Reilly Tar and Chemical Corporation N.P.L Site
St. Louis Park, Minnesota
Sampling Plan

Prepared for:
City of St. Louis Park
St. Louis Park, MN

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0987-0009
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1.0 Introduction

Groundwater in the City of St. Louis Park, Minnesota, has been found to contain polynuclear aromatic hydrocarbons (PAH) as a result of activities at a coal-tar distillation and wood preserving plant (Site) operated from 1917 to 1972. Numerous previous studies have identified PAHs in various aquifers beneath St. Louis Park and adjacent communities.

The United States Environmental Protection Agency (EPA), the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Health (MDH), the City of St. Louis Park (City), and Reilly Industries, Inc. (formerly Reilly Tar & Chemical Corporation - Reilly) have agreed to acceptable drinking water quality criteria for PAH. These criteria, as incorporated into a Consent Decree, include the following concentration levels:

	Advisory Level	Drinking Water Criteria
Sum of benzo(a)pyrene and dibenz(a,h) anthracene	3.0 ng/l*	5.6 ng/l
Carcinogenic PAH	15 ng/l	28 ng/l
Other PAH	175 ng/l	280 ng/l
*** or the lowest concentration that can be quantified, whichever is greater**		

In conjunction with the implementation of remedial measures to limit the spread of PAH, granular activated carbon (GAC) treatment systems have been installed to treat water from City wells (identified - SLP) 4, 10 and 15. Further provisions of a Remedial Action Plan (RAP) call for long-term monitoring of the influent and effluent of the GAC treatment systems and the major aquifers underlying the region. The general objective of the monitoring program is to identify the distribution of PAH in the groundwater. The analytical data will be used to evaluate water quality by comparing the levels of PAH found in the various samples collected from drinking water aquifers with historical water quality data and with drinking water quality criteria established in the Consent Decree-RAP. The specific objectives of the monitoring program, and therefore, the intended end use of the data varies for the different aquifers being monitored in accordance with the Consent Decree-RAP. Also, the data will allow an assessment of monitored natural attenuation.

The objective of the GAC treatment system monitoring is to assess and evaluate the performance of the treatment systems. Analytical results for influent and effluent samples will be compared to the drinking water criteria for PAH as established in the Consent Decree-RAP.

The objective of monitoring the existing Mt. Simon-Hinckley Aquifer municipal drinking water wells and any new Mt. Simon-Hinckley Aquifer municipal drinking water wells installed within one mile of well W23, and analyzing for PAH, is to assure the continued protection of these wells from PAH resulting from activities of Reilly at the Site. The analytical data will be used to make comparisons between the

levels of PAH found in the Mt. Simon-Hinckley Aquifer, and the drinking water criteria established in the Consent Decree-RAP.

If any new Ironton-Galesville Aquifer drinking water wells are installed within one mile of well W23, then those wells will be sampled and analyzed for PAH to meet the objective of assuring protection of the wells from PAH resulting from the activities of Reilly at the Site. The analytical data will be used to compare the levels of PAH found in potential Ironton-Galesville Aquifer drinking water wells to the drinking water criteria established in the Consent Decree-RAP.

The objectives of monitoring the Prairie du Chien-Jordan Aquifer wells, including municipal drinking wells, private or industrial wells, and monitoring wells are to: 1) monitor the distribution of PAH in the aquifer, thus evaluating the source and gradient control systems, and 2) assure the continued protection of drinking water wells from PAH resulting from the activities of Reilly at the Site. The analytical data will be used to compare the levels of PAH in the Prairie du Chien-Jordan Aquifer to historical PAH data and to various criteria established in the Consent Decree-RAP (e.g., drinking water criteria for drinking water wells; and a cessation criterion of 10 micrograms per liter of total PAH for source control well W23). Water level data will be used to evaluate groundwater flow patterns in the Prairie du Chien-Jordan Aquifer.

The objective of monitoring St. Peter Aquifer wells is to determine the distribution of PAH in the aquifer, thus evaluating any changes in the distribution over time. The analytical data will be used to compare the levels of PAH in the St. Peter Aquifer to historical PAH data and to Minnesota Department of Health's Health Risk Limits/Health-Based Values. Water level data will be used to evaluate groundwater flow patterns in the St. Peter Aquifer.

The objective of monitoring the Drift-Platteville Aquifer wells is to monitor the distribution of PAH in the aquifer, thus evaluating any changes in the distribution over time. The extent to which monitored natural attenuation may replace pumping at wells W420, W421 and/or W439 will be evaluated. Groundwater analytical data will be used to compare levels of PAH in the Drift-Platteville Aquifer to historical water quality data for the aquifer and to Minnesota Department of Health's Health Risk Limits/Health-Based Values. Water level data will be used to evaluate groundwater flow patterns in the Drift-Platteville Aquifer.

The 2012 Sampling (Plan) outlines the scope of work to be performed in order to monitor the groundwater in the St. Louis Park, Minnesota, area in accordance with the Consent Decree-RAP related to the Reilly N.P.L. Site and in accordance with evolving data needs to assess monitored natural attenuation. Included in this Plan are: 1) the identity of wells to be monitored, 2) the schedule for groundwater monitoring, and 3) a description of the procedures that will be used for sample collection, water level measurement, sample handling, sample analysis, and reporting. A GAC treatment system has been constructed to treat water from well W23 and the Drift-Platteville Aquifer source control wells prior to discharge to surface water; however, monitoring of the effluent is not within the scope of work to be performed under this Plan, as the activity is not embodied in the Consent Decree-RAP. Similarly, a GAC treatment system has been constructed to treat water from well SLP4 prior to discharge to the municipal water supply system; however, monitoring of the effluent is not within the scope of work to be performed under this Plan, as the activity is not embodied in the Consent Decree-RAP.

The time period covered by this Plan is from January 1, 2012, or the date of its acceptance and approval by the Agencies whichever is later, to December 31, 2012. The next subsequent Sampling Plan (RAP Section 3.3) will be submitted by October 31, 2012 covering the 2013 calendar year. The

Quality Assurance Project Plan for the 2012 calendar year was submitted to the Agencies on June 30, 2011 and consisted of the same QAPP, unchanged from the prior year.

2.0 Monitoring Schedule

The monitoring schedule outlined in this Plan indicates the starting criteria and the frequencies of monitoring for the GAC treatment system and wells (Tables 1 and 2). In general, the monitoring schedule will allow economies of scale in the field and in the laboratory by grouping the various monitoring events to the extent possible. Samples will be collected within the frequency indicated on Tables 1 and 2.

Tables 1 and 2 summarize the GAC system/groundwater monitoring schedule for the period January 1, 2012 through December 31, 2012, and represent the minimum monitoring program that is likely to occur during the year. However, additional monitoring will take place if the drinking water criterion established in the Consent Decree-RAP is exceeded in samples collected from the GAC treatment system treated water, or active municipal drinking water wells. This additional monitoring is described in Sections 4 and 12 of the RAP, and is reproduced in Appendix A of this Plan.

Figures 1 through 5 identify the location of wells to be monitored in each of the five aquifers. The duration of field sampling events will depend on the number and type of wells to be monitored. For estimating purposes, Drift and Platteville Aquifer monitoring wells typically are monitored at a rate of five to 10 wells per day, St. Peter Aquifer monitoring wells typically are monitored at a rate of five wells per day, and Prairie du Chien Aquifer monitoring wells typically require two to four hours or more per well to monitor.

