FIFTH FIVE-YEAR REVIEW REPORT FOR REILLY TAR & CHEMICAL CORP. (ST. LOUIS PARK PLANT) SUPERFUND SITE HENNEPIN COUNTY, MINNESOTA

MPCA

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LIST OF ACRONYMS

CD-RAP	Consent Decree, with attached Remedial Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COCs	Contaminants of Concern
City	City of St. Louis Park
cPAH	Carcinogenic polycyclic aromatic hydrocarbons
EDD	Enforcement Decision Document
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GAC	Granular Activated Carbon
gpm	Gallons per minute
HBV	Health-Based Value
HRL	Health Risk Limit
ICs	Institutional Controls
LTS	Long-term Stewardship
MCL	Maximum Contaminant Level
MPCA	Minnesota Pollution Control Agency
MDH	Minnesota Department of Health
Mgal	Million gallons
µg/L	Microgram per liter
MOU	Memorandum of Understanding
NCP	National Contingency Plan
ng/L	Nanogram per liter
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
oPAH	Other (non-carcinogenic) polycyclic aromatic hydrocarbons
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbons
RAO	Remedial Action Objectives
RAP	Remedial Action Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
Site	Reilly Tar & Chemical Corp. (St. Louis Park Plant) Superfund Site
USFWS	United States Fish and Wildlife Service
UU/UE	Unlimited use and unrestricted exposure
VOC	Volatile organic compound

EXECUTIVE SUMMARY

This is the fifth Five-Year Review (FYR) for the Reilly Tar & Chemical Corp. (St. Louis Park Plant) Superfund Site (Site) located in St. Louis Park, Hennepin County, Minnesota. The purpose of this FYR is to review information to determine if the remedy is and will continue to be protective of human health and the environment. The triggering action for this statutory FYR was the signing of the previous FYR on June 27, 2011.

Republic Creosoting Company, a subsidiary of Reilly Tar & Chemical Corp. and then Reilly Industries, operated a coal tar distillation and wood preserving plant at the Site from 1917 through 1972. During the time that the facility operated, wastes containing coal tar and its distillates were disposed of into a ditch that emptied into a peat bog to the south of the Site. The discharge into the bog continued for the duration of the facility's operation. In addition, coal tar leaked through an onsite well into deeper aquifers. Consequently, many private wells and eventually municipal drinking water supply wells became contaminated with polycyclic aromatic hydrocarbons (PAHs).

Records of Decision (RODs) for the Site did not specify Operable Units (OUs); however, for the purposes of FYRs, the United States Environmental Protection Agency (EPA) has assigned actions specified by each ROD as a separate OU. OU1 consists of St. Louis Park drinking water supply wells SLP10 and SLP15. EPA signed a ROD for OU1 on June 6, 1984. The remedy for OU1 included installation of a treatment system to treat PAH contamination in the water. OU2 consists of source materials and groundwater throughout the Site. EPA signed an Enforcement Decision Document (EDD) for OU2 on May 30, 1986. The remedy for OU2 included actions to protect drinking water in the Prairie du Chien/Jordan aquifer and the Mt. Simon/Hinckley aquifer, and actions to control exposure to the sources of contamination. Currently-pumping wells associated with this EDD include SLP4 W23, W420 and W421. This EDD also required additional investigation and feasibility studies for the St. Peter aquifer and for northern areas of the Drift and Platteville aquifers. OU3 consists of the northern area of the Drift aquifer. EPA and the Minnesota Pollution Control Agency (MPCA) signed a ROD for OU3 on September 30, 1992. The remedy required two pumping wells to intercept and contain groundwater in this area (originally W422 and W439; now the purposes of this ROD are fulfilled by W420 and W421). OU4 consists of the St. Peter aquifer. MPCA and EPA signed a ROD for OU4 on September 26, 1990, and September 28, 1990, respectively. The remedy required a pumping well to intercept and contain contaminated groundwater in this aquifer (W410). OU5 consists of the northern area of the Platteville aquifer. MPCA and EPA signed a ROD for OU5 on June 27, 1995, and June 30, 1995, respectively. The remedy required construction of a new pumping well to intercept and contain contaminated groundwater in this area. MPCA and EPA modified the remedy in an Explanation of Significant Differences (ESD) signed by MPCA on May 26, 1997, and signed by EPA on April 11, 1997. The ESD allowed use of an existing well for this purpose (well W434), that has since been approved to discontinue pumping.

Upon review, EPA and MPCA find that the remedy for the Site currently protects human health and the environment because drinking water affected by Site-related contamination is being treated prior to use, most source control and gradient control groundwater pumping wells are operating as required, and vapor intrusion does not present an unacceptable risk. In addition, the remedy and pre- and post-ROD actions have resulted in covering of source materials to prevent

future exposures. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: Evaluate existing soil data and conduct additional sampling if needed to identify all Site-affected properties not available for unlimited use and unrestricted exposure (UU/UE); develop and implement an Institutional Controls (IC) Plan; implement additional ICs needed; address long-term stewardship through development of a Long-term Stewardship (LTS) Plan or amendment to the Operation and Maintenance (O&M) Plan; complete a decision document clarifying ICs requirements; clarify safety and notification protocols for excavation work in Site-affected areas; consider benzene and ethylbenzene in evaluation of plume capture; re-evaluate capture of the Site-related plume in the Drift/Platteville and St. Peter aquifers and increase pumping if needed; continue to evaluate the optimal pumping scenario for capture of the Site-related plume in the Prairie du Chien/Jordan aquifer; and continue to evaluate leaky multi-aquifer wells that may be present at the Site and plug or re-complete as needed.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Reilly Tar & Chemical Corp. (St. Louis Park Plant) Superfund Site		
EPA ID: MND980609804		
Region: 5	**State:** MN	**City/County:** St. Louis Park/Hennepin County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: State Minnesota Pollution Control Agency		
Author name (Federal or State Project Manager): Jennifer Jevnisek		
Author affiliation: MPCA		
Review period: 11/13/2015 - 3/23/2016		
Date of site inspection: 11/13/2015		
Type of review: Statutory		
Review number: 5		
Triggering action date: 6/27/2011		
Due date *(five years after triggering action date)*: 6/27/2016		

I. INTRODUCTION

The purpose of a FYR is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

EPA and MPCA are preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Site. The triggering action for this statutory review is the completion date of the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for UU/UE. RODs for the Site did not specify OUs; however, for purposes of FYRs, beginning in 1996, EPA assigned actions specified by each ROD to an OU. For purposes of FYR, the Site is considered to consist of five OUs, all of which are addressed in this FYR. OU1 consists of St. Louis Park drinking water supply wells SLP10 and SLP15. OU2 consists of source materials and groundwater throughout the Site. The OU2 EDD included a requirement for additional remedial investigation and feasibility study (RI/FS) for three areas of groundwater contamination that were the subject of subsequent additional RODs. OU3 consists of the St. Peter aquifer. OU4 consists of the northern area of the Drift aquifer. OU5 consists of the northern area of the Platteville aquifer.

The Reilly Tar & Chemical Corp. (St. Louis Park Plant) Superfund Site FYR was conducted jointly by EPA and MPCA. Participants from EPA included Nabil Fayoumi (Remedial Project Manager or RPM), Leah Evison (RPM), and Heriberto Leon (Community Involvement Coordinator). Participants from MPCA included Jennifer Jevnisek (Project Leader) and Dave Scheer (Hydrogeologist). The City of St. Louis Park (City) and Vertellus Specialties, Inc. (successor of Reilly Tar) were notified of the initiation of the FYR. The review began on November 13, 2015.

Site Background

The 80-acre Site is located near the intersection of Louisiana Avenue and U.S. Highway 7, in St. Louis Park (Figure 1). It is bounded to the north by West 32nd Street and to the south by Walker Street in St. Louis Park. Most of the Site is located west of Louisiana Avenue but a small portion extends to the east of Louisiana Avenue. From 1917 to 1972, Reilly Tar & Chemical Corp. distilled coal tar and treated wood products at a plant known as Republic Creosoting Company.

Plant operations were primarily located in the south-central and southeastern portions of the Site. These areas contained the coal tar distillation still, wood-treating building and aboveground and underground storage tanks for creosote, tars, pitch and fuel oils. From approximately 1917 to 1939, wastes containing coal tar and its distillation by-products were discharged overland into a ditch that ran the length of the Site and discharged into a peat bog south of the Site. Past disposal practices may also have included discharge of waste into wells at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Hazardous substances, including coal tar and creosote wastes containing PAHs and other organic contaminants known as benzene-extractable organics, were detected in soil at the Site at concentrations that could cause a direct contact risk to residents and other users of the Site. PAHs were also found in groundwater at the Site, and in drinking water wells near the Site, at levels that could cause a risk to human health through drinking. The groundwater was also a potential risk to the environment where it discharged to surface water. Site-related contamination was detected in the Drift/Platteville, St. Peter, Prairie du Chien/Jordan, and Wonewoc (formerly Ironton/Galesville) aquifers (Figure 2). In earlier years, the Drift/Platteville and St. Peter aquifers were used for both private and municipal drinking water in the area. Today, municipal drinking water for the City of St. Louis Park and surrounding cities is obtained from the Prairie du Chien/Jordan aquifer and a deeper aquifer known as the Mt. Simon/Hinckley aquifer.

Response Actions

Pre-ROD Actions

In 1972, Reilly Industries conveyed the Site property to the City. The City demolished the Republic Creosoting Company buildings and conveyed the property to the Housing and Redevelopment Authority. In 1973, the Housing and Redevelopment Authority constructed a storm water collection system at the Site, including a lined pond, conducted excavation and backfilling, and constructed residential buildings on the northern end of the property. Excavated soil was covered and stored on the southwest corner of the Site. The City reports that anecdotal evidence suggests that topsoil was brought in in order to establish grass and much of the site was used as a park once the Reilly facility was gone. The City reports that volume and thickness of this original soil cover are unknown, but an exposure of the fill near well W23 on the Site included approximately six inches of topsoil overlying soil containing obvious contamination.

In 1978, St. Louis Park municipal drinking water wells SLP10 and SLP15, which are co-located, were closed due to elevated levels of PAHs. Due to their proximity to the groundwater plume, municipal drinking water wells SLP7 and SLP9 were also closed. These wells were closed in order to prevent wells SLP7 and SLP9 from controlling the hydraulic gradient and drawing additional PAH contaminants to these wells. In 1979, municipal drinking water wells SLP4 and SLP5 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 percent of the existing capacity prior to 1978. In order to accommodate the decrease in water supply, the City instituted a water conservation program during the summer, increased pumping rates at uncontaminated supply wells, and drilled SLP17 to the deeper Mt. Simon/Hinckley aquifer. The City also purchased a limited amount of water from the neighboring City of Plymouth. During this period, the City of Hopkins also closed municipal drinking water well H3.

In 1978, the City of St. Louis Park reported to MPCA that 60,000 cubic yards of contaminated soil were removed from the northern portions of the Site that was not suitable for building

construction and relocated to form a mound in the southwest corner of the Site. The report did not include documentation of the thickness of the clean soil cover; however the City has compared the reported volume of contaminated soil to historic air photos and topographic maps and estimates that a significant portion of the height is due to clean soil cover. The City also reports anecdotal evidence indicating that routine additions to the soil cover were made to fight erosion. In 2012, a significant addition was made to the northern and northeastern flanks of the mound when soil from the St. Louis Park High School football field was brought to the site. This project added more than three feet of fill in some areas.

Also in 1978, the Minnesota Department of Transportation, Minnesota Department of Health (MDH) and MPCA entered into a Memorandum of Understanding (MOU) to delay construction of an intersection at Highway 7 and Louisiana Avenue because construction would interfere with Site-related investigations.

In 1979, State and local agencies coordinated to abandon or reconstruct 28 multi-aquifer wells to prevent further spread of contaminants. In 1981, MPCA removed significant volumes of coal tar from two on-site wells (W23 and W105). In subsequent years, MPCA reconstructed both wells for use as future source control pumping wells. Additional remedial measures conducted by MPCA under two cooperative agreements between the MPCA and EPA included RI/FS for the Site.

In 1984, the MOU regarding Highway 7 work was redrafted to allow for construction subject to a variety of environmental restrictions, including discharge of contaminated water to the sanitary sewer and proper handling and disposal of excavated contaminated soil.

RODs

RODs for the Site did not specify OUs; however, for the purposes of FYRs, EPA has assigned actions specified by each ROD as a separate OU.

OU1

OU1 consists of St. Louis Park drinking water supply wells SLP10 and SLP15. EPA signed a ROD for OU1 on June 6, 1984. The OU1 ROD does not include Remedial Action Objectives (RAOs) as such, but states the following regarding objectives (p. 9):

> The following objectives were established to provide for developing and evaluating water supply alternatives for St. Louis Park:
>
> - Total supply shortfall of 3,400 gallons per minute (gpm)
> - 1,200 gpm year-round usage for SLP15/10
> - 2,200 gpm "peaking" usage, three weeks per year, possibly utilizing the wells currently closed (SLP7,9)
> - Restore pre-1978 capacity
> - Water quality equivalent to pre-1978 water quality in St. Louis Park

The remedy selected in the OU1 ROD includes the following remedy components:

1. Construction of a granular activated carbon (GAC) water treatment system at St. Louis Park Well 15/10 as a major component of restoration of drinking water quality to St. Louis Park, Minnesota; and
2. Operation of the above system at 1200 gpm will also serve as a major component of a gradient control well system. The operation of the gradient control well system will protect the drinking water supplies of neighboring cities from contamination, and eventually allow St. Louis Park to open other wells closed due to contamination.

At the time of OU1 ROD, promulgated Federal or State drinking water standards were not available for PAHs. The OU1 ROD describes the process used to derive Site-specific drinking water treatment criteria for the OU1 remedy and concludes (p. 8): *MDH is confident, and EPA agrees, that a level of approximately 280 ng/l for "other" PAH, and 2.8 ng/l for carcinogenic PAH will assure less than or equal to a 10^{-6} health risk to the population.*

OU2

OU2 consists of source materials and groundwater throughout the Site. EPA signed an EDD for OU2 on May 30, 1986. The EDD did not include a statement of RAOs. Information about the general purposes of cleanup can be found in Section E of a multi-party Consent Decree and Remedial Action Plan (CD-RAP) entered into on September 4, 1986 for cleanup of the Site.

The OU2 EDD describes the selected remedy as presented below (p. 3). The CD-RAP includes additional detailed requirements for these remedial elements.

> The RAP attached to the CD, prescribes the following remedial actions and RI/FSs to be completed over the next five years and to be operated until cessation criteria enumerated in the RAP are satisfied.
>
> 1. Restoration of drinking water supply and water quality by construction of a GAC system at St. Louis Park Wells (SLP15/10), in accordance with the June 6, 1984 ROD. This task has been completed by the Reilly Tar and Chemical Corporation and is in the start-up process;
> 2. Monitoring and contingency treatment of the Mt. Simon/Hinckley aquifer to maintain drinking water quality;
> 3. Monitoring, pumping and treatment of the Ironton/Galesville aquifer to protect the deeper Mt. Simon/Hinckley aquifer;
> 4. 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;
> 5. Monitoring and contingent action for the maintenance of drinking water quality in the St. Peter aquifer;
> 6. Monitoring, pumping and treatment of the Drift and Platteville aquifers to protect the down gradient use of the aquifer and the deeper St. Peter aquifer;
> 7. Monitoring, pumping and treatment of the source material in the Glacial Drift aquifer and in well W23 in the Prairie du Chien/Jordan aquifer;

8. Capping and filling of exposed hazardous wastes in the vicinity of the bog, south of the Site, in accordance with the United States Fish and Wildlife Service (USFWS) and EPA regulations;
9. 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;
10. Further subsurface investigation in the vicinity of the Site, to implement deed restrictions for current and future land use in the areas of contamination;
11. 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; and
12. Further RI/FS in the St. Peter aquifer as necessary to implement the remedial action prescribed to protect drinking water quality.

In a section entitled "Development of the Site" (p. 32), the OU2 EDD also documented responsibilities for safe development of the Site and requirements to reduce releases to the environment and properly dispose of excavated material. The EDD specified that the City and the Housing and Redevelopment Authority were responsible for mitigating any hazards resulting from their development of the Site, and cited requirements of the CD-RAP for proper disposal of any contaminated excavated material removed off-Site and requirements to reduce releases to the environment due to actions taken. The EDD stated that before any development occurs, a Plan must be submitted to EPA for approval, and in compliance with all applicable environmental laws. The EDD stated that these conditions stipulated in the CD-RAP apply to all current and future land owners on the Site.

The OU2 EDD did not include numeric drinking water standards. Instead, it stated that (p. 10): *The RAP is very specific with respect to action levels and cessation criteria for each remedial action requiring the pumping of an aquifer. It is not reproduced in this EDD and is noted here by reference as the RAP.*

The EDD explains that the CD-RAP requires compliance with all environmental laws, including the Clean Water Act and the Safe Drinking Water Act (SDWA). The EDD explains that drinking water criteria for PAHs had not been developed through the SDWA and therefore it was necessary to develop site-specific criteria (p. 33 of the EDD). Although the EDD did not use the language of Applicable or Relevant and Appropriate Requirements (ARARs) or "to be considereds" (TBCs), later RODs for the Site explain that EPA considers the site-specific criteria developed for the CD-RAP to be TBCs for the remedy.

The CD-RAP established Drinking Water Criteria and Advisory Levels as shown in Table 1 below (p. 6 of the RAP). The CD-RAP uses Drinking Water Criteria for two purposes: 1) as treatment standards for drinking water affected by the Site, and 2) as criteria to allow cessation of gradient control pumping in the Prairie du Chien/Jordan drinking water aquifer (discussed more below). The CD-RAP Drinking Water Criteria are not used as cessation criteria for source-control pumping in this aquifer, as discussed further below.

Table 1: Drinking Water Criteria and Advisory Levels in the CD-RAP

Contaminant Group	Advisory Level (ng/L)	Drinking Water Criteria (ng/L)
The sum of benzo(a)pyrene and dibenz(a,h)anthracene	3.0*	5.6
Carcinogenic PAH	15**	28**
Other PAH	175	280

ng/L: nanogram per liter, or 1 part per trillion (ppt)

*Or lowest concentration that can be quantified, whichever is greater.

**Different concentrations for Additional Carcinogenic PAH may be established in accordance with the procedures specified in Part D.1 of the CD-RAP.

In the CD-RAP, pumping cessation criteria for source control and gradient control wells in the Drift/Platteville aquifer are based on narrative standards that require control in specific geographic areas. For gradient control pumping in the Prairie du Chien aquifer, the CD-RAP narrative standard also requires meeting CD-RAP Drinking Water Criteria. In the CD-RAP, pumping cessation criteria for the source control wells in the Prairie du Chien/Jordan aquifer and the Ironton-Galesville (Wonewoc) aquifer are based on a different numerical standard that is less stringent than CD-RAP Drinking Water Criteria because gradient control wells were also required to operate outside of that area to capture less-contaminated groundwater. This is summarized in Table 2 below. (There are additional pumping wells at the Site added after the time of the CD-RAP. Pumping cessation criteria for these wells are discussed under the additional OUs below.)

(see next page)

Table 2: Pumping Cessation Criteria in the CD-RAP

Aquifer	Pumping Well	Purpose	Pumping Cessation Criteria
Drift/Platteville	W420, W421	Source control	When operation is no longer required to control the source of contamination in an area defined by Walker St. on the north, Louisiana Ave on the east, Lake St. & South Frontage St. Extension on the south, and a N-S line extending from intersection of Walker & W 37th St on the west (CD-RAP Section 9.1.1 and 9.1.4).
Drift/Platteville	W422	Gradient control	When operation is no longer required to limit the spread of contamination into the area delineated by the buried bedrock valley as mapped by a specified geologic report (CD-RAP Section 9.2.4)
Drift/Platteville	W439	Gradient control in northern area	When operation is no longer required to limit the spread of contamination located within an area bounded by West 32nd St. to the north, Alabama Ave. to the east, Hwy 7 to the south, and Louisiana Ave to the west (CD-RAP Section 9.5.2 and 9.3.1)
Prairie du Chien/Jordan	W23	Source control	When the mean plus one standard deviation of at least six consecutive samples collected bimonthly contain less than 10 µg/L total PAH (CD-RAP Section 7.1.4)
Prairie du Chien/Jordan	SLP10/15	Drinking water supply/gradient control	No specific pumping cessation criteria. CD-RAP Sections 4.2.2 and 4.4 require operation of the treatment system whenever the water is used for drinking water, until the Agencies approve stopping GAC system based when the mean plus one standard deviation of at least six consecutive feed water samples collected bimonthly being less than all Drinking Water Criteria and the mean of such samples are less than Advisory Levels for cPAH and the sum of B(a)P + dibenz(a,h)anthracene.
Prairie du Chien/Jordan	SLP4	Drinking water supply/gradient control	When SLP4 and all wells north of a E-W line through W48, including W48 but not W23, are each less than Drinking Water Criteria for PAH for two consecutive years (CD-RAP Section 7.2.9)
Ironton-Galesville (now Wonewoc)	W105	Source control	When the mean plus one standard deviation of at least four consecutive samples collected quarterly being less than 10 µg/L total PAH (CD-RAP Section 6.1.5)

OU3

OU3 consists of the northern area of the Drift aquifer. EPA and MPCA signed a ROD for OU3 on September 30, 1992. The OU3 ROD does not include RAOs, but states the following regarding the expected outcome of the selected action (p. 10):

MPCA and EPA signed a ROD for OU4 on September 26, 1990, and September 28, 1990, respectively. (This ROD pre-dated the ROD for OU3.) The ROD does not include RAOs, but states the following regarding the expected outcome of the selected action (p. 5):

> The remedy will contain the spread of contaminated groundwater of PAHs in the aquifer by the interception and containment by pumping well number W410. By containing the spread of contamination in the St. Peter aquifer, the remedy will preserve the quality of groundwater in the rest of the aquifer and will also reduce the potential of cross contamination of deeper aquifers used for drinking water. Therefore, the increase in environmental risk is negated.

