DRINKING WATER PROTECTION MANAGEMENT PLAN

Prepared for:
City of Aurora, Nebraska

October 6, 2023

Olsson Project No. 021-05223

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ACRONYMS AND ABBREVIATIONS

AEM ... airborne electromagnetics
BMP ... best management practice
CDL ... cropland data layer
CRP ... Conservation Reserve Program
CSI ... contaminant source inventory
DWPMP ... drinking water protection management plan
ENWRA ... Eastern Nebraska Water Resources Assessment
EPA ... U.S. Environmental Protection Agency
ETJ ... extraterritorial jurisdiction
GMA ... groundwater management area
GMP ... groundwater management plan
gpm ... gallons per minute
lb/a ... pounds per acre
lbs/yr ... pounds per year
LPMT ... Lower Platte Missouri Tributaries
MCL ... maximum contaminant level
MGD ... million gallons per day
mg/L ... milligrams per liter
NDEE ... Nebraska Department of Environnment and Energy
NDHHS ... Nebraska Department of Health and Human Services
NLCD ... National Land Cover Database
NRCS ... Natural Resources Conservation District
NRD ... Natural Resources District
PLET ... Pollution Load Estimation Tool
ppm ... parts per million
RAP ... remedial action plan
SARA ... Superfund Amendments and Reauthorization Act
UNL ... University of Nebraska-Lincoln
UNL-CSD ... University of Nebraska-Lincoln, Conservation and Survey Division
USDA ... U.S. Department of Agriculture
USGS ... U.S. Geological Survey
WHP ... wellhead protection

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Photo 1. View overlooking the downtown area of Aurora, with the Hamilton County Courthouse in the foreground.

1.0 INTRODUCTION

This dual-purpose Drinking Water Protection Management Plan (DWPMP) and Wellhead Protection (WHP) Plan was prepared for the City of Aurora, Nebraska (Aurora). The plan was developed with technical support from the Nebraska Department of Environment and Energy (NDEE), the Upper Big Blue Natural Resources District (NRD) and the U.S. Environmental Protection Agency (EPA). Olsson, under contract with Aurora, wrote this DWPMP, which is intended for the city to use as a guide to implement programs, practices, and activities that will be protective of groundwater in and around the community. Currently, groundwater is the only source of drinking water for the residents of Aurora.

1.1 Aurora Population Growth

Aurora is a thriving community that has continually experienced growth since 1990 (**Table 1**). According to the 2020 U.S. Census, the population of Aurora is 4,678 with about 2,000 residential water customers (Aurora 2023). Based upon recent historical population data, it is projected that the city will continue to experience slight growth into the future.

Table 1. Aurora population data and percent change over time.

Year	Population	Percent Change Over Previous Period (%)
1990	3,879	-
1995	4,102	+5.7
2000	4,231	+3.1
2005	4,219	-0.3
2010	4,485	+6.3
2015	4,459	-0.6
2020	4,678	+4.9

1.2 Aurora Water System and Demand

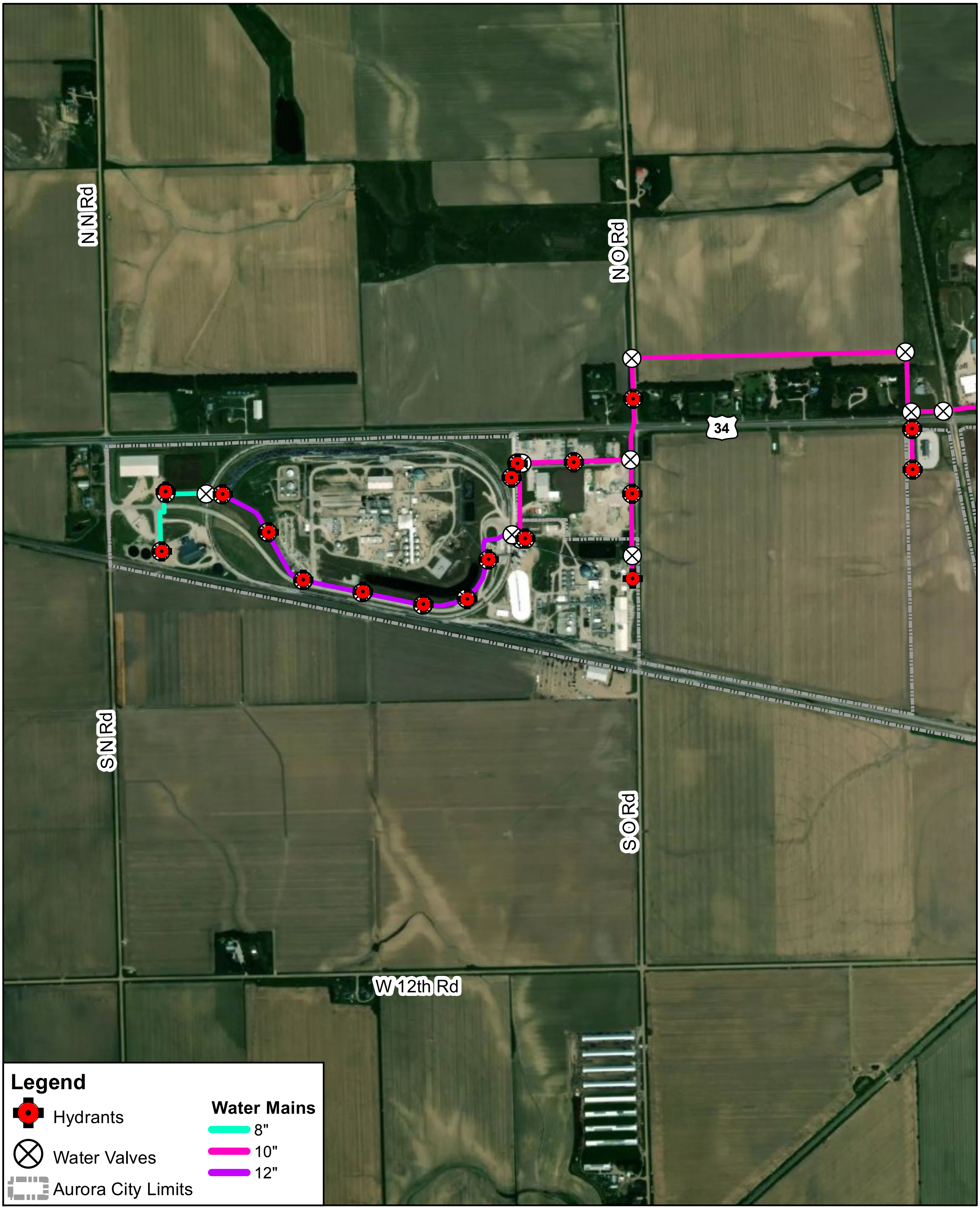
The city's first water supply wells were constructed in 1956 to supply the growing population. The water system has been modified and expanded several times to meet the increasing demand of the customer base. The most recent updates include a re-drilled well in 2005, and two new wells installed in 2016 and 2019. The average quantity of water distributed by Aurora is approximately 1 million gallons per day (MGD), which equates to an average use of 222 gallons per capita per day (JEO Consulting Group, Inc. 2021).

Currently, Aurora has seven active wells that supply the municipal water system (**Table 2**). The wells produce groundwater from the regional High Plains Aquifer (University of Nebraska, Lincoln - Conservation Survey Division [UNL-CSD] 2013). In general, the wells are in good condition, and together they have a combined pumping capacity of around 7,065 gallons per minute (gpm). Two of the wells have back-up generators with an available capacity of 2,150 gpm (JEO Consulting Group, Inc. 2021). Aurora's water system has a system capacity of 10.5 MGD as of 2021 (JEO Consulting Group, Inc. 2021). **Figures 1-3** show the water system infrastructure.

