume which may be escaping the Prairie du Chien gradient control system. In addition, the cooling water well at Methodist Hospital, W48, is no longer in use. This well was considered part of the gradient control system. The City, MPCA, and the MDH are currently working on the establishment of a regional ground water flow model. This model will be used to help determine whether or not W48 should be returned to service and whether or not contaminant migration may be moving beyond existing pumping control efforts.

4. Monitoring and contingent action for the maintenance of drinking water quality in the St. Peter Aquifer.

Subsurface conditions are described above under Operable Unit 1. Routine visits to the site and vicinity and annual reporting indicate that this RA is functional.

SLP-3 is located northeast of the Site and the gradient control well, W410, is located southeast of the Site. Other St. Peter monitoring wells are located east and southeast of the Site.

Contaminated ground water above drinking water standards was found in samples of water from wells W133, W412, and W122 which may not be under the control of well W410. Recommendations to address this condition are presented in the recommendations section.

5. Monitoring, pumping and treatment of the Drift and Platteville Aquifers to protect the downgradient use of the aquifer and the deeper St. Peter Aquifer.

A Site visit will be conducted this spring during construction of well W440.

The Drift and Platteville Aquifer source and gradient control wells are located southeast of the Site. There is a gradient control well, W422, and a source control well, W420, in the Drift Aquifer. The Platteville Aquifer has a source control well, W421. These wells have been monitored quarterly since 1987 when pumping began. There is also a Platteville gradient control well, W434, installed as a contingency at the request of the City, to prevent migration of contamination in the Platteville into the buried valley and thence into the St. Peter Aquifer. The location and description of this contingency action is described above under the general RA section. This well is not yet in operation.

Drift is a term used to include all sediments deposited as a result of glacial activity. The detailed stratigraphy of the drift in the area of the Site is complex, containing three areally persistent units of hydrogeologic significance: the Middle Drift aquifer of glacial sand and gravel, a confining bed of lake deposits (fine sand, silt and clay) which overlies the Middle Drift aquifer, and an underlying basal drift mixture of till, outwash deposits (generally sand and gravel), valley-fill deposits (drift or stream deposited sand and gravel filling a buried former valley in the bedrock), and deeply weathered bedrock. The confining bed that overlies the Middle Drift aquifer is not present in all areas. Therefore, spills of liquids on

the Site could move vertically downward and enter the Middle Drift aquifer or other local ground water-filled sand and/or gravel deposits. Building foundations, sumps, or other Site excavations could allow contaminants to move directly from the surface to the Drift Aquifer system. Drainage ditches and overland flow could allow liquids or contaminated rainwater to move off site to locations where the confining bed deposits do not exist, allowing contaminants to move down into the Middle Drift or other permeable deposits. Once in the Middle Drift aquifer or other sand or gravel deposit, contaminants would move with the ground water flow horizontally to eventually discharge at a surface water body, or vertically downward into the Platteville Aquifer.

In most areas the drift deposits are hydraulically connected to the Platteville Aquifer. This means that contaminated ground water can flow from the drift aquifers downward into the underlying Platteville Aquifer. The Platteville is a bedrock deposit consisting of limestone and dolomite and is underlain by the Glenwood Shale which is a confining bed. In the Platteville, ground water (and contaminants) will move horizontally through fractures and cavities in the rock. Ground water in the Platteville is under a head difference such that water in the Platteville will move vertically downward through the Glenwood Shale into the St. Peter Sandstone Aquifer by leaking directly through the shale or through uncased wells or wells that have holes in their casings.

An additional consideration in the Drift and Platteville Aquifers is the potential for release of contaminants to the St. Peter Aquifer. About one-half mile southeast of the former Reilly site, within the City of St. Louis Park, the Platteville and Glenwood bedrock units have been removed by erosion, and the drift directly overlies the St. Peter Aquifer. Contaminated ground water moving to the southeast in the Drift and/or Platteville could discharge into the St. Peter Aquifer as the ground water emerges from the Drift and/or Platteville at the edge of the buried valley.

Ground water contamination remains relatively high in the monitoring wells and has shown no definite increase or decrease during the period of monitoring. Figure 6-2 of the 1994 Annual Monitoring Report shows an area of contamination north of the Site in which PAH levels in the Platteville exceed the drinking water criteria. This area is centered on wells W100 and W1. It is possible that well SLP-3, which is screened in the Platteville and St. Peter Aquifers, is drawing contamination in the Platteville to the north. The Agencies will address this issue in the recommendations section below.

Ground water data for W117, W116, P308, and W427 may indicate a portion of the Drift Aquifer which is not within the control of the gradient control well. These wells are east of the Site. To the south of the Site W10 shows levels of total PAHs above the 280 ppt drinking water criteria. The issue of contamination which may be outside the control of source and gradient control wells is addressed in the recommendations.

There are some monitoring wells in the Drift and Platteville Aquifers that are no longer needed and that do not meet the standards of the water well code. These wells should be

abandoned. Other wells that do not meet the standards should be repaired. Some of the monitoring wells are allowing contaminants from the surface to enter the aquifers.

6. Monitoring, pumping and treatment of the source material in the Glacial Drift Aquifer and in well W23 in the Prairie du Chien-Jordan Aquifer.

An evaluation of well W23 is done above under Operable Unit 2, Item 3.

A discussion of the response action for the Glacial Drift Aquifer is included above under Operable Unit 2, Item 5 and under Operable Unit 3, discussed below.

7. Capping and filling of exposed hazardous wastes in the vicinity of the bog, south of the Site, in accordance with the U.S. Fish and Wildlife and EPA regulations.

The bog and wetland areas are located adjacent to the southeast corner of the Site, south of Walker St. and north of Highway 7.

A Site visit was conducted by U. S. Department of Interior officials on January 6, 1987. Their visit confirmed that the requirements of the RAP and an approved wetland filling work plan had been met. MPCA inspection of the Site had been completed in 1986.

8. Discharge of hazardous wastes to a sanitary sewer for any contaminated material excavated and dewatered for the purposes of construction of an intersection in the vicinity of the bog.

The road construction work performed occurred immediately south of the Site between Walker Street and Highway 7. The characterization and disposal of contaminated soils was conducted in accordance with guidance provided by the MPCA. A Site inspection was completed in 1992.

9. Further subsurface investigation in the vicinity of the Site, to implement deed restrictions for current and future land use in the areas of contamination.

This area is defined as follows: Lake Street on the north, Monitor Street and an imaginary line connecting Monitor Street and Methodist Hospital on the east, Minnehaha Creek on the south, and Taft Avenue and an imaginary line connecting Taft Avenue and Minnehaha Creek on the west. Fifteen soil borings were installed in this area. Traces of contamination were found in soil samples below the water table in two borings. This contamination was attributable to ground water contamination which had passed through this area and impacted soils below the water table.

A Site inspection was conducted in 1989 and MPCA personnel determined that the area was relatively free of hazards and agreed that no further work was necessary to fulfill the requirements of the CD/RAP. Notices in deed for property owners in this area were made by the City.