The OU4 ROD includes the following major remedy components (p. 1):

1. The interception and containment of contaminants by pumping well W410 at a rate of 65 to 100 gallons per minute; and
2. The discharge from the well will initially be routed to the sanitary sewer for treatment at the Metropolitan Waste Control Commission wastewater treatment plant to remove contaminants from the collected groundwater.

The OU4 ROD cited the CD-RAP Drinking Water Criteria and Advisory Levels as listed in Table 1 as TBCs for the remedy and states the following (p. 8): *This TBC will be met by the preferred alternative by preventing the spread of groundwater exceeding these Drinking Water Criteria.* The ROD does not explicitly specify cessation criteria for pumping, but based on this statement, it is reasonable to assume that it anticipated that those criteria would include achievement of CD-RAP Drinking Water Criteria.

OU5

OU5 consists of the northern area of the Platteville aquifer. MPCA and EPA signed a ROD for OU5 on June 27, 1995, and June 30, 1995, respectively. The ROD does not include RAOs, but states the following regarding the expected outcome of the selected action (p. 10):

> The remedy will contain the spread of contaminated groundwater through interception and containment effects created by the pumping of a gradient control well, identified as well W440. By containing the spread of contamination in the Northern Area of the Platteville aquifer, the remedy will preserve and protect the quality of groundwater in the rest of the Platteville aquifer and will also reduce the potential for additional contamination of deeper aquifers currently used for drinking water supplies and on the natural resource value of uncontaminated portions of the aquifer.

The OU5 ROD includes the following major remedy components (p. 2):

1. The interception and containment of contaminants by use of a gradient control well which will prevent the further spread of contaminated groundwater in the Northern Area of the Platteville aquifer;

The remedy will contain the spread of contaminated groundwater through interception and containment effects created by the pumping of multiple gradient control wells, including using existing well W422. By containing the spread of contamination in the Northern Area of the Drift aquifer, the remedy will preserve and protect the quality of ground water in the rest of the Drift aquifer and will also reduce the potential for additional contamination of deeper aquifers currently used for drinking water supplies.

The OU3 ROD includes the following major remedy components (p. 4):

1. The interception and containment of contaminants by use of gradient control wells which will prevent the further spread of contaminated groundwater in the northern area of the Drift aquifer;
2. The discharge from the new wells will initially be routed to the sanitary sewer for treatment at the Metropolitan Waste Control Commission wastewater treatment plant to remove contaminants from the collected groundwater;
3. Continued water level and water quality monitoring of the groundwater contaminant plume during remediation activities; and
4. Within three to five years, it is anticipated that the water quality of groundwater pumped from the gradient control wells will be improved sufficiently to meet National Pollutant Discharge Elimination System (NPDES) limits. This would allow the City to route the groundwater pumped from the gradient control wells to a storm sewer for eventual discharge to Minnehaha Creek. If necessary, an off-site treatment facility will be built to treat groundwater discharge from the gradient control wells and an NPDES permit will be obtained for the discharge from such facility.

The OU3 ROD cited the CD-RAP Drinking Water Criteria and Advisory Levels as listed in Table 1 above as TBCs for the remedy, and the Clean Water Act as an ARAR for any future surface water discharge of treated water (p. 15-16). The OU3 ROD also listed surface water discharge criteria to be used as NPDES limits, if surface water discharge is used.

The OU3 ROD states that "the CD-RAP Drinking Water Criteria will be used to assess the need for groundwater control measures throughout the aquifer…" (p. 18), based on a provision in the CD-RAP that states that EPA may, "for the purpose of preventing the further spread of groundwater exceeding any of the Drinking Water Criteria," require Reilly to install and operate a gradient control system in the northern area of the Drift aquifer (CD-RAP Section 9.5.1).

OU4

OU4 consists of the St. Peter aquifer. The CD-RAP states that "…the Regional Administrator and Director may, for the purpose of preventing the further spread of ground water exceeding any of the Drinking Water Criteria defined in Section 2.2., require Reilly to install and operate a gradient control well system consisting of one or two gradient control wells." (Section 8.3)

2. The discharge from the new well will initially be routed to the sanitary sewer for treatment at the Metropolitan Council Environmental Services wastewater treatment plant to remove contaminants from the collected groundwater;
3. Continued water level and water quality monitoring of the groundwater contaminant plume during remediation activities; and
4. Within three to five years, it is anticipated that the water quality of groundwater pumped from the gradient control well will be improved sufficiently to meet NPDES limits. This would allow the City to route the groundwater pumped from the gradient control well to a storm sewer for eventual, discharge to Minnehaha Creek. If necessary, an off-site treatment facility will be built to treat groundwater discharge from the gradient control well and a NPDES permit will be obtained for the discharge from such facility.

The OU5 ROD cited the CD-RAP Drinking Water Criteria and CD-RAP Advisory Levels as listed in Table 1 as TBCs for the remedy.

EPA and MPCA modified the OU5 ROD in an ESD signed by EPA on March 26, 1997 and signed by MPCA on April 11, 1997. The ESD documented that well W440 was installed; however, the well could not provide sufficient drawdown to establish a significant capture zone. The ESD documented EPA and MPCA's decision to allow use of well W434, which is located immediately south of the Northern Area, as a substitute gradient control well. Cessation criteria for well W434 are not established in a ROD or in the CD-RAP and are discussed further in the Data Review section of this FYR.

Status of Implementation

The status of remedy components described above for each OU are summarized below using the same numbering as ROD elements described above. Implementation of ROD elements was governed by requirements of the CD-RAP. In many instances, the CD-RAP added additional detail to the remedies selected in the RODs.

OU1 Implementation

1. Reilly Tar & Chemical Corp constructed the GAC treatment unit for the City in 1985, and the City continues to operate and maintain it.
2. Wells SLP10 and SLP15 are operated one at a time and pump approximately 1300 gpm. The water is treated and used for drinking water.

OU2 Implementation

1. This action was completed. See OU1.
2. The City continues to monitor the Mt. Simon/Hinckley aquifer by monitoring existing municipal drinking water wells SLP11, SLP12, & SLP13 quarterly for PAHs and volatile organic compounds (VOCs). The remedy's contingency for treatment has not been required.
3. As required by the CD-RAP, the City pumped well W105 (known in early documents as the Sugar Beet Well) in the Ironton/Galesville aquifer from 1987 through 1991. The water was discharged to the sanitary sewer for treatment. EPA and MPCA approved discontinuing pumping of this well in 1991 because it met

the cessation criteria of the CD-RAP. Since that time, the well has been used as a monitoring well.

4. The City began pumping well SLP4 as a gradient-control well for the Prairie du Chien/Jordan aquifer in approximately 1990. Initially the water was discharged to surface water as approved by EPA (treatment was not needed to meet surface water discharge requirements). In 1991-1992, the City added GAC treatment to the existing water treatment plant and returned the well to use as a drinking water well. An additional pumping well in the Prairie du Chien/Jordan aquifer, Well W48, was operated by its owner, Methodist Hospital, until approximately 1991. This well contributed to gradient control in the aquifer. In later years, the well was used sporadically for irrigation purposes, and was plugged during an expansion of the hospital in 2015.
5. The City continues to monitor the St. Peter aquifer. The remedy's contingency for treatment has not been required. Additional information about remedy implementation for this aquifer is described under OU4.
6. As required by the CD-RAP, the City began operating pumping well W422 in the Drift aquifer (which is hydraulically linked to the Platteville aquifer) for gradient control in 1987. EPA and MPCA approved cessation of pumping in 2000, in part because wells W420 and W421, which continued in operation, were considered sufficient to capture the highly contaminated groundwater immediately south of the Site.
7. As required by the CD-RAP, the City operates three pumping wells for control of groundwater near the source: well W420 completed in the Drift aquifer, well W421 completed in the Platteville aquifer (in hydraulic communication with the Drift), and well W23 completed in the Prairie du Chien aquifer for source control. Water from some wells was initially routed to the sanitary sewer for treatment. In 1993, water was rerouted to the Groundwater Treatment Facility (GTF) and discharged to Minnehaha Creek under the terms of a NPDES permit.
8. The CD-RAP required Reilly to fill the bog (called a wetland in the RAP) with one foot of clean fill compatible with possible later construction of the Louisiana Avenue/Highway 7 intersection in this area. The location of the bog was identified in Appendix B to the CD-RAP (Figure 3). MPCA, EPA, and USFWS approved the work plans and the City completed filling of the bog in 1986. The work was inspected and approved by the agencies.
9. In 1991 and 1992, the City conducted the road construction work for Highway 7 addressed in the ROD. The work included removal of 400 cubic yards of contaminated soil, which was disposed of at the U.S. Pollution Control, Inc. Landfill in Rosemount, Minnesota. The City has completed additional construction projects related to Highway 7 since the time of the ROD. Contaminated soil and groundwater are disposed of in accordance with plans approved by EPA and MPCA.
10. The CD-RAP defined the area requiring further subsurface investigation south of the Site as (p. 69 of RAP): *an area bounded by Lake Street on the north; Monitor Street and an imaginary straight-line extension of Monitor Street to Methodist Hospital on the east; Minnehaha Creek on the south; and Taft Avenue and an imaginary straight-line extension of Taft Avenue to Minnehaha Creek on the west.* The CD-RAP also required owners of properties on which any Site-related releases occurred, to file deed notices on the property. The City performed the soil investigation on the required area. The City reported results are in a *Soil*

Investigation Report dated April 18, 1989. The report describes finding mostly clean soil, likely due to patterns of surface flow that bypassed this area, with some low levels of background contamination. The report stated that the investigation area was used for industrial/commercial land use and that risks were low. EPA and MPCA did not require deed notices for this area. A current evaluation of the need for ICs in areas surrounding the Site is discussed in the ICs section of this FYR.

11. The City completed an RI/FS for the northern area of the Drift and Platteville aquifers in 1991. Remedy implementation is summarized under OU3 and OU4.
12. The City completed an RI/FS for the Peter aquifer in 1994. Remedy implementation is summarized under OU5.

OU3 Implementation

1. At the time of the ROD, the City was already operating pumping well W422 in the Drift aquifer. This pumping began in 1987 in response to a CD-RAP requirement. The City constructed an additional pumping well, well W439, which began operating in 1995. EPA and MPCA approved shut-down of pumping at well W422 in 2000 and stated that wells W420 and W421 appeared to sufficiently capture the highly contaminated groundwater immediately south of the former Reilly Site. The City continues to pump W439.
2. The discharge from both wells was routed to the sanitary sewer and this continues for W439.
3. The City continues to monitor water levels and water quality in the Drift aquifer.
4. Water from W439 continues to be discharged to the sanitary sewer.

OU4 Implementation

1. The City constructed and began pumping well W410 in 1991. Pumping rates for this well are discussed in the Data Review section of this FYR.
2. The discharge from the well is routed to the sanitary sewer for treatment.

OU5 Implementation

1. In 1996, the City constructed well W440 in a location that EPA and MPCA considered most likely to produce water; however, it did not produce enough water to provide a significant capture zone. The well was plugged shortly after testing. An alternative was to utilize well W434, located immediately south of the northern area, as a substitute gradient control well. Well W434 was initially installed to capture PAH-impacted groundwater before it entered the buried bedrock valley to the southeast of the Site. After modifying the OU5 ROD in 1997, EPA and MPCA approved use of pumping well W434 to meet the requirements of the ROD. Pumping at Well W434 continued until 2006 when, at the request of the City, the MPCA and EPA approved cessation of pumping. The approval letter noted that groundwater sample results from this well met current MCLs, HRLs, and HBVs, and also noted that well W421, that continued to operate, also captured groundwater from this area.
2. The discharge from the W434 was routed to the sanitary sewer for treatment.
3. The City continues to monitor water levels and water quality in the Platteville aquifer.

4. Until it was converted to a monitoring well in 2006, contaminated groundwater pumped from well W434 continued to be routed to the sanitary sewer for treatment.

Other Post-ROD Activities

From 1988 to 1990, the City conducted investigations of a property at 3501 Louisiana Avenue (northeast of the intersection of Louisiana Avenue and Walker Street), including soil borings, test pits and a soil gas survey, and study of a petroleum tank release. The study found soils impacted by PAHs, benzene extractable compounds and other contaminants. During the 1990's, additional redevelopment occurred at the Site under MPCA's Voluntary Investigation and Cleanup (VIC) program. As part of oversight of this work, MPCA approved Remedial Action Plans for safe handling and disposal of contaminated soil encountered.

In 1994, the University of Minnesota conducted a study for MPCA entitled *Bioremediation of Contaminated Soils – Aquifers on the Reilly Site, St. Louis Park, Minnesota*. The report describes treatability studies that found evidence of in-situ biodegradation and mineralization of Site soils, but found that the natural processes were very slow. The study recommended field studies of in-situ biodegradation with oxygen addition and water injection to see whether it could increase degradation rates without adversely impacting groundwater. In 1995, EPA's National Risk Management Research Laboratory conducted a bioremediation field study at the Site. In a report entitled *Bioventing for Enhanced Degradation of PAHs Contaminated Soil: Innovative Technology Evaluation Report*, dated October 2000, EPA summarized results of the study. The study tested treatment of Site soils using a continuous low flow of air into the subsurface to enhance growth of aerobic microorganisms present in the soil. The study concluded that bioventing contributed to the reduction of PAH contamination; however, for the six-ring PAHs (presenting the highest risk), overall net reduction was 15%. The study also documented potential hazards to the community, including exposure to volatile organic contaminants emitted by the venting and noise from 24-hour blower operation. EPA did not pursue full-scale treatment.

In 2002, the City built Louisiana Oaks Park at the Site, including walking trails, a playground, athletic fields, a recreational pavilion, and a pond that provides wildlife habitats. In 2015, a pedestrian bridge and trail were installed at the park. Based on observations during their 2015 work, the City reports that soil cover on the Site is not less than six inches and is more typically one to two feet thick, with the exception of a tree-covered mound near the center of the Site, where a stone curb is visible today. This area was the location of the plant office building. The athletic fields constructed in 2002 include a soil cover that exceeds three feet in thickness. Soil cover on the mound area known as "Mount Reilly", located in the southwest corner of the Site, is undocumented, but is estimated to exceed several feet. The City prepared a summary figure showing depths of clean soil cover at the Site (Figure 4).

The only place on the Reilly site where there is no fill to cover the ground surface that was left after demolition of the creosote plant is the tree-covered mound in the central portion of the site, where the plant office building was located. A stone curb is visible at that location. The city has top-dressed all other portions of the site to establish a vegetative cover. Private owners of residential property at the Site may also have added soil, although the extent is unknown. It is estimated that approximately 25 acres or 30% of the Reilly site is covered by impermeable cover

in the form of streets, driveways, parking areas, asphalt paths, buildings, and the lined stormwater pond.

In 2004 – 2005, the City conducted a project to widen Minnesota Trunk Highway 7 (T.H. 7) south of the Site with turning and acceleration lanes.

During the current FYR period, the intersection of T.H. 7 and Louisiana Avenue underwent another major reconstruction project featuring an overpass for T.H.7 and roundabouts for the connecting roads and ramps. A Response Action Plan for the project was approved by EPA and MPCA on May 17, 2013, and construction occurred from June 2013 to June 2015. Pilings were used in the western portion of the bog area to raise the elevation of T.H.7 for the overpass. In the eastern portion of the bog area, the peat and organic soil were excavated and backfilled with granular materials.

The project generated a total of 203,558 tons of excavated soil which was disposed at the SKB landfill in Rosemount, Minnesota. The deepest soil excavation in the eastern portion of the bog area was approximately 30 to 40 feet below the former grade. Dewatering for the soil excavation generated approximately 84,798,200 gallons of groundwater which was treated and discharged to the sanitary sewer. A final report describing the work done is expected in mid-2016.

In 2015, in response to public concerns about a potential cancer cluster in the St. Louis Park area, MDH conducted a detailed study of cancer occurrence and released a report entitled *Cancer Occurrence in St. Louis Park, 1993-2012*, dated March 2, 2016. In the report, MDH analyzed data from the Minnesota Cancer Surveillance System comparing cancer rates among individuals living in St. Louis Park at the time of their diagnosis with cancer rates in the Twin Cities metropolitan area during the most recent 20-year period for which complete data were available. The MDH concluded that the study firmly established that overall cancer incidence and mortality rates in St. Louis Park are virtually identical to cancer rates in the Twin Cities Metro area.

Institutional Controls

ICs are required to restrict property use, maintain the integrity of the remedy, and assure the long-term protectiveness for areas which do not allow for UU/UE. ICs in place and planned for the Site are listed in the table below.

(see next page)

Table 3: Summary of Planned and Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	To Be Determined	Restrict exposure to subsurface contamination	Restrictive Covenants - Planned
Soil	Yes	No	To Be Determined	Notification within City building permit process of potential hazardous substances resulting from the site	Permit Notifications - Planned
Groundwater	Yes	No	State-wide	Requires notification of proposed construction of a groundwater supply well to the commissioner	Minnesota Statute 103I.205
Groundwater	Yes	No	State-wide	Prohibits construction of wells that interconnect aquifers separated by a confining layer or interconnect an unconsolidated aquifer and a bedrock aquifer	Minnesota Rule 4725.2020
Groundwater	Yes	No	State-wide	Requires all buildings to be connected to municipal water supply if one is available	Minnesota Rule 4714.0311
Groundwater	Yes	No	City-wide	Prohibits connection of private water supplies to the municipal supply system	St. Louis Park Municipal Code Chapter 32 Article V. Section 32-205

A map which depicts the current conditions of the Site and areas which do not allow for UU/UE will be developed in the IC follow up actions discussed below.

Status of Access Restrictions and ICs

ICs for soil are not currently in place for the Site and EPA is in the process of identifying properties that require ICs. Additional actions are needed, as described in the IC Follow-up Actions section below.

In September 2012, EPA completed a report entitled *Identification of Potentially Affected Properties for Development of ICs*. In this study, EPA developed a database of soil and soil gas data for the Site that included over 200 contaminants, including primarily PAHs and a group of contaminants also known to be present at the Site known as BTEX, made up of benzene, toluene, ethylbenzene and xylenes. Results for all contaminants were compared to risk-based screening criteria. Figure 5 shows the location of samples included in the database and results indicating properties with samples that exceeded screening levels. The report also includes tables showing which contaminants exceeded screening levels for the properties.

Although not an IC, procedures described in the OU2 EDD for ensuring that any excavation at the Site is done in a safe manner are also in place and substantially effective, although increased clarity for the public and better notification procedures for off-Site work are needed, as noted in the IC Follow-up Actions section below.

Most recently, in December 2014, the City submitted a plan entitled *Construction Plan for Reilly Site Trails, Sidewalks, and Parking Lot Expansion and Walker Street Re-Alignment*. EPA and MPCA approved the plan in February 2015. Private parties may also undertake work that includes excavation in off-Site contaminated areas. As a matter of practice, private parties also report any plans for off-Site excavation in areas near known contamination to MPCA or EPA. EPA and MPCA coordinate to contact entities planning to conduct excavation and relay requirements for safety of workers and the public.

ICs for groundwater are in place, as listed in Table 3 and discussed below.

Current Compliance

As explained above, ICs for soil are not in place for the Site so no IC compliance review was conducted. Even though ICs have not yet been implemented, there are currently no known uses of the Site which would be considered inconsistent with the stated objectives which will be required in ICs. The soil remedy appears to be functioning as intended. However, soil ICs are necessary to ensure protectiveness of the remedy.

During the period of this FYR, there has been compliance with approved procedures for excavation work done at and near the Site, and EPA and MPCA are not aware of deviations from approved plans. However, comments received from the public indicate that enhancements of public notification regarding the safety procedures that are in place are needed.

Regarding compliance with groundwater ICs, MPCA has been working with the City of St. Louis Park and City of Edina in an ongoing effort to identify residences for which there is no record of a connection to the municipal water supply. This effort is focused on a larger non-Site-

related VOC plume that encompasses the area of the Reilly plume. They have identified multiple homes without a record of connection and are evaluating options for assuring compliance; however, none of the homes are within the area which exceeds CD-RAP Drinking Water Standards or current drinking water standards for Site-related contaminants.

There are many wells existing in St. Louis Park left over from before City water was available. State law requires well disclosures during property transfers and unused wells are to be sealed at that time or used only for irrigation. Three City of St. Louis Park wells that were open to the Platteville and St. Peter have been sealed.

IC Follow-up Actions Needed

The following actions are needed regarding ICs and are included in the Issues and Recommendations section of this FYR:

- Development of an IC Study (identifying what is in place) and an IC Plan (identifying what more is needed) is needed. Included in the IC Plan should be identifying whether an IC is needed to require continued operation of an existing air-exchange system in a building near the Site. The Study should include confirmation of the deed restrictions required by the CD-RAP.
- Existing data for some properties for which available data did not exceed soil screening levels may be inadequate to determine whether ICs are needed for those properties. EPA should evaluate the adequacy of data and fill data gaps as needed, and
- ICs for soil are not in place and should be implemented for all properties for which they are needed.
- A map should be developed which depicts the current conditions of the Site and areas which do not allow for UU/UE.
- A decision document requiring additional ICs for soil and groundwater should be completed.

Although not ICs, follow-up actions are also needed regarding the following:

- Improved clarity for the public regarding safety procedures in place for work conducted in potentially-contaminated areas, and
- Improved mechanism for notifying EPA and MPCA of off-Site work in affected areas.