Table 2. Water supply well information for Aurora, Nebraska.

Local Well Number	NeDNR Registration Number	Well Depth (ft bgs)*	Year Completed	Aquifer/Material	Status
Well #1	G-028309	170	1956	Unknown	Active
Well #2	G-028310	223	2005	Fine/Medium Gravel and Medium/Coarse Sand	Active
Well #3	G-035327	248	1973	Clay/Gravel & Coarse Sand	Active
Well #4	G-028307	192	1978	Clay/Fine and Coarse Gravel and Sand	Active
Well #5	G-101011	218	1999	Clay/Fine Gravel and Coarse Sand	Active
Well #6	G-179922	187	2016	Clay & Fine Sand	Active
Well #7	G-187475	203	2019	Clay & Fine Sand	Active

* ft bgs = feet below ground surface



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WESTERN WATER SUPPLY INFRASTRUCTURE
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
1

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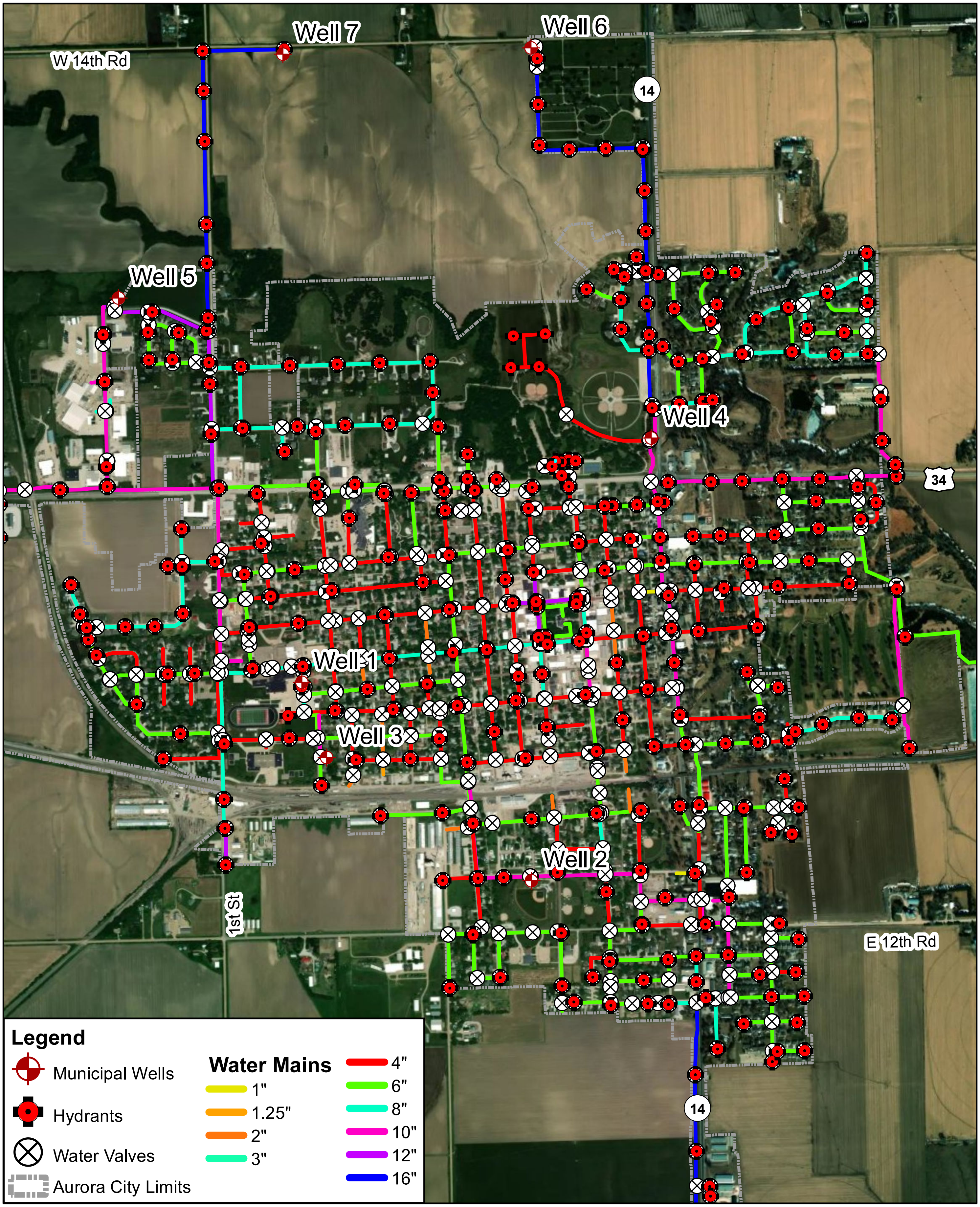

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CENTRAL WATER SUPPLY INFRASTRUCTURE
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
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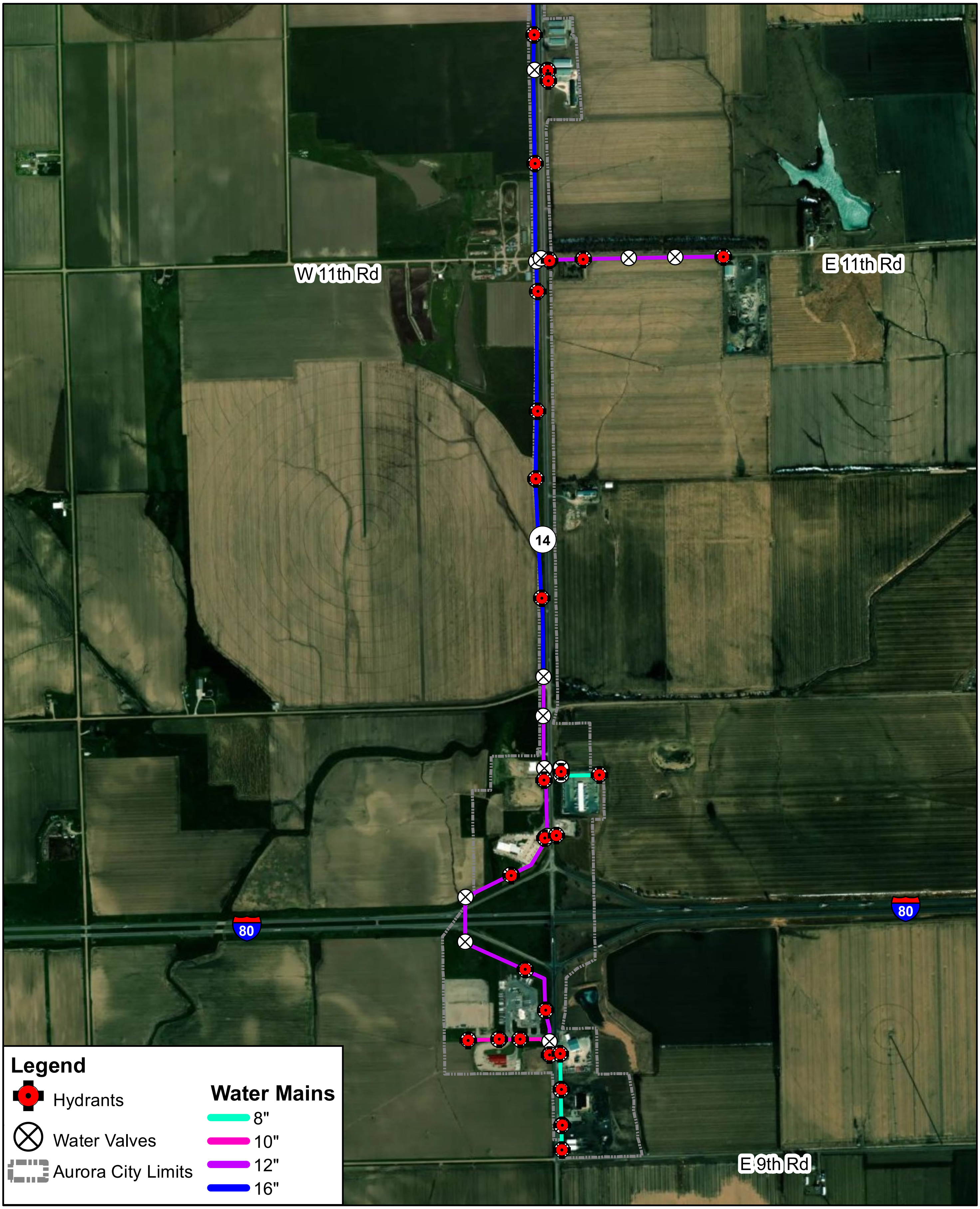