Operable Unit 3

A description of the characteristics of the Northern Area Drift Aquifer is included above under the Operable Unit 1 site conditions and under Operable Unit 3 RA description.

There are 24 monitoring wells identified in the ROD for this operable unit that are to be sampled twice per year as part of this remedy. Of these, eight wells exist within the Northern Area boundary described above. Since the remedy was installed in 1994, routine monitoring reports have not yet been provided.

Samples of the 24 monitoring wells were collected from 1988 through 1992 as part of the RI/FS process. A review of PAH concentrations found in the "Technical Memorandum, Hydrogeologic Investigation of the Northern Area Drift-Platteville Aquifer" report for the eight wells within the Northern Area indicate that the PAH concentrations in most of the wells are generally in the low part per billion (ppb) range except for P307, P308, and P309 which have concentrations in the range of a few hundred ppb. All of the wells provided at least one sample that exceeded the CD/RAP drinking water criteria at least once, but insufficient water quality data exists to discern any trends. Because the gradient control system was installed in late 1994, data on the effectiveness of this system has not yet been compiled.

Operable Unit 4

A description of the characteristics of the St. Peter Aquifer is included above under the Operable Unit 1 site conditions. This aquifer is a significant source of ground water in the Twin Cities, although the Prairie du Chien is the primary source of drinking water in the vicinity of the site.

A review of PAH concentrations found in samples of the St. Peter monitoring wells collected from 1991 through 1994 indicate that the PAH concentrations in most of the wells are relatively stable. However, samples from W409 and W410 have shown increases since 1991 which probably reflect the effect of drawing ground water toward the pumping in well W410. Therefore the gradient control well is helping to control a significant portion of the contamination. However, contaminated ground water above drinking water standards were found in samples of water from wells W133, W412, and W122 which may not be under the control of well W410. These wells appear to be outside the cone of influence of well W410. Recommendations to address this condition are presented below in the recommendations section.

Operable Unit 5

A description of the characteristics of the Northern Area Drift Aquifer is included above under the Operable Unit 1 site conditions and under the Operable Unit 5 RA description.

There are approximately nine monitoring wells that have been used to periodically sample the Platteville Aquifer in the Northern Area.

The PAH and phenolic results of ground water monitoring since 1988 show that, near the source of contamination, PAH concentrations in ground water are consistently in the range of several hundred ng/l to high ug/l. The trend of this data suggests that contaminant levels have fluctuated approximately ten percent in the past several years. Based on historical ground water monitoring, the extent of contamination in the Northern Area of the Platteville Aquifer is shown in Figure 7.

Selected wells were sampled twice in 1994. A few of the wells showed a sharp increase in total PAH concentrations. However, there has not been sufficient time to ascertain whether this 1994 data represents a trend. The 1994 data suggest that a current interpretation of the ground water quality data may indicate an area of contamination north of the area of contamination shown on Figure 7. This area appears to be centered on wells W100 and W1, and PAH levels in the Platteville exceed the drinking water criteria. It is possible that the pumping of SLP-3, a St. Peter Aquifer drinking water supply well, is causing contamination in the Platteville to move further to the north. SLP-3 is only used as an emergency backup supply well. This area in the Platteville is outside of any planned gradient control system. These issues will be addressed below under recommendations.

There are some monitoring wells in the Drift and Platteville Aquifers that are no longer needed and that do not meet the standards of the water well code. These wells should be abandoned. Other wells that do not meet the standards should be repaired. Some of the monitoring wells are allowing contaminants from the surface to enter the aquifers.

III. RECOMMENDATIONS

A. Recommendations/Technology

Operable Unit 1

MPCA staff recommend that the City continue with the operation and maintenance of this water treatment system. Based on the January 17, 1996, inspection, it appears that the remedy is functional and operational. Ground water contaminant concentrations are still well above drinking water criteria established in the CD and will require treatment prior to distribution.

The rapid breakthrough of PAHs in the GAC system should continue to be evaluated.

MPCA WQD staff monitor and evaluate discharges from the treatment plant under an NPDES permit. The WQD staff indicated that the discharges have met all standards.

Operable Unit 2

1. Monitoring and contingency treatment of the Mt. Simon-Hinckley Aquifer to maintain drinking water quality.

It is recommended that the City continue the monitoring of ground water in the Mt. Simon-Hinckley Aquifer.

2. Monitoring, pumping and treatment of the Ironton-Galesville Aquifer to protect the deeper Mt. Simon-Hinckley Aquifer.

It is recommended that the City continue the monitoring of ground water from W105 to ensure that the well will not have to resume pumping.

3. Monitoring, pumping and treatment of the Prairie du Chien-Jordan Aquifer until such time that drinking water quality is uniformly established within the area of gradient control.

The City, MPCA and the MDH are currently working on establishing a regional ground water flow model. This model will be used to help determine whether or not W48 should be returned to service and whether or not contaminant migration may be posing a threat to the Edina well fields. It is recommended that this effort continue. Should this modeling show that the gradient control system would not be effective without W48, the Agencies will work with the City to provide additional gradient control measures.

It is also recommended that repairs be made on a few monitoring wells screened in this aquifer in order to maintain sufficient ground water flow information.

4. Monitoring and contingent action for the maintenance of drinking water quality in the St. Peter Aquifer.

Monitoring of the St. Peter Aquifer has been ongoing on a semi-annual basis since 1988 in compliance with the CD/RAP.

As in the case with the pumping of the Prairie du Chien Aquifer, water quality evaluations and ground water flow modeling will be performed to assess the effectiveness of pumping in the St. Peter Aquifer. An evaluation of the effectiveness of W410 as a gradient control well is being considered under the recommendations pertaining to Operable Unit 4.

SLP-3, a water supply well in the St. Peter Aquifer is used occasionally for drinking water. However, this well is also screened in the Platteville Aquifer and may, when pumping, effect the movement of contaminants in the Platteville. It is recommended that an evaluation of the impact of pumping at SLP-3 on the Platteville Aquifer be performed by the City.

5. Monitoring, pumping and treatment of the Drift and Platteville Aquifers to protect the downgradient use of the aquifer and the deeper St. Peter Aquifer.

It is recommended to continue the monitoring of ground water data to determine whether or not the Drift Aquifer gradient and source control system are performing adequately. Modeling of ground water flow and evaluation of ground water quality data will be performed to determine whether or not the source and gradient control systems are effective.

Similarly, it is recommended that monitoring of the Platteville Aquifer be continued and that modeling be performed to determine whether or not the gradient control system is performing adequately.

There are some monitoring wells in the Drift and Platteville Aquifers that are no longer needed and that do not meet the standards of the water well code. It is recommended that these wells be abandoned as soon as possible.

6. Monitoring, pumping and treatment of the source material in the Glacial Drift Aquifer and in well W23 in the Prairie du Chien-Jordan Aquifer.

An evaluation of W23 was completed under Operable Unit 2, Item 3. It is recommended that pumping and monitoring of W23 be continued.