Table 1
SLP10/SLP15 GAC Treatment System Monitoring Schedule[a]

RAP Section	Sampling Points	Start of Monitoring	Sampling Frequency	Analyses[b]
4.3.1(C)	Treated water (TRTD)	Date of plan approval	Quarterly	PAH (ppt)[c]
4.3.3(D)	Feed water (FEED)	Date of plan approval	Annually	PAH (ppt)
4.3.4	Treated water	Date of plan approval	Annually	Extended PAH (ppt)
4.3.4	Treated or Feed water	Date of plan approval	Annually	Acid fraction compounds in EPA Test Method 625

a **This schedule does not include certain contingencies (e.g. exceedance monitoring) and, therefore, represents the minimum program that is likely to occur between the date this Plan is approved and December 31, 2011. Sections 4 and 12 of the CD-RAP outline the additional monitoring that will be conducted if PAH criteria are exceeded. The first samples will be collected during the period indicated by the monitoring frequency following the date of the start of monitoring.**

b **Lists of parameters and methods for analysis of PAH and acid fraction compounds in EPA Test Method 625 are provided in the QAPP. Extended PAH refers to the 25 carcinogenic PAH plus other PAH listed below:**

Acenaphthene	Dibenz(a,j)acridine	1-Methylnaphthalene
Acenaphthylene	Dibenzo(a,e)pyrene	1-Nitropyrene
Anthracene	Dibenzo(a,h)pyrene	2-Chloronaphthalene
Benzo(a)anthracene	Dibenzo(a,i)pyrene	2-Methylnaphthalene
Benzo(a)pyrene	Dibenzo(a,l)pyrene	2-Nitrofluorene
Benzo(e)pyrene	Dibenzofuran	3-Methylcholanthrene
Benzo(g,h,i)perylene	Fluoranthene	4-Nitropyrene
Benzofluoranthenes (Total)	Fluorene	5-Methylchrysene
Carbazole	Indeno(1,2,3-cd)pyrene	5-Nitroacenaphthene
Chrysene	Naphthalene	6-Nitrochrysene
Dibenz(a,h)acridine	Perylene	7,12-Dimethylbenz(a)anthracene
Dibenz(a,h)anthracene	Phenanthrene	7H-Dibenzo(c,g)carbazole
	Pyrene	

Field blanks will be collected and analyzed at a frequency of one every 10 samples or fewer. Treated and Feed water duplicate samples will be collected and analyzed at a frequency of one per 10 samples.

c **ppt = parts per trillion. This signifies analysis using selected ion monitoring gas chromatography mass spectrometry.**

Table 2

Sampling Plan Groundwater Monitoring Schedule[a]

Source of Water	Sampling[b] Points	Start of Monitoring	Sampling Frequency	Analyses[c]
CD-RAP Section 5.1 Mt. Simon-Hinckley Aquifer	SLP11, SLP12, SLP13, and SLP17	Date of plan approval	Annually	PAH (ppt)
	New municipal wells within one mile of well W23	At the time of installation	Annually	PAH (ppt)
CD-RAP Section 6.1.4 Ironton-Galesville Aquifer	W105	Date of plan approval	Every even numbered year [d]	PAH (ppt)
	New municipal wells within one mile of well W23	At the time of installation	Annually	PAH (ppt)
CD-RAP Section 7.3 Prairie du Chien-Jordan Aquifer [e]	SLP6, W48, W119, and W413	Date of plan approval	Quarterly	PAH (ppt)
	E13	Date of plan approval	Semi-annually	
	SLP4, SLP10 or SLP15, W23, W29, W40, W70, W401, W402, W403, E2, E3, E7, and E15	Date of plan approval	Annually	PAH (ppt)
	H6, MTKA6, SLP7 or SLP9, SLP14, SLP16, and W405 or W406 [f]	Date of plan approval	Every even numbered year	PAH (ppt)
CD-RAP Section 8.1.3 St. Peter Aquifer	W14, W24, W33R, W122, W409, W410, W411, W412, W129, W408, and W414	Date of plan approval	Annually	PP PAH (ppb)
CD-RAP Section 9 Platteville Aquifer	W421	Date of plan approval	Quarterly	PP PAH (ppb)

Source of Water	Sampling[b] Points	Start of Monitoring	Sampling Frequency	Analyses[c]
Platteville Aquifer	W22	Date of plan approval	Semi-annually	PP PAH (ppb)
	W18, W20, W27, W101, W121, W130, W131, W143, W424, W426, W428, W434, W437, and W438	Date of plan approval	Annually	PP PAH (ppb)
CD-RAP Section 9 Drift Aquifer	W420	Date of plan approval	Quarterly	PP PAH (ppb)
	P309, W2, W7[g], W9, W15, and W439	Date of plan approval	Semi-annually	PP PAH (ppb)
	P109, P307, P308, P310, and W422	Date of plan approval	Annually	PP PAH (ppb)
	P112, P312, W10, W117, W128, W136, and W427	Date of plan approval	Every even numbered year	PP PAH (ppb)

a **This schedule does not include certain contingencies (e.g. exceedance monitoring) and, therefore, represents the minimum program that is likely to occur between the date this Plan is approved and December 31, 2012. Section 12 of the CD-RAP outlines the additional sampling that will be conducted if the drinking water criteria are exceeded in samples from water supply wells. The first samples will be collected during the period indicated by the monitoring frequency following the date of the start of monitoring. Field blanks will be collected at a frequency of one for every 10 samples or fewer and one duplicate sample will be collected for every 10 samples.**

b **Sampling points are located on the maps shown in Figures 1 through 5. Letter prefixes to well codes are defined as follows:**

W *4-inch monitoring well*
P ***Monitoring piezometer***
SLP *St. Louis Park supply well*
E *Edina supply well*
H ***Hopkins supply well***
MTKA ***Minnetonka supply well***

c **Lists of parameters and descriptions of the methods for analysis of PAH and expanded analyses are provided in the June 30, 2010 QAPP as modified July 23, 2010 and approved by the Agencies on 12/8/2010. No changes to the QAPP were made for 2012, as stated in the City's June 30, 2011 submittal. Water levels will be measured each time samples are collected for analyses, except for those wells which prove to be inaccessible for such measurements. PP PAH refers to priority pollutant PAH; ppt = parts per trillion; ppb = parts per billion.**

d **Wells sampled every two years shall alternate the season the well is sampled. For example, SLP14 will be sampled in spring 2012, fall 2014, spring 2016, etc.**

e **Several PDCJ wells are unavailable (W29, E7, W32), yet to be installed (W413), or have been abandoned (W70, W40).**

f **W405 = American Hardware Mutual, W406 = Minikahda Golf Course**

g **Well W7 does not exist, however if a replacement well is installed it will be sampled two times in 2012.**

3.0 Groundwater Sampling Procedures

An important distinction is made between the sampling procedures for active pumping wells (e.g. municipal wells) and for non-pumping monitoring wells. Active pumping wells are used on a regular basis, have dedicated pumps and associated plumbing, and have sample taps for collecting samples. Non-pumping monitoring wells may be new or may have not been sampled for several years. Most require pumping and associated equipment for sampling. Another distinction is that the active pumping wells are typically located inside buildings whereas non-pumping monitoring wells typically are not.

With these considerations in mind, this Plan has been developed so that the groundwater monitoring program in each aquifer meets the requirements and intent of the RAP. Groundwater monitoring will be conducted in accordance with the procedures given in the Quality Assurance Project Plan (QAPP), and with Minnesota Pollution Control Agency guidelines entitled "Development of Sampling Plans, Protocols and Reports", January 1995. Low flow sampling techniques will be used at non-pumping monitoring wells, as described below in Section 3.3.

3.1 Water Level Measurements

Water level measurements will be made using electric tapes. Using the electric tape, the probe at the end of the tape will be lowered slowly in the well until contact with the water is made. Because of surface tension, readings of the water level made when the probe enters the water will differ from readings made when the probe leaves the water, thus breaking surface tension. To standardize these measurements, the second reading will always be used (i.e. the reading made when the probe leaves the water). Most of the municipal wells are equipped with automated systems for water level and pumping data collection. Therefore, the automated data will be used for municipal wells and the sampling team will avoid using measuring tapes in municipal wells.

Water level measurement made for the purpose of defining groundwater flow patterns in a particular aquifer may be performed independently from groundwater sampling, as a discrete event so as not to last more than two days. The wells will be revisited for sampling, and measurements to determine the volume of water in the well (for non-pumping wells) will be made at that time.

3.2 Sample Collection at Active Pumping Wells

At active pumping wells, the sampling team will first determine that the wells have actually been pumping during the period preceding sampling. This information may be derived from inspecting flow recorders or from interviewing knowledgeable persons regarding the wells (water department employees, well owners, etc.). The information will be documented in the field notes of the sampling team.

Prior to sampling, water will be allowed to run through the sampling tap for a minimum of two minutes to clear the lines and help get a representative sample for analysis. Sampling will proceed by filling the required containers with water from the sampling tap as near to the well head as possible, and before any holding tanks or treatment is encountered. The only exception to this is the GAC treatment system monitoring under RAP Section 4.3 that includes treated water monitoring. If any tubing is used to convey water from the sample tap to the containers, it will be new tubing for each sampling round.

If it cannot be determined that a well has been pumping at some time during the 24-hour period preceding sampling, or if it is known the well was not pumping, then the well shall be purged until field measurements of temperature, pH, and specific conductance have stabilized after at least three well volumes have been removed from the well. These measurements, water levels, and the amount of water pumped will be recorded in the field notes.