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SOUTHERN WATER SUPPLY INFRASTRUCTURE

Drinking Water Protection Management Plan

Aurora, Nebraska

FIGURE

3

1.3 Aurora Water Quality Information

The most common groundwater contaminant in Nebraska is nitrate (UNL Institute of Agriculture and Natural Resources 2022). Nitrate concentrations exceeding 1.0 mg/L are indicative of anthropogenic nitrate loading (Dubrovsky et al. 2010). Contamination occurs primarily through leaching of nitrate-nitrogen from applied fertilizer through the soil profile. Sources of nitrate may include runoff or seepage from fertilized agricultural lands, municipal and industrial wastewater, refuse dumps, animal feedlots, septic tanks and private sewage disposal systems, urban drainage, and decaying plant debris.

Aurora, like many communities across Nebraska, is facing nitrate contamination in its drinking water wells. The EPA's safe drinking water regulatory standard for nitrate is 10 milligrams per liter (mg/L). Aurora has had three wells (Wells #1, #2, and #3) test above the safe drinking water maximum contaminant level (MCL) at least once over the past ten years. When a municipal well tests at 10.4 mg/L or above, the well is immediately taken out of service. A confirmation sample is then collected and the average nitrate concentration of the two samples is reported to the Nebraska Department of Health and Human Services. For public notification, the procedures outlined in Aurora's Emergency Response Plan (**Section 8.7**) are followed. As seen in **Figure 4**, the most recent nitrate samples from all seven of Aurora's municipal wells result in an average nitrate concentration of 5.63 mg/L, with a median value of 5.2 mg/L (Aurora 2023). As of March 2021, none of the municipal wells were exceeding the EPA's MCL for nitrate, denoted by the dashed black line in **Figure 4**. Nitrate sampling from Aurora's municipal wells in 2022 recorded an average annual nitrate concentration of 9.6 mg/L in Well #7 (Aurora 2023). Six of the seven municipal wells in Aurora averaged nitrate concentration levels between 5 and 10 mg/L, with Well #6 below 5 mg/L. None of Aurora's municipal wells have recorded an annual average that has surpassed the EPA's regulatory standard since 2013. The nitrate concentration of Well #7 nears the EPA's MCL, and for that reason it will be used as the benchmark concentration for the nitrate reduction goals included in this DWPMP.

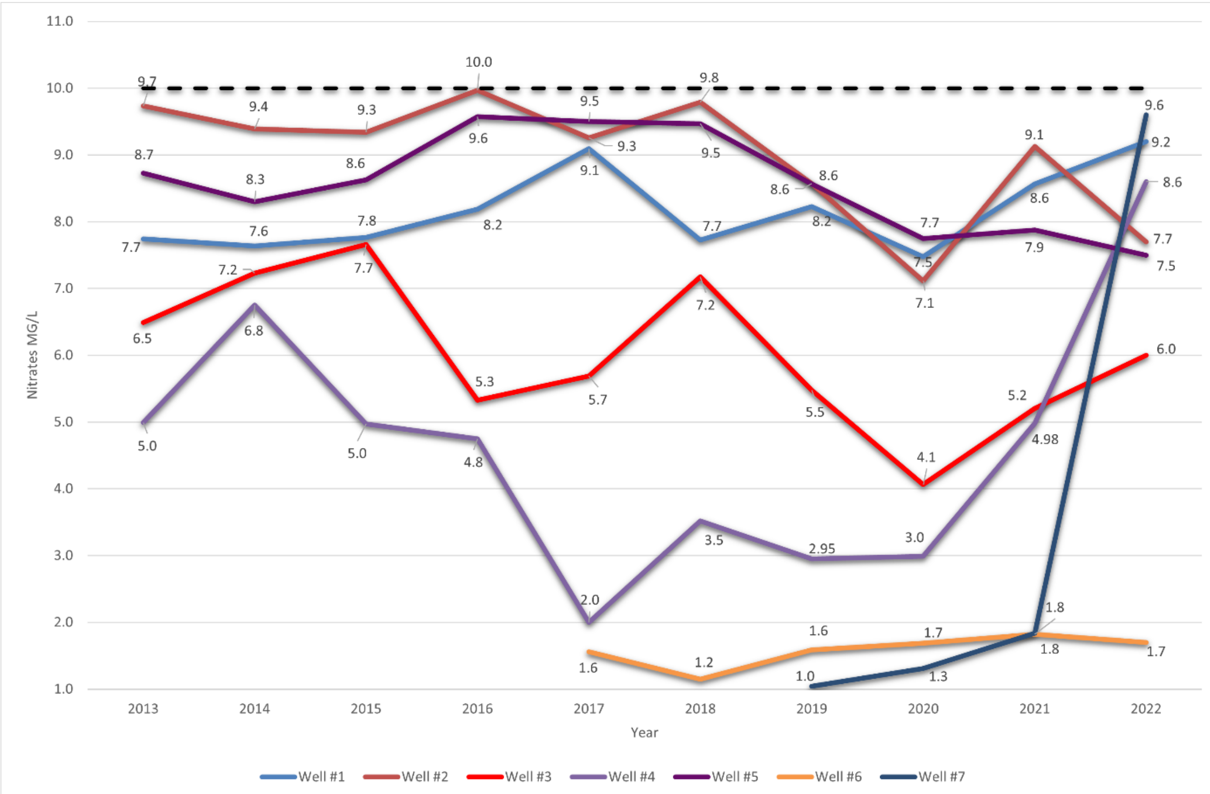


Figure 4. Aurora municipal well average annual nitrate levels (2013 to 2022) in milligrams per liter (mg /L) (Aurora 2023).

Groundwater quality data surrounding Aurora indicates similar results with a wide range in nitrate levels that vary by location. The Upper Big Blue NRD operates a water quality monitoring program across their footprint to collect annual water samples and enforce regulations if median nitrate concentrations are above a set trigger level. Upper Big Blue NRD has three phases of groundwater quality management areas: the entire NRD is designated as a Phase I groundwater management area (GWMA), Phase II GWMAs have a median nitrate concentration of over 7.0 mg/L, and Phase III GWMAs have median nitrate concentrations above 10.0 mg/L. Furthermore, the Upper Big Blue NRD is split into 12 GWMA zones (Upper Big Blue NRD 2020). These zones are drawn with consideration to city and county boundaries, USGS hydrologic unit codes (HUC), nitrate concentrations from 2000-2015, and other physical characteristics of the NRD (Upper Big Blue NRD 2020). Upper Big More information on controls and triggers for Upper Big Blue NRD groundwater quality management areas are found in **Section 8.2.2.** Aurora falls in Zone 2 of the NRD's monitoring program. Zone 2 hit the Phase II trigger of 7 mg/L nitrate-nitrogen in 2014. Since then, median nitrate levels have hovered around 8-9 mg/L, going as high as 9.7 mg/L in 2018. The median nitrate concentration for Zone 2 was 7.8 mg/L in 2022 (Upper Big Blue NRD 2022). **Figure 5** shows the locations of the Upper Big Blue NRD samples in Zone 2, as well as the resulting nitrate concentrations from 2022. Zones in Phase II Groundwater Quality Management Areas are outlined and shaded in yellow and Phase III areas are shaded in red in **Figure 5**.