Recommendations concerning the Glacial Drift Aquifer are included under Operable Unit 2, Item 5.

7. Capping and filling of exposed hazardous wastes in the vicinity of the bog, south of the Site, in accordance with the U.S. Fish and Wildlife regulations.

No further action is required for this response action.

8. Discharge of hazardous wastes to a sanitary sewer for any contaminated material excavated and dewatered for the purposes of construction of an intersection in the vicinity of the bog.

No further action is required for this response action.

9. Further subsurface investigation in the vicinity of the Site, to implement deed restrictions for current and future land use in the areas of contamination.

The investigative work has been completed and approved by the Agencies. It is recommended that the Agencies continue to monitor development on the Site and vicinity in order to maintain deed restrictions and to implement additional institutional controls if necessary.

Operable Unit 3

The RA has been in operation for approximately one year, so it is too early to determine whether or not pumping at well W439 is effective in controlling the migration of PAH contamination in the Northern Area of the Drift Aquifer. It is recommended that ground water quality and water level data continue to be collected.

There are some monitoring wells in the Drift Aquifer that are no longer needed and that do not meet the standards of the water well code. These wells should be abandoned. Other wells that do not meet the standards should be repaired. Some of the monitoring wells are allowing contaminants from the surface to enter the aquifers.

Operable Unit 4

It is recommended that an evaluation of the effectiveness of W410 as a gradient control well be performed. As in the case of the Prairie du Chien Aquifer, it is recommended that computer modeling be performed by the MPCA in cooperation with the City of St. Louis Park and the MDH to assess the effectiveness of the gradient control system. It is also recommended that water quality and water level data continue to be collected.

Operable Unit 5

The RA has not yet been constructed, so it is not possible to evaluate the effectiveness of pumping at well W440 in controlling the migration of PAH contamination in the Northern Area of the Platteville Aquifer. Upon completion of the gradient control system, monitoring of the system will begin.

As noted in Operable Unit 2, Item 4, it is also recommended that an evaluation of whether or not well SLP-3 is causing the migration of contamination to the north in the Platteville Aquifer be done. Additional sampling of wells W1 and W100 and possibly other wells in the vicinity of SLP-3 should be performed to aid in this evaluation.

There are some monitoring wells in the Northern Area of the Platteville Aquifer that are no longer needed and that do not meet the standards of the water well code. These wells should be abandoned. Other wells that do not meet the standards should be repaired. Some of the monitoring wells are allowing contaminants from the surface to enter the aquifers.

B. Statement on Protectiveness

STATEMENT OF PROTECTIVENESS

Operable Unit 1

The treatment plant appears to be operating properly and supplying safe water to the City.

Operable Unit 2

1. Monitoring and contingency treatment of the Mt. Simon-Hinckley Aquifer to maintain drinking water quality.

This RA is being implemented as required in the CD and is sufficiently protective.

2. Monitoring, pumping and treatment of the Ironton-Galesville Aquifer to protect the deeper Mt. Simon-Hinckley Aquifer.

This RA is being implemented as required in the CD and is sufficiently protective. Ground water contamination continues to be present in the Ironton-Galesville Aquifer in the immediate vicinity of the Site, but remains below the criteria established in the CD. The Agencies approved a request to discontinue pumping in this aquifer and the RA is considered protective.

3. Monitoring, pumping and treatment of the Prairie du Chien-Jordan Aquifer until such time that drinking water quality is uniformly established within the area of gradient control.

Currently, monitoring and treatment of municipal water supplies obtained from the Prairie du Chien-Jordan Aquifer is providing sufficient safe drinking water. However, it is uncertain whether or not gradient control is being maintained. Contamination may be migrating to the east and southeast from the Site. Modelling is being performed to assess the situation.

In addition, several monitoring wells screened in this aquifer need repairs in order to maintain a sufficient ground water flow information.

4. Monitoring and contingent action for the maintenance of drinking water quality in the St. Peter Aquifer.

Currently, monitoring and treatment of the municipal water supply obtained from the St. Peter Aquifer is providing sufficient safe drinking water. Recommendations for an evaluation of effectiveness of the gradient control system is included in the recommendations for Operable Unit 4.

5. Monitoring, pumping and treatment of the Drift and Platteville Aquifers to protect the downgradient use of the aquifer and the deeper St. Peter Aquifer.

At the present time there is still uncertainty whether or not the Drift and Platteville RAs are performing adequately. Water quality data evaluation and ground water flow modeling will be evaluated to determine whether or not the Platteville Aquifer gradient

control system is performing adequately. As noted above, water supply obtained from the St. Peter Aquifer is safe for consumption.

6. Monitoring, pumping and treatment of the source material in the Glacial Drift Aquifer and in well W23 in the Prairie du Chien-Jordan Aquifer.

An evaluation of W23 was done under Operable Unit 2, Item 3. A discussion of the Glacial Drift aquifer is included in Operable Unit 2, Item 5.

7. Capping and filling of exposed hazardous wastes in the vicinity of the bog, south of the Site, in accordance with the U.S. Fish and Wildlife and EPA regulations.

This response action has been completed and is protective.

8. Discharge of hazardous wastes to a sanitary sewer for any contaminated material excavated and dewatered for the purposes of construction of an intersection in the vicinity of the bog.

This response action has been completed and is protective.

9. Further subsurface investigation in the vicinity of the Site, to implement deed restrictions for current and future land use in the areas of contamination.

This response action has been completed and is protective.

Operable Unit 3

A statement of protectiveness cannot be provided at this time. The remedy was completed in late 1994 and additional monitoring data should be acquired.

Operable Unit 4

A portion of the aquifer is being controlled by the existing gradient control well. Computer modeling and ground water quality data evaluation will be performed to assist in determining whether or not additional gradient control or other measures are necessary. As noted above, water supply currently being obtained from the St. Peter Aquifer is safe for consumption.

Operable Unit 5

A statement of protectiveness cannot be provided at this time. The gradient control system will be constructed in 1996.

IV. NEXT REVIEW

This comment applies to all of the response action items discussed above. Hazardous substances, pollutants or contaminants will remain at this Site which will not allow unlimited use or unrestricted exposure. Another Five-Year Review will be conducted by March 2001. This review will be a level I review.

V. IMPLEMENTATION REQUIREMENTS

This comment applies to all of the response action items discussed above. Prior to the next Five-Year Review the aforementioned recommendations should be addressed.

PARTIAL LIST OF DOCUMENTS REVIEWED:

Calgon Corp., Jan. 18, 1985, Granular Activated Carbon System for Reilly Tar & Chemical Corp.,

City of St. Louis Park, 1986, 1987, Soil Investigation Plan for The Reilly Tar & Chemical Corp. N.P.L. Site, St. Louis Park, Mn., An Area Bounded by West Lake Street on the North, Monitor Street on the East, Taft Avenue on the West, and Minnehaha Creek on the South.

City of St. Louis Park, Annual Progress Reports on the Implementation of the Consent Decree, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994.