3.3 Sample Collection at Monitoring Wells and Piezometers

Monitoring wells and piezometers not equipped with dedicated submersible pumps will be purged and sampled using the following low-flow procedure (modeled after U.S. EPA 1996, Puls and Barcelona). A decontaminated submersible pump will be lowered to the mid-point of the screened interval (or open-hole portion) of the well. Appendix D contains a table of well information including the depth where sampling pumps should be set at each well. The pump will be activated to produce a steady discharge of approximately 200 ml/min. Water level measurements will commence to ensure that the pump does not create more than 1.0 feet of drawdown in the well. The discharge will be directed into a flow cell where measurements of temperature, pH, specific conductivity, redox potential, dissolved oxygen, and turbidity will be made. Field parameter readings will be recorded at five minute intervals. The well will be ready for sampling when three successive readings of the field parameters are stabilized in accordance with the following guidance:

Parameter	Stabilization Criteria	Reference
pH	+/- 0.1	Puls and Barcelona, 1996; Wilde et al., 1998
Specific electrical conductance (SEC)	+/- 3%	Puls and Barcelona, 1996
Oxidation-reduction potential (ORP)	+/- 10 millivolts	Puls and Barcelona, 1996
Turbidity	+/- 10% (when turbidity is greater than 10 NTUs)	Puls and Barcelona, 1996; Wilde et al., 1998
Dissolved oxygen (DO)	+/- 0.3 milligrams per liter	Wilde et al., 1998

Samples will be collected by filling each of the appropriate sample containers in rapid succession, without pre-rinsing the containers with sample. The bottle will be held under the sample stream without allowing the mouth of the bottle to come in contact with the sampling port or tubing and filled completely, and the cap securely tightened. All sample labels will be checked for completeness, sample custody forms will be completed, and a description of the sampling event will be recorded in the field notebook.

The discharge from purging monitoring wells will be handled in accordance with the Contingency Plan (Appendix B). In general, if a visible sheen can be seen on the water surface, the discharge will be routed to the sanitary sewer. Otherwise, the storm sewer or surface discharge will be used. Non-dedicated groundwater sampling or monitoring equipment that comes in contact with the groundwater will be decontaminated between uses.

4.0 Analytical Program

Table 1 and Table 2 show the groundwater monitoring summary for the coming year. Indicated on the tables are the analyses required. Details of the analytical methodology can be found in the June 30, 2010 QAPP, as modified on July 23, 2010, and its appendices. Analyses will be performed at Test America Laboratories, formerly Severn Trent Laboratories), Arvada, Colorado, and at Pace Analytical Services, Inc in Minneapolis, Minnesota. Test America will analyze the drinking water samples and has agreed to provide a turnaround time of 30-working days from the receipt of samples to the submittal of analytical reports. The laboratory will notify the City if it cannot meet this turnaround time.

Groundwater monitoring will include two methods of PAH analyses. Drinking water aquifer (Prairie du Chien – Jordan and Mt. Simon – Hinckley Aquifers) wells will be analyzed using a low-level (nanograms per liter or part per trillion) PAH analysis utilizing selected ion monitoring (SIM) gas chromatography mass spectrometry (GC/MS). The drinking water analysis for extended PAH will have the lowest detection limits commercially available in Minnesota laboratories.

Priority pollutant PAH analyses will be performed on samples from Drift, Platteville, and St. Peter Aquifer wells that are not subject to the RAP's requirements for meeting drinking water criteria. The priority pollutant PAH analysis is a full scan method SW 846 8270C used to measure priority pollutant PAH in the micrograms per liter or part per billion range.

5.0 Reporting

The analytical reporting requirements of the Consent Decree and RAP are identified in Part K of the Consent Decree, and Sections 3.4, 4.3.5, 12.1.1, and 12.1.2 of the RAP. Park K requires Reilly to submit an annual monitoring report on March 15 of each year for data collected from the previous year. This report will contain analytical data and an assessment of data quality as specified in the QAPP. All water level measurements and chemical analyses that have not been presented in previous reports, and interpretive maps and tables, as specified in RAP Section 3.4(B) and (C) will be included in the annual monitoring report. Also, the effectiveness of the source and gradient control well systems in the Drift-Platteville and St. Peter Aquifers will be discussed in the annual report.

The reporting requirements for each aquifer, and for the GAC treatment system, are described below.

5.1 GAC Treatment System

RAP Section 4.3.5 requires the City to submit an annual report that presents the results of all monitoring of the GAC treatment system. Analytical results for wellhead water, feed water, and treated water will be included in this report. The report will also describe briefly the operating performance of the GAC treatment system during the previous calendar year. The GAC treatment system annual reports are due March 15 for the previous year.

5.2 Mt. Simon-Hinckley Aquifer

The monitoring data for the Mt. Simon-Hinckley Aquifer will be included in the annual report. In addition to the results of all water level measurements and chemical analyses, the report will contain a map showing each well sampled with the concentrations of Other PAH, Carcinogenic PAH, and the sum of benzo(a)pyrene and dibenz(a,h) anthracene labeled by the location of each well in accordance with RAP Section 3.4(C). Since the Mt. Simon-Hinckley Aquifer wells are monitored on an annual basis, there will be only one sampling event to report.

5.3 Ironton-Galesville Aquifer

The monitoring data for well W105, and for any new Ironton-Galesville Aquifer drinking water well installed within one mile of well W23, will be included in the Annual Report.

5.4 Prairie du Chien-Jordan Aquifer

The monitoring data for the Prairie du Chien-Jordan Aquifer will be included in the annual report. The results of all water level measurements and chemical analyses will be included. For each of the water level measuring periods, a water level contour map will be prepared with elevations labeled at each well. For each sampling event, a map showing each well sampled with the concentrations of Other PAH, Carcinogenic PAH, and the sum of benzo(a)pyrene and dibenz(a,h) anthracene labeled by the location of each well will be prepared in accordance with RAP Section 3.4(C), and a map of the area indicating the extent of PAH above drinking water criteria shall be provided.

5.5 St. Peter Aquifer

The monitoring data for the St. Peter Aquifer will be included in the annual report. The results of chemical analyses will be reported and a map showing each well sampled with the concentrations of the sum of Other PAH and the sum of Carcinogenic PAH labeled by the location of each well will be prepared in accordance with RAP Section 3.4(C). Likewise, the results of water level measurements will be provided and a water level contour map will be prepared with elevations labeled at each well in accordance with RAP Section 3.4(B). In addition, a map showing the general distribution of PAH in the aquifer (an isoconcentration map) shall be provided. The St. Peter Aquifer monitoring data will be included in the annual report to support a discussion of the results with respect to the effectiveness of the gradient control well system.