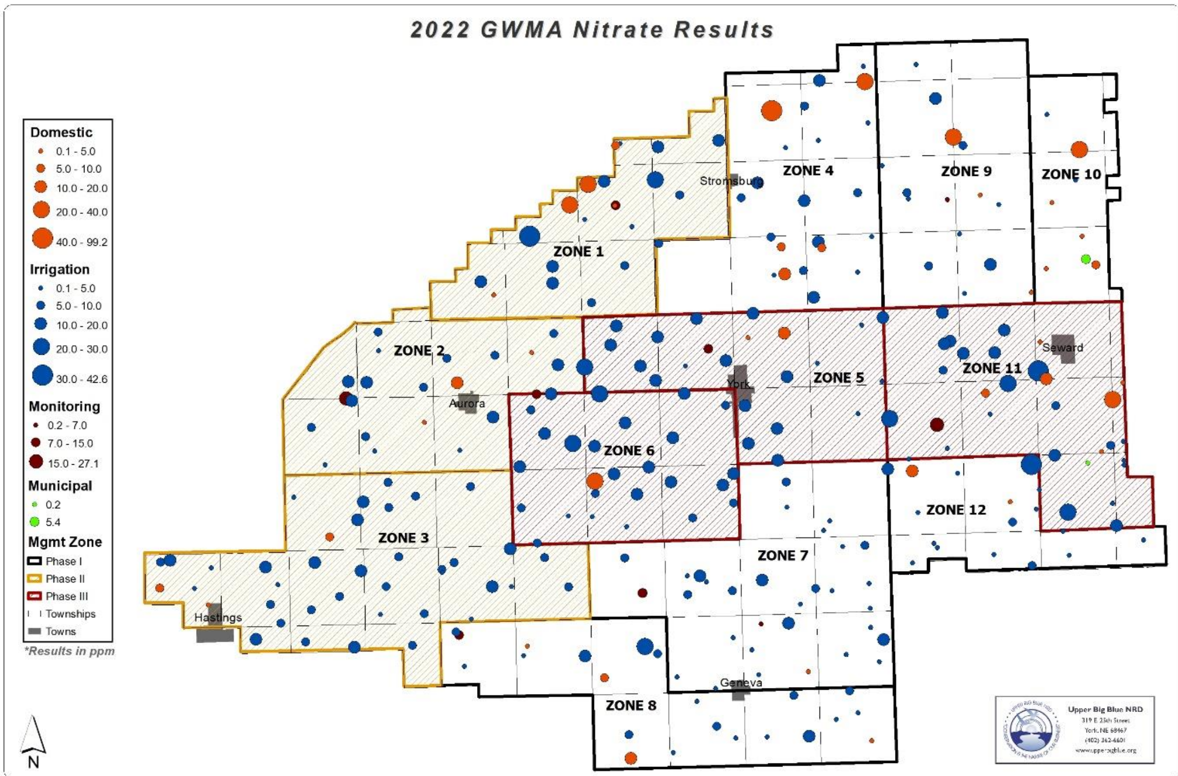


Figure 5. Water quality sample results taken by the Upper Big Blue NRD in 2022 (Upper Big Blue NRD 2022).

1.4 Document Organization

Because this is a dual-purpose DWPMP that meets the required elements of a WHP Plan, it is important to describe how the document is organized and where to find the required elements of each plan. The first section of this document defines the primary issues that led to the development of the DWPMP, which includes the WHP Plan. Similarly, although the goals and objectives defined in **Section 2.0** were written for the DWPMP alone, there is significant overlap between the two programs. **Section 3.0** defines the physical setting of the Aurora WHP area including the aspects of the natural setting that affect groundwater and contaminant fate and transport. **Section 3.0** also includes DRASTIC modeling results to spatially represent where groundwater is vulnerable to contamination within the proposed WHP area. **Section 4.0** provides information on the primary contaminant (nitrate) identified as the contaminant of concern in the Aurora area. Nitrate sources and estimates of environmental loads are also provided. The next three sections, **5.0**, **6.0**, and **7.0**, provide information on management, implementation, and monitoring strategies to reduce nitrate loading through urban and rural best management practices (BMPs). The final section provides some of the elements that are specific to a WHP Plan but not required in a DWPMP. The intent for segregating the WHP Plan elements was to facilitate review by the different agencies that oversee the two plans.