City of St. Louis Park, 1987 (received), W105 Source Control Well Plan

City of St. Louis Park, 1987 (received), Drift-Platteville Aquifer Source Control Well Plan

City of St. Louis Park, July 21, 1989, St. Peter Aquifer Remedial Investigation Report.

City of St. Louis Park, April 26, 1990, St. Peter Aquifer Feasibility Study.

Consent Decree and Response Action Plan, 1986

Correspondence from the City of St. Louis Park regarding Source Control Well W23, 1986 to 1993.

ENSR, March 15, 1994, Annual Monitoring Report, 1993, Reilly Tar & Chemical Corp. N.P.L. Site, St. Louis Park, Minnesota.

ENSR, March 15, 1995, Annual Performance Report of the Granular Activated Carbon Treatment System for 1987, 1988, 1990, 1991, 1993, and 1994, Reilly Tar & Chemical Corp.

Hult, M. F., and M. E. Schoenberg, 1984, Preliminary Evaluation of Ground Water Contamination by Coal Tar Derivative, St. Louis Park, Minnesota, U. S. Geological Survey Water-Supply Paper 2211.

Longest, H. L., May 23, 1991, Structure and Components of Five-Year Reviews, Memorandum, Office of Emergency Response, U.S. EPA.

MPCA Board Item documents, April, 1986

Record of Decision, September 30, 1992, Northern Area of the Drift Aquifer

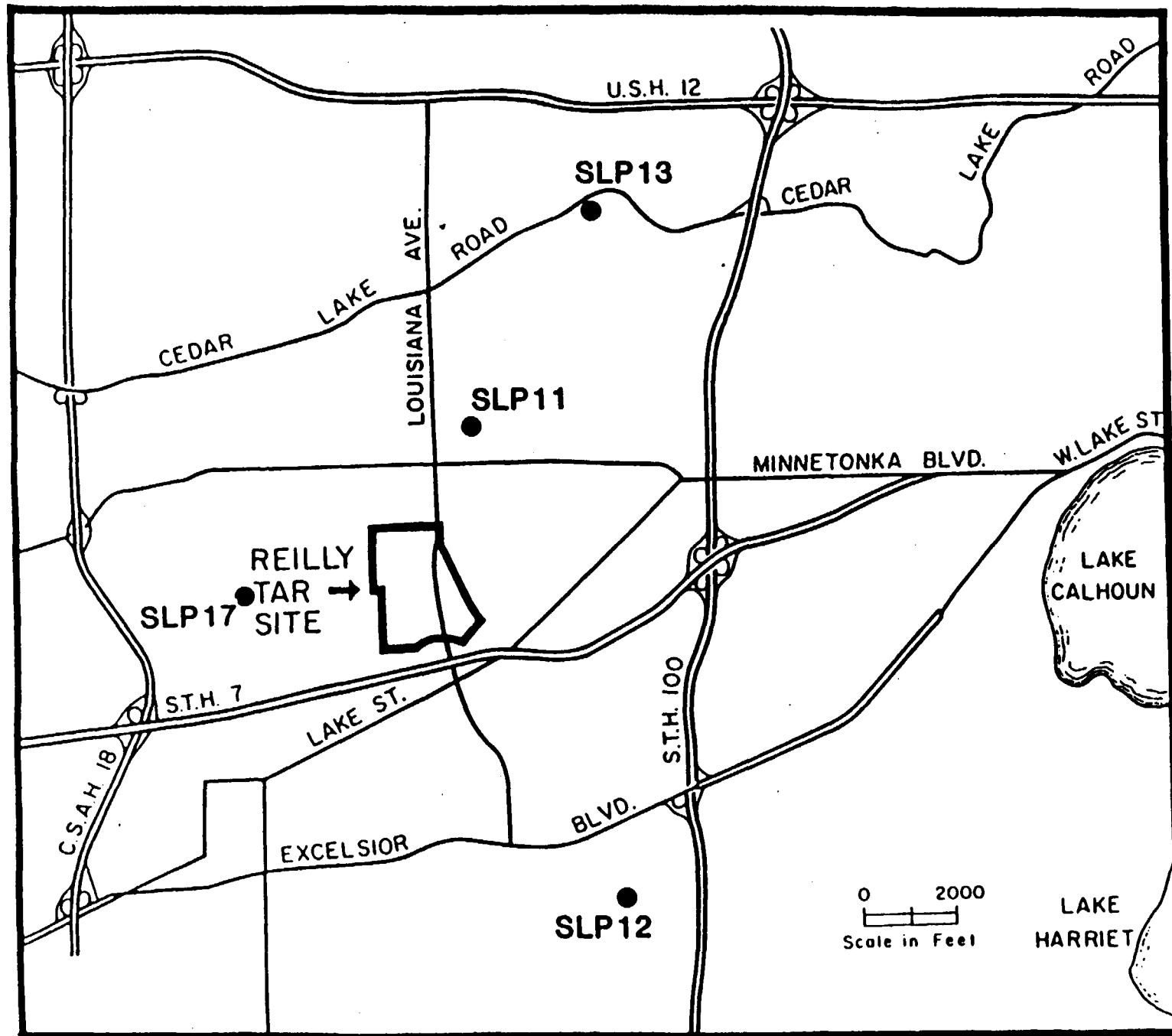
Record of Decision, June 30, 1995, Northern Area of the Platteville Aquifer

Record of Decision, September 28, 1990, St. Peter Aquifer

U.S. Department of the Interior, Fish and Wildlife Service, January 16, 1987, Letter from John Popowski, acting Regional Director to James Grube, Director of Public Works, City of St. Louis Park, re: inspection of wetlands filling work; and various plans and drawings.