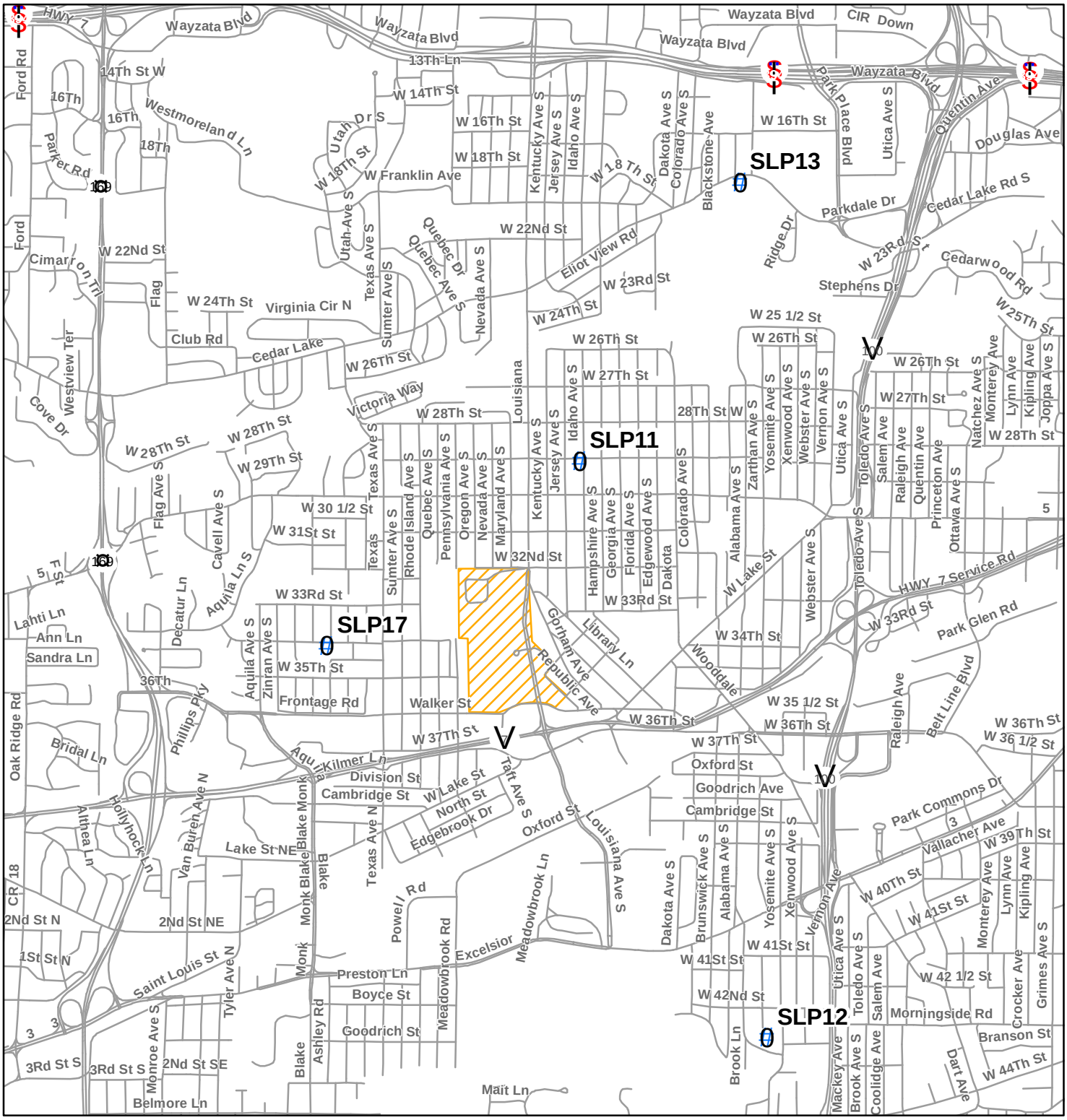
5.6 Platteville Aquifer

The monitoring data for the Platteville Aquifer including the results of all water level measurements and chemical analyses will be presented in the Annual Monitoring Report. A map showing each well sampled with the concentrations of the sum of Other PAH and the sum of Carcinogenic PAH labeled by the location of each well, will be prepared in accordance with RAP Section 3.4. In addition, a map showing the general distribution of PAH in the aquifer (an isoconcentration map) shall be provided. The Platteville Aquifer monitoring data will be included in the annual report to support a discussion of the results with respect to the effectiveness of the source and gradient control well systems.

5.7 Drift Aquifer

The monitoring data for the Drift Aquifer including the results of all water level measurements and chemical analyses will be presented in the Annual Monitoring Report. A map showing each well sampled with the concentrations of the sum of Other PAH and the sum of Carcinogenic PAH labeled by the location of each well, will be prepared in accordance with RAP Section 3.4. In addition, a map showing the general distribution of PAH in the aquifer (an isoconcentration map) shall be provided. The Drift Aquifer monitoring data will be included in the annual report to support a discussion of the results with respect to the effectiveness of the source and gradient control well systems.

Figures



Map adapted from U.S. and Canada Detailed Streets (2008), Tele Atlas North America, Inc., ESRI.

Explanation

Monitoring well that will be sampled in 2012

REILLY SITE

Site Location

0 2,500 Feet

1 inch = 2,500 feet

LOCATION OF MOUNT SIMON HINKLEY AQUIFER GROUNDWATER MONITORING WELLS

2012 SAMPLING PLAN

Reilly Site, City of St. Louis Park, Minnesota

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Figure 1

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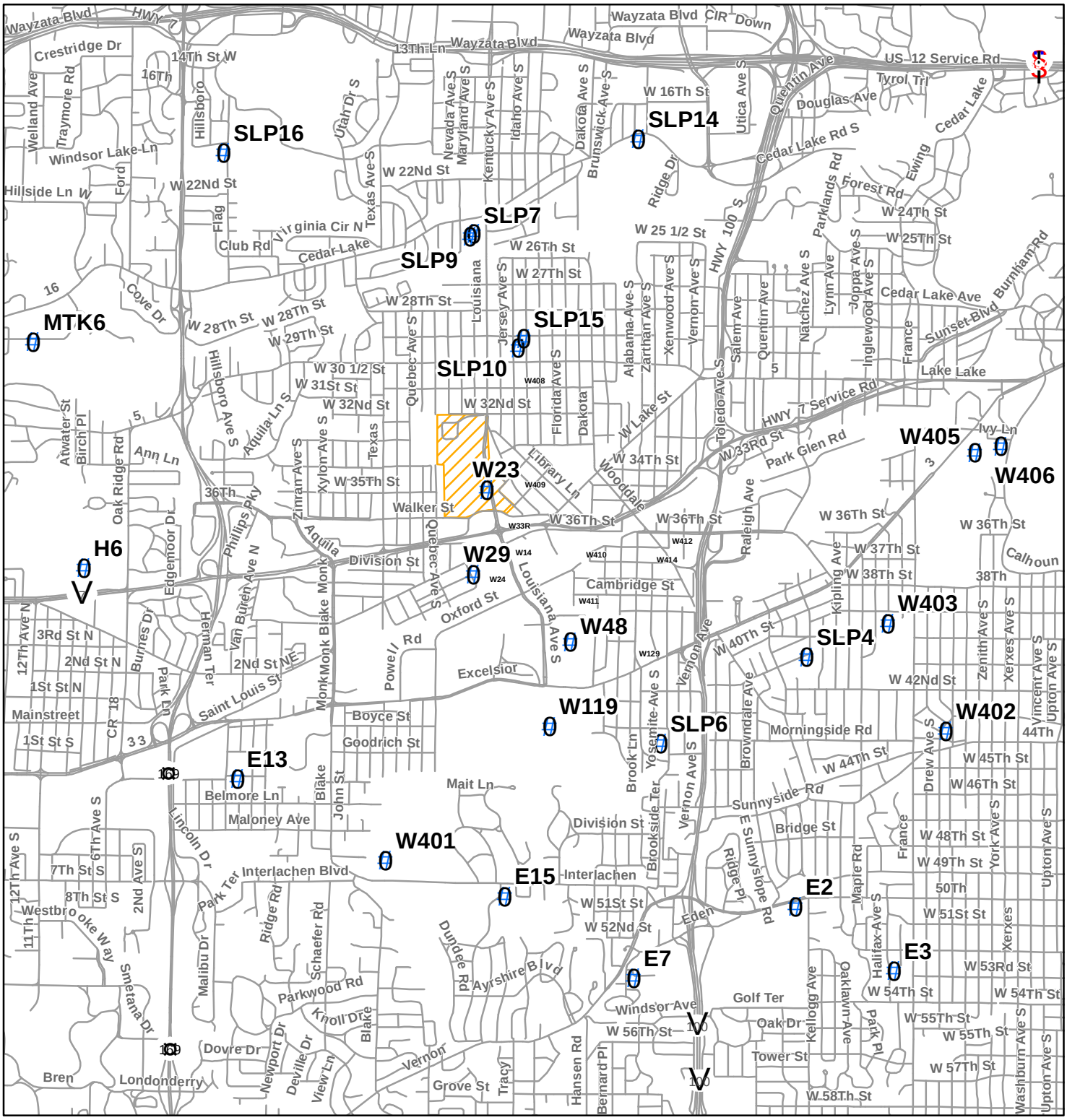
Summit Proj. No.: 0987-0007
Plot Date: 10-24-11
Arc Operator: PRB
Reviewed by: BMG



Map adapted from U.S. and Canada Detailed Streets (2008), Tele Atlas North America, Inc., ESRI.