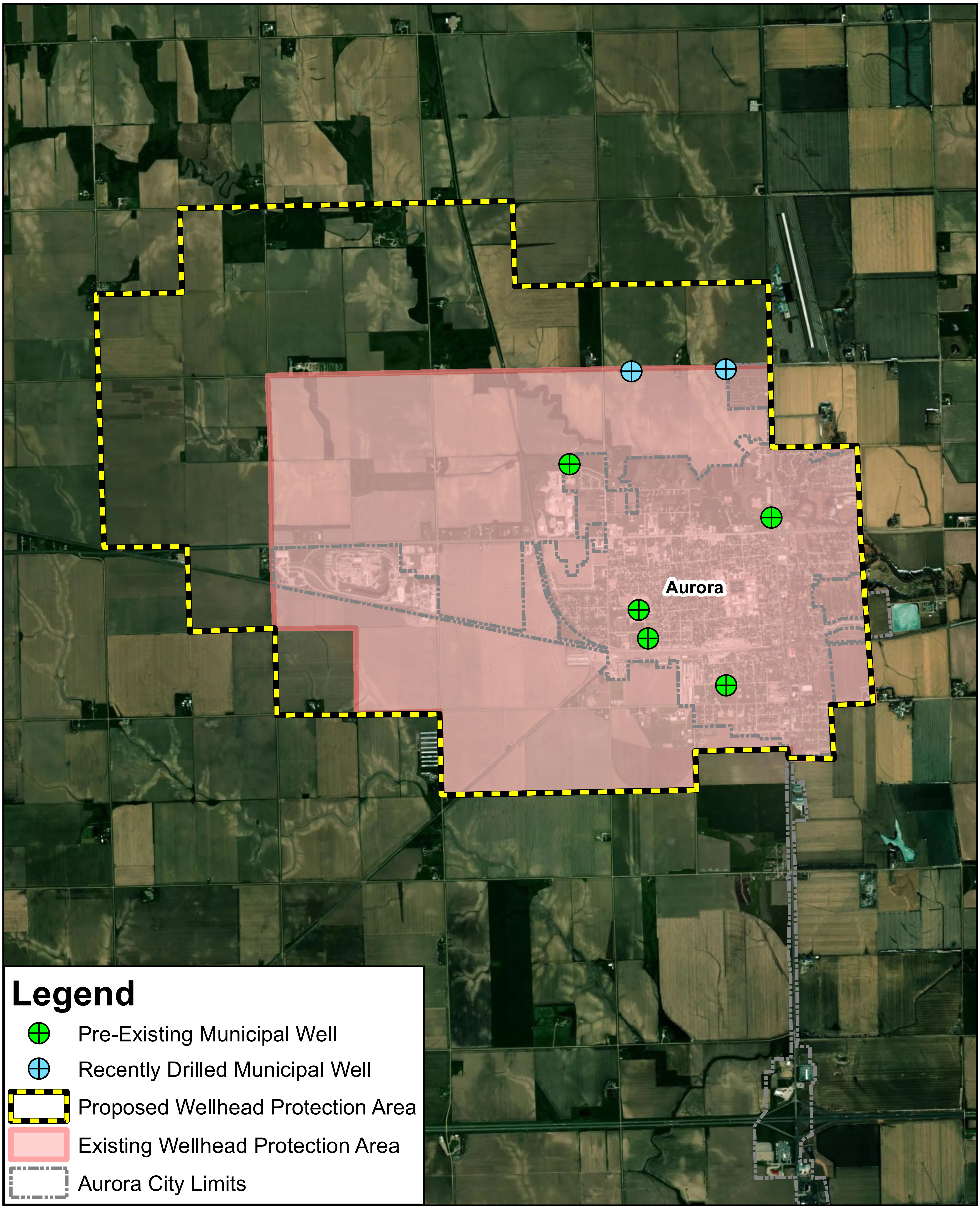
2.0 DRINKING WATER PROTECTION MANAGEMENT PLAN GOALS AND OBJECTIVES

As Aurora continues to thrive and diversify its water supply, this plan focuses on strategies that address areas of drinking water quality concern, as well as educate and empower the local community to improve their drinking water quality should certain contaminant levels increase. Looking into the future, the major concerns for the city's water supply are two-fold: (1) providing a water supply that satisfies future demand; and (2) mitigating the threat of nitrate contamination in existing and new wells. While Aurora has not experienced significant population growth in recent years, there may be a need for additional wells in the future should water quality conditions in current wells worsen or water demands change. If the economic development in Aurora results in demands greater than the system can handle, appropriate measures will need to be taken to ensure an adequate water supply. The concern for groundwater quality stems from the levels of nitrate in Aurora's water supply wells and in the surrounding aquifer.

The focus of this DWPMP is to investigate potential sources of contamination to groundwater and to provide a proactive approach to addressing these sources and better protect Aurora's water supply.

2.1 Planning Area

As part of this plan, Aurora has updated the WHP area to include the source water area for two recently drilled municipal wells and proposed an extension of the WHP area to the 50-year time of travel (TOT) boundary. This proposed WHP area will be referenced throughout this report as the planning area. The planning area for this DWPMP is illustrated in **Figure 6**. The planning area covers 7,689 acres and extends well beyond the current 20-year WHP area as defined by NDEE, which was established in 2016 prior to the drilling of two new municipal wells. NDEE has encouraged communities completing a DWPMP to expand their WHP areas to the 50-year TOT boundary to be more protective of the resource and unlock funding resources for implementing BMPs in a larger area. The addition of two new municipal wells and the expansion to the 50-year TOT boundary results in an increase of 3,583 acres to the existing WHP area.



1 inch = 4,000 feet
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PLANNING AREA
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
6

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2.2 Goals and Objectives

The goals and objectives of the Aurora DWPMP are designed to guide future management decisions related to improving water quality and quantity. These goals and objectives are outlined by the NDEE's Nonpoint Source Management Plan (2021a). They provide a connection between future implementation projects and the goals and objectives of the various conservation programs of partner agencies. In addition to those goals provided by NDEE, the intent of this plan is to reduce peak groundwater nitrate concentrations 27 percent by reducing nitrate concentrations an average of 0.13 mg/L per year over a 20-year period and implement BMPs to reduce anthropogenic groundwater nitrate contributions to prevent nitrate levels from exceeding Upper Big Blue NRD's threshold for a Phase II Groundwater Quality Management Area. The goals and objectives presented below also address many of the concerns raised by the community stakeholders involved in the planning process.

Specifically, the water quality concerns raised by the stakeholders included the following:

- The upward trend of nitrate contamination in the area
- The potential for upstream pollution affecting the community's drinking water wells
- The threats of groundwater contamination to existing wells
- Avoiding potential water treatment needs/costs
- Keeping the average nitrate concentrations in the municipal wells below the EPA drinking water regulatory standard

Stakeholders for this project include members of the public considered leaders in the community that come from a variety of backgrounds. More about the community stakeholders and their role in developing and implementing the plan will be presented later in the plan. Along with the role of the stakeholders, it is important to understand the roles and responsibilities of the organizations involved in developing and implementing the plan.

GOALS, OBJECTIVES, and TASKS for the City of Aurora adapted from Nebraska's

NONPOINT SOURCE MANAGEMENT PLAN (NDEE 2021)

GOAL 1. The primary goal of the Nebraska Nonpoint Source Management Program is to reduce nonpoint source water pollution and improve water quality in the state. The program will be a comprehensive and collaborative program that efficiently and effectively implements actions to restore and protect water resources from impairment by nonpoint source pollution.

Objective 1. Actions for management of nonpoint source pollution will be based on sound data and effective directing of resources.

Task 1. Review and, as necessary, revise monitoring and assessment methods and protocols to assure that data accurately detect and quantify nonpoint source threats and impairments, and that data are useful in guiding nonpoint source management decisions

Task 2. Evaluate threats and impairments to the drinking water system through ongoing monitoring, data assessment, and special studies

Task 3. Revise, biennially, the lists of waters identified for restorative or protective management actions to identify degraded or impaired waters and high quality waters for nonpoint source pollution management actions based on the latest state Integrated Report, published reports, special studies, and consultation with natural resources specialists.

Task 4. Review and amend the state Nonpoint Source Management Plan at least every 5 years to update, at a minimum, the milestones, and schedule for implementation.

Objective 2. Strong working partnerships and collaboration among appropriate local, state and federal agencies and organizations will be established and maintained regarding management of nonpoint source pollution.

Task 1. Participate in the USDA State Technical Committee and other inter-organizational advisory committees and work groups to communicate issues regarding management of nonpoint source pollution.

Task 2. Develop and support local citizen advisory groups to assist in planning and implementing local nonpoint source pollution management projects and activities.

Task 3. Utilize interagency liaisons to facilitate coordination and integration of program activities.

Task 4. Conduct consistency reviews of select federally funded programs and activities in accordance with established procedures.

Objective 3. Comprehensive and systematic strategies will be employed to restore and protect water resources from nonpoint source pollution and to communicate nonpoint source pollution information.

Task 1. Develop basin, watershed, and drinking water protection management plans that meet EPA guidelines for a 9-element or alternative management plan and utilize multiple complementary conservation programs.

Task 2. Implement projects throughout the state that restore and protect water resources, reduce loading of pollutants, and lead to delisting of impaired waters or protection of high quality waters.

Task 3. Update at least two existing 9-element watershed management plans or alternative plans over the next five years (2021-2026).

Task 4. Develop at least two 9-element (or alternative) drinking water protection management plans over the next five years (2021-2026).

GOAL 2. Resource managers, public officials, community leaders and private citizens will understand the effects of human activities on water quality and support actions to restore and protect water resources from impairment by nonpoint source pollution.

Objective 1. Deficiencies in knowledge needed to improve decisions regarding management of nonpoint source pollution will be identified and investigated.

Task 1. Identify and evaluate emerging or poorly understood nonpoint source pollutants such as bacteria, blue-green algae, hormones and antibiotics, and their sources in Nebraska.

Task 2. Develop and improve management practices to control nonpoint source pollution.

Objective 2. Tools to effectively transfer knowledge and facilitate actions regarding management of nonpoint source pollution will be developed, improved and maintained.

Task 1. Develop and improve guidance documents for developing and implementing basin management plans, watershed management plans, drinking water protection management plans, and project implementation plans to restore or protect water resources.

Task 2. Develop and improve guidance documents for developing and implementing effective communication programs, projects, and activities to educate key audiences about management of nonpoint source pollution.

Task 3. Develop and distribute audience-specific materials and methods to inform and engage community leaders, local media, youth, educators, and other defined audiences regarding nonpoint source pollution management.