JP:lma

MT. SIMON - HINCKLEY AQUIFER



Depth Below
Land Surface.
in Feet

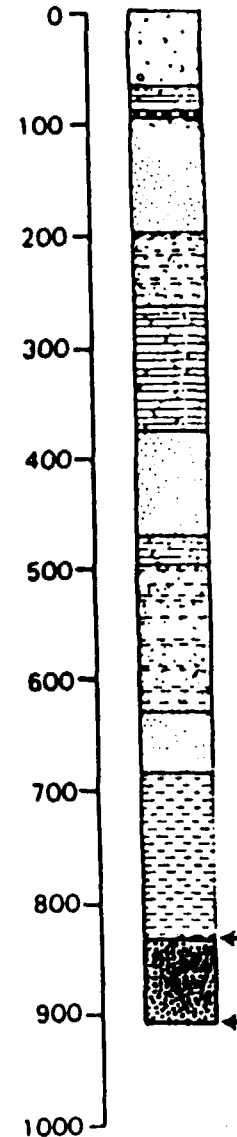
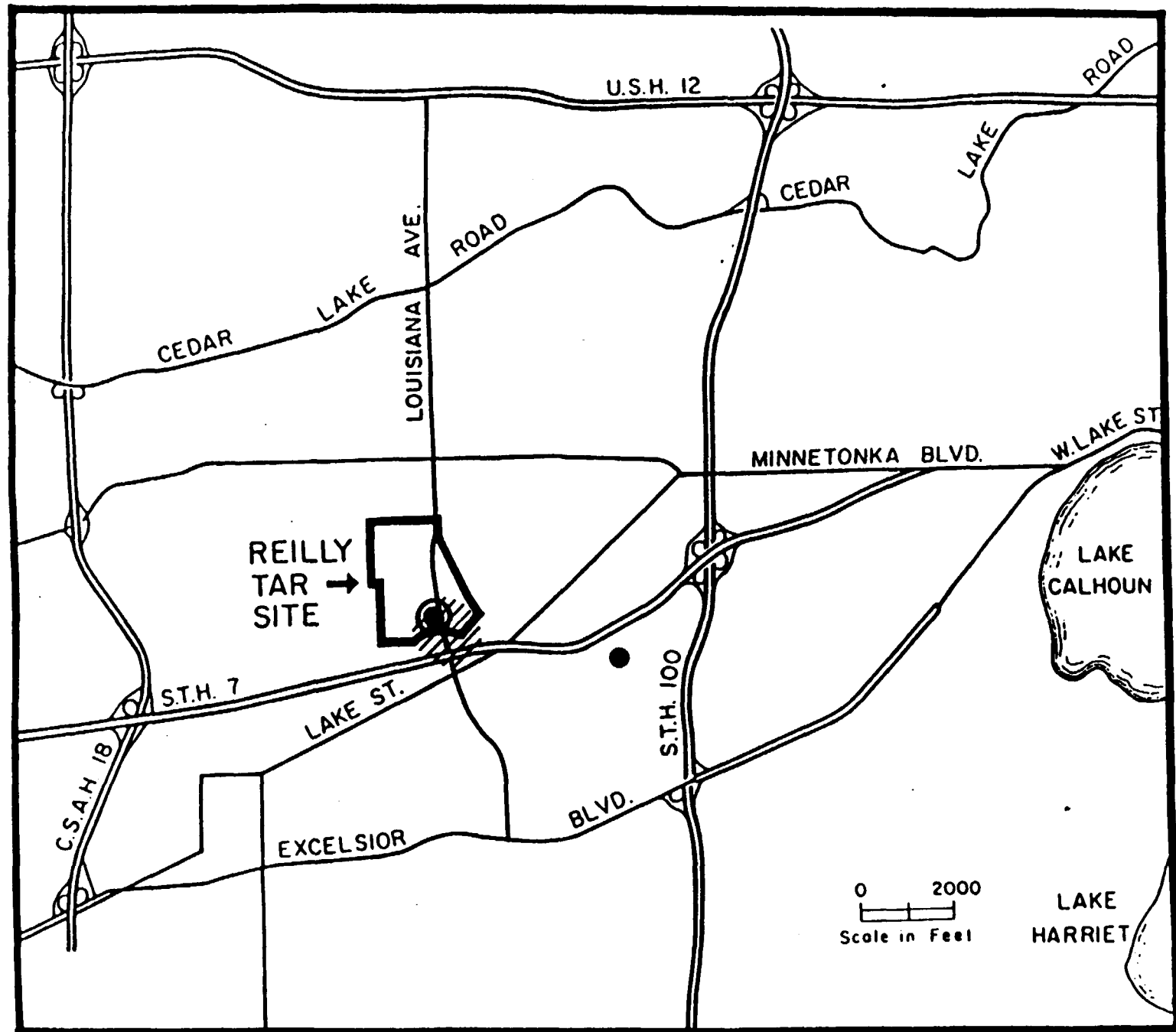