All of the follow-up actions above are included in the Issues and Recommendations section of this FYR.

Long Term Stewardship

Since compliance with ICs is necessary to ensure the protectiveness of the remedy, planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. A LTS Plan or an amendment to the O&M Plan should be developed that outlines procedures for inspecting and monitoring compliance with the ICs, and submittal of an annual report to EPA and MPCA to demonstrate that the site was inspected, that no inconsistent uses have occurred, that ICs remain in place and are effective, and that any

necessary contingency actions have been executed. This is addressed in the Issues and Recommendations section of this FYR.

Systems Operations/Operation & Maintenance

O&M for the remedy is performed by the City and documented in Annual Monitoring Reports for the Site. In 2012, the Annual GAC Report was incorporated into the Annual Monitoring Reports. The City also submits updates to the Annual Sampling Plan and the Quality Assurance Project Plan each year to EPA and MPCA for review and approval. Maintenance to pumping wells included in the Site remedy during the period of this FYR are summarized in Appendix B.

Other routine ongoing O&M activities include the following:

- O&M of the seven currently-operating pumping wells included in the remedy (W420, W421, W439, W410, W23, SLP10/15, and SLP4), including monitoring of average annual pumping rates in comparison to required rates, water quality monitoring and comparisons to cessation criteria of the CD-RAP
- O&M of the GAC treatment plants for drinking water wells SLP 10/15 and SLP 4, located at the City's Treatment Plant 1 and Treatment Plant 4, including quarterly monitoring of treated water and annual monitoring of feed water
- O&M of the GAC treatment plant at the GTF located on the Site, including quarterly monitoring of treated water and annual monitoring of feed water, and comparison of the treated water to permit requirements

In 2014, EPA, MPCA, and the City agreed on a modified list of contents to streamline future Annual Monitoring Reports and focus more closely on Agency needs. The modified format was put in place and resulted in a faster review and approval of the report. During the process of this FYR, EPA found that several items should be added to the report; these are addressed in the Other Findings section of this FYR.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations. The last FYR was conducted in 2011. The 2011 FYR did not make a protectiveness determination for OU2 or a Site-wide protectiveness determination because of a pending vapor intrusion study. After completing the vapor intrusion study, EPA and MPCA completed an Addendum to the 2011 FYR in 2014. The Addendum added a protectiveness determination for OU2 and a Site-wide determination. The 2014 FYR Addendum also updated issues and recommendations made in the 2011 FYR. Table 4 below includes the most recent protectiveness statement for each area of the Site.

Table 4: Protectiveness Determinations/Statements from 2011 FYR and 2014 FYR Addendum*

OU	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at OU1 is protective of human health and the environment; exposure pathways that could result in unacceptable risks are being controlled by filtering groundwater through granulated active carbon prior to introduction into the municipal supply.
2*	Short-term Protective	The remedy for OU2 currently protects human health and the environment in the short-term because source materials have been covered, drinking water affected by contaminants above levels specified in the Consent Decree is being treated, most source control and gradient control groundwater wells are operated as required, and the vapor intrusion pathway does not present an unacceptable risk to human health. However, in order for the remedy to be protective in the long-term, the following additional actions need to be taken: (1) Add monitoring locations and increase gradient control in the Prairie du Chien aquifer southwest of the site; (2) Conduct additional groundwater modeling to evaluate plume boundaries and capture zones; (3) Develop and implement an IC Study and IC Plan; and (4) Identify potentially leaky multi-aquifer wells in areas of the current Site plume not previously investigated.
3	Protective	The Remedy at OU3 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. At the specified pumping rate, gradient control wells are limiting contaminant migration in the northern area drift aquifer.
4	Protective	The remedy at OU4 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Groundwater pumping in the St. Peter Aquifer continues to limit contaminant migration in the vicinity of the Site and is removing PAH contaminants from the aquifer.
5	Protective	The remedy at OU5 is protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. PAH concentrations are generally below drinking water criteria established by the CD-RAP.
Site-wide*	Short-term Protective	The remedy for the Site currently protects human health and the environment in the short-term because source materials have been covered, drinking water affected by contaminants above levels specified in the Consent Decree is being treated, most source control and gradient control groundwater wells are operating as required, and the vapor intrusion pathway does not present an unacceptable risk to human health. However, in order for the remedy to be protective in the long-term, the following additional actions need to be taken: 1) Add monitoring locations and increase gradient control in the Prairie du Chien aquifer southwest of the Site; 2) Conduct additional groundwater

		modeling to evaluate plume boundaries and capture zones; 3) Develop and implement an IC Study and IC Plan; and 4) Identify potentially leaky multi-aquifer wells in areas of the current Site plume not previously investigated.

*The protectiveness determinations for OU2 and the Site-wide determination listed here are as updated in the 2014 FYR.

The 2014 FYR Addendum updated all issues and recommendations for the Site. Table 5 below presents the status of these recommendations.

Table 5: Status of Recommendations from the 2014 FYR Addendum

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	PAH concentrations in Edina 13 and Edina 7 drinking water wells in the Prairie du Chien aquifer have increased and have twice exceeded CD-RAP advisory levels	Add monitoring locations and increase gradient control in the PdC aquifer southwest of the Site	Ongoing	The City has added three new monitoring locations in the PdC aquifer (SLP5, Blake School Well, and a well located at 8098 Excelsior Boulevard). Gradient control discussions were put on hold pending completion of EPA's groundwater modeling effort, which is ongoing and expected to be completed in 2016. The City, in coordination with MPCA and MDH, is studying the feasibility of pumping SLP6 to address a multi-source VOC plume, which would also result in additional gradient control for the Reilly plume.	NA
2, 3, 4, 5	The plume boundary and capture zone in the Prairie du Chien aquifer and potentially in other aquifers including the northern area of the Drift	Conduct additional groundwater modeling to evaluate plume boundaries and capture zones	Ongoing	EPA has completed identification of locations that exceed CD-RAP standards and current drinking water standards for all aquifers. Work to delineate capture zones in the PdC aquifer is ongoing, to be followed by work on other aquifers.	NA

	aquifer and the northern area of the Platteville aquifer are unclear				
2	ICs for areas of the site where UU/UE has not been achieved may not be in place	Develop and implement an IC Study Develop and Implement an IC Plan	Addressed in Next FYR	This work has not been done. See IC section of this FYR for additional detail.	NA
2	Potential for additional leaky multi-aquifer wells in areas not previously investigated	Identify, and address as needed, potentially leaky multi-aquifer wells in area of current Site plume not previously investigated	Ongoing	MPCA and MDH have identified some of these wells and are evaluating options to plug them. Other areas remain to be done.	NA

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public meeting was held November 12, 2015, to provide a general update about Site status and to answer questions about the Site. The public was also informed of the upcoming FYR at the meeting and invited to submit questions. An additional public notice for the FYR was made available by publication in the local newspaper, the St. Louis Park Sun Sailor, on December 3, 2015, entitled *Announcement of a Five-Year Review for the Reilly Tar and Chemical Corp. Superfund Site.* The notice stated that there was a FYR and invited the public to submit any comments to EPA or MPCA. The public notice was also published on the EPA website and the Sun Sailor website. The results of the review and the report will be made available at the Site information repository located at the St. Louis Park Public Library, 3240 Library Lane, St. Louis Park, Minnesota 55426 and the MPCA St. Paul office located at 520 Lafayette Road North, St. Paul, Minnesota 55155.

From February 2 to February 4, 2016, EPA conducted in-person interviews with area residents, local officials and community leaders, to document any perceived problems or successes with the remedy that has been implemented to date. On February 16, EPA conducted phone interviews with residents who were unable to meet in person. A total of 32 people were interviewed. The biggest concern raised during the interviews was about ensuring that the city's drinking water is

and remains safe. Some people expressed frustration regarding a lack of communication about the Site. Some also expressed concern about vapor contamination, and indicated that they understood that there were multiple potential sources of vapor, some of which were not Site-related, but that it all affects them. Multiple people were concerned about potential exposure to soil contamination that remains on the Site and in nearby areas, including exposure through vegetable gardening, and had questions regarding documentation of the amount of clean soil placed on the Site. Several residents were concerned about odors they experienced during City work at the Site in fall of 2015. Multiple people also expressed concern about cancer rates in St. Louis Park. City officials shared their concern that work at the Site be done as efficiently and as cost-effectively as possible while not compromising standards or quality. The city officials also indicated that the CD-RAP should be updated to include the latest scientific information.

EPA, MPCA, MDH, and the City have coordinated to answer questions raised at the public meeting and during the community interviews and issues raised have been incorporated into this FYR. More information and detailed answers to questions raised are available in the forthcoming Community Involvement Plan for the Site.

Data Review

In general, the CD-RAP criteria are more stringent than current drinking water standards, and the Site is operated to meet both the CD-RAP criteria and current drinking water standards, as described in detail below.

The CD-RAP requires that groundwater treated for drinking water as part of the remedy meet CD-RAP Drinking Water Criteria. Exceedance of CD-RAP Advisory Levels generally triggers additional monitoring. Both are shown in Table 1 of this FYR. The CD-RAP Drinking Water Criteria and CD-RAP Advisory Levels are TBCs in the RODs, as discussed previously. The SDWA is an ARAR for the Site. The drinking water treatment plants at the Site are operated to meet the CD-RAP Drinking Water Criteria and federal Maximum Contaminant Levels (MCLs) under the SDWA, as well as other risk-based drinking water standards established by MDH known as Health Risk Limits (HRLs) and Health-Based Values (HBVs). There is an MCL established for only one PAH, benzo(a)pyrene, a cPAH. The MCL for benzo(a)pyrene is 200 ng/L, that is higher than the CD-RAP Drinking Water Criteria for total cPAH of 28 ng/L. There are MDH risk-based standards for additional PAHs, as shown in Table 6 (Appendix B). In this FYR, MCLs, HRLs, and HBVs are together called current drinking water standards. MCLs and HRLs are promulgated standards and HBVs are non-promulgated standards that are expected to be promulgated in the future.

<u>Groundwater Treatment</u>

Treatment Plant 1

- Treatment Plant 1 treats water from drinking water wells SLP10/15 and SLP11. Wells SLP10/15 are completed in the Prairie du Chien aquifer and receive routine drinking water treatment and GAC treatment. SLP11 is completed in the deeper Mt. Simon/Hinckley aquifer and receives routine drinking treatment because GAC treatment is not needed.

- During the period of this FYR, the City replaced the GAC every other year, most recently in October 2015. The City replaced the GAC proactively and did not wait for treated water to exceed CD-RAP Advisory Levels.
- During the period of this FYR, treated water from well SLP10/15 consistently met CD-RAP Drinking Water Criteria and also met MCLs, HRLs and HBVs. One anomalous result is described below.
- On September 13, 2011, the analysis result for treated water from Well SLP10 showed an anomalous result of 62.8 ng/L cPAH that exceeded the CD-RAP Drinking Water Criteria for cPAH. Field blanks for this sampling event also showed cPAH. A split sample sent to a different laboratory did not detect any cPAH. The treated water was resampled in accordance with requirements of the CD-RAP and the reanalysis confirmed that no cPAH was present in the treated water.
- CD-RAP Section 4.2.2 requires operation of the treatment system whenever the water is used for drinking water, until the mean plus one standard deviation of at least six consecutive feed water samples collected bimonthly are less than all CD-RAP Drinking Water Criteria and the mean of such samples are less than CD-RAP Advisory Levels for cPAH and the sum of B(a)P + dibenz(a,h)anthracene.
- A statistical analysis performed by EPA showed that, during the period of this FYR, SLP10/15 water prior to treatment exceeded the CD-RAP Drinking Water Criteria for oPAH, confirming that treatment remains required by the CD-RAP.
- For informational purposes during this FYR, EPA and MPCA also compared recent monitoring results for wells SLP10/15 water prior to treatment to current risk-based levels established by MDH, including Health Risk Limits (HRLs) and Health-Based Values (HBVs). Results indicate that the water also does not exceed HRLs or HBVs for Site-related contaminants.
- During the period of this FYR, the City has continued to treat water from SLP10/15, as required.

Treatment Plant 4

- Treatment Plant 4 treats water from drinking water well SLP4. Treatment includes routine drinking water treatment and GAC treatment.
- During the period of this FYR, the City replaced the GAC every two to two and a half years, most recently in fall of 2013. The City replaced the GAC proactively and did not wait for treated water to exceed CD-RAP Drinking Water Criteria.
- During the period of this FYR, SLP4 treated water consistently met the CD-RAP Drinking Water Criteria.
- The CD-RAP does not specify a specific statistical test for deciding when treatment is no longer required for SLP4; however, a statistical analysis performed by EPA during this FYR showed that SLP4 water prior to treatment does not exceed the CD-RAP Drinking Water Criteria nor does it exceed current MCLs, HRLs or HBVs for Site-related contaminants. However, as a matter of public policy, during the period of this FYR the City has continued to treat SLP4 water with GAC. EPA and MPCA may approve removal of the GAC treatment in the future.

Groundwater Treatment Facility

- The GTF treats groundwater from wells W23, W420 and W421. It has a treatment capacity of 150 gpm and the water is treated to meet effluent limits of NPDES/State Disposal System Permit ID MN0045489. Water from the plant is routed to South Oak Pond which has an outfall to Minnehaha Creek. Quarterly permit monitoring reports are sent to the Metropolitan Commission of Environmental Services (MCES).
- During the period of this FYR, the City replaced the GAC every year (or, in the year that Reilly pumping was reduced to accommodate the need to dewater for Reilly-impacted highway expansion, one-and-a-half years), most recently in July 2015.
- MPCA conducted a compliance review for the NPDES permit on June 4, 2015. The review identified a number of corrective actions needed. The City of St. Louis Park began corrective actions immediately and completed all corrective actions by September 2015.
- A comparison of the water prior to treatment to pumping cessation criteria of the CD-RAP is presented in the presented in the following section.

Groundwater Pumping

Counting co-located wells SLP 10/15 as one well, seven pumping wells currently operate as part of the Site remedy: wells SLP4, SLP10/15, W23, W410, W420, W421, and W439. The location of these wells and other wells that previously pumped as part of the remedy are shown in Figure 6. Average annual pumping rates for all pumping wells included in the remedy are reported in Appendix B. A summary is presented below. A stratigraphic column showing the aquifers present at the Site is found in Appendix B.

Drift/Platteville Aquifer

The Drift formation and Platteville Limestone are separate formations that are in hydraulic communication with each other, the first unconsolidated glacial deposits and the second a fractured limestone that underlies the glacial deposits. For the purpose of this FYR, they are considered one aquifer. No known drinking water wells are present in this aquifer in the area of the Site. During the period of this FYR, three pumping wells operated in the Drift/Platteville aquifer as part of the remedy: wells W420, W421 and W439.

For wells W420 and W421, the CD-RAP requires a pumping rate of 25 gpm; however, in a letter dated June 30, 1989, Reilly stated that a rate of 40 gpm for W420 was shown to effectively control groundwater flow in the bog area. Since that time, all parties have considered 40gpm to be the required pumping rate for W420. During the period of this FYR, well W420 has met or exceeded its required pumping rate; however, W421 has been unable to meet its required rate. Despite pump and piping replacement and well redevelopment in 2013, the well has been unable to achieve its required pumping rate of 25 gpm. As of April 2016, W421 is out of service awaiting replacement parts.

For well W439, the required pumping rate is established at 50 gpm in a report entitled *Northern Area Drift Aquifer Gradient Control Work Plan,* dated February 22, 1994. (Neither the CD-RAP nor the OU3 ROD specify a pumping rate for this well or area.) During 2011 through 2015, well W439 achieved average annual pumping rates of 47 to 50 gpm. During this period, the City

performed repeated maintenance of the well in an attempt to raise the pumping rate, including redevelopment, acid treatment and high velocity jetting. The well currently achieves a pumping rate of approximately 25 gpm and the City has determined that if pumping is still required in this area, a new well may be needed. This issue has been added to the Issues and Recommendations section of this FYR.

Cessation criteria for pumping of the Drift/Platteville source control wells (W420 and W421) is established by the CD-RAP in Sections 9.1.4 and 9.1.1(A). These sections of the CD-RAP establish cessation criteria as when the wells are no longer required to control the source of contamination in the area defined by Walker Street on the north, Louisiana Avenue on the east, Lake Street and South Frontage Street Extension on the south, and a north-south line extending from intersection of Walker Street and West 37th Street on the west.

The cessation criterion for pumping of the Drift/Platteville gradient control well (W439) is established in the OU3 ROD as the CD-RAP Drinking Water Criteria, based on the CD-RAP Section 9.5.1, as discussed earlier in this FYR.

In a letter dated September 28, 1999, the City of St. Louis Park proposed cessation criteria for gradient control well W422, and Platteville gradient control well W434. In a response dated December 6, 1999, EPA and MPCA established four lines of evidence to be used as guidelines for a request to stop pumping these wells. These are (paraphrased from more lengthy explanations):

1) Achievement of cessation concentrations equal to current MCL/HRL/HBV
2) Compliance with gradient control objectives
3) Continued monitoring to assess contaminant spreading
4) Establishment of criteria for resuming gradient control pumping

In December 2012, the City submitted a report entitled *Drift, Platteville, and St. Peter Aquifer Pumping Well Evaluations and Cessation Request*. This report provided the technical basis for a request to stop pumping all wells in the Drift/Platteville (wells W420, W421 and W439) and St. Peter aquifers (well W410, discussed below). In this report, the City proposed a strategy for cessation based on using the current health-based drinking water standards of MDH (HRLs and HBVs, which were also lower or equivalent to MCLs) for PAHs. The request also compared data from these wells to the non-numeric CD-RAP cessation criteria and to the four lines of evidence established in EPA and MPCA's December 6, 1999, letter. EPA and MPCA responded to the cessation report in a letter dated March 4, 2014. In the letter, the EPA and MPCA stated that they could not approve the cessation request at that time because the extent of gradient control in non-drinking water aquifers had not been adequately characterized and there was a lack of plume definition in these aquifers. Since that time, the wells have remained pumping. For W439, the proposed use of current drinking water standards appears inconsistent with the OU3 ROD and CD-RAP. This has been added to the Other Findings section of this FYR.

St. Peter Aquifer

The St. Peter aquifer is a sandstone aquifer at the Site located beneath the Platteville aquifer and separated from it by a shale formation. Some natural leakage may occur between the two. No

known drinking water wells are located in this aquifer in the area of the Site. During the period of this FYR, one pumping well operated in the St. Peter aquifer as part of the remedy: W410. The pumping rate for this well is specified in the ROD as 65-100 gpm. During the period of this FYR, well W410 has been unable to meet its required rate. From 2011 to 2012, W410 pumped at a rate of approximately 56 gpm. In 2013, the pumping rate dropped further and the City redeveloped the well. Despite this work, from 2013 through 2015, well W410 has achieved a pumping rate of 40 to 42 gpm. This well was included in the City's 2012 cessation request discussed above.

The request to stop pumping W410 was based in part on achieving current drinking water standards; however, it appears that the ROD would require achievement of CD-RAP Drinking Water Criteria. Well W410 current exceeds the CD-RAP criteria for oPAHs, as it does elsewhere in the aquifer, including W129 that is located further down-gradient. An issue regarding pumping rate and plume capture in the St. Peter aquifer has been added to the Issues and Recommendations section of this FYR.

Although the Drift/Platteville and St. Peter aquifers are not known to be used currently as drinking water aquifers in St. Louis Park, and groundwater ICs are in place, there is some concern that natural leakage or the possible presence of potentially leaky multi-aquifer wells could transport contaminants to deeper aquifers. For informational purposes during this FYR, EPA and MPCA compared water quality in the Drift/Platteville and St. Peter pumping wells to current MCLs, HRLs and HBVs. Results indicate that the three Drift/Platteville pumping wells continue to exceed current drinking water standards for multiple contaminants; however, the St. Peter pumping well does not. Wells W420 and W439, completed in the Drift, exceed current drinking water standards for naphthalene, benzene, ethylbenzene and benzo(a)pyrene-equivalents ($B(a)P_{eq}$). Well W421, completed in the Platteville, exceeds current drinking water standards for benzo(a)pyrene and $B(a)P_{eq}$. Well W410, completed in the St. Peter aquifer, does not exceed current drinking water standards. As discussed in the Groundwater Monitoring data review section below, two monitoring wells located closer to the Site in the St. Peter aquifer do continue to exceed current drinking water standards. The presence of benzene and ethylbenzene as Site-related groundwater contaminants has been added to the Issues and Recommendations section of this FYR.

Prairie du Chien-Jordan Aquifer

The Prairie du Chien Group and Jordan Formation are separate formations that are in hydraulic communication with each other, the first a primarily fractured dolostone (dolomite) unit and the second a sandstone unit that underlies the dolostone. For the purpose of this FYR, they are considered one aquifer. The Prairie du Chien/Jordan aquifer is located beneath the St. Peter aquifer. The basal St. Peter is an interbedded sandstone, siltstone and shale. Some natural leakage occurs between the two aquifers. The Prairie du Chien/Jordan aquifer is a major drinking water aquifer for the City of St. Louis Park and surrounding cities. During the period of this FYR, three pumping wells (considering co-located wells SLP 10/15 as one well) operated in the Prairie du Chien/Jordan aquifer as part of the remedy: wells W23, SLP4, and SLP10/15.

For well W23, CD-RAP Section 4.2.1 requires a monthly average pumping rate of 50 gpm. During the period of this FYR, W23 met or exceeded its required monthly rates and achieved

average annual rates of 54 to 67 gpm. In July 2014, the City increased pumping of this well, setting the pump at 65 gpm rather than the previous 50 gpm setting, to remove more contaminated water from the source area in this drinking water aquifer.