3.0 SOURCE WATER AREA INFORMATION

The following sections describe physical characteristics of the planning area that have potential to influence groundwater in the area. First, a description is presented of how the proposed WHP area was defined using a groundwater model that represents the area in and around Aurora. Information on the local climate, surface water and groundwater system are provided to build an understanding of the source water that Aurora uses as its drinking water supply. The data presented below also provide a basis for the programs, practices, and activities that are to be implemented to protect the drinking water supply for Aurora.

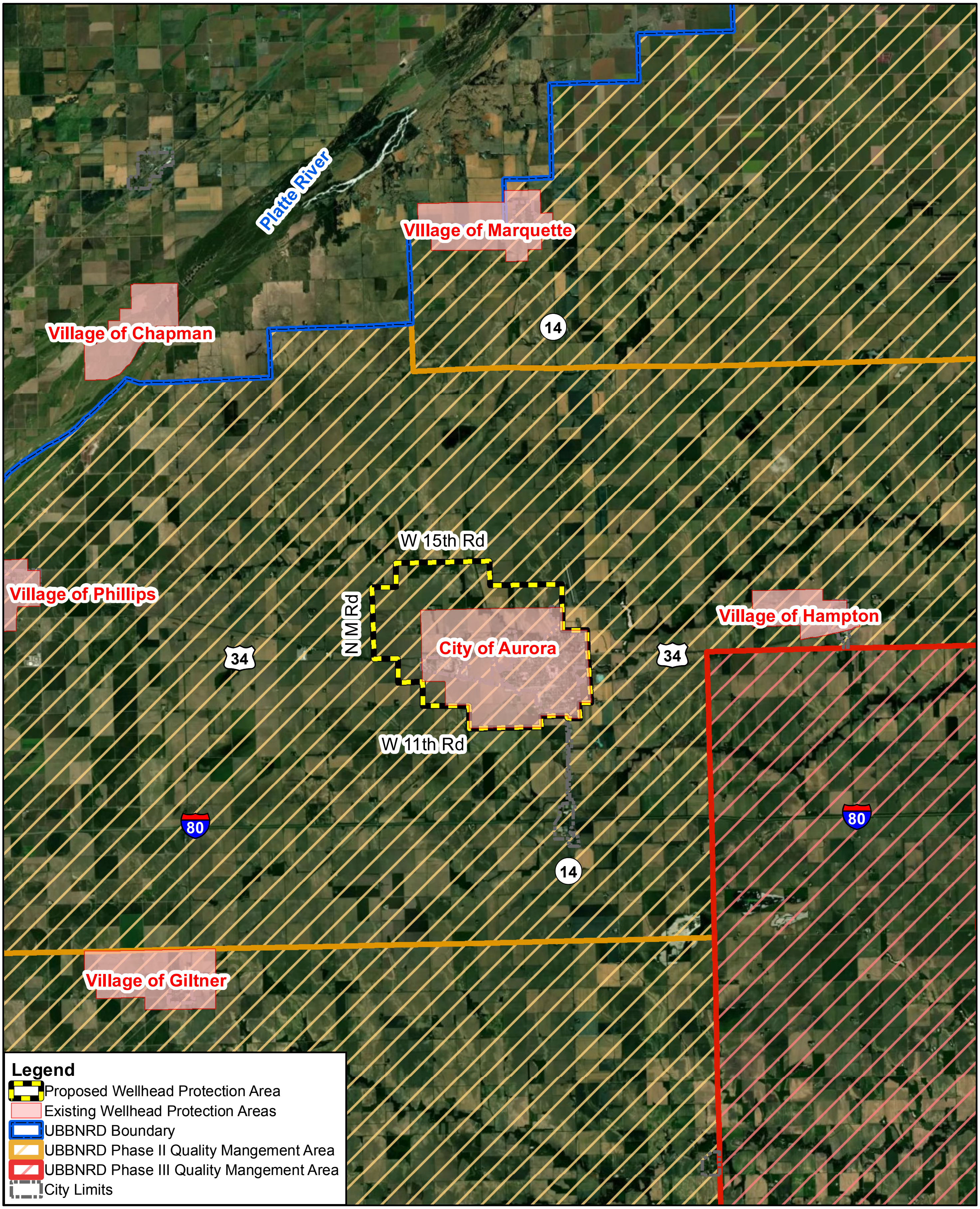
3.1 Aurora Wellhead Protection Area

Nebraska's Wellhead Protection Program is a voluntary program that assists communities and other public water suppliers in preventing contamination of their water supplies. NDEE and Aurora have designated the area illustrated in **Figure 7** as the current Aurora WHP area. The current WHP area was established for the "20-year time of travel" boundary. The term "time of travel (TOT)" is used to describe the amount of time a hypothetical particle of water travels through the aquifer. As part of this DWPMP, Olsson analyzed the extent of the former WHP area for Aurora and made recommendations to extend the boundaries of the WHP area to include the source water area of two new municipal wells using a model developed by the Nebraska Department of Natural Resources (NeDNR) called the Blue Basin groundwater model and the Cooperative Hydrologic Study (COHYST) groundwater model created by a collaboration of entities (NeDNR 2013; COHYST 2017).

NDEE guidelines for development of DWPMPs require the use of a three-dimensional groundwater model to estimate the time it takes the groundwater to move from its source to the drinking water well. Communities are encouraged to extend their WHP areas to the 50-year TOT boundary to be more protective of the water resource and promote the adoption of water quality improvement best management practices (BMPs).

The well locations for Aurora lie within two regional groundwater models: the Blue Basin model and the COHYST model. The Blue Basin model covers the Blue River basin and parts of the Upper Platte River, Lower Platte River, and Nemaha River basins in southeastern Nebraska. The COHYST model covers the portion of the Platte River basin that extends from the Colorado border to Columbus, Nebraska. Both models were created to assist the NeDNR in performing evaluations of the long-term availability of surface water and hydrologically connected groundwater supplies.

Both the Blue Basin and COHYST models were used to calculate the 50-year groundwater flow paths. Several "particles" are added to the groundwater models at each municipal well location to identify the source area, or capture zone, for Aurora's wellfield. Results from a climatically normal 50-year period indicate that groundwater flows from the west-northwest direction to Aurora's wells. Flow paths from both models are shown in **Figure 8**. The slight difference in flow path orientation between the two models can be attributed to differing aquifer properties. It is recommended that Aurora adopt the expanded WHP area drawn around the composite model results shown in **Figure 9**. This proposed WHP area covers 7,689 acres, an expansion of 3,583 acres from Aurora's current WHP area. A full description of the methods, results, and recommendations of the groundwater modeling are provided in **Appendix A.**