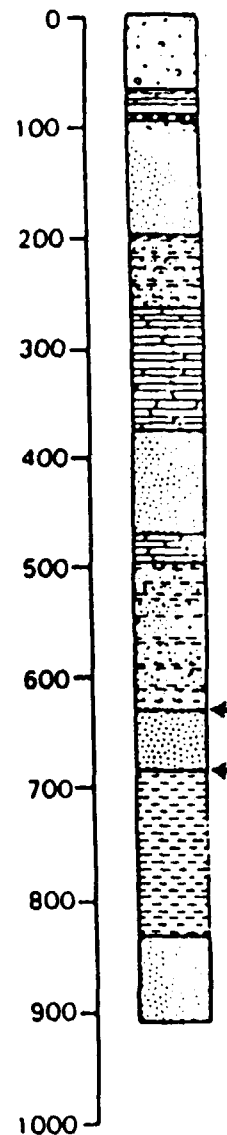
FIGURE 1

● MONITORING AND MUNICIPAL WELL

IRONTON - GALESVILLE AQUIFER



Depth Below
Land Surface,
in Feet



AREA OF CONTAMINATION



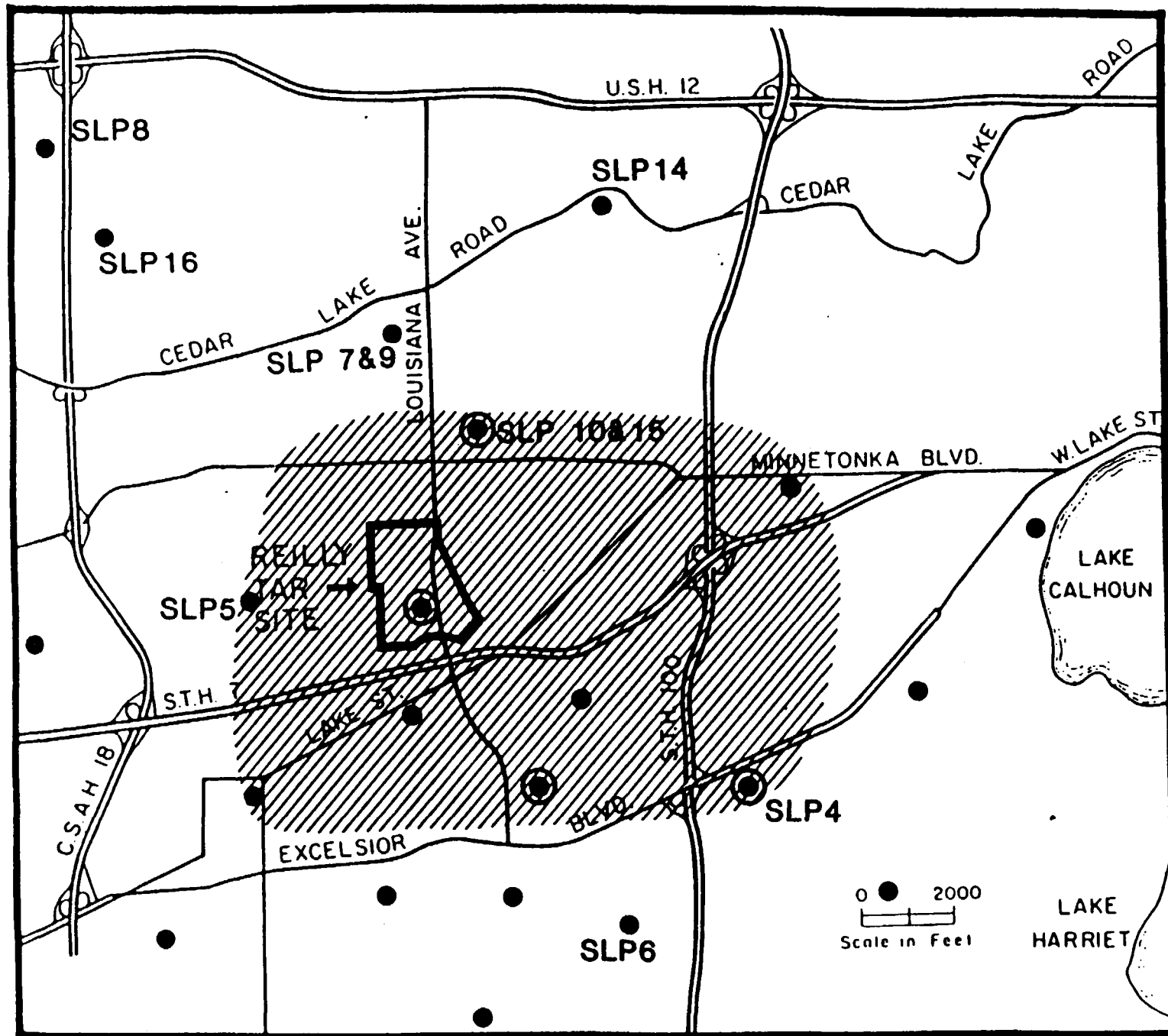
MONITORING WELL



SOURCE OR GRADIENT
CONTROL WELL

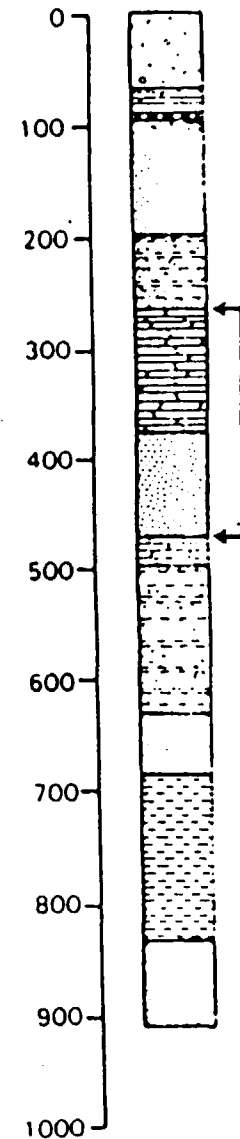
PRAIRIE DU CHIEN - JORDAN AQUIFER

FIGURE 3



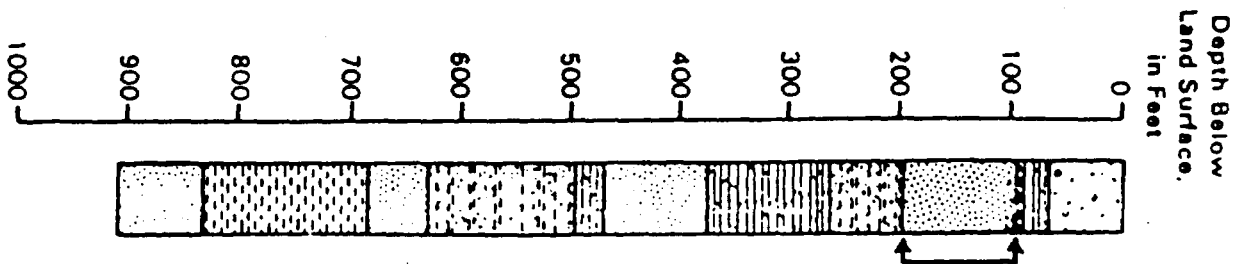
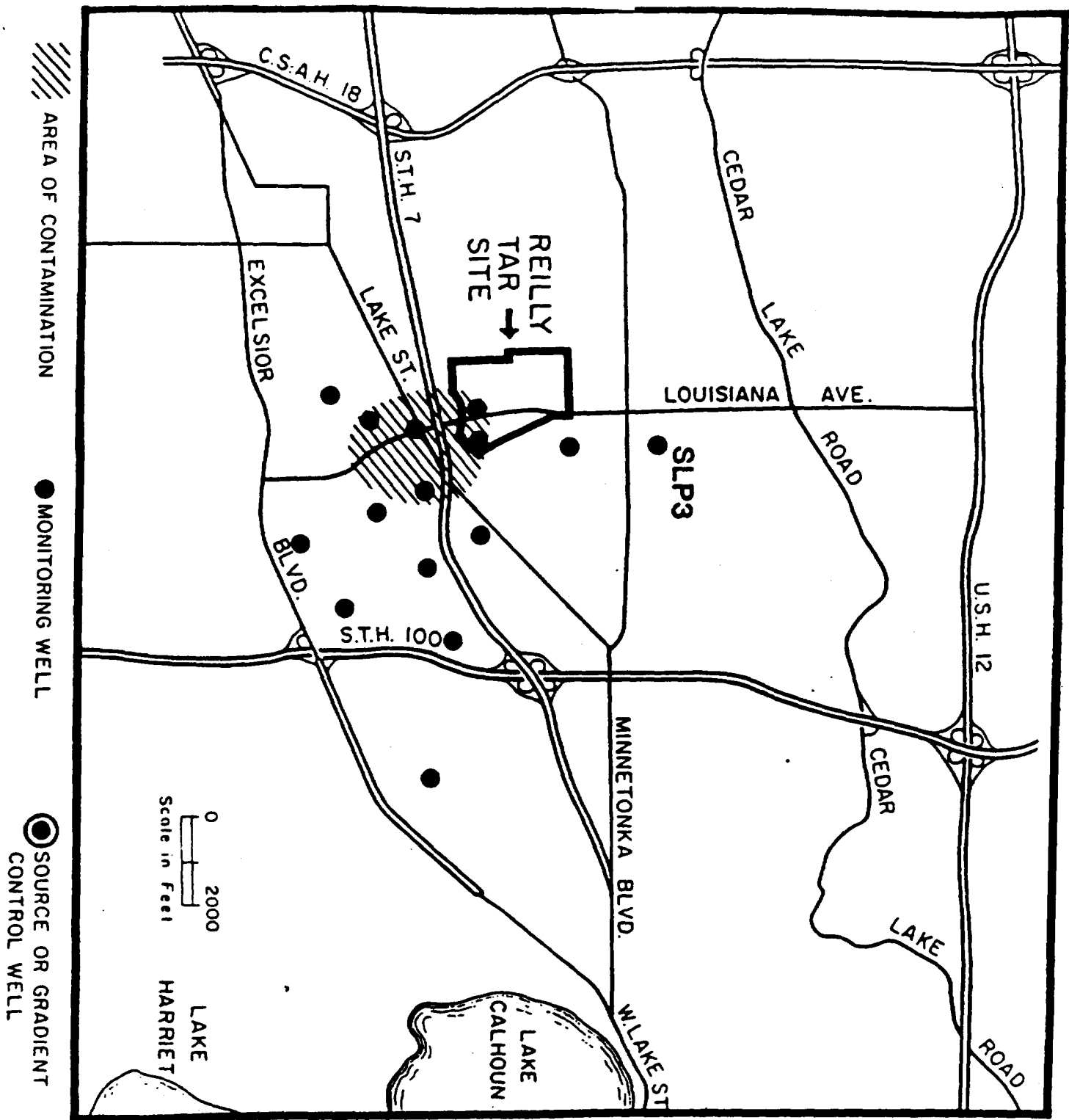
 AREA OF CONTAMINATION
  MONITORING WELL
  SOURCE OR GRADIENT CONTROL WELL