Similar to the source control wells in the upper aquifers, CD-RAP Section 7.1.4 requires pumping in well W23 to continue until the mean plus one standard deviation of at least six consecutive samples collected bimonthly contains less than 10 micrograms per liter (µg/L) total PAHs. Currently well W23 contains approximately 11 µg/L total PAHs, and the City continues to pump it as required and sample it annually. PAH concentrations in this well have decreased significantly since it began pumping in 1988. At that time, total PAH concentrations were approximately 111 µg/L. For informational purposes during this FYR, EPA and MPCA also compared untreated water from well W23 to current MCLs, HRLs and HBVs. Results indicate that the groundwater continues to exceed current drinking water standards for benzene and $B(a)P_{eq}$.

For well SLP4, CD-RAP Section 7.2.7 requires pumping at its capacity (900 gpm or as near as practicable) from October through April and 300 gpm from May through September. The CD-RAP also specifies that if all parties agree, the rate can be adjusted up or down by up to 250 gpm. During the period of this FYR, well SLP4 met or exceeded its required pumping rates and achieved average annual rates of 844 to 993 gpm. See the Groundwater Treatment section above for additional information about this well.

For well SLP10/15, CD-RAP Section 4.2.1 requires operation of the treatment system at a minimum annual pumping rate of 200 million gallons per year (Mgal/yr), and a minimum pumping volume of 10Mgal in any calendar month. The CD-RAP does not include a pumping requirement independent of operation of the treatment system. For the period of this FYR, the SLP10/15 treatment plant met or exceeded its required and achieved annual rates of 245 to 331 Mgal/yr. See the Groundwater Treatment section above for additional information about this well.

Existing Wells Not Currently Pumping

Drift/Platteville Aquifer

The City operated pumping well W422 in the Drift aquifer from 1987 to 2000 and operated pumping well W434 in the Platteville aquifer from approximately 1991 to 2006. EPA and MPCA approved shut-down of these wells in letters dated October 3, 2000, and March 17, 2006, respectively. Since shut-down of pumping, both wells have been used as monitoring wells.

For informational purposes during this FYR, EPA and MPCA compared groundwater monitoring results from wells W422 and W434 to current MCLs, HRLs and HBVs, consistent with the City's 2012 cessation request discussed above. Results indicate that the groundwater exceeds the current drinking water standard for benzene but not for PAHs. EPA and MPCA believe that benzene is an additional Site-related contaminant, although additional sources have caused comingling of what is likely Site-related benzene with a multi-contaminant VOC plume also located near the Site; multiple Drift/Platteville monitoring wells southeast of the Site also exceed

the current drinking water standard for benzene. This is addressed in the Issues and Recommendations section of this FYR.

Wonewoc (formerly Ironton/Galesville) Aquifer

During this FYR period, the Minnesota Geological Survey issued a notice indicating an update of stratigraphic nomenclature, including one for the Ironton-Galesville, which was replaced with the Wonewoc Sandstone. The 2014 Annual Monitoring Report for the Site reflects this change. The change does not affect the remedy for the Site.

The Wonewoc aquifer is located beneath the Prairie du Chien/Jordan aquifer and is separated from it by the St. Lawrence-Franconia formation confining unit. Some natural leakage may occur between the two. The City operated pumping well W105 in the Wonewoc aquifer from 1987 to 1991. EPA and MPCA approved shut-down of this well in a letter dated December 4, 1991. Since that time, the well has been used as a monitoring well.

The CD-RAP Section 6.1.5 states that the criterion for cessation of pumping this well is the mean plus one standard deviation of at least four consecutive samples collected quarterly being less than 10 µg/L total PAHs. During the period of this FYR, the total PAH concentration in well W105 has remained below 10 µg/L with the exception of the sample event in September 2014, when total PAHs were approximately 19 µg/L. MPCA resampled the well in April 2015 and found total PAHs to be approximately 1 µg/L. This well has sporadically exceeded the 10 µg/L criteria in the past, occasionally by large amounts, but has not exceeded the cessation criteria of the CD-RAP. Currently the City continues to sample the well annually. This is addressed in the Other Findings section of this FYR.

For informational purposes during this FYR, EPA and MPCA also compared recent monitoring results of well W105 to current MCLs, HRLs and HBVs. A statistical analysis conducted by EPA indicates that well W105 exceeds the current drinking water standard for $B(a)P_{eq}$, due mainly to the presence of fluoranthene. Currently, MPCA is considering an evaluation of the well to determine whether it could be a conduit to deeper aquifers.

Groundwater Monitoring

The City conducts groundwater monitoring in accordance with an Annual Sampling Plan that is updated and reviewed annually by EPA and MPCA, and is available on EPA's web site. In the 2015 plan, nine wells were sampled quarterly, including all drinking water wells, and approximately 70 additional wells were sampled annually. Locations of wells are shown on Figures 7 (for the Drift/Platteville and St. Peter aquifers) and Figure 8 (for the Prairie du Chien/Jordan, Ironton-Galesville or Wonewoc, and Mt. Simon/Hinkely aquifers). Analysis included PAHs and VOCs. The City also monitors water levels in the monitoring and pumping wells, either manually or by transducer.

During this FYR, S.S. Papadopulos & Associates, Inc., on behalf of EPA, compared groundwater monitoring results from the past ten years to the 95% Upper Confidence Limit of the mean of the most recent ten monitoring results. Results were compared to CD-RAP Drinking Water Criteria and current drinking water standards for Site-related contaminants, represented by the lowest of

MCLs, HRLs, or HBVs. MCLs and HRLs are promulgated standards; HBVs are non-promulgated standards, but were included in the current standards category because MDH intends to promulgate these levels in the future. Results were also compared to CD-RAP Advisory Levels, and to the lower of current EPA tap-water screening levels or MDH Risk Assessment Advice levels. The comparisons to CD-RAP Advisory Levels, EPA tap-water screening levels, and MDH Risk Assessment Advice levels were made mainly to assist EPA and MPCA in reviewing future groundwater monitoring plans and are not discussed in this FYR. Full results of the analysis are found in a report entitled *Evaluation of Groundwater Sample Results, Reilly Tar & Chemical Corporation St. Louis Park Plant Superfund Site, Hennepin County, Minnesota*, May 2016.

For the purpose of this evaluation, Site-related contaminants were considered to include all PAHs and BTEX compounds. BTEX compounds were added to the analysis because of the frequent occurrence of benzene in soil data during the original remedial investigations for the Site, combined with its presence in groundwater.

Results for the Site as a whole are summarized below, followed by a summary of results for each affected aquifer. Although shallow aquifers at the Site are not used for drinking water and are not required by the CD-RAP to meet the CD-RAP Drinking Water Criteria, for informational purposes and ease of computation, results for all aquifers were compared to CD-RAP Drinking Water Criteria and to current drinking water standards.

Results for the Site as a whole are summarized on Figure 9, 10 and 11. Using the methodology described above, exceedances of the CD-RAP Drinking Water Criteria for cPAH occur in four wells: St. Peter well W14, Platteville well W421, Prairie du Chien well W23, and Wonewoc (Ironton-Galesville) well W105. Exceedances of the CD-RAP Drinking Water Criteria for the sum of B(a)P and dibenzo(ah)anthracene (BaP-DahA) are found in the same four locations. The analysis showed that one additional location in the Prairie du Chien aquifer (well W403) also exceeds CD-RAP Drinking Water Criteria for BaP-DahA; however, there is some uncertainty about the cause of this result. The result was affected by the presence of NAPL-like material that was removed from the well in 2013 and monitoring results since that time have been below CD-RAP drinking water criteria. Continued monitoring will demonstrate whether this continues to be the case. Exceedances of the CD-RAP Drinking Water Criteria for oPAH are found in 28 locations which are included in the aquifer-specific discussion below. Only two locations exceed the CD-RAP Advisory Levels without exceeding the Drinking Water Criteria: well W15, located in the Drift aquifer on the Site, and well W122, located in the St. Peter aquifer east of the Site.

Most locations exceeding CD-RAP Drinking Water Criteria indicate no trend or a downward trend. Locations with a CD-RAP Drinking Water Criteria exceedance and a statistically-calculated upward trend (all for oPAH) include Drift aquifer wells P308 and P309, St. Peter well W129, and Prairie du Chien well W48 (plugged during a recent Methodist Hospital expansion). Two additional wells also exhibit an upward trend based on a visual inspection of the data: well W410 in the St. Peter aquifer and well W426 in the Drift/Platteville aquifer.

Using the methodology described above, the following contaminants (or in the case of $B(a)P_{eq}$, contaminant groups) exceeded current drinking water standards for Reilly contaminants of concern (COCs) in at least one location (in order of prevalence): benzene, $B(a)P_{eq}$, naphthalene,

and ethylbenzene. The contaminant at the Site that exceeds current drinking water standards by the highest amount is the $B(a)P_{eq}$ group. Most locations exceeding current drinking water standards indicate no trend or a downward trend. Locations with exceedances and upward trends are Drift aquifer wells P307 and P309 (increasing for benzene), Platteville aquifer well W426 (increasing for $B(a)P_{eq}$).

Reilly COCs exist in groundwater further from the Site at levels below CD-RAP Drinking Water Criteria and below current drinking water standards. Figure 11 shows locations where monitoring wells or drinking water wells before treatment contain a PAH or BTEX compound that exceeds the lowest of EPA tap-water screening levels or MDH Risk Assessment Advice levels. PAHs that exceed the lower of these levels are located at wells in an area extending approximately 5,000 feet southeast of the Site.

Benzene exceeds tap-water screening levels in an area extending further from the Site, including in water before treatment at one active drinking water well in the City of Edina (well E2). Well E2 is currently being treated for VOCs due to the presence of other non-Reilly contaminants. Benzene also exceeds tap-water screening levels in a currently unused drinking water well in the City of St. Louis Park (well SLP6), at an irrigation well used as a monitoring well (well W119) and at monitoring well W402, also in the City of St. Louis Park. The wells with exceedances of benzene tap-water screening levels (but which do not exceed current drinking water standards) are all in the Prairie du Chien/Jordan aquifer.

In addition, there have been sporadic detections of Site-related contaminants at low levels at other wells which do not exceed the 95% UCL. These include low-level detections of PAHs in several Edina drinking water wells prior to treatment. For example, during the period of this FYR, low levels of acenaphthene, anthracene, pyrene and fluoranthene have been detected in Edina well E7 and low levels of acenapththene and pyrene have been detected in Edina well E13. These detections are below MCLs, HRLs and HBVs, but have in some cases exceeded tap-water screening levels.

Drift/Platteville aquifer

Groundwater in the Drift/Platteville aquifer exceeds the CD-RAP Drinking Water Criteria for PAHs beneath the Site at most monitoring locations in an area extending approximately 3,500 feet southeast of the Site (Figure 9). A network of monitoring wells for this aquifer outside of that area do not exceed CD-RAP Drinking Water Criteria for PAHs. Groundwater in this aquifer exceeds current drinking water standards (MCL, HRL, or HBV) for PAHs at the Site and immediately southeast of the Site, in the location of the former bog (Figure 10). Groundwater exceeds current drinking water standard for another Reilly COC, benzene, in an area extending approximately 3,000 feet southeast of the Site.

St. Peter Aquifer

Groundwater in the St. Peter aquifer exceeds the CD-RAP Drinking Water Criteria in some of the St. Peter monitoring wells located in an area extending at least 5,000 feet southeast of the Site (Figure 9). Some St. Peter monitoring wells located closer to the Site exceed CD-RAP Drinking Water Criteria and some do not. There are no St. Peter monitoring wells located further

southeast, so the full extent of low-level contamination in this aquifer is unknown. Groundwater in this aquifer exceeds the current drinking water standards for Reilly COCs at two of 15 monitored locations (Figure 10). One monitoring well located 500 feet east of the Site exceeds the current drinking water standard for benzene and one monitoring well located approximately 750 feet southeast of the Site exceeds the current drinking water standard for $B(a)P_{eq}$.

Prairie du Chien/Jordan Aquifer

Groundwater in the Prairie du Chien/Jordan aquifer exceeds the CD-RAP Drinking Water Criteria at four locations (Figure 9). Before it is treated, groundwater in drinking water well SLP10, located approximately 2,000 feet north of the Site, exceeds the CD-RAP Drinking Water Criteria for oPAH. Three monitoring wells with exceedances are located on the Site or in an area extending approximately 10,000 feet southeast of the Site, including pumping well W23 (exceeds for cPAH, oPAH, and BaP-DahA), previously-pumping well W48 (exceeds for oPAH, now plugged), and monitoring well W403 (exceeds for BaP-DahA). Groundwater in this aquifer exceeds current drinking water standards for Reilly COCs at two wells: source control pumping well W23 located on the Site (exceeds for B(a)Peq and benzene) and well W48, located 4,000 feet southeast of the Site and now plugged (exceeded for benzene) (Figure 10). Based on this evaluation, no wells being pumped for drinking water exceed either CD-RAP Drinking Water Criteria or current drinking water standards for Site-related contaminants, even before treatment. However, there is some uncertainty about the boundaries of the plume and capture zones in this aquifer because monitoring wells are widely-spaced and, in some zones of the aquifer, flow occurs through fractured bedrock. This issue is addressed in the Issues and Recommendations section of this FYR.

Wonewoc (Ironton-Galesville) Aquifer

There is only one monitoring well in the Wonewoc aquifer at the Site, well W105. This well is located on-Site and exceeds CD-RAP Drinking Water Criteria for cPAH, oPAH and BaP-DahA (Figure 9). Groundwater at this location also exceeds the current drinking water standard for $B(a)P_{eq}$ (Figure 10). The Wonewoc aquifer is not typically used as a drinking water aquifer. Well W105 was originally constructed as a Mt. Simon well in 1908. Due to concern about leakage around the well annular space, MPCA arranged for the well casing to be relined and the annular space sealed. The lower portion of the well in the Mt. Simon formation was also sealed.

Mt. Simon/Hinckley Aquifer

St. Louis Park municipal supply wells SLP11, SLP12, SLP13 and SLP17 are located in the Mt. Simon Hinckley aquifer (Figure 8). Monitoring is ongoing for SLP11, 12, and 13; however, well SLP17 was plugged by the City in 2013 without a final sampling. Overall monitoring results show that this aquifer remains predominantly unaffected by Site contamination and, using the EPA methodology described above, the groundwater does not exceed the CD-RAP Drinking Water Criteria or any current drinking water standard for Reilly COCs. However, during the period of this FYR, the first quarter sample from well SLP13 exceeded both the current drinking water standard for $B(a)P_{eq}$ and the CD-RAP Drinking Water Criteria for cPAH and BaP-DahA. The City resampled this well and subsequent samples have not detected this contamination. However, the aquifer is not totally unaffected by the Site; for example, SLP11 sampling shows

frequent detections of acenaphthene at levels below current drinking water standards and CD-RAP Drinking Water Criteria.

Site Inspection

The inspection of the Site was conducted on November 13, 2015, preceded by a pre-meeting of the Site team. In attendance at either the pre-meeting, field inspection, or both were Nabil Fayoumi and Leah Evison, representing EPA; Jennifer Jevnisek, Dave Scheer, Crague Biglow, and Jacob Knapp (Antea), representing MPCA; David Jones, representing MDH; Mark Hanson, Jay Hall, Cindy Walsh, Bill Gregg (Summit Envirosolutions), Eric Tollefsrud (Geosyntech Consultants), and David Zoll (Lockridge Grindall Nauen P.L.L.P.), representing the City; and John Jones (on the phone), representing Vertellus Specialties, Inc. The purpose of the inspection was to make a visual survey of the Site to help assess the protectiveness of the remedy. The Site team walked the land portion of the Site and observed the general recreation areas, the athletic field, the on-Site mound known as Mount Reilly, and housing areas located on and adjacent to the Site. The Site team also inspected areas that were under construction at the time of the inspection for trail and sidewalk improvements and walking bridge replacement. No issues were noted that affect the current protectiveness of the remedy; however, the Site inspection highlighted the need to clarify safety protocols for on- and off-Site work so that they are more transparent for the public. This has been added to the Issues and Recommendations section of this FYR. Photographs from the Site Inspection are included in Appendix C.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Yes.

Question A Summary:

Overall, the remedy is functioning as intended by the decision documents; however, there are areas in which it is not, as described under the Remedial Action Performance section below. Groundwater that exceeds CD-RAP Drinking Water Criteria is present at one St. Louis Park drinking water well (SLP10), and is being effectively treated for PAHs prior to use. Source control wells are removing contaminants from groundwater in the source area. Gradient control wells are preventing migration of Site-related contaminants at concentrations that exceed CD-RAP Drinking Water Criteria from reaching drinking water wells in the City of Edina. However, capture of groundwater appears incomplete for the St. Peter and Prairie du Chien/Jordan aquifers. Overall monitoring results show that Site-related contamination has affected some areas of the deeper Mt. Simon/Hinckley aquifer at low levels and that continued monitoring is important.

Remedial Action Performance

During this review period, several changes to groundwater source control and gradient control wells have occurred. These include:

- Pumping well W439 in the Drift/Platteville aquifer and pumping well W410 in the St. Peter aquifer are both unable to meet their required pumping rates despite redevelopment attempts. A request by the City to stop pumping at these locations was declined by EPA and MPCA in 2014. Increasing contaminant concentrations at down-gradient monitoring well W129 suggest that capture may not be complete in the St. Peter aquifer. Discussions between EPA, MPCA and the City are ongoing concerning this issue.
- Previously-pumping well W48, that was intended to contribute to gradient control in the Prairie du Chien/Jordan aquifer, was plugged by Methodist Hospital in 2014. This well had not pumped significant volumes since 1991, but was intended by the CD-RAP to contribute to gradient control. SLP4 continues to pump at its required rates in this aquifer; however, Site-related contaminants continue to be detected in Edina drinking water well E7 prior to treatment. Although these detections are at levels below CD-RAP Drinking Water Criteria and below current drinking water standards, they suggest that capture is not complete. Discussions between EPA, MPCA and the City concerning pumping an additional well in the Prairie du Chien aquifer (SLP6) are ongoing.
- In 2014, the City increased the pumping rate in source control well W23 in the Prairie du Chien/Jordan aquifer from 50 to 65 gpm. Groundwater at this location has improved since the time of the ROD and is currently approaching the pumping cessation criteria of the CD-RAP; however, it continues to exceed current drinking water standards. As explained earlier in this FYR, pumping cessation criteria for the source control well exceed some current drinking water standards, although gradient control wells are pumping elsewhere in the aquifer to capture this groundwater. This issue is under discussion between EPA, MPCA and the City.

System Operations/O&M

Groundwater treatment systems operated as part of the remedy at the GTF and drinking water Treatment Plants 1 and 4 continue to meet treatment requirements. Currently the City, MPCA and EPA are evaluating whether GAC treatment should be continued at well SLP4 that appears to meet CD-RAP Drinking Water Criteria as well as current drinking water standards for Site-related contaminants before treatment. However, during the period of this FYR the City continued to treat SLP4 water with GAC.

Implementation of Institutional Controls and Other Measures

Groundwater ICs in the form of governmental controls are in place for the Site; however, ICs for soil are not in place and need to be placed on those parcels not meeting UU/UE. In addition, LTS procedures need to be developed and implemented to ensure ICs remain in place and effective. Further evaluation and implementation of ICs for the site is necessary in order to achieve long-term protectiveness at the Site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes.

Question B Summary:

The exposure assumptions used at the time of remedy selection did not include the vapor intrusion pathway; however, the evaluation of this pathway was documented in the 2014 FYR Addendum that showed no completed pathway. Toxicity data have changed for many Site-related contaminants since the time of remedy selection. The CD-RAP Drinking Water Criteria remain protective and generally more stringent than current drinking water standards; however, in this FYR, benzene and ethylbenzene have been recognized as Site-related groundwater contaminants. Remedial action objectives used at the time of remedy selection are still valid. Updating the remedy to include current drinking water standards (defined previously in this FYR as MCLs, HRLs, and HBVs) for all Site-related contaminants rather than CD-RAP Drinking Water Criteria would result in a more efficient remedy. For example, it may lead to a reduction of pumping in certain areas, resulting in less removal of groundwater as a resource and resulting in a cost saving for the City.

Changes in Standards and TBCs

The CD-RAP Drinking Water Criteria for PAHs remain protective; however, as noted in the last FYR, there have been significant advances in risk assessment for PAHs since the time of the RODs and this should be incorporated into the remedy. Current drinking water standards are based on individual PAHs or, in the case of the HRL for $B(a)P_{eq}$, a group of PAHs, rather than the total cPAH or oPAH standards in the CD-RAP, which are in general higher than the current standards. A modification of the remedy may result in a more efficient but still protective remedy. A table showing CD-RAP Drinking Water Criteria and current standards is found in Appendix B.

Changes in Toxicity and Other Contaminant Characteristics

During the period of this FYR, EPA and MPCA have recognized benzene and ethylbenzene as Site-related contaminants because of the frequent occurrence of benzene in soil data during the original remedial investigations for the Site combined with its presence in groundwater. Multiple sources of these compounds are also possible. This could affect the protectiveness of the remedy because these contaminants are not included in the RODs.

Changes in Risk Assessment Methods

During the period of the FYR, there have been improvements made to vapor intrusion risk assessment that were incorporated in to the vapor intrusion assessment for the Site and documented in the 2014 FYR Addendum.

Changes in Exposure Pathways

During the period of this FYR, there have not been changes in current or reasonably anticipated future land use on or near the Site, nor newly-identified exposure pathways that could change the protectiveness of the remedy.