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WELLHEAD PROTECTION AREAS
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
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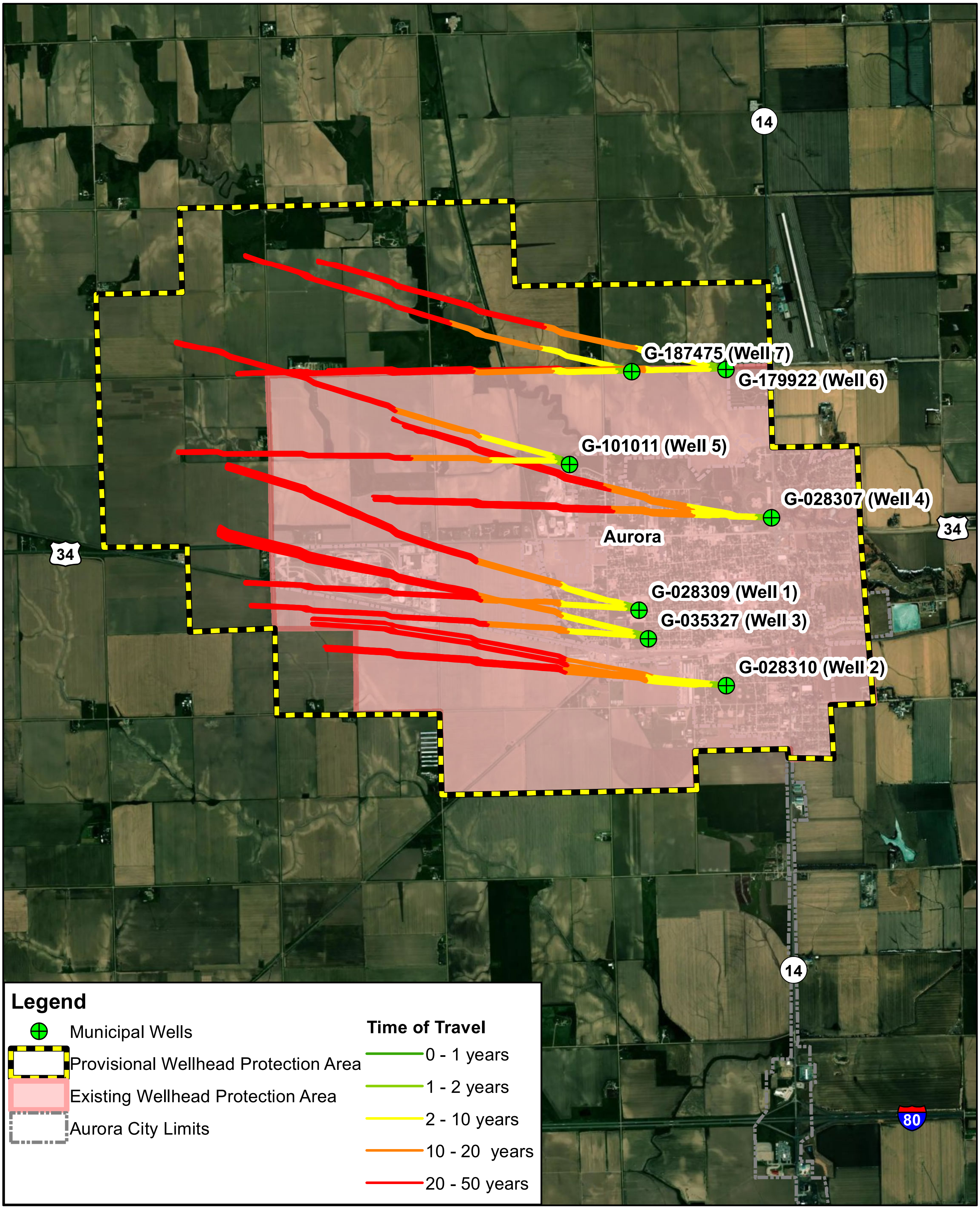

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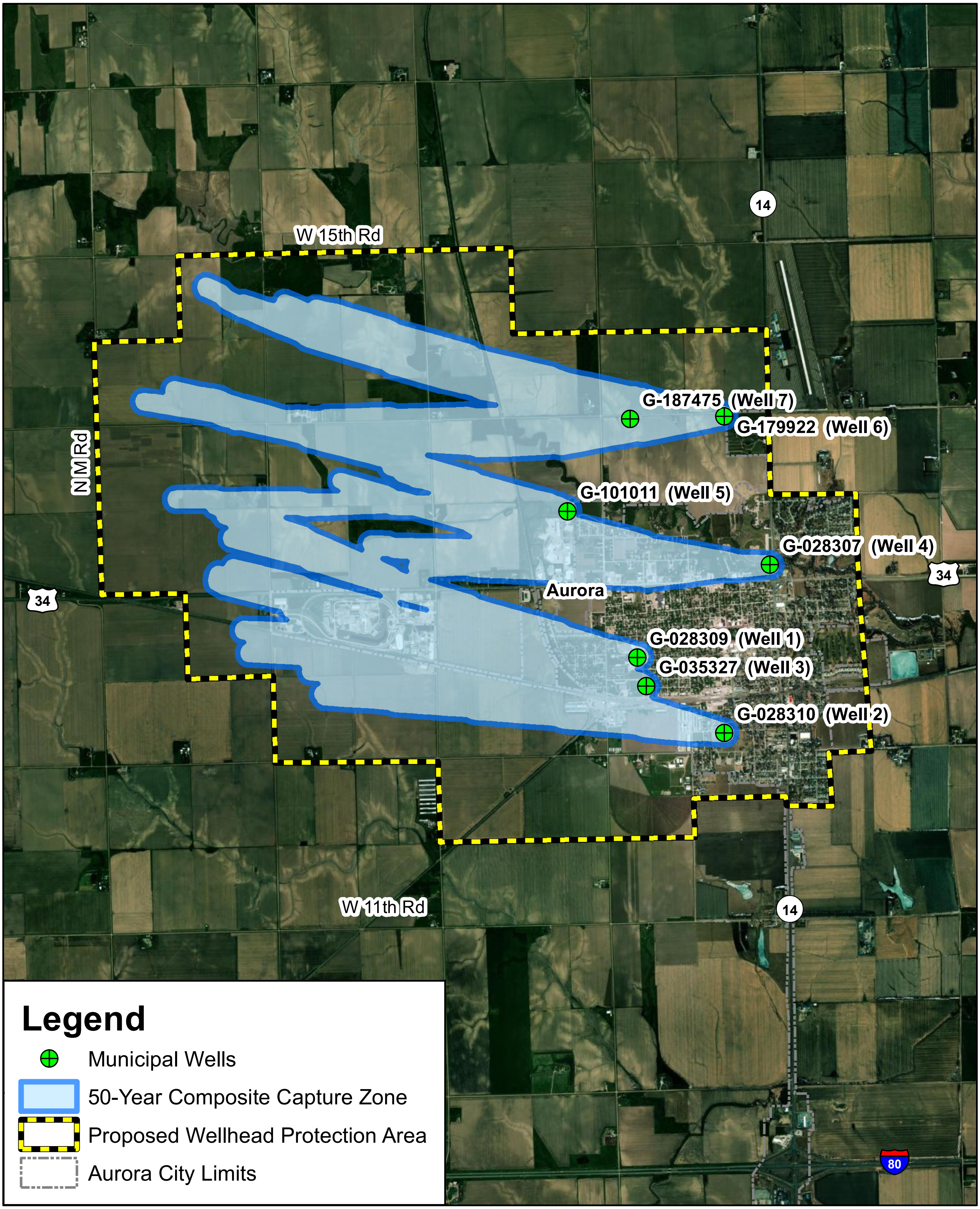
TIME OF TRAVEL PATHWAYS
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE 8



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50-YEAR COMPOSITE CAPTURE ZONE

Drinking Water Protection Management Plan

Aurora, Nebraska

FIGURE

9

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3.2 Climate

The climate in Hamilton County is typical of continental, temperate conditions with large seasonal variations in temperature and precipitation. The High Plains Regional Climate Center (HPRCC) collects and reports climate data across Colorado, Kansas, Nebraska, North Dakota, South Dakota, and Wyoming. The following information was summarized from HPRCC records measured from weather stations in Aurora (HPRCC 2022). Normal monthly climate statistics from 1981-2010 in Aurora are shown in **Figure 10**. The average temperature normally ranges from 25°F to 76°F. Average precipitation for the planning area is 30.5 inches per year. For comparison, the average annual precipitation amounts range from less than 12 inches per year in western Nebraska to over 33 inches per year in the southeastern part of the state.

In Hamilton County, over two-thirds of the precipitation occurs as rainfall during the growing season from April through September (HPRCC 2022). Precipitation is the primary source of replenishment, or recharge, of the groundwater resources in an area. Groundwater recharge is the deep drainage or deep percolation of water that moves downward from the surface to groundwater. The amount of groundwater recharge in an area is highly dependent on the soil type, topography, and vegetation. With an average of 30.5 inches of precipitation each year, a rough estimate of the amount that recharges the aquifer is approximately 10 percent, or 3.0 inches per year. This approximation is confirmed by a statewide study of groundwater recharge that estimated regional recharge rates in the uplands of east central Nebraska generally range from 2.4 to 5.5 inches per year (Szilagyi et al. 2005).