Depth Below
Land Surface.
in Feet

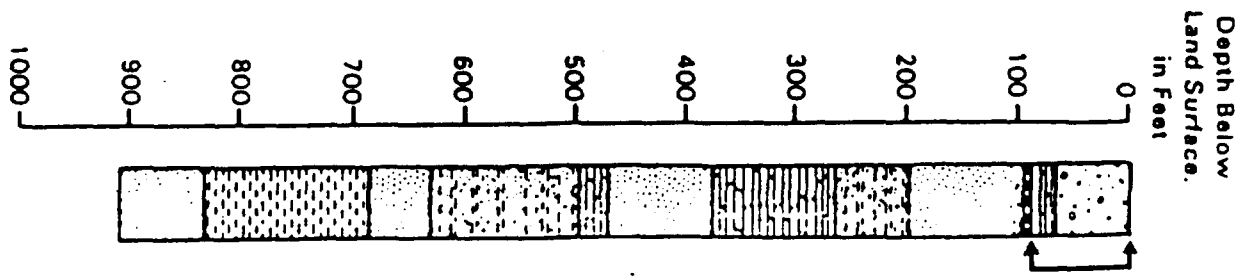
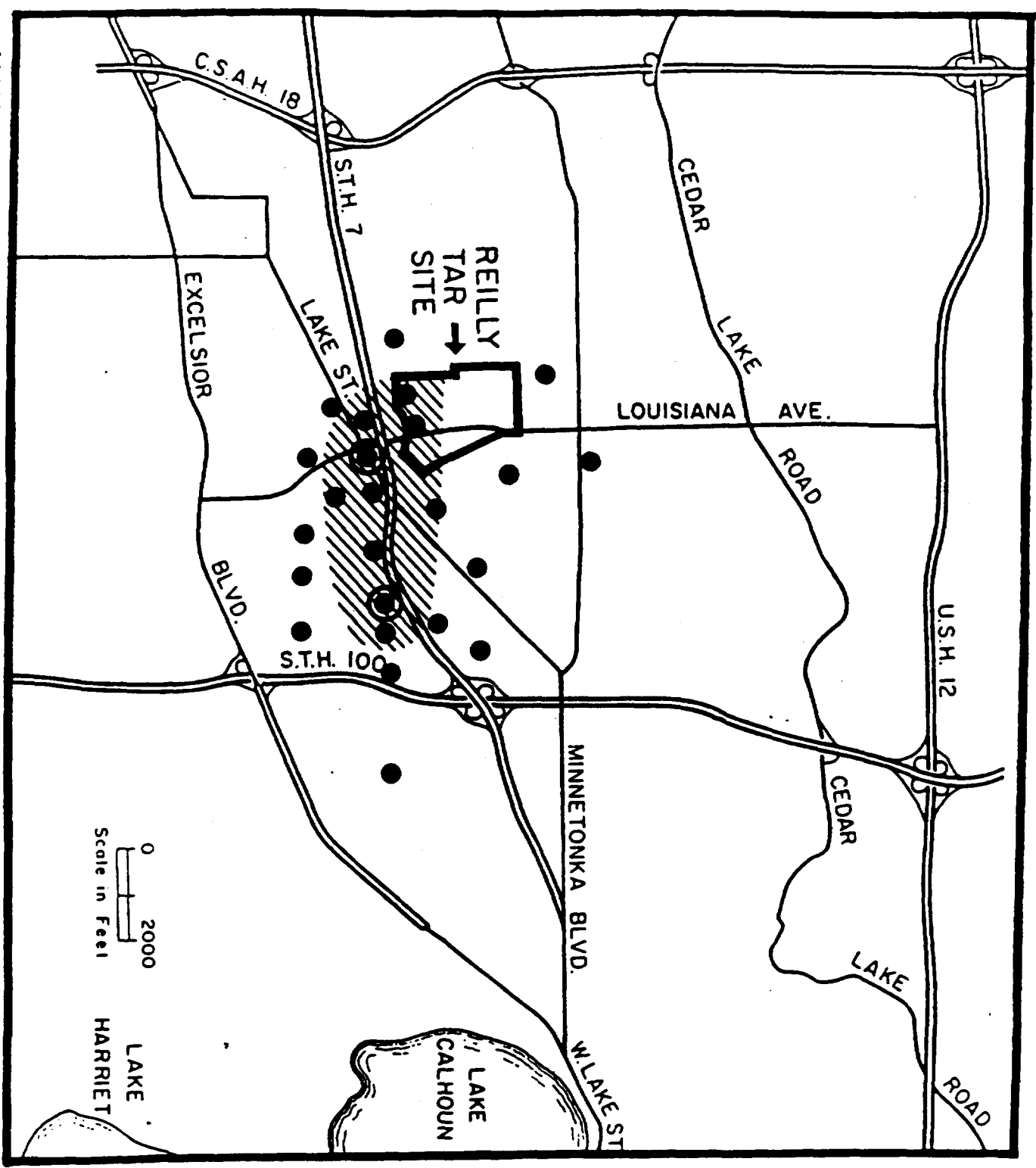