Progress Towards Meeting RAOs

Contaminant concentrations in groundwater near the source have declined significantly since the time of the remedy selection and most monitoring wells throughout the Site show either no trend or a downward trend in concentration. The remedy is progressing toward meeting RAOs, but ICs are needed for soils.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes.

During the period of this FYR, MPCA and MDH discovered a non-Site-related plume of VOC contamination in groundwater that has affected multiple aquifers at the Site and has co-mingled with the Reilly plume. Actions needed to protect drinking water from this plume will need to be coordinated with Site actions in the future. This is likely to lead to a need to change the optimum pumping scenario and may also lead to a need to modify the remedy for the Site.

VI. VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
1

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 2	**Issue Category: Institutional Controls**			
	Issue: Existing soil data may be inadequate to identify all Site-affected properties that need use restrictions.			
	Recommendation: Evaluate existing soil data and conduct additional sampling if needed to identify all Site-affected properties not available for UU/UE.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	6/30/2018

OU(s): 2	Issue Category: Institutional Controls			
	Issue: A decision document is needed to require ICs for soil and groundwater as appropriate.			
	Recommendation: Complete a decision document clarifying ICs requirements.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	6/30/2018

OU(s): 2	Issue Category: Institutional Controls			
	Issue: ICs for areas of the site where UU/UE has not been achieved are not in place. An IC Plan needs to be developed to aid in the determination of ICs that are needed and in the implementation of such ICs.			
	Recommendation: An IC Plan should be developed to evaluate existing ICs and the need for additional ICs. The IC Plan should also discuss the implementation and maintenance of any additional ICs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	12/30/2017

OU(s): 2	Issue Category: Institutional Controls			
	Issue: Planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended.			
	Recommendation: Develop a LTS Plan or an amendment to the O&M Plan that outlines procedures for inspecting and monitoring compliance with the ICs. An annual report should be submitted to EPA and MPCA to demonstrate that the site was inspected, that no inconsistent uses have occurred, that ICs remain in place and are effective, and that any necessary contingency actions have been executed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	12/30/18

OU(s): 2	Issue Category: Institutional Controls			
	Issue: ICs are not in place for soils where UU/UE has not been achieved.			
	Recommendation: Develop and implement appropriate ICs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	12/30/2018

OU(s): 2	Issue Category: Institutional Controls			
	Issue: Safety protocols for work involving excavation in on- and off-Site affected areas, and notification procedures for work on off-Site areas, need additional clarity.			
	Recommendation: Clarify safety and notification protocols for excavation work in Site-affected areas.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	12/30/2016

OU(s): 2	Issue Category: Remedy Performance			
	Issue: Benzene and ethylbenzene are newly recognized as likely Site-related groundwater contaminants that exceed current drinking water standards.			
	Recommendation: Consider Site-related benzene and ethylbenzene in evaluation of plume capture.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	6/30/2017

OU(s): 2, 3, 5	Issue Category: Remedy Performance			
	Issue: Pumping well W439 in the Drift is unable to attain the pumping rate specified in the gradient control plan and pumping well W434 in the Platteville is currently in approved shut-down mode; however down-gradient monitoring wells contain benzene that may be Site-related.			
	Recommendation: Continue to evaluate capture and stability of the Site-related plume in the Drift/Platteville aquifer and adjust pumping if required.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	6/30/2017

OU(s): 2	Issue Category: Remedy Performance			
	Issue: Well W48 (now plugged) is not pumping as intended by the CD-RAP and low concentrations of Reilly COCs continue to be detected in Edina drinking water wells prior to treatment.			
	Recommendation: Increase gradient control pumping in the Prairie du Chien/Jordan aquifer if required following completion of EPA's capture zone analysis.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	12/30/2016

OU(s): 2	Issue Category: Changed Site Conditions			
	Issue: Additional leaky multi-aquifer wells may be present at the Site.			
	Recommendation: Continue to evaluate leaky multi-aquifer wells that may be present at the Site and plug or re-complete as needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	6/30/2018

OU(s): 2, 4	Issue Category: Remedy Performance			
	Issue: Well W410 in the St. Peter aquifer is unable to meet its required pumping rate and down-gradient oPAH concentrations are increasing, although they do not exceed current drinking water standards.			
	Recommendation: Re-evaluate capture of the Site-related plume in the St. Peter aquifer and increase pumping if needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	City	EPA/State	6/30/2018

OTHER FINDINGS

In addition, the following recommendations were identified during the FYR and may improve performance of the remedy, but do not affect current nor future protectiveness:

- Evaluate whether RODs should be modified to include benzene and ethylbenzene as additional Site-related contaminants in groundwater;

- Evaluate the apparent discrepancy between use of CD-RAP Drinking Water Criteria as TBCs in the RODs and proposal to use current drinking water standards as one element of the pumping cessation criteria;

- Continue the ongoing evaluation of Site pumping scenarios could capture both the Site-related Reilly COC plume and the non-Site related VOC plume;

- Evaluate whether it is advisable to continue pumping source control wells beyond the cessation criteria required by the CD-RAP. Cessation criteria for source control wells defined by the CD-RAP are above current drinking water standards. Although the source area plume as defined by current drinking water standards does not appear to be expanding, the drift aquifer remains the most highly-contaminated aquifer and continued pumping may serve to protect deeper drinking water aquifers;

- Evaluate the potential for resuming pumping of well W105 in the Wonewoc (Ironton-Galesville) aquifer, located on-Site. Although this well meets cessation criteria of the CD-RAP, it remains significantly contaminated and pumping may serve to protect deeper drinking water aquifers. MPCA and MDH are also currently evaluating whether this well could be leaking contaminants to deeper aquifers. If so, it will need plugging, re-completion, or replacement; and

- Add summaries of GAC treatment compliance and NPDES permit compliance to the Annual Monitoring Report.

VII. PROTECTIVENESS STATEMENTS

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment. At OU1, exposure pathways that could result in unacceptable risks are being controlled by filtering groundwater from wells SLP10 & SLP15 through GAC prior to introduction to the St. Louis Park municipal supply. RAOs for this OU1 are being met through treatment of drinking water and by pumping at a required rate that contributes to gradient control in the Prairie du Chien/Jordan aquifer.	

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
2	Short-term Protective

Protectiveness Statement:
The remedy at OU2 currently protects human health and the environment because drinking water affected by Site-related contamination is being treated prior to use, most source control and gradient control groundwater pumping wells are operating as required, and vapor intrusion does not present an unacceptable risk. In addition, the remedy and pre- and post-ROD actions have resulted in covering of source materials to prevent future exposures. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: Evaluate existing soil data and conduct additional sampling if needed to identify all Site-affected properties not available for UU/UE; develop and implement an IC Plan; implement additional ICs needed; address long-term stewardship through development of a LTS Plan or amendment to the O&M Plan; complete a decision document clarifying ICs requirements; clarify safety and notification protocols for excavation work in Site-affected areas; consider benzene and ethylbenzene in evaluation of plume capture; re-evaluate capture and stability of the Site-related plume in the Drift/Platteville and St. Peter aquifers and adjust pumping if needed; continue to evaluate the optimal pumping scenario for capture of the Site-related plume in the Prairie du Chien/Jordan aquifer; and continue to evaluate leaky multi-aquifer wells that may be present at the Site and plug or re-complete as needed.

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
3	Short-term Protective

Protectiveness Statement:
The remedy at OU3 currently protects human health and the environment because well W439 continues to pump in the northern area of the Drift aquifer. However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: Re-evaluate capture and stability of the Site-related plume in the Drift/Platteville aquifer and adjust pumping if needed.

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
4	Short-term Protective

Protectiveness Statement:
The remedy at OU4 currently protects human health and the environment because well W410 is pumping in the St. Peter aquifer and although groundwater down-gradient of this location exceeds CD-RAP Drinking Water Criteria it does not exceed current drinking water standards (MCLs, HRLs, or HBVs). However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: Re-evaluate capture and stability of the Site-related plume in the St. Peter aquifer and adjust pumping if needed.

Protectiveness Statement(s)	
Operable Unit: 5	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU5 currently protects human health and the environment because the Platteville member of the Drift/Platteville aquifer is not known to be a current source of drinking water, there are no complete exposure pathways, and pumping continues in this aquifer, although at a reduced rate. However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: Re-evaluate capture and stability of the Site-related plume in the Drift/Platteville aquifer and adjust pumping if needed.	

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy at the Site currently protects human health and the environment because drinking water affected by Site-related contamination is being treated prior to use, most source control and gradient control groundwater pumping wells are operating as required, and vapor intrusion does not present an unacceptable risk. In addition, the remedy and pre- and post-ROD actions have resulted in covering of source materials to prevent future exposures. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: Evaluate existing soil data and conduct additional sampling if needed to identify all Site-affected properties not available for UU/UE; develop and implement an IC Plan; implement additional ICs needed; address long-term stewardship through development of a LTS Plan or amendment to the O&M Plan; complete a decision document clarifying ICs requirements; clarify safety and notification protocols for excavation work in Site-affected areas; consider benzene and ethylbenzene in evaluation of plume capture; re-evaluate capture and stability of the Site-related plume in the Drift/Platteville and St. Peter aquifers and adjust pumping if needed; continue to evaluate the optimal pumping scenario for capture of the Site-related plume in the Prairie du Chien/Jordan aquifer; and continue to evaluate leaky multi-aquifer wells that may be present at the Site and plug or re-complete as needed.

VIII. NEXT REVIEW

The next FYR report for the Reilly Tar & Chemical Corp. (St. Louis Park Plant) Superfund Site is required within five years from EPA's signature date for this review.

Appendix A: Documents Reviewed

Minnesota Statute 103I.205
Minnesota Rule 4725.2020
Minnesota Plumbing Board, Minnesota Rule 4715.0310
St. Louis Park Municipal Code Chapter 32 Article V. Section 32-205
September 30, 1992; *Superfund Record of Decision: Reilly Tar and Chemical (St. Louis Park), MN;* EPA
April 11, 1997; *Explanation of Significant Differences in the Approved Remedy for Operable Unit 5, Northern area of the Platteville Aquifer at the Reilly Tar and Chemical Company Superfund Site in St. Louis Park, Minnesota;* EPA
June 30, 1998; *Declaration for the Record of Decision;* EPA
December 16, 2009; *Public Health Assessment, Reilly Tar and Chemical Corporation Site, St. Louis Park, Hennepin County, Minnesota*; Agency for Toxic Substances and Disease Registry
March 15, 2011; *Annual Monitoring Report for 2011*; St. Louis Park
April 6, 2011; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *Annual Monitoring Report for 2010, Annual Performance Report Granular Activated Carbon Treatment System for 2010, and Annual Progress Report for 2010 Reilly Tar and Chemical Superfund Site, St. Louis Park, MN*
June 27, 2011; *Fourth Five Year Review Report;* EPA/MPCA
November 2011; *Screening Levels for Vapor Intrusion Contaminants of Concern, Reilly Tar and Chemical Co. Superfund Site;* EPA
March 15, 2012; *Annual Performance Report Granular Activated Carbon Treatment System;* St. Louis Park
May 29, 2012; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *2011 Annual Performance Report for the Granular Activated Carbon Treatment System*
May 30, 2012; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE:*2011 Annual Monitoring Report, Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*
July 19, 2012; Letter from City (Gregg/Rardin) to Agencies/Vertellus (Kerr/Fellows/Jones); RE: *United States of America, et al., vs. Reilly Tar and Chemical Corporation et al., File No. Civ. 4-80-469. CD-RAP Section 3.4*
September 24, 2012; *Identification of Potentially Affected Properties for Development of Institutional Controls;* S.S. Papadopulos & Associates, Inc.
October 1, 2012; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: Annual Monitoring Report Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota
October 22, 2012; Letter from City (Gregg) to Agencies (Kerr/Fellows); Subject: *United States of America, et al., vs. Reilly Tar and Chemical Corporation et al., File No. Civ. 4-80-469. CD-RAP Section 3.4 2011 Annual Monitoring Report.*
January 14, 2013; Email from City (Gregg) to EPA (Kerr); RE: *Short questions on revised AMR [Reilly Tar Superfund Site]*
January 18, 2013; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *2011 Revised Annual Monitoring Report, 2012 Annual Monitoring Report Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

February 8, 2013; Letter from City (Gregg/Rardin) to Agencies (Kerr/Fellows); Subject: *United States of America, et al., vs. Reilly Tar and Chemical Corporation et al., File No. Civ. 4-80-469. CD-RAP Section 3.4*

February 21, 2013; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE:*Vertical Gradients in Groundwater Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

March 4, 2013; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *Drift, Platteville, and St. Peter Aquifer pumping Well Evaluations and Cessation Request Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

March 15, 2013; *Annual Performance Report Granular Activated Carbon Treatment System*; St. Louis Park

May 15, 2013; Letter from City (Gregg) to Agencies (Kerr/Fellows); Subject: *United States of America, et al., vs. Reilly Tar and Chemical Corporation et al., File No. Civ. 4-80-469. CD-RAP Section 3.4 2012 Annual Monitoring Report.*

August 21, 2013; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *Modification of the Gradient Control System for the Prairie du Chien Aquifer Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

August 29, 2013; Letter from Agencies (Kerr/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *2012 Annual Monitoring Report Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

September 10, 2013; Letter from Vertellus (Mesevage) to Agencies (Kerr/Fellows); RE: *Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota USEPA/MPCA Correspondence Dated August 21, 2013*

September 30, 2013; Letter from Lockridge Grindal Nauen P.L.L.P (Nauen) to Agencies (Kerr/Fellows); RE: *United States of America, et al., vs. Reilly Tar and Chemical Corporation et al., File No. Civ. 4-80-469*

February 4, 2014; Letter from Agencies (Short/Burman) to SLP/Vertellus (Harmerning/Jones); RE: *Remedy Performance Reilly Tar and Chemical Corporation Superfund Site, St. Louis Park, Minnesota*

February 5, 2014; *Vapor Intrusion Pathway Investigation Report Reilly Tar and Chemical Corporation Superfund Site St. Louis Park, Minnesota;* CH2MHILL

February 26, 2014; Letter from Lockridge Grindal Nauen P.L.L.P (Nauen) to Vertellus (Mesevage/Jones); RE: *Reilly Tar and Chemical Site, St. Louis Park, Minnesota USEPA/MPCA Correspondence Dated February 4, 2014 Agreement by and between Reilly and the City of St. Louis Park*

March 15, 2014; *Annual Monitoring Report for 2013*; Summit Envirosolutions, Inc.

May 8, 2014; Memorandum from John Kinny to Adam Gordon; SEH; RE: *Saint Louis Park FM Response Action Plan Addendum*

May 27, 2014; Letter from Agencies (Evison/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *Drft Revised Gradient Control Plan Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

June 2, 2014; Letter from Agencies (Evison/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *2013 Progress Report on the Implementation of the Concent Decree Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

June 16, 2014; Letter from Lockridge Grindal Nauen P.L.L.P (Nauen) to Agencies (Evison/Fellows); RE: *United States of America, et al., vs. Reilly Tar and Chemical Corporation et al., File No. Civ. 4-80-469*

September 2, 2014; Letter from Agencies (Evison/Fellows) to SLP/Vertellus (Harmerning/Jones); RE: *2013 Annual Monitoring Report Reilly Tar and Chemical Superfund Site, St. Louis Park, MN*

September 8, 2014; Letter from Agencies (Evison/Fellows) to SLP/Vertellus (Harmerning/Jones); RE:*Third Draft Revised Gradient Control Plan Reilly Tar and Chemical Superfund Site, St. Louis Park, Minnesota*

December 2014; *Construction Plan for Reilly Site Trails, Sidewalks, and Parking Lot Expansion and Walker Street Re-Alignment;* Summit Envirosolutions, Inc.

February 9, 2015; Letter from Agencies (Evison/Fellows) to SLP (Hanson); RE: *Agency Approval of Construction Plan for Reilly Site Trails, Sidewalks, and Parking Lot Expansion and Walker Street Re-alignment*

February 25, 2015; Letter from Agencies (Evison/Fellows) to Metropolitan Council Environmental Services (Pickart); Re: *MPCA and U.S. EPA Superfund approval of Response Action Plan, Sites 1 and 2, St. Louis Park Forcemain, near TH7 and Louisiana Avenue, St. Louis Park*

March 15, 2015; *Annual Monitoring Report for 2014*; Summit Envirosolutions, Inc.

May 7, 2015; Letter from Agencies (Evison/Fellows) to SLP (Hanson); RE: *Agency Approval of 2015 Annual Monitoring Report*

December 30, 2015; *Draft Reilly Site Soil Cover;* St. Louis Park

March 2, 2016; *Cancer Occurrence in St. Louis Park, 1993-2012*; Minnesota Department of Health, Minnesota Cancer Surveillance System.

May 2016; *Evaluation of Groundwater Sample Results, Reilly Tar & Chemical Corporation St.Louis Park Plant Superfund Site, Hennepin County, Minnesota;* S.S. Papadopulos & Associates, Inc.

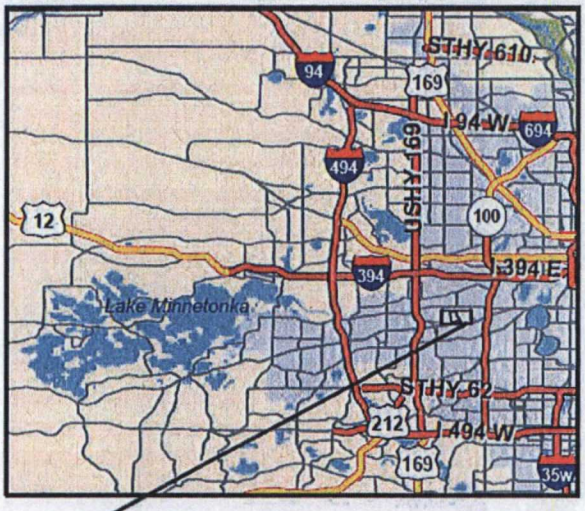
Figure 1
Site Location

Superfund
U.S. Environmental Protection Agency

Reilly Tar and Chemical Corp.
Hennepin County, MN

MND980609804

State



County

Site

Created by Sarah Backhouse
U.S. EPA Region 5 on 9/22/06
Image Date: 2003

Legend
Reilly Tar and Chemical Corp.

N

GEOS

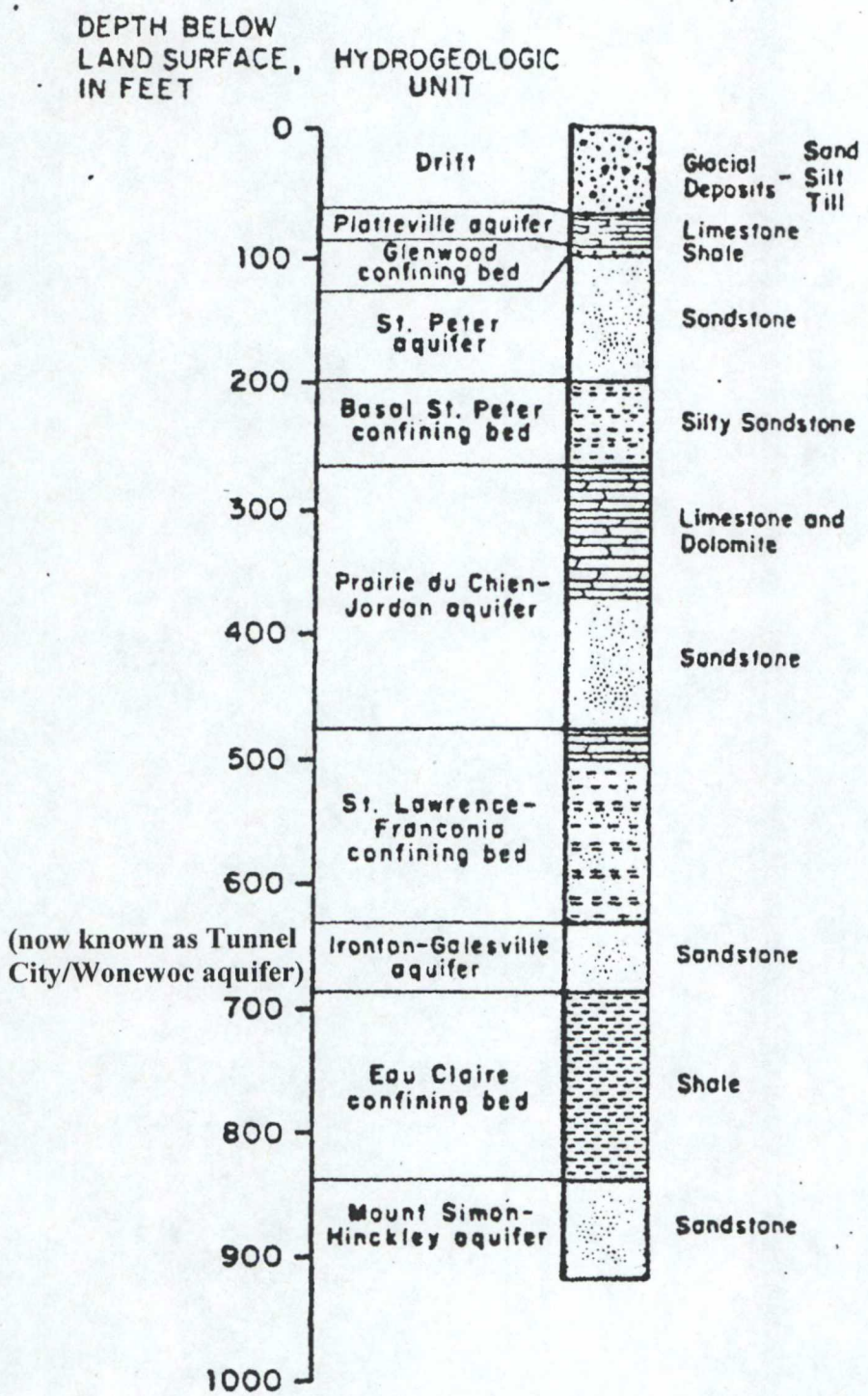


FIG. 2 GENERALIZED STRATIGRAPHIC COLUMN BASED ON WELL LOGS FROM W 23 ON SITE
(AFTER HULT AND SCHOENBERG 1984)