Explanation

Monitoring well that will be sampled in 2012

REILLY SITE

Site Location

0 3,500 Feet

1 inch = 3,500 feet

LOCATION OF PRAIRIE DU CHEIN-JORDAN AQUIFER GROUNDWATER MONITORING WELLS

2012 SAMPLING PLAN

Reilly Site, City of St. Louis Park, Minnesota

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Figure 2

File: Fig2_OPCJ
Summit Proj. No.: 0987-0007
Plot Date: 10-24-11
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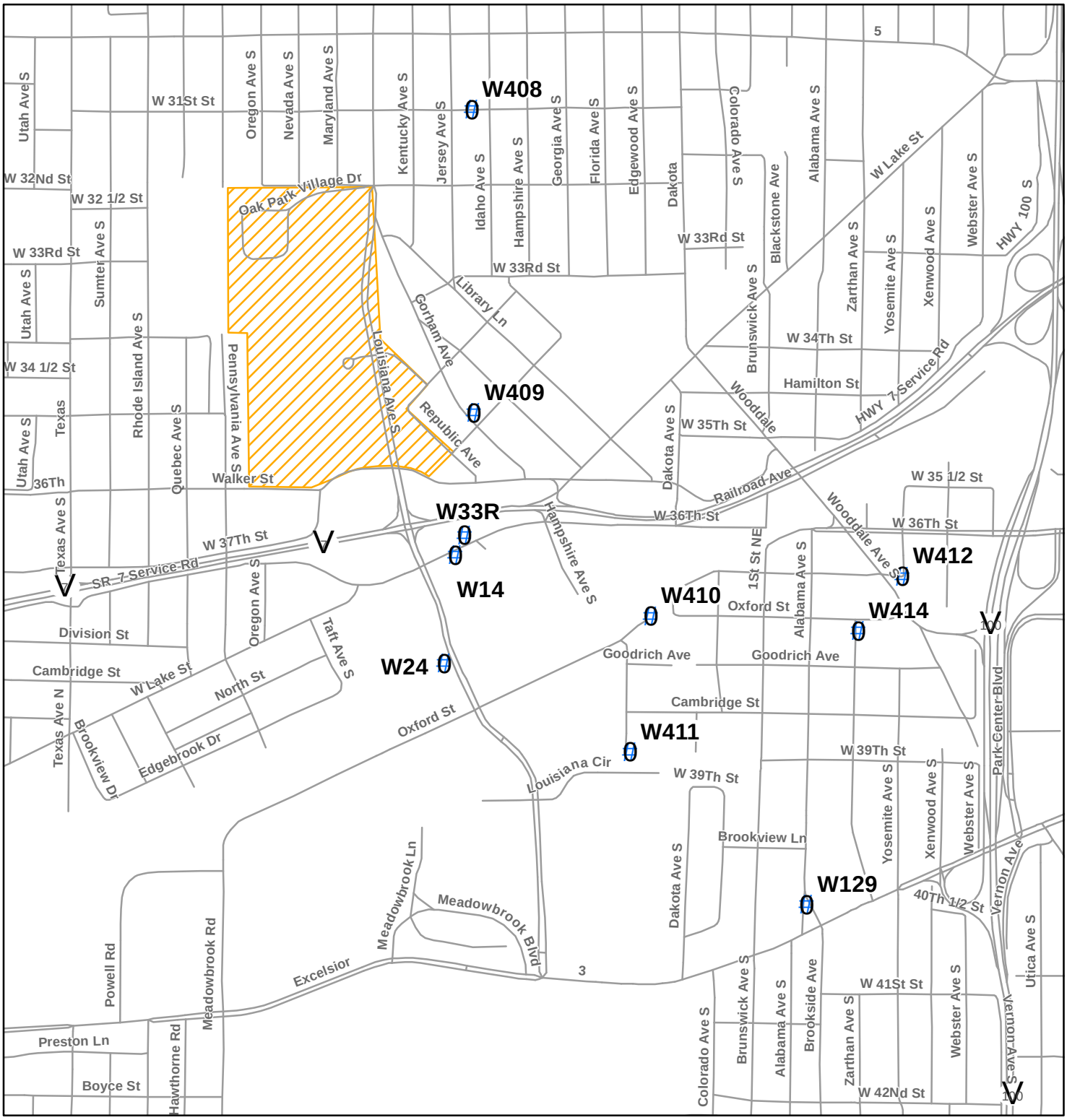
Reviewed by: BMG



Map adapted from U.S. and Canada Detailed Streets (2008), Tele Atlas North America, Inc., ESRI.

Explanation

- Monitoring well that will be sampled in 2012
- REILLY SITE

Site Location

0 1,200 Feet

1 inch = 1,200 feet

LOCATION OF ST. PETER AQUIFER GROUNDWATER MONITORING WELLS

2012 SAMPLING PLAN

Reilly Site, City of St. Louis Park, Minnesota

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Figure 3

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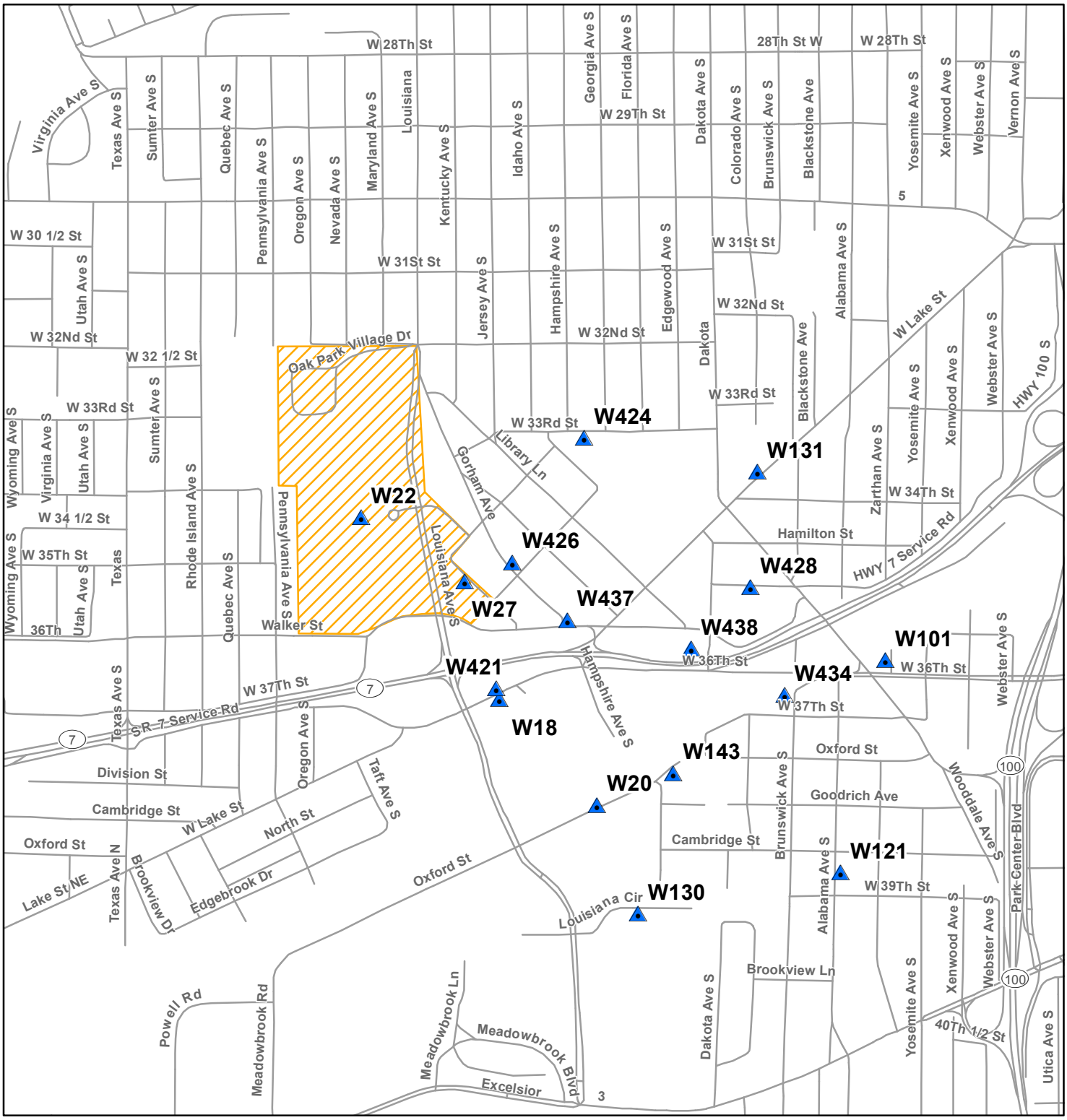
Summit Proj. No.: 0987-0007
Plot Date: 10-24-11
Arc Operator: PRB
Reviewed by: BMG



Map adapted from U.S. and Canada Detailed Streets (2008), Tele Atlas North America, Inc., ESRI.