ST. PETER AQUIFER

FIGURE 4



DRIFT AND PLATTEVILLE AQUIFERS



NEAR - SURFACE CONTAMINATION INVESTIGATION AREA

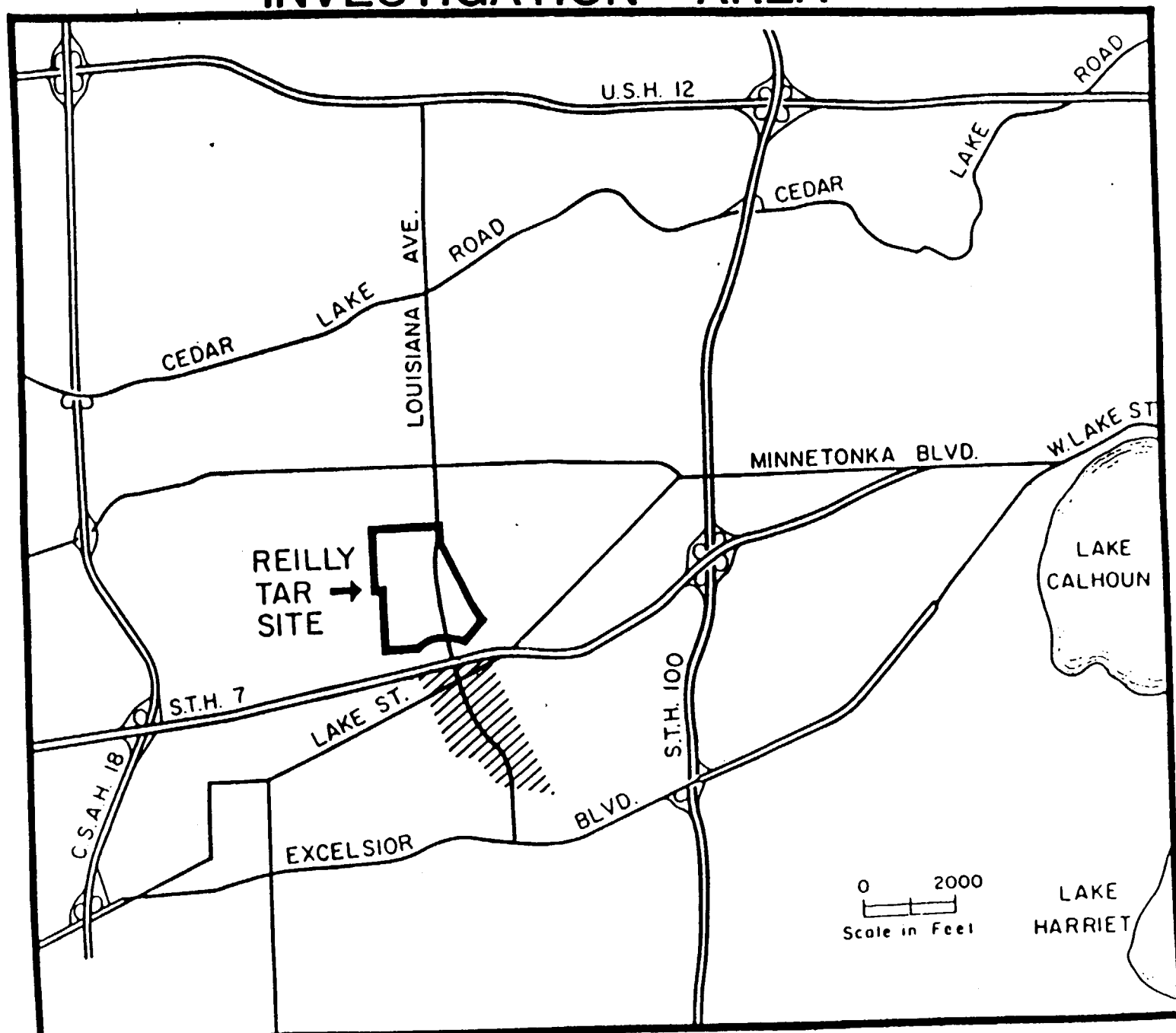
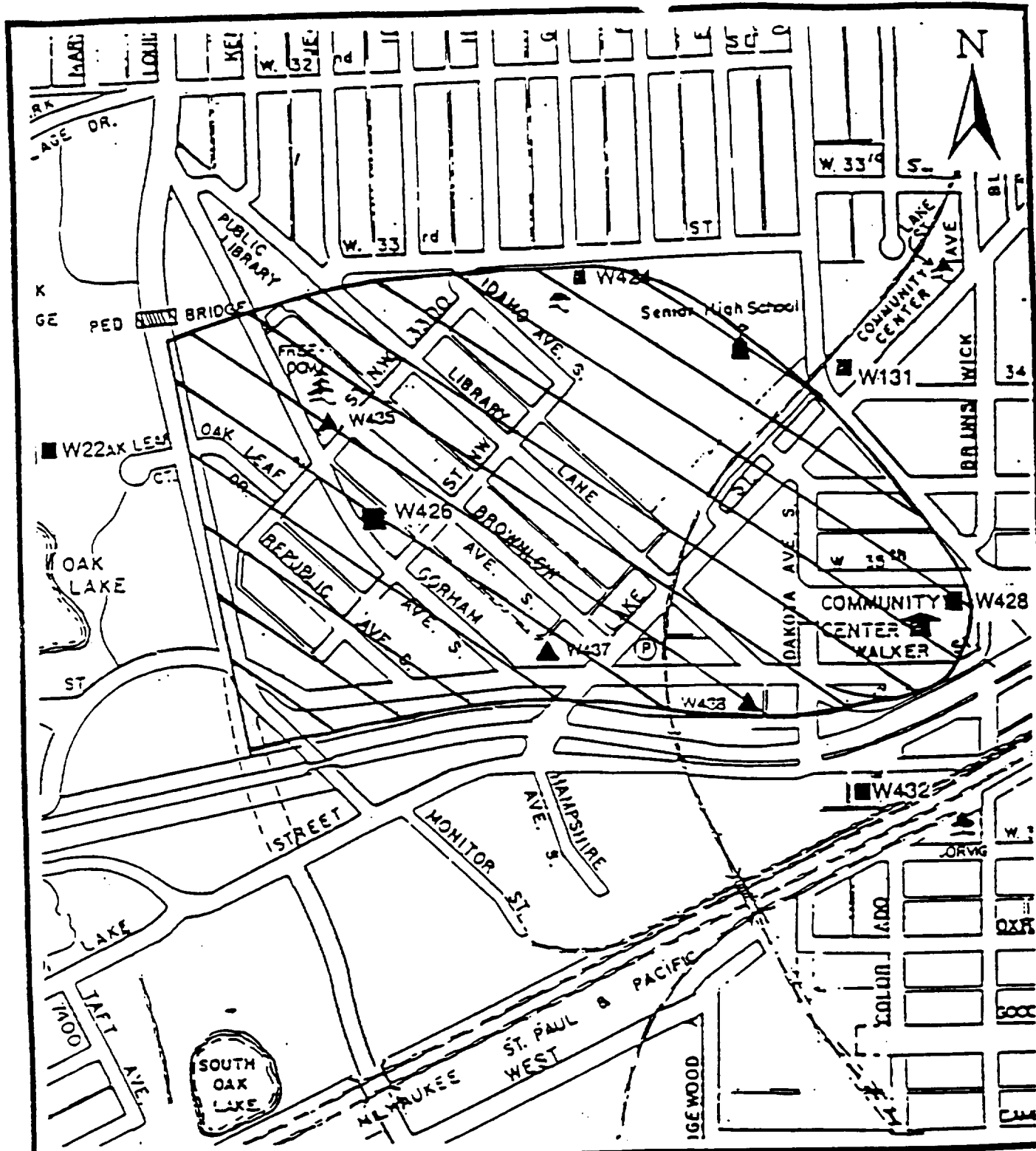


FIGURE 6

Figure 1



- ▲ New Platteville Wells
- Existing Platteville
- Inferred Extent of Contamination in Northern Area of Platteville

ENSR
Consulting and Engineering

Platteville Aquifer Wells for
Water Quality Monitoring
St. Louis Park, MN

DRAWN: LUG

DATE: 5/4/92

PL. 10: 1620-00