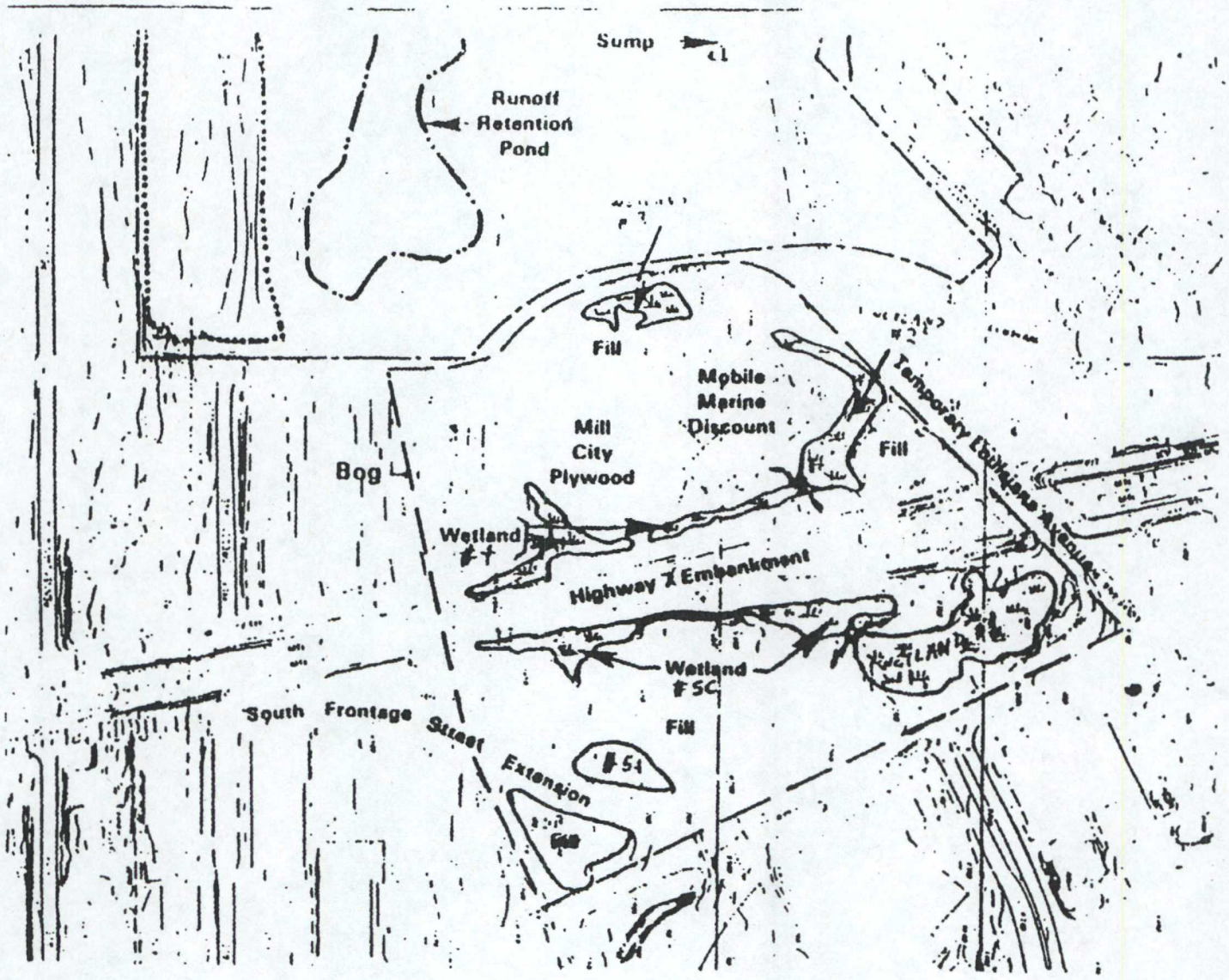
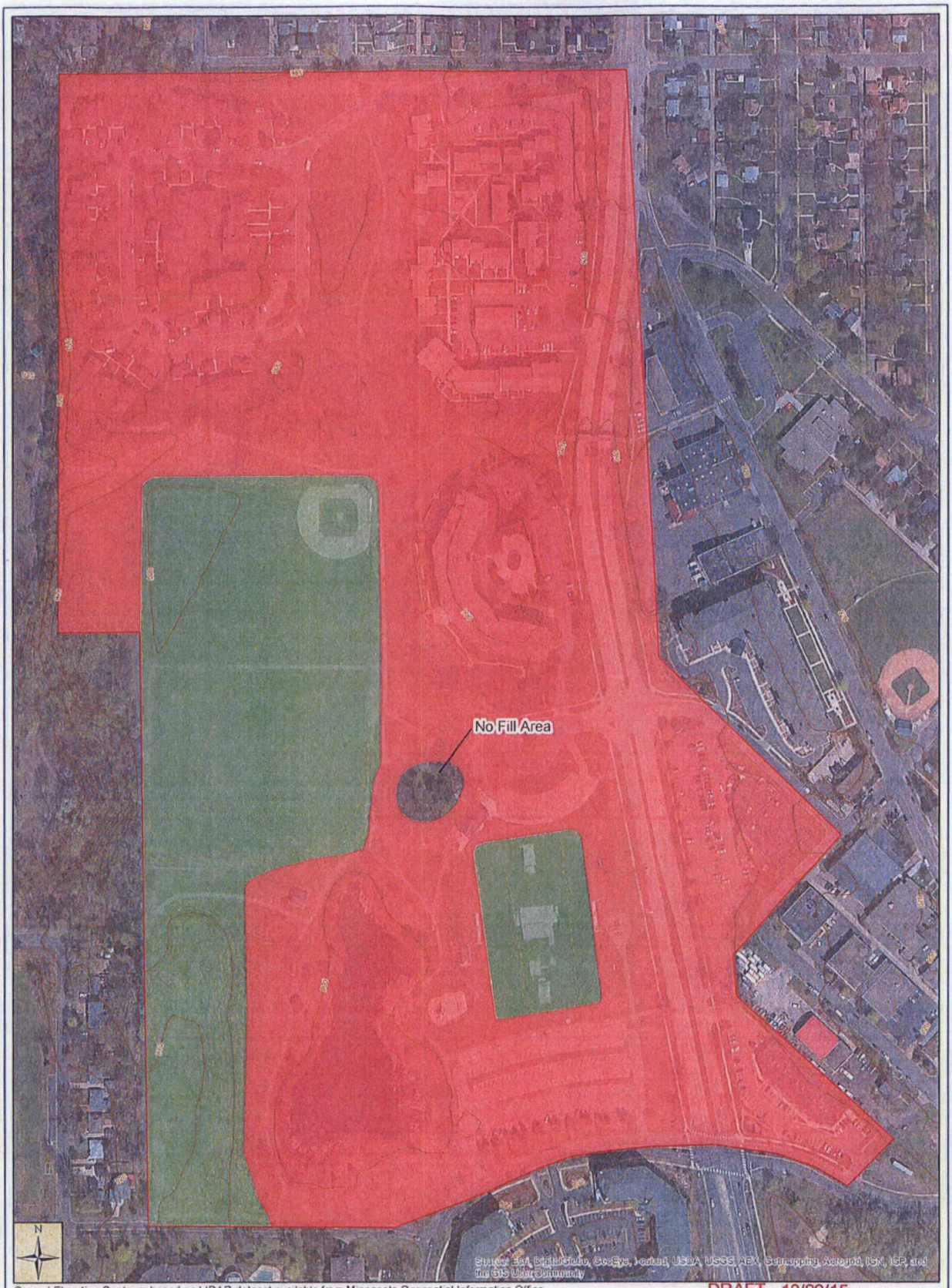


Figure 3. Former Bog Locations
(from 1986 Consent Decree)



Ground Elevation Contours based on LIDAR dataset available from Minnesota Geospatial Information Office

DRAFT 12/29/15

Explanation

Approximate Reilly Site Boundary

Estimated Soil Cover Thickness

0.5 to 3 feet

Over 3 feet

Ground Elevation Contours

10 foot contours

2 foot contours

0 400 Feet

1 inch = 200 feet

Note: "Estimated Soil Cover Thickness" excludes areas covered by impervious surfaces such as roads, sidewalks, parking lots, buildings, etc.

SOIL COVER THICKNESS
Reilly Site
St. Louis Park, MN

Summit Envirosolutions

Figure 4

File: Soil_Map
Summit Proj. No.: 0987-0009
Plot Date: 12/29/15
Arc Operator: RLA
Reviewed by: WMG

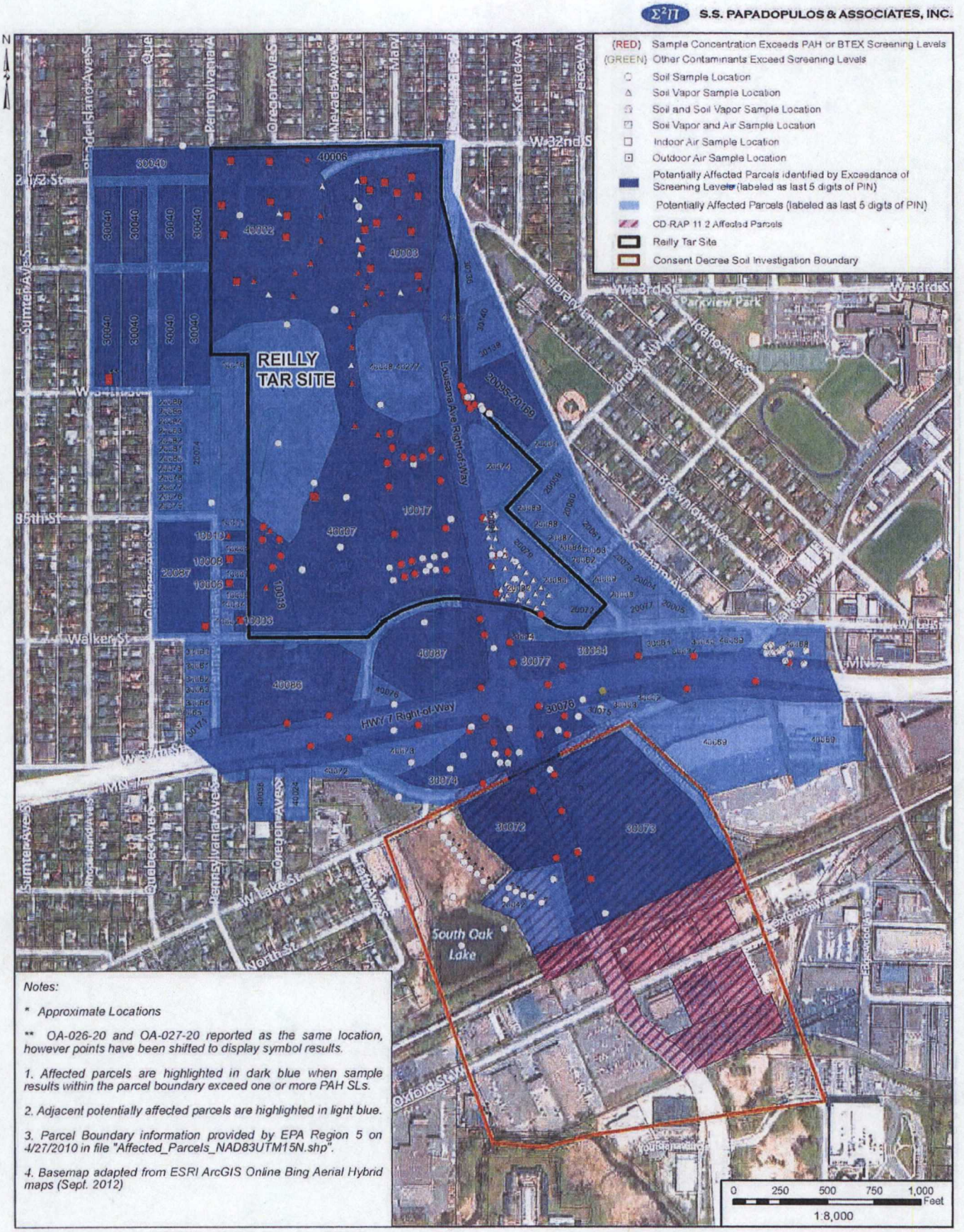
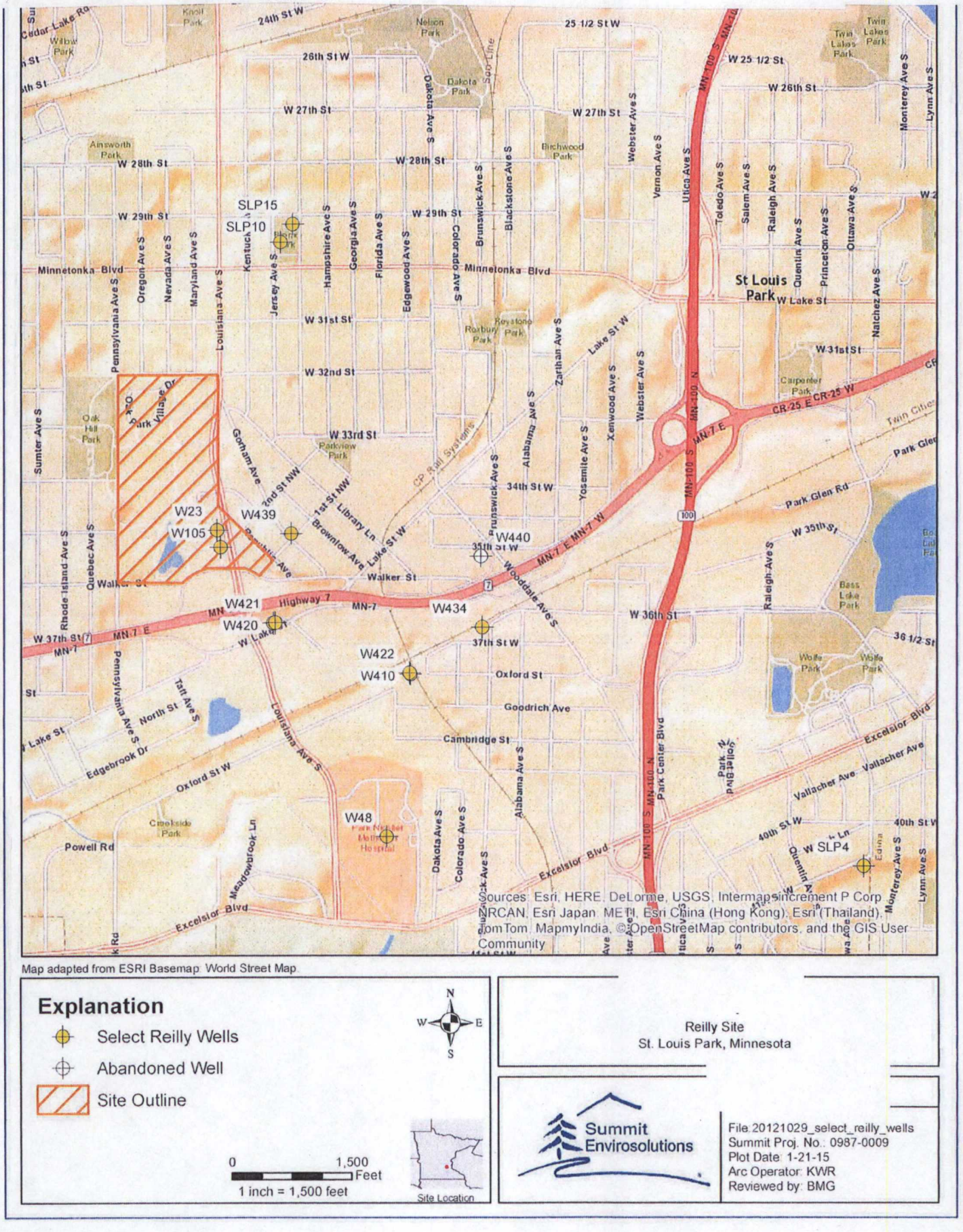


Figure 5 Location of Samples, Samples Exceeding Screening Levels, and Potentially Affected Parcels
(from *Identification of Potentially Affected Properties for Development of Institutional Controls, Reilly Tar Superfund Site, St. Louis Park, Minnesota*, S.S. Papadopoulos & Associates, Inc., September 24, 2012, under contract to EPA)

Figure 6. Location of Reilly Site Pumping and Previously-Pumping Wells



Map adapted from ESRI Basemap: World Street Map

Explanation

- Select Reilly Wells
- Abandoned Well
- Site Outline

N
W E
S

0 1,500 Feet
1 inch = 1,500 feet

Site Location

Reilly Site
St. Louis Park, Minnesota

Summit Envirosolutions

File:20121029_select_reilly_wells
Summit Proj. No.: 0987-0009
Plot Date: 1-21-15
Arc Operator: KWR
Reviewed by: BMG

Figure 7. Location of Wells (Drift-Platteville and St. Peter aquifers)

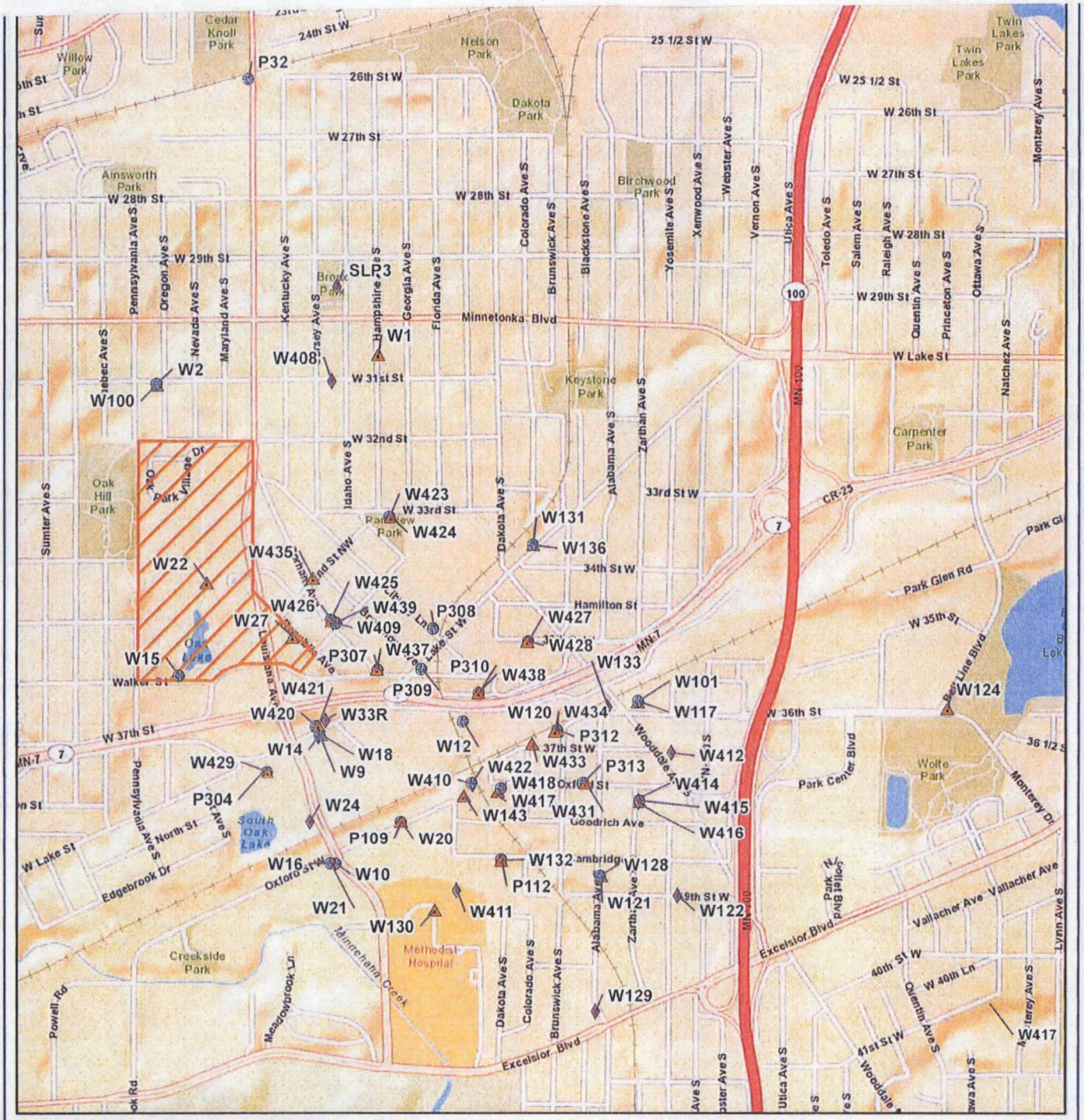
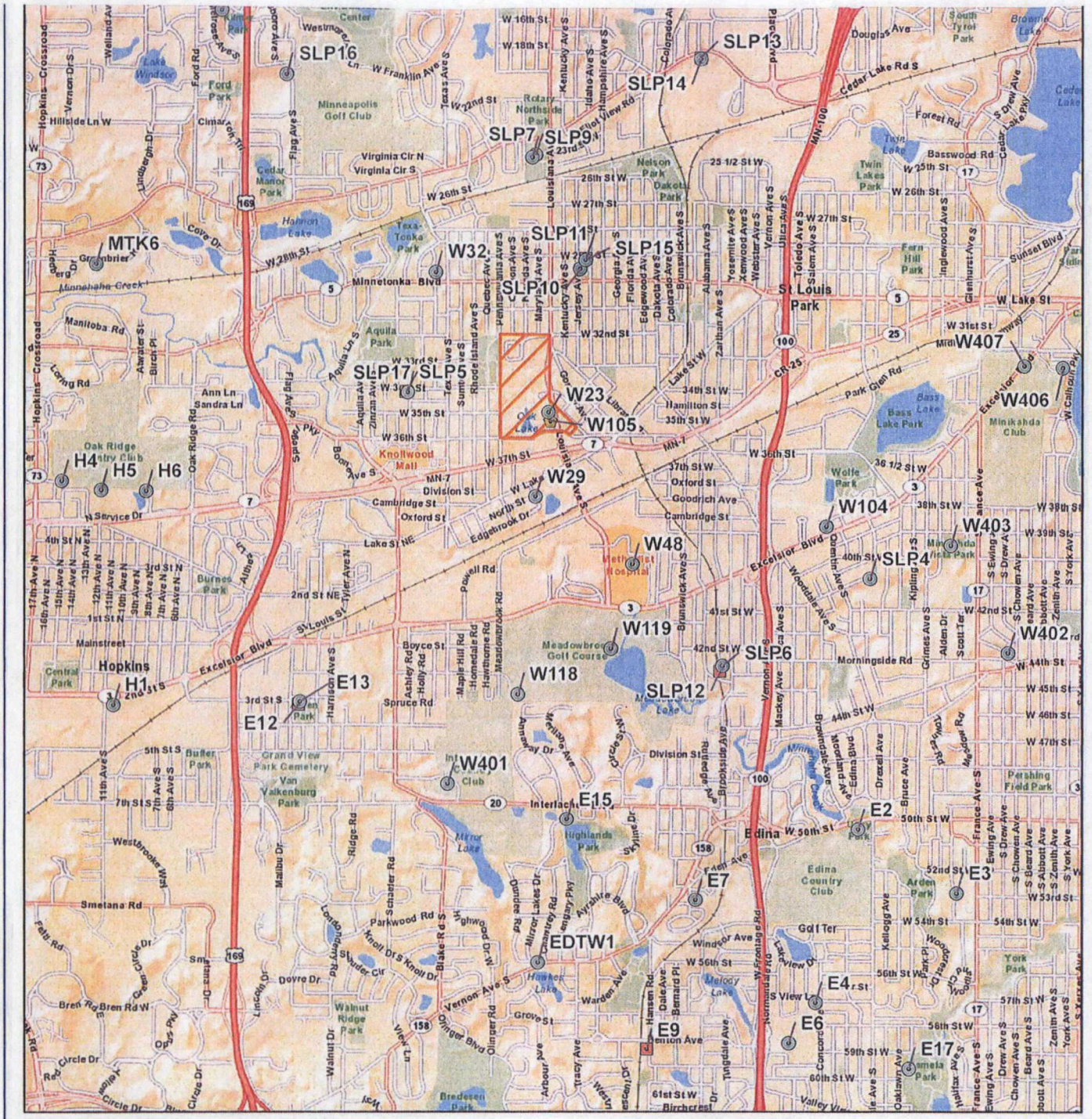