Explanation

▲ Monitoring well that will be sampled in 2012

REILLY SITE

Site Location

0 1,200 Feet

1 inch = 1,250 feet

N W E S

LOCATION OF PLATTEVILLE AQUIFER GROUNDWATER MONITORING WELLS

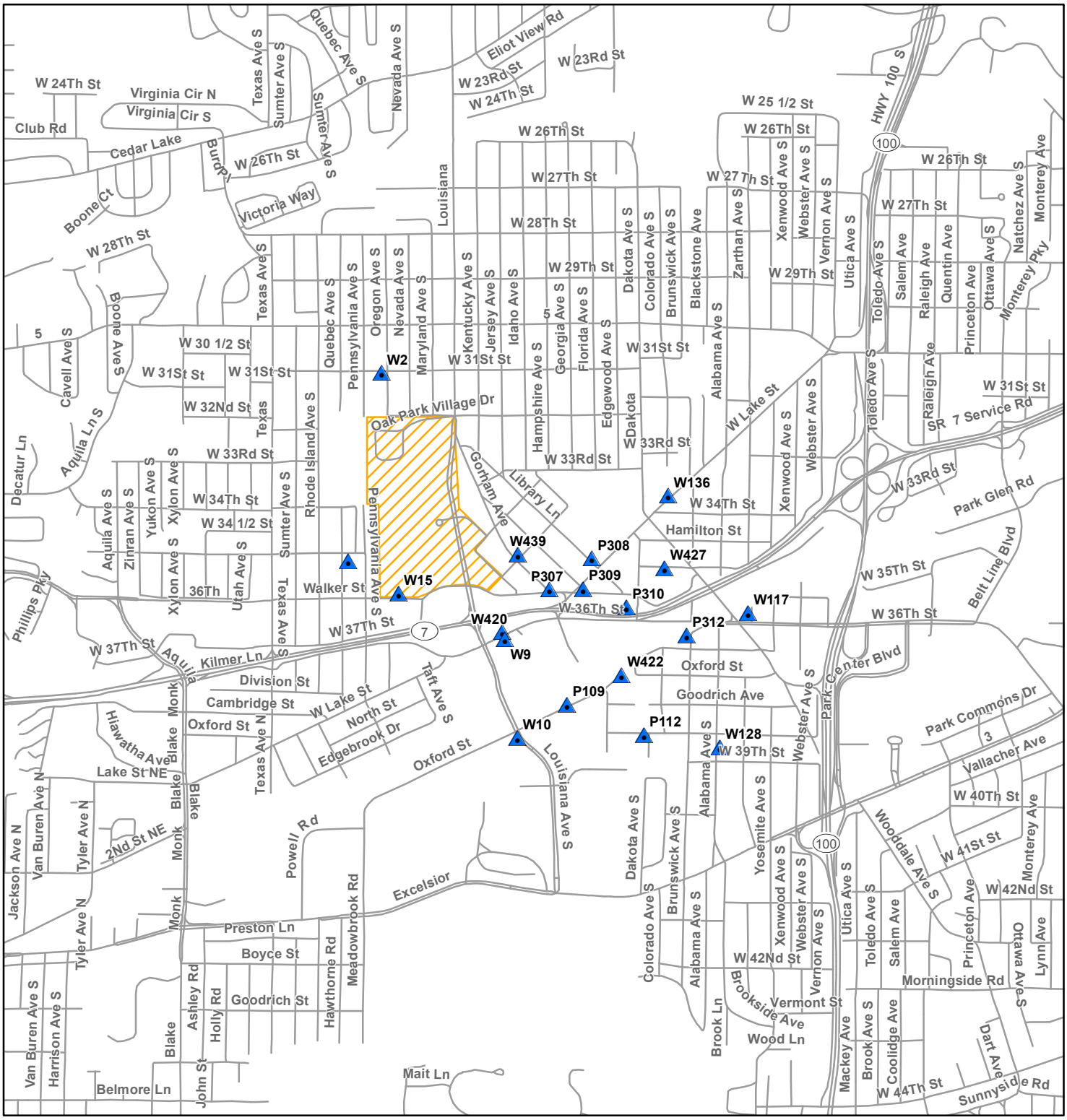
2012 SAMPLING PLAN

Reilly Site, City of St. Louis Park, Minnesota

Summit Envirosolutions

Figure 4

File: Fig4_OPVL
Summit Proj. No.: 0987-0007
Plot Date: 1-13-11
Arc Operator: PRB
Reviewed by: BMG



Map adapted from U.S. and Canada Detailed Streets (2008), Tele Atlas North America, Inc., ESRI.

Explanation

Monitoring well that will be sampled in 2012

REILLY SITE

LOCATION OF DRIFT AQUIFER GROUNDWATER MONITORING WELLS
2012 SAMPLING PLAN
Reilly Site, City of St. Louis Park, Minnesota

Summit Envirosolutions

Figure 5

File: Fig5_DRIFT
Summit Proj. No.: 0987-0007
Plot Date: 1-13-12
Arc Operator: PRB
Reviewed by: BMG

Appendix A

Additional Monitoring Requirements

Level or Drinking Water Criterion is exceeded during the first year of operation of the system, Reilly shall immediately notify the Regional Administrator, the Director, and the Commissioner, and shall undertake such additional Monitoring as is required by Section 4.3.2.

(D) Routine Monitoring after two carbon changes shall be quarterly, unless the Regional Administrator, the Director, and the Commissioner determine that the observed service life of the carbon is too short to permit this frequency, in which case the Regional Administrator, the Director and the Commissioner shall notify Reilly of the required Monitoring frequency in accordance with Part G or H of the Consent Decree.

4.3.2. Carbon Replacement Monitoring

(A) If the analytical results from any treated water sample obtained pursuant to Section 4.3.1. exceed the Drinking Water Criterion for Other PAH or exceed the Advisory Level for either Carcinogenic PAH or the sum of benzo(a)pyrene and dibenz(a,h)anthracene, then Reilly shall collect two additional treated water samples at least 2 Days apart within one week of receiving the results of the exceedance sample. If the

analytical results from either one or both of the two additional samples also exceed the Drinking Water Criterion for Other PAH or the Advisory Level for either Carcinogenic PAH or the sum of benzo(a)pyrene and dibenz(a,h)anthracene, and neither of the conditions specified in (C)(1) and (2) below are met, then the carbon shall be replaced within 21 Days of receiving the additional sample results.

(B) If the analytical results from any treated water sample obtained pursuant to Section 4.3.1. exceed the Advisory Level for Other PAH, then Monitoring of treated water shall be conducted immediately according to Section 12.1. If the results of any two samples required by Section 12.1. exceed the Drinking Water Criterion for Other PAH, and neither of the conditions specified in (C)(1) and (2) below are met, then the carbon shall be replaced within 21 Days of receiving the additional sample results.

(C) If any analytical result from the additional samples taken as required by (A) or (B) above exceeds the Drinking Water Criterion for Other PAH, or the Advisory Level for either Carcinogenic PAH or the sum of benzo(a)pyrene and dibenz(a,h)anthracene during either

(1) within one year after the carbon treatment system is placed into service or

(2) within one year after the first carbon change if carbon was changed in the first year of operation of the carbon treatment system,

then Reilly shall conduct the Monitoring program specified in Section 4.6. Reilly shall report the results of the Section 4.6. Monitoring program to the Regional Administrator, the Director and the Commissioner within 7 Days of receiving the analytical data. If the treated water from the carbon treatment system is determined pursuant to Section 4.6. to exceed the Drinking Water Criterion for Other PAH or the Advisory Levels for Carcinogenic PAH or the sum of benzo(a)pyrene and dibenz(a,h)anthracene, then Reilly shall replace the carbon within 14 Days of making this determination. If the treated water is determined pursuant to Section 4.6. to meet the Drinking Water Criterion for Other PAH and the Advisory Levels for Carcinogenic PAH and the sum of benzo(a)pyrene and dibenz(a,h)anthracene, then normal GAC system operation and Monitoring in accordance with Sections 4.3.1.(B) and

4.3.1(C). shall be resumed. Time computation under (1) and (2) above shall be measured from the date the sample was collected, not from the date on which analytical results from the sample were generated.

(D) Following replacement of carbon, treated water shall be Monitored weekly for one month and in accordance with the Monitoring requirements of Section 4.3.1. thereafter.

(E) If exceedance of the Drinking Water Criterion for Other PAH or an Advisory Level for either Carcinogenic PAH or the sum of benzo(a)pyrene and dibenz(a,h)anthracene is confirmed, the Commissioner may direct that wells SLP 10 and/or SLP 15 be removed from active service until the carbon is replaced.

4.3.3. Feed Water

Feed water to the GAC system (i.e. water treated by the existing pressure sand filters) shall be Monitored at the same time as treated water from the GAC system is Monitored at the following intervals:

(A) During the testing period prior to hookup, feed water shall be Monitored twice per week.

(B) During the first month after connection to the distribution system, feed water shall be Monitored biweekly.

(C) After the first month of operation, Monitoring of feed water shall be performed quarterly until the carbon has been changed twice. If the Regional Administrator, the Director and the Commissioner determine pursuant to Section 4.3.1.(B) that the GAC system is not operating properly, Reilly may, upon receipt of such determination, be required to resume biweekly Monitoring of feed water.

(D) After two carbon changes in the GAC system, feed water shall be Monitored annually.