Figure 8. Location of Wells (Prairie du Chien-Jordan, Ironton-Galesville or Wonewoc, and Mt. Simon-Hinkley aquifers)



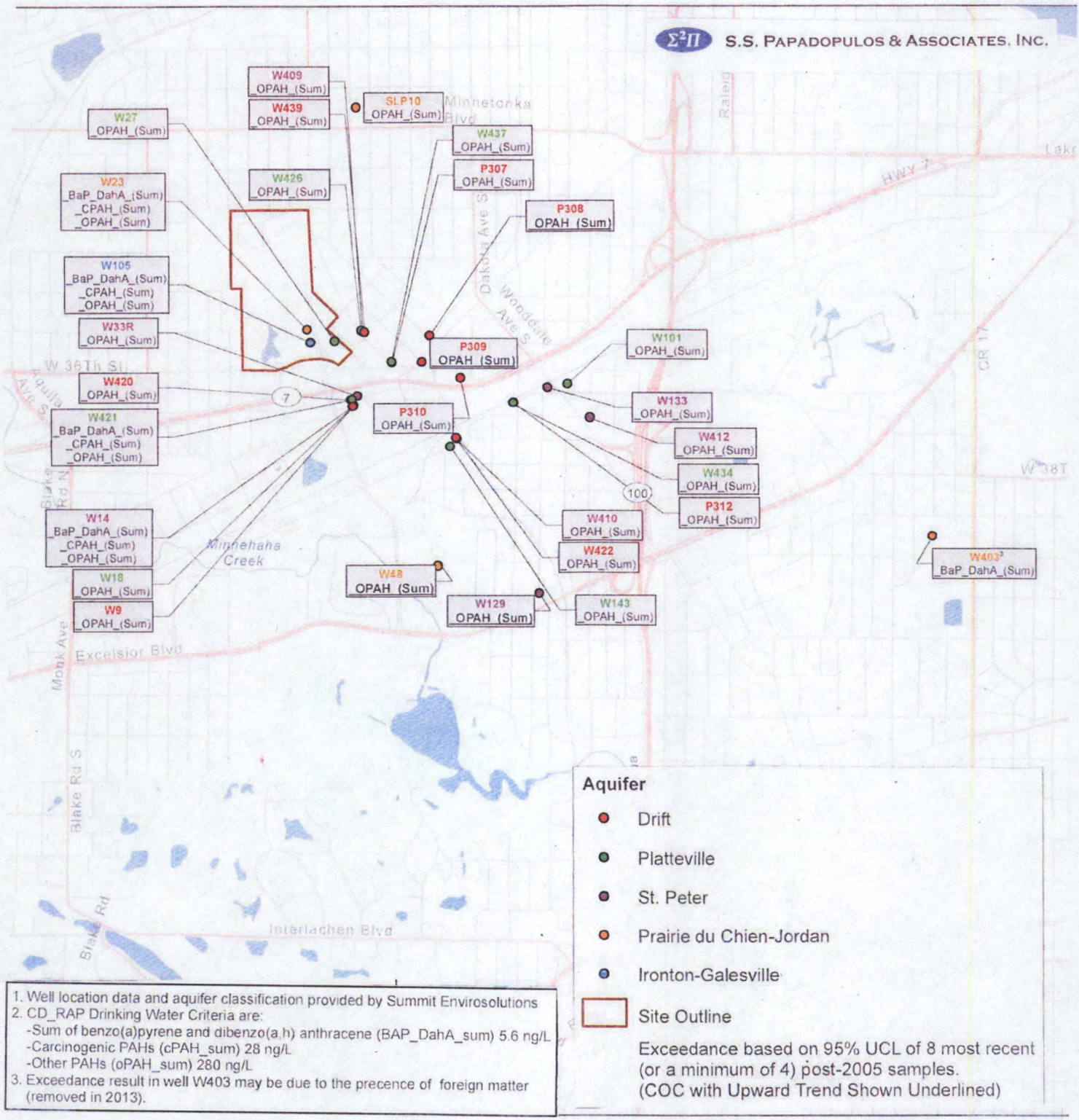


Figure 9. Site-related Contaminants Exceeding CD-RAP Drinking Water Criteria
(Shows exceedances of cPAH, oPAH, and B(a)P + DahA)

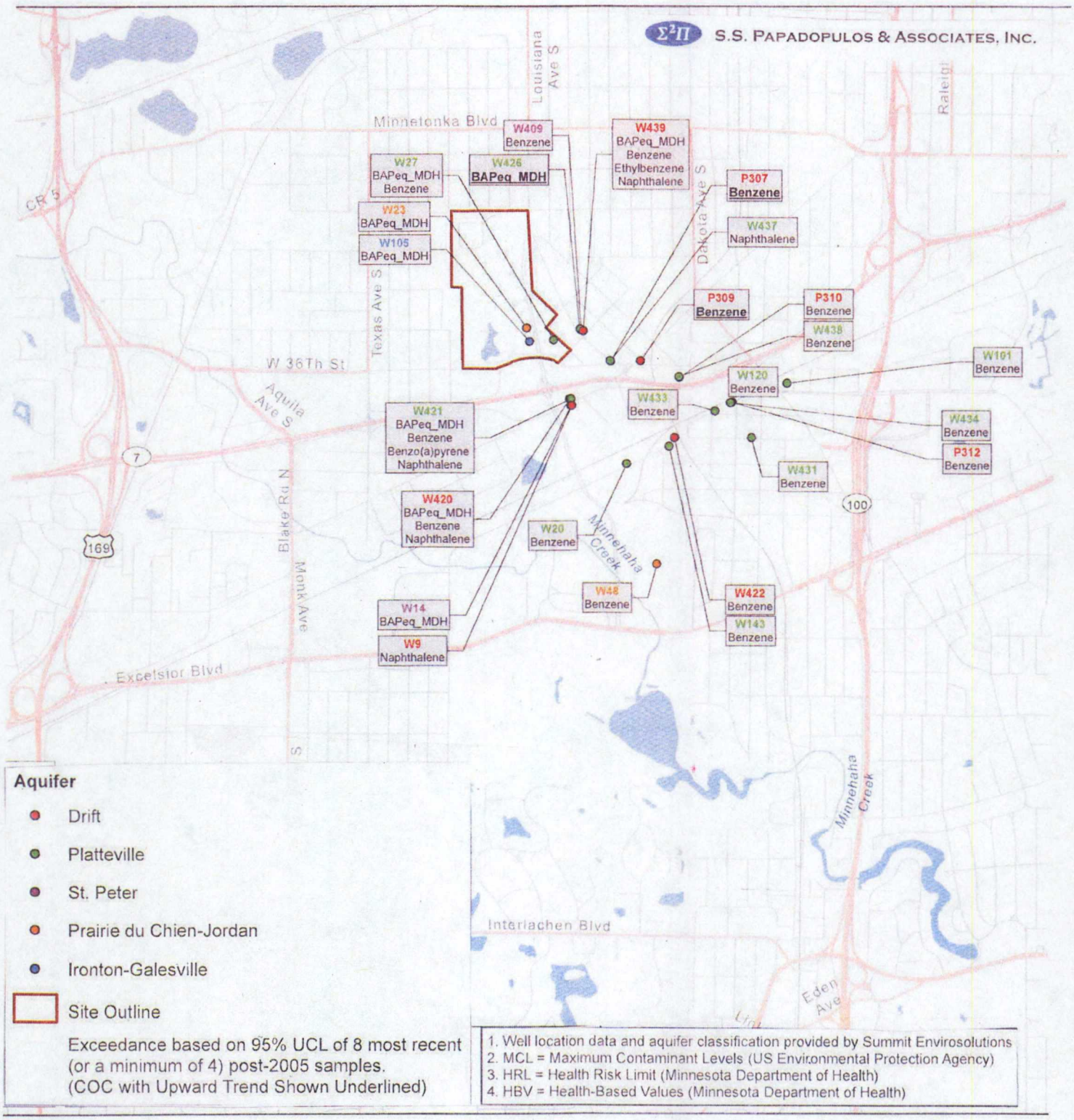


Figure 10. Site-related Contaminants Exceeding Current Drinking Water Standards
(Shows exceedances of MCL, HRL, and HBV; benzene may have multiple sources)

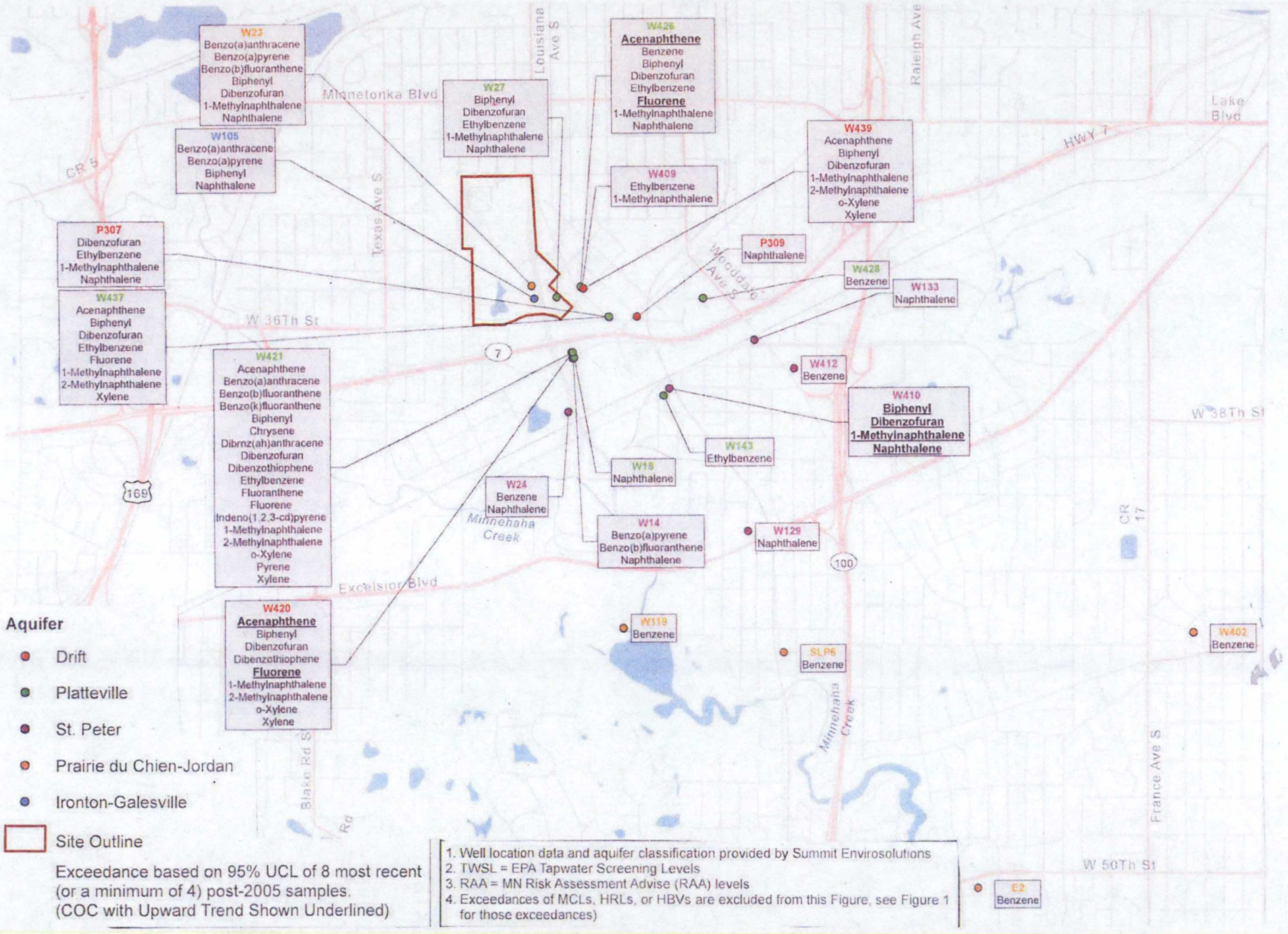


Figure 11. Site-Related Contaminants Exceeding Lowest Tapwater Screening Level
(Shows exceedances of EPA TWSL and MDH RAA at locations that do not exceed current drinking water standards; benzene may have multiple sources)

Table 6. Reilly Well and Maintenance Information

Well	Aquifer/Address	Pumping Set Point	Actual Yearly Average	CD-RAP Pumping Requirement	Status	Repair History (BC=Bergerson-Caswell) (K=Keys) (R=Renner)
W23	**Prairie du Chien** **3508 Louisiana** **Pumps to GTF**	2015: 65 gpm 2014: 50 gpm 2013: 50 gpm 2012: 50 gpm 2011: 50 gpm 2010: 50 gpm	2015: 67 gpm 2014: 57 gpm 2013: 54 gpm 2012: 54 gpm 2011: 60 gpm 2010: 60 gpm	Section 7.1.3 monthly average rate of 50 gpm.	**Good**, pumps to GTF Set point was increased to 65 gpm on July of 2014. Previously set to 50 gpm. August 2011 pump dropped to 27 gpm. **GAC is swapped out every year.** **GAC swapped out 7-2015**	BC, **10-1-93** replaced discharge pipe. **BC 10-15-93** replaced drop pipe. BC, **8-22-94** replaced pump motor. **6-6-95** repair discharge pipe. BC, **10-22-01** replaced pump, motor, drop pipe, and video investigated. BC, **7-29-05** replaced drop pipe and videoed. **7-21-08** replaced drop pipe. BC, **9-21-09** pulled and tested flow capacity. BC, **5-26-10** replaced drop pipe. BC, **9-2-11** replaced drop pipe to stainless steel. Tested pump at 56 gpm at 35 psi
W48	**Prairie du Chien**	**Sealing 2/15**	**Sealing 2/15**	**Methodist Hospital**	Plan on **Sealing** the well in February 2015	Sealed 2015
W105	**Ironton-Galesville** **3512 Louisiana**	**OFF**	**OFF**	Section 6.1.3 monthly average rate of **25 gpm.**	**OFF** 1992 ROD states that Agencies approved discontinuing pumping in 1991 after well met the cessation criteria.	
W410	**St. Peter** **6411 Oxford Street** **Pumps to sanitary**	2015: 50 gpm 2014: 50 gpm 2013: 50 gpm 2012: 50 gpm 2011: 50 gpm 2010: 50 gpm	2015: 40 gpm 2014: 42 gpm 2013: 42 gpm 2012: 57 gpm 2011: 56 gpm 2010: 51 gpm	1990 ROD selected 1 well operated at **65-100 gpm**.	**Operational**, but can only pump 40 gpm.	**1991** well was constructed and pumped 70gpm. BC, **2-20-03** disassembled and cleaned, but well still broke suction. BC, **7-30-03** redeveloped well with Nuwell, air surging and surge block. BC, **10-31-08** redeveloped well, 45 gallon of HCl acid & surge pad. BC, **9-27-13** pumping dropped from 54 gpm to 19.5 gpm, well was redeveloped and put back in operation and can only pump 40 gpm.
W420 **W421**	**Drift Platteville** **7130 Lake Street** **Pumps to GTF**	2016: 40 & 20 gpm 2015: 45 &20 gpm 2014: 45 & 20 gpm 2013: 45 & 20 gpm 2012: 45 & 20 gpm 2011: 45 & 35 gpm 2010: 45 & 20 gpm	2016: 40 & 20 gpm 2015: 45 & 21 gpm 2014: 45 & 21 gpm 2013: 44 & 21 gpm 2012: 45 & 22 gpm 2011: 42 & 33 gpm 2010: 46 & 21 gpm	**W420 40 gpm** **W421 25 gpm**	**Good** W420 **Operational** W 421, but can only pump 21 gpm. **GAC is swapped out every 1-1/2" years.**	**W420:** BC, **6-25-01** replaced some pipe, brushed casing, video inspect. BC, **7-30-03** redeveloped well with NuWell 100, air surging & surge block, extended pipe to 58', replaced some drop pipe and pump set to 26 gpm. BC, **7-4-06** replaced pump, motor, wire, pipe, tested at 40 gpm at 34' pwl. BC, **2-07** Performance tested pump 23.4 gpm at 22' pwl. BC, **5-1-12** pulled well, brushed casing, video inspected, options to repair screen. BC, **9-15-13** removed pump, screen repair, added 2" stainless steel pipe, air lift. BC, **1-7-16** removed debris (rock and sand) can only pump at 40 gpm BC, **3-1-16** **W421** BC, **6-25-01** replaced pump, videoed, bailed gravel, tested 28.8 gpm. BC, **8-11-06** replaced entire pumping equipment, tested 40 gpm at 34' pwl. BC, **6-24-08** inspected, no problem found, set pump to 30 gpm at 51' pwl. BC, **6-29-09** replace drop pipe and repair well head. BC, **5-16-13** replaced pump motor and 1-1/2" stainless steel pipe. Breaks suction at 22.7 gpm. BC, **8-21-13** redeveloped well, air surging, air lifting. Can only pump at 21 gpm.
W422	**Drift Platteville** **6411 Oxford**	**OFF**	**OFF**	**50 gpm**	**OFF** Shut off in 2000.	
W434	**Platteville** **3600 Brunswick**	**OFF**	**OFF**	**20-25 gpm**	**OFF** Met cessation criteria in 2006.	
W439 **W440**	**Drift Platteville** **3301 Gorham Ave** **Pumps to sanitary**	2016: 30 gpm 2015: 50 gpm 2014: 50 gpm 2013: 50 gpm 2012: 50 gpm 2011: 50 gpm 2010: 50 gpm	2016: 30 gpm 2015: 50 gpm 2014: 49 gpm 2013: 49 gpm 2012: 49 gpm 2011: 47 gpm 2010: 60 gpm	**W439 50 gpm**	**1-8-16** can only pump at 30 gpm, will pull sand. **Good** W439, **May 2013** dropped to 38 gpm in. **May 2012** began surging and dropped to 23 gpm. **OFF W440** never produced enough water.	BC, **8-2-04** replaced drop pip cleaned pump and redeveloped well. BC, **4-17-08** replaced everything below the well head. BC, **6-27-12** replaced pump end and drop pipe, videoed, bailed well casing/screen. BC, **7-8-13** redeveloped acid treated & HV jetting to well screen. Pumps at 50 gpm. BC, **4-13-15** Pulled, bailed sand reconfigured and reinstalled. Needs a new well. 3-10 year fix. BC, **1-8-16** replaced pump and pump motor, can only pump at 30 gpm.
SLP4	**Prairie du Chien** **4701 West 41st Street** **Potable Water**	2015: 900 gpm 2014: 900 gpm 2013: 1,000 gpm 2012: 1,000 gpm 2011: 1,000 gpm 2010: 1,000 gpm	2015: 891 gpm 2014: 883 gpm 2013: 936 gpm 2012: 844 gpm 2011: 993 gpm 2010: 999 gpm	**900 gpm** from October to April. **300 gpm** from May to Sept. GAC	**Good.** **GAC is swapped out every other year.**	K, **2003** Rehab: rebuild pump, replace column pipe, line shaft bearings, bowl shaft, and suction pipe. K, **2009** Rehab: replace shaft, column pipe, line shaft bearings, head shaft, & motor bearing, rebuild pump. K, **2012** Rehab: suction pipe, head shaft, replace pump, replace & epoxy column pipe, line shaft bearings, transducer.

SLP10/15	**Prairie du Chien 2936 Idaho Potable Water**	2015: 1,250 gpm 2014: 1,000 gpm 2013: 1,000 gpm 2012: 1,000 gpm 2011: 1,000 gpm 2010: 1,000 gpm	2015: total 283,272,000 2014: total 293,143,000 2013: total 279,588,000 2012: total 331,570,000 2011: total 245,767,000 2010: total 133,248,000	Minimum of 200,000,000 gallons pumped a year and minimum of 10,000,000 gallons in any calendar month. GAC	**Good.** Began pumping SLP 15 at 1,250 gpm in July of 2014. **GAC was swapped out October 2015** **GAC is swapped out every other year.**	K, **SLP 10: 2004** Rehab: replace pump, line shaft bearings, head shaft, column pipe, rewind motor, suction pipe. K, **SLP 10 2009** inspect motor, replace excess sleeve, motor bearings. B, **SLP 10 2014** Rehab: suction pipe, head shaft, replace pump, replace & epoxy column pipe, line shaft bearings, transducer. B **SLP 15**: Rehabbed 8-2015, upgraded to Premium efficient VHS motor DT79, suction pipe, head shaft, replace & epoxy column pipe, line shaft bearings, transducer.

Table 7. Current Drinking Water Standards for Site-related Contaminants (Reilly COCs & Potential COCs, 11/16/15)				
	Drinking Water Standards		Advisory Levels	Screening Levels
Chemical	MDH HRL[3] (ug/L)	EPA MCL[4] (ug/L)	MDH HBV[3] (ug/L)	EPA Tap-water Screening[6] (ug/L)
CD-RAP Routine Monitoring cPAH				
benz[a]anthracene				0.034
benzo[b]fluoranthene[D]				0.034
benzo[j]fluoranthene[D]				0.065
benzo(g,h,i)perylene[I]				
benzo[a]pyrene		0.2	0.06 B(a)P equiv	0.0034
chrysene				3.4
dibenz[a,h]anthracene[E]				0.0034
indeno[1,2,3,-c,d]pyrene				0.034
quinoline[I]				
CD-RAP Extended List cPAH				
3-methylcholanthrene*				
7,12-dimethylbenz(a)anthracene*				0.0001
benzo[c]phenanthrene				
dibenz[a,c]anthracene[E]				
dibenzo[a,e]pyrene				0.0065
dibenzo[a,h]pyrene				
dibenzo[a,i]pyrene				
CD-RAP Routine Monitoring oPAH				
1-methylnapthalene				1.10
2-methylnaphthalene				3.6
2,3-benzofuran				
2,3-dihydroindene	(development planned)			
acenaphthene	400 (update planned)			53
acenaphthylene				
acridine				
anthracene	2000			180
benzo(k)fluoranthene[D]				0.34
benzo[e]pyrene				
benzo[b]thiophene				

Chemical	MDH HRL[3] (ug/L)	EPA MCL[4] (ug/L)	MDH HBV[3] (ug/L)	EPA Tap-water Screening[6] (ug/L)
biphenyl				
carbazole				
dibenzofuran				0.79
dibenzothiophene	(development planned)			6.5
fluoranthene[F]	300 (Update planned)			80
fluorene	300			29
indene				
indole				
naphthalene[H]	70			0.170
perylene				
phenanthrene				
pyrene	200 (Update planned)			12.0
MDH Priority cPAHs Not in CD-RAP				
5-methylchrysene				
6-nitrochrysene				
anthanthrene**				
benzo[c]fluorene**				
cyclopenta[c,d]pyrene**				
dibenzo[a,l]pyrene				
MPCA Extended List cPAHs Not in CD-RAP, not on MDH Priority cPAHs and not EPA Priority Pollutants				
1,6-dinitropyrene*				
1,8-dinitropyrene*				
2-nitrofluorene*				
1-nitropyrene				
4-nitropyrene*				0.019
5-nitroacenaphthene*				
7H-dibenzo[c,g]carbazole*				
dibenzo[a,h]acridine*				
dibenzo[a,j]acridine*				
Other Potential Reilly COC not in CD-RAP				
benzene	2	5		0.45

BOLD = EPA's 16 Priority Pollutant PAHs (same as MPCA's "short list" of 7 cPAHs and 9 oPAHs)	
* These PAHs are on MPCA's Extended List but MDH 2014 cPAH guidance states that MDH does not consider these to be Priority PAHs at this time based on analytical issues, toxicological or environmental database uncertainties or low risk.	
red = MDH Priority cPAH (2014 guidance)	
** These 3 cPAH are not on MPCA's Extended List because their current policy not to put cPAHs on the list until there are both water and soil analytical methods for them and these lack a soil method.	
D	Benzo(j)f coelutes with either benzo(b)f or benzo(k)f, depending on the relative concentration of the two in solution. Therefore, is generally reported as (j)+(b) or (j)+(k) or total. MDH and EPA now consider all three to be cPAH.
E	Dibenzo(a,h)anthracene and dibenzo(a,c)anthracene coelute. Results are the total of the two.
F	MDH considers fluoranthene to be also a cPAH. EPA's tapwater screening value is based on non-cancer risks.
G	EPA considers 1-methylnapthalene to have both cancer and non-cancer risk. The value given is for cancer risk and is lower than the screening value for non-cancer risk (62 ug/L).
H	EPA considers naphthalene to have both cancer and non-cancer risk. The value given is for cancer risk and is lower than the screening value for non-cancer risk (0.61 ug/L).
I	benzo(g,h,i)perylenel is now considered mainly an oPAH by MDH.
J	Lab reports that analytical standards are consistently available.
1	CD-RAP specifies that if quinoline is the only cPAH detected, the oPAH standard should be used instead of cPAH.
3	**Minnesota Department of Health - Health Risk Limits (promulgated values), Health-Based Values (non-promulgated values), Risk Assessment Advice.** For this purpose, the lowest value should be used (typically the "chronic" or "cancer" value). Generally these are based on HI of 1 & cancer risk of 10^{-5}. See web site below.
	http://www.health.state.mn.us/divs/eh/risk/guidance/gw/table.html
4	**EPA Maximum Contaminant Levels (MCLs)** -- the maximum permissible level of a contaminant in water delivered to users of a public water system. These values consider both health-based and other factors. See web site below.
	http://water.epa.gov/drink/contaminants/upload/mcl-2.pdf
6	**EPA Regional Screening Levels (RSLs)** - Developed by the Superfund program for screening sites/areas/media that warrent further analysis. Based on 10^{-6} cancer risk and a child-based Hazard Quotient of 0.1 non-cancer risk. (EPA recommends screening at HQ of 0.1 when there are multiple contaminants present.) Values given in the spreadsheet are for residential **tapwater** and include ingestion, inhalation & dermal pathways, as of Nov 2014. See web site below.
	http://www.epa.gov/region9/superfund/prg/

Appendix C: Site Inspection Photos

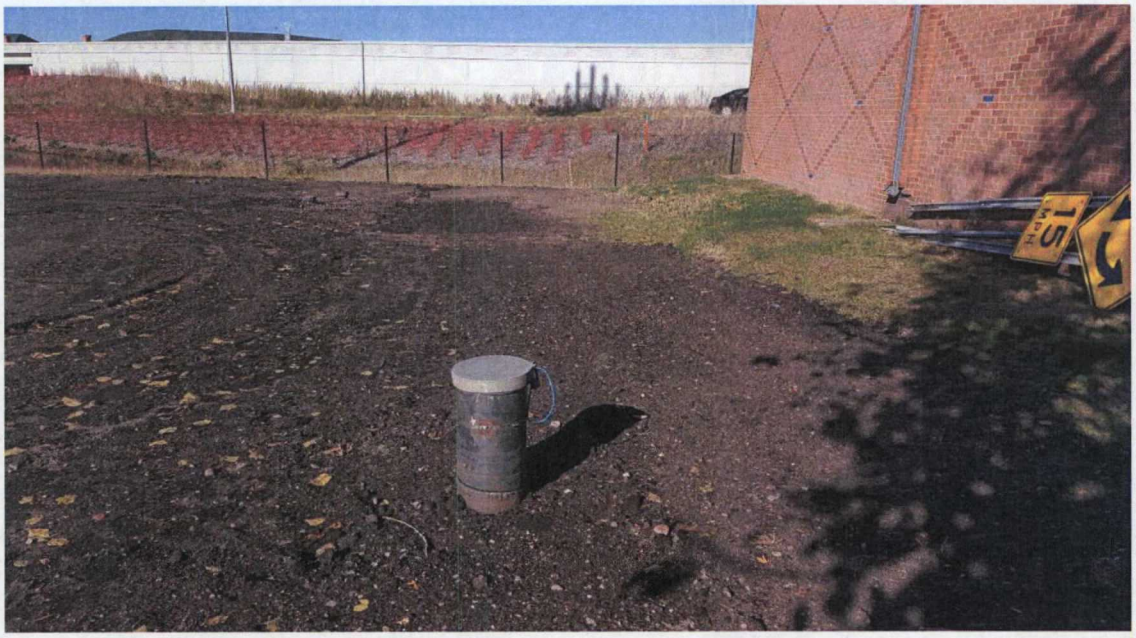


Photo ID	Description: W33R looking North	Direction
1	Date: 11/13/15	N

Photo ID	Description: Groundwater Treatment Facility	Direction
2	Date: 11/13/15	N

Photo ID	**Description:** Groundwater Treatment Facility	Direction
3	**Date:** 11/13/15	NA

Photo ID	**Description:** Groundwater Treatment Facility	Direction
4	**Date:** 11/13/15	NA

Photo ID	Description: South east corner of site looking north	Direction
5	**Date:** 11/13/15	N

Photo ID	Description: East side of site looking west	Direction
6	**Date:** 11/13/15	W

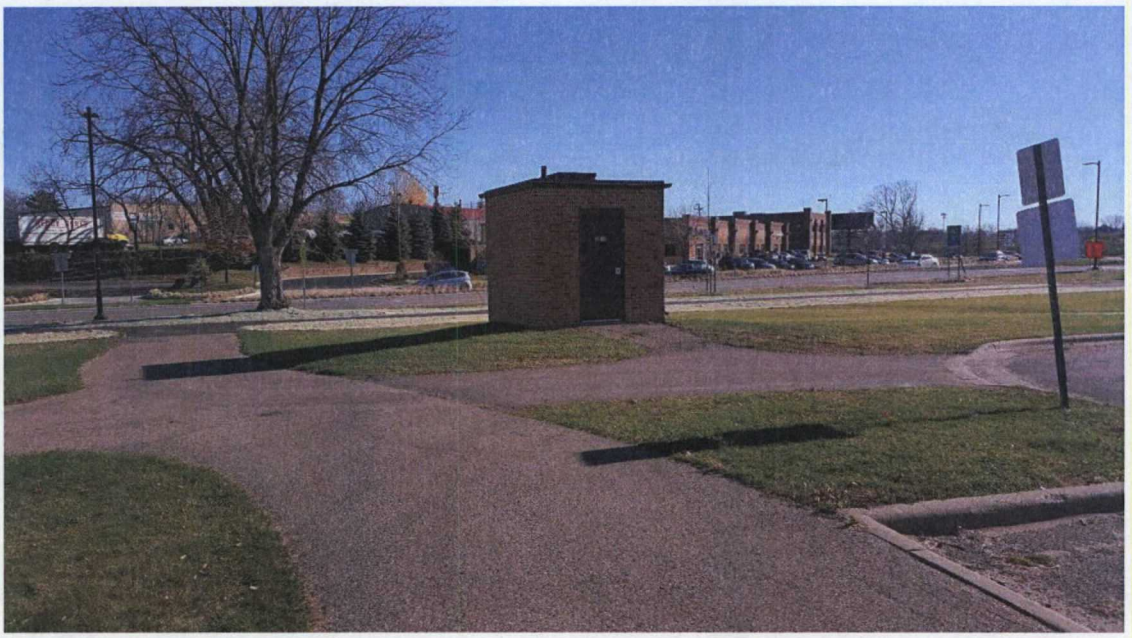


Photo ID	Description: W105 Well House	Direction
7	Date: 11/13/15	E

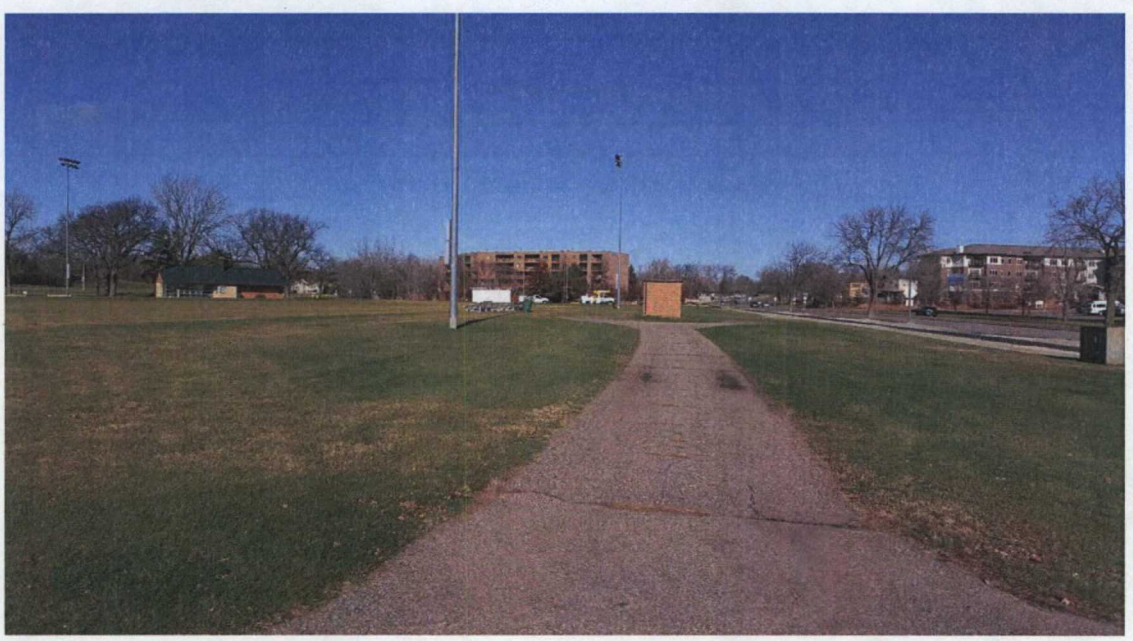


Photo ID	Description: W23 Well house	Direction
8	Date: 11/13/15	N

Photo ID	Description: W105	Direction
9	Date: 11/13/15	NA

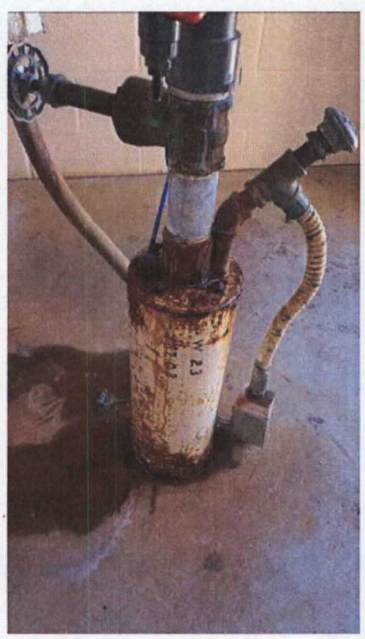


Photo ID	Description: W23	Direction
10	Date: 11/13/15	NA

Photo ID	Description: W105 well house (center right) and reconstruction on Louisiana Ave.	Direction
11	**Date:** 11/13/15	SE

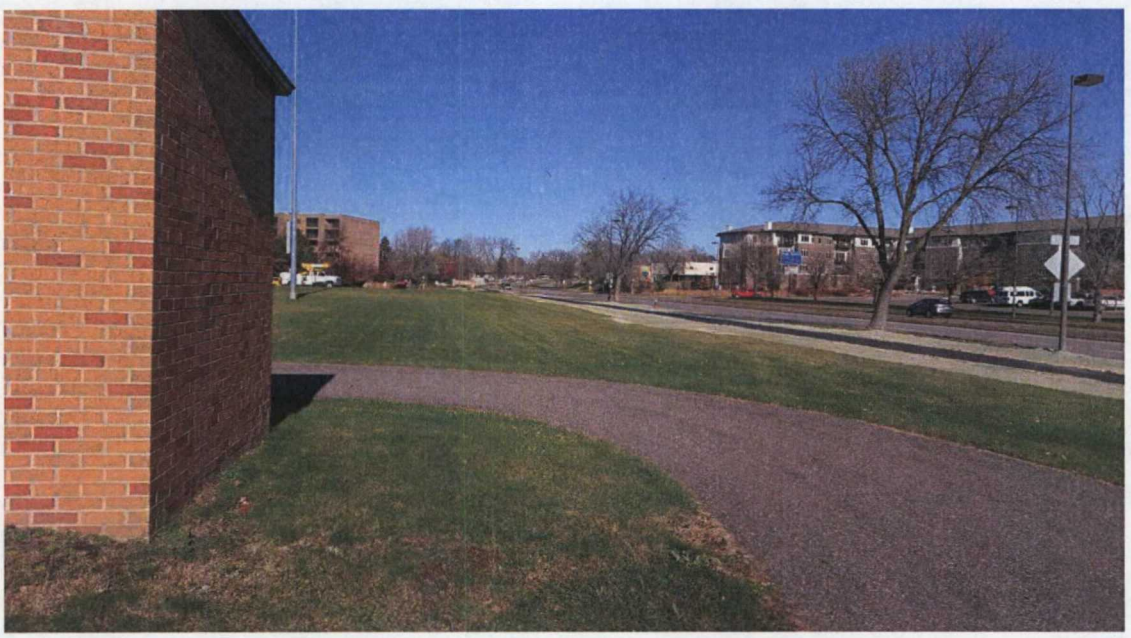


Photo ID	Description: W23 well house (left) and reconstruction on Louisiana Ave.	Direction
12	**Date:** 11/13/15	N

Photo ID	Description: Center of Site, tree covered mound where former plant office building was located	Direction
13	**Date:** 11/13/15	N

Photo ID	Description: Lined storm water pond	Direction
14	**Date:** 11/13/15	SW

Photo ID	Description: "Mt. Reilly" at southwest corner of the site	Direction
15	**Date:** 11/13/15	SW

Photo ID	Description: Lined storm water pond	Direction
16	**Date:** 11/13/15	S

Photo ID	Description: Newly constructed walking path to pedestrian bridge	Direction
17	**Date:** 11/13/15	E

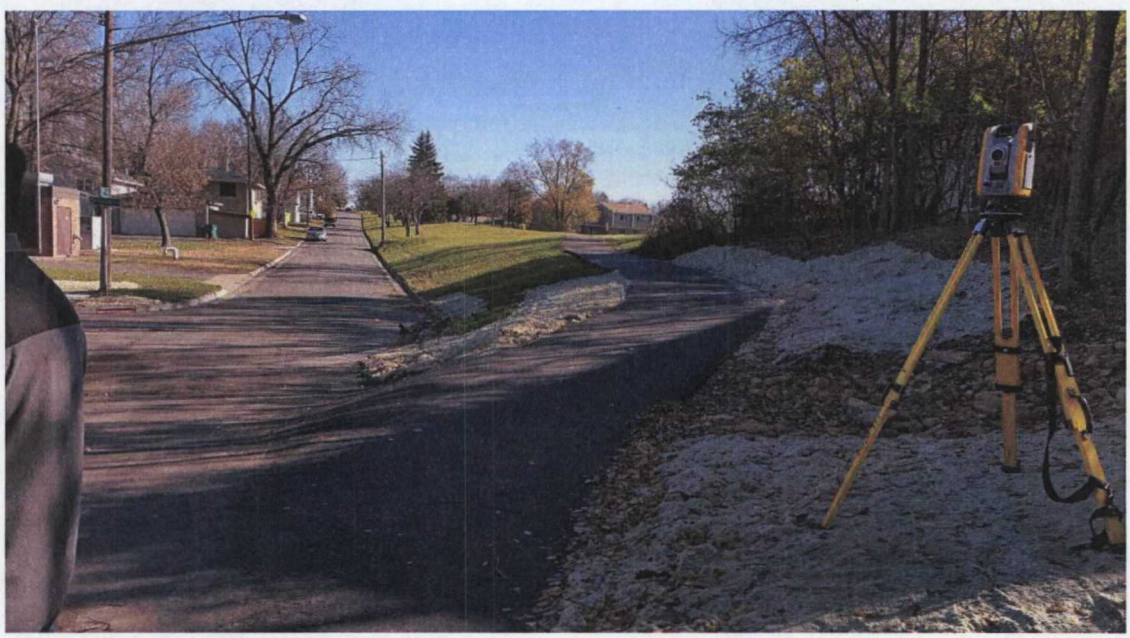


Photo ID	Description: New walking path at north end of site	Direction
18	**Date:** 11/13/15	E