4.3.4. Extended Monitoring

Treated water from the GAC system shall be sampled and analyzed annually for the extended list of PAH in Part A.2. of Appendix A, using gas chromatography/mass spectroscopy (GC/MS), or other methods approved by the Regional Administrator and the Director. During this extended analysis, any compounds listed in Part A.2. of Appendix A, or any other compounds which are detected with significant peak heights that are not routinely Monitored, shall be identified and, if possible, quantified, using a mass spectral library which contains extensive spectra of PAH compounds, such as the National Bureau of Standards mass spectral library. Reilly shall analyze a sample of treated or feed water once a year for the acid fraction compounds determined by EPA Test Method 625 or by other methods approved by the Regional Administrator and the Director.

12.

CONTINGENT ACTIONS FOR MUNICIPAL DRINKING WATER SUPPLY WELLS

12.1. Contingent Monitoring

12.1.1. Exceedance of Advisory Levels

If the analytical result of any sample taken from an active municipal drinking water well under the Monitoring requirements of Sections 3., 4.3., 5.1., 6.2.1., 7.3., or 8.4. above exceeds an Advisory Level, Reilly shall take another sample within seven Days of receiving the analytical results and analyze this sample. If the results of the second sample are below all of the Advisory Levels, a third sample shall be taken by Reilly within seven Days of receiving the results of the second sample. If the third sample is below all of the Advisory Levels, Monitoring of the affected well shall revert to its normal schedule. If the analytical result of the second or third sample exceeds an Advisory Level but is less than all Drinking Water Criteria, the Regional Administrator, the Director, and the Commissioner shall be notified by Reilly immediately and subsequent samples shall be taken by Reilly monthly until such time as either:

(A) three consecutive samples yield results less than all of the Advisory Levels, in which case the sampling interval shall revert to the level specified for the affected well in Sections 3., 4.3., 5.1., 6.2.1., 7.3., or 8.4. above; or

(B) a sample yields results greater than a Drinking Water Criterion, in which case the requirements of Section 12.1.2., below, apply.

12.1.2. Exceedance of Drinking Water Criteria

(A) If the analytical result of any sample taken from an active municipal drinking water well pursuant to Section 12.1.1 exceeds the Drinking Water Criterion for Carcinogenic PAH, the sum of benzo(a)pyrene and dibenz(a,h)anthracene, or Other PAH, the Regional Administrator, the Director and the Commissioner shall be immediately notified by Reilly, and another sample shall be taken by Reilly within three Days of receiving the results of the first sample and analyzed. If the analytical result of the second sample is less than all of the Drinking Water Criteria but greater than any Advisory Level, a third sample shall be taken by Reilly within seven Days of receiving the results of the second sample and analyzed. If the results of this third sample are less than all of the Drinking Water Criteria, but greater than any Advisory Level, Reilly shall comply with the monthly sampling frequency specified in Section 12.1.1. above.

(B) If the analytical result of the second or third sample taken pursuant to Section 12.1.2.(A) above is greater than the Drinking Water Criterion for Carcinogenic PAH, the sum of benzo(a)pyrene and dibenz(a,h)anthracene, or Other PAH, Reilly shall Monitor the well weekly until such time as either: (1) three consecutive samples yield results below all of the Drinking Water Criteria, in which case Monitoring of the well shall revert to the normal schedule (including Advisory Level Monitoring as specified by Section 12.1.1. above if applicable); or, (2) three consecutive samples yield results above any Drinking Water Criterion, in which case Reilly shall immediately notify the Regional Administrator, the Director and the Commissioner. The Commissioner may then require the affected well to be taken out of service, in which case Reilly shall undertake the contingent actions specified in Section 12.2. below.

12.1.3. Analytical Turn-around Time

All Monitoring conducted pursuant to Section 12.1. shall be on a 21-Day turn-around time basis in accordance with Section 2.8.

Appendix B

Contingency Plan

CONTINGENT ACTIONS FOR CONTAMINATED WATER

It is possible that groundwater contaminated with coal tar materials will be encountered during the sample retrieval operations. Groundwater generated during sample retrieval operations will be classified as contaminated if the water exhibits a discernible oil sheen or oil phase. Contaminated water will be pumped to the sanitary sewer if it contains less than 10 percent organic material. Estimates of flow rate, disposal volume and water quality will be established and the Metropolitan Council Environmental Services (MCES) will be informed before the discharge to the sanitary sewer if the estimated flow exceeds 150 gallons per workday from any individual site. Contaminated liquids containing more than 10 percent organic material or failing to receive MCES approval for discharge will be disposed of in accordance with all applicable local, state and federal rules and regulations and Part T of the Consent Decree. Uncontaminated water will be disposed of in the storm sewer or by other means acceptable to the City of St. Louis Park.

The City will be responsible for keeping the Environmental Protection Agency, Minnesota Pollution Control Agency and Vertellus Specialties, Inc. informed of all significant actions involving the generation of contaminated groundwater. All actions, decisions and communications by the City, Environmental Protection Agency, Minnesota Pollution Control Agency, and Vertellus Specialties Inc. in dealing with contaminated soils will be in accordance with and subject to the provisions of Parts I, J, and O of the Consent Decree in the Reilly settlement.

Appendix C

Community Relations Plan

COMMUNITY RELATIONS PLAN

The Sampling Plan is to be completed in accordance with the Consent Decree-Remedial Action Plan for Reilly Tar & Chemical Corporation's St. Louis Park, Minnesota, N.P. L. Site. All community relations programs related to this work will be coordinated through the following agencies:

United States Mr. Heriberto Leon

United States Environmental Protection Agency

(312) 886-6163

State of Minnesota Mr. Sam Brungardt

Minnesota Pollution Control Agency

(651) 757-2249

City of St. Louis Park Mr. Jamie Zwilling

City of St. Louis Park

(952) 924-2632

Information necessary to conduct the Community Relations Plan will be provided by the City and Vertellus Specialties Inc.

Appendix D

Monitoring Well Information Table

Monitoring Well Information Table
2011 Sampling Plan

Unique #	Well ID	Aquifer	Owner	Address	Elevation	Total Depth	Status	Well Use	Comments
	E13								
207674	E15	Prairie du Chien-Jordan	EDINA		897	405	Active	Drinking	Well in good condition
208399	E2	Prairie du Chien-Jordan	EDINA			391	Active	Drinking	Well in good condition
	E3		EDINA				Active	Drinking	well in good condition
	E4							Drinking	
206474	E7	Prairie du Chien-Jordan	EDINA		950	547	Inoperable	Unused	Edina denied access in 2011.
	H3							Drinking	
	H6		HOPKINS				Active	Drinking	well in good condition
	MTKA 6		MINNETONKA				Active	Drinking	well in good condition
216194	P 109	Drift	USGS	OXFORD & EDGEWOOD	892	44	Active	Monitoring	well in good condition
216166	P 112	Drift	USGS	6318 CAMBRIDGE	902	51	Active	Monitoring	no cap
462926	P 307	Drift	ST. LOUIS PARK	GORHAM & WALKER		81	Active	Monitoring	well in good condition
462927	P 308	Drift	ST. LOUIS PARK	LIBRARY & LAKE		80	Active	Monitoring	well in good condition
462928	P 309	Drift	ST. LOUIS PARK	LAKE & WALKER		81	Active	Monitoring	well in good condition
462929	P 310	Drift	ST. LOUIS PARK	LAKE & TH7		70	Active	Monitoring	well in good condition
462932	P 312	Drift	ST. LOUIS PARK	JORVIG PARK	892	85	Active	Monitoring	well in good condition
	P116	St. Peter					Abandoned	Unused	
	P311	Drift						Monitoring	
	P47	Drift						Monitoring	
206442	SLP 10	Prairie du Chien-Jordan	ST. LOUIS PARK	JERSEY AVE.	925	500	Active	Drinking	Well in good condition
206439	SLP 11	Mt. Simon-Hinkley	ST. LOUIS PARK	29TH & IDAHO	925	1093	Active	Drinking	Well in good condition
206456	SLP 12	Mt. Simon-Hinkley	ST. LOUIS PARK	42ND & ZARTHAN	915	1095	Active	Drinking	Well in good condition
206424	SLP 13	Mt. Simon-Hinkley	ST. LOUIS PARK	CEDAR LK & ALABAMA	902	1045	Active	Drinking	Pump pulled for O&M - no 2011 sample.
227965	SLP 14	Jordan	ST. LOUIS PARK	CEDAR LK & ALABAMA	900	485	Active	Drinking	well in good condition
215447	SLP 15	Jordan	ST. LOUIS PARK	29TH & IDAHO	925	503	Active	Drinking	Well in good condition
203187	SLP 16	Jordan	ST. LOUIS PARK	FLAG & FRANKLIN	920	500	Active	Drinking	Well in good condition
147459	SLP 17	Mt. Simon-Hinkley	ST. LOUIS PARK	34TH & WYOMING	930	1085	Inoperable	Unused	No pump in well. No 2011 sample.
200542	SLP 4	Prairie du Chien-Jordan	ST. LOUIS PARK	41ST & NATCHEZ	900	490	Active	Drinking	Well in good condition
206457	SLP 6	Prairie du Chien-Jordan	ST. LOUIS PARK	42ND & ZARTHAN	915	480	Active	Drinking	Well in good condition
206436	SLP 7	Prairie du Chien-Jordan	ST. LOUIS PARK	2500 LOUISIANA	905	446	Inoperable	Unused	No pump in well. No 2011 sample.
206437	SLP 9	Prairie du Chien-Jordan	ST. LOUIS PARK	2500 NEVADA AVE	905	473	Inoperable	Unused	No pump in well. No 2011 sample.
	SLP3							Backkup	
216038	W 10	Drift	USGS	LOUISIANA OXFORD	891	29	Active	Monitoring	Well rusted shut. Needs new lock
149711	W 101	Platteville	USGS	36TH & WOODDALE	914	106	Active	Monitoring	Well in good condition
200979	W 105	Ironton-Galesville	REILLY (VERTELLUS)	ON SITE	892	750	Active	Monitoring	In well house at Louisiana Oaks Park
160031	W 117	Drift	USGS	36TH & WOODDALE	914	72	Active	Monitoring	Well in good condition
216009	W 119	Prairie du Chien-Jordan	MEADOWBROOK GC	MEADOWBROOK GC	890	502	Active	Monitoring	Well in good condition
165577	W 121	Platteville	USGS	JUSTAD PARK	920	115	Active	Monitoring	Well in good condition
165578	W 122	St. Peter	USGS	39TH & YOSEMITE	920	239	Active	Monitoring	Well in front yard landscaping
165583	W 128	Drift	USGS	JUSTAD PARK	920	67	Active	Monitoring	Well in good condition
165584	W 129	St. Peter	USGS	3984 ALABAMA	913	122	Active	Monitoring	Needs to be re-labled.
165585	W 130	Platteville/St. Peter	USGS	NW METH. HOSP LOT	887	88	Active	Monitoring	At hospital. No bumper posts. Needs re-labeling
165586	W 131	Platteville	USGS	6200 LAKE STREET	919	107	Active	Monitoring	Very slow recharge
165591	W 136	Drift	USGS	6200 LAKE STREET	916	53	Active	Monitoring	Well in good condition
114472	W 14	St. Peter	USGS	HWY 7 AND LAKE ST	890	95	Active	Monitoring	Well in good condition
216051	W 143	Platteville	USGS	6425 OXFORD ST	907	90	Active	Monitoring	No bumper posts

	E13								
216043	W 15	Drift	USGS	ON SITE	891	76	Active	Monitoring	well in good condition. Needs new label
216046	W 18	Platteville	USGS	LAKE & LOUISIANA	891	78	Active	Monitoring	Sams club driveway. No cap. In well vault
216031	W 2	Drift	USGS	31ST AND OREGON	897	36	Active	Monitoring	well in good condition. Needs new label
216048	W 20	Platteville	USGS	NEAR 6725 OXFORD	893	90	Active	Monitoring	well in good condition
200993	W 22	Platteville/St. Peter	REILLY (VERTELLUS)	ON SITE	895	91	Active	Monitoring	Obstruction below WL at ~8 ft bgs.
216050	W 23	Prairie du Chien-Jordan	REILLY (VERTELLUS)	ON SITE	895	909	Active	Pumping	Louisiana Oaks Park
160018	W 24	St. Peter	USGS	LAKE AND LOUISIANA	889	90	Active	Monitoring	Down well pump still active. Pumps at ~4gpm.
216052	W 27	Platteville/St. Peter	USGS	3320 REPUBLIC AVE	903	112	Active	Monitoring	Reddy rents. Well cap broken
206454	W 29	Prairie du Chien-Jordan	FLAME INDUSTRIES	7317 W. LAKE	897	335	Inoperable	Unused	New owner will be contacted for 2012
206444	W 40	Prairie du Chien-Jordan	MINN RUBBER	3630 WOODDALE AVE	910	475	Abandoned	Unused	Well no longer exists.
453805	W 401	Prairie du Chien-Jordan	INTERLACHEN GC	6200 INTERLACHEN		482	Active	Irrigation	well in good condition
508116	W 402	Prairie du Chien-Jordan	REILLY (VERTELLUS)	310 CHOWEN AVE S		390	Active	Monitoring	well in good condition
439751	W 403	Prairie du Chien-Jordan	REILLY (VERTELLUS)	INGLEWOOD & 39TH		385	Active	Monitoring	debris in well
223938	W 405	Prairie du Chien-Jordan	AMER HARDWARE MUTUAL	NEAR LAKE CALHOUN			Not used	Unused	Not visited in2011
200534	W 406	Prairie du Chien-Jordan	MINIKAHDA CLUB	MINIKAHDA CLUB	920	585	Active	Irrigation	Well in good condition
432037	W 408	St. Peter	ST. LOUIS PARK	31ST & IDAHO		140	Active	Monitoring	No bumper posts
432036	W 409	St. Peter	ST. LOUIS PARK	1ST & GORHAM		222	Active	Monitoring	well in good condition
434042	W 410	St. Peter	ST. LOUIS PARK	6425 OXFORD ST	908	184	Active	Monitoring	well in good condition
432035	W 411	St. Peter	ST. LOUIS PARK	N OF METH HOSP		110	Active	Monitoring	well in good condition
432034	W 412	St. Peter	ST. LOUIS PARK	37TH & WOODALE		139	Active	Monitoring	well cap recently repaired
434045	W 420	Drift	REILLY (VERTELLUS)	LAKE & LOUISIANA	896	67	Active	Pumping	well in good condition
434044	W 421	Platteville	REILLY (VERTELLUS)	LAKE & LOUISIANA	896	84	Active	Pumping	well in good condition
434043	W 422	Drift	REILLY (VERTELLUS)	6425 OXFORD ST	908	78	Active	Monitoring	well in good condition
439809	W 424	Platteville	ST. LOUIS PARK	33RD & HAMPSHIRE	933	110	Active	Monitoring	well in good condition
439812	W 426	Platteville	ST. LOUIS PARK	1ST & GORHAM	923	116	Active	Monitoring	well in good condition
439811	W 427	Drift	ST. LOUIS PARK	35TH & DAKOTA		45	Active	Monitoring	well in good condition
439810	W 428	Platteville	ST. LOUIS PARK	35TH & DAKOTA		109	Active	Monitoring	well in good condition
463012	W 434	Platteville	ST. LOUIS PARK	JORVIG PARK		114	Active	Monitoring	well in good condition
498917	W 437	Platteville	ST. LOUIS PARK	GORHAM & WALKER		104	Active	Monitoring	well in good condition
498919	W 438	Platteville	ST. LOUIS PARK	LAKE & TH7		107	Active	Monitoring	well in good condition
	W 439	Platteville	ST. LOUIS PARK	1ST & GORHAM	920	94	Active	Pumping	well in good condition
216067	W 48	Prairie du Chien-Jordan	METHODIST HOSPITAL	6500 EXCELSIOR	890	485	Active	Irrigation	well in good condition
216035	W 7	Drift	USGS	35TH & QUEBEC	925	70	Well not located	Unused	Well no longer exists.
200539	W 70	Prairie du Chien-Jordan	PARK THEATRE BLDG	4825 MTKA BLVD	905	398	Abandoned	Unused	Well no longer exists.
216037	W 9	Drift	USGS	LAKE & LOUISIANA	890	25	Active	Monitoring	No cap. Protop broken.
	W112		Old SLP #1				Abandoned	Unused	
	W116	Drift					Abandoned	Unused	
	W133	St. Peter		36th and Wooddale				Monitoring	
	W135	Drift					Abandoned	Unused	Well no longer exists.
203190	W32	Prairie du Chien-Jordan	Property Owner	Texatonka Mall			Inaccessible	Unused	Not visited in 2011
753534	W33R	St. Peter	SAINT LOUIS PARK	7020 W LAKE ST		183	Active	Monitoring	well in good condition
	W413						Proposed	Unused	Well not installed
	W414	St. Peter	MPCA	OXFORD & ZARTHAN		226	Active	Monitoring	well in good condition

Well Inspection Punch List

Project Well ID

Well Label
Locking Cover
Well Seal
Protective Posts
Pro-Top
Ground Settlement
Ground Filling
Frost Heave
Potential Sources of Contamination
Encroaching Vegetation
Anomalous Depth or WL
Other Damage
Recommendations