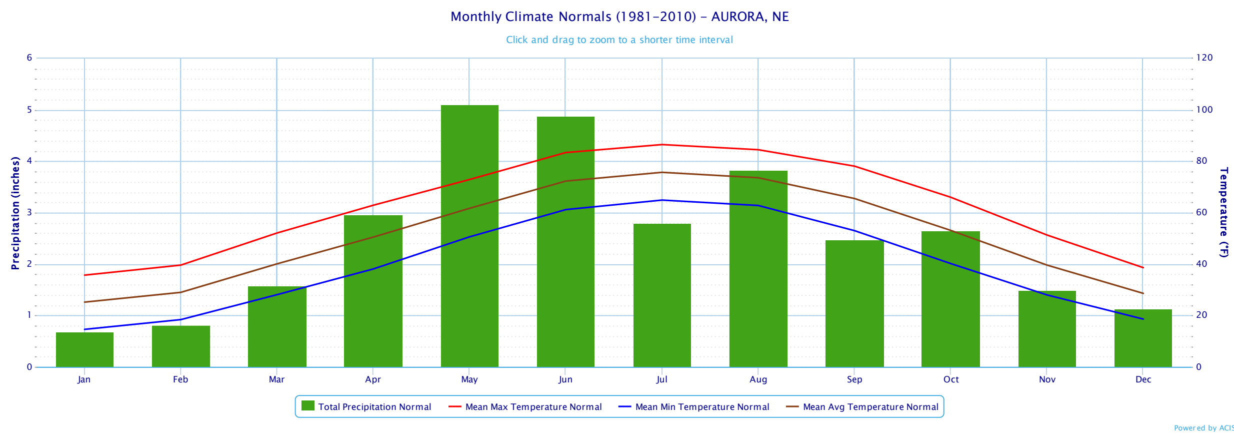
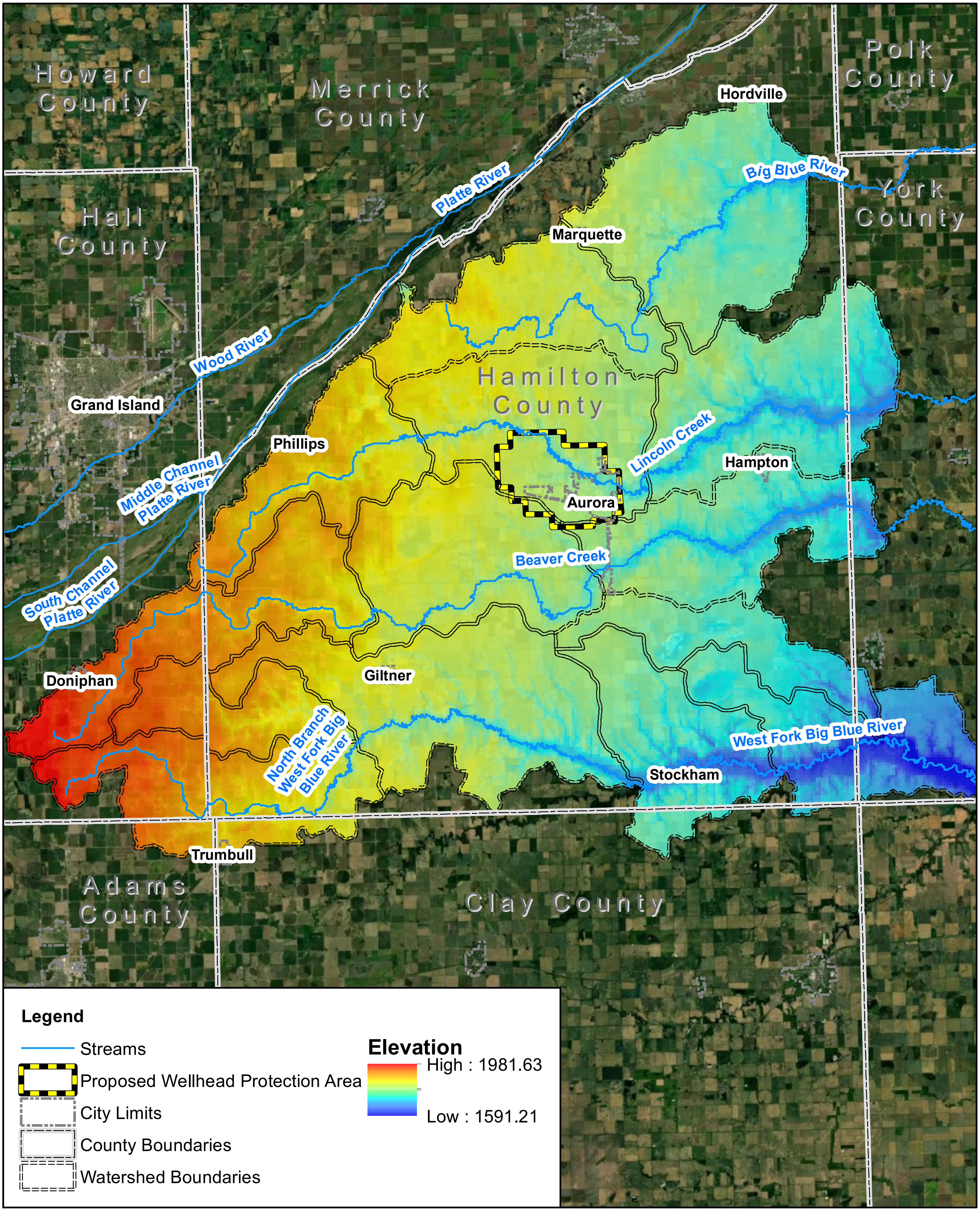


Figure 10 Monthly climate normal from 1981-2010 for Aurora, Nebraska. (HPRCC 2022)

3.3 Topography

The topography in the vicinity of Aurora can be described as plains with bluffs and escarpments that fall into the Platte River valley approximately 10 miles to the northwest (**Figure 11**). As described in the Groundwater Atlas of Nebraska, the biggest factor that affected the topography in the area was erosion (UNL-CSD 2013). During the Quaternary period this region was blanketed by layers of loess, or windblown silt primarily from the Sand Hills of western Nebraska, but also dust blown from rivers at low flow. The topography in and around Aurora currently ranges from 1,600 to 2,000 feet above mean sea level.



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TOPOGRAPHY

Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE

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3.4 Land Cover

Land cover can be a significant factor in the impact of a potential contaminant source. This is particularly evident when considering nonpoint sources of pollution such as excess fertilizers, herbicides, and insecticides from agricultural land and oil, grease, and toxic chemical runoff from urban areas. **Figure 12** displays the land cover types as defined by the National Land Cover Database (NLCD) (USGS 2019). A review of land cover in the DWPMP area was completed to assist in evaluating the BMPs described in **Section 6.0** of this DWPMP.

Table 3 lists the complete breakdown of land cover from the U.S. Geological Survey (USGS) NLCD (USGS 2019) throughout the planning area. Based on this dataset, the largest land cover constituent within the planning area is agricultural cropland with approximately 65 percent of the land in cultivated crops. The planning area was analyzed with the National Agricultural Statistics Service (NASS) and U.S. Department of Agriculture (USDA) CropScape Cropland Data Layer (CDL) (NASS/USDA 2022). The CDL from 2022 shows that approximately ¾ of the agricultural acres in the planning area are producing corn and ¼ of the agricultural acres in the planning area are producing soybeans, 3,591 and 1,216 acres respectively, along with a variation of other crops in smaller acreages. Urban land cover is the second most common land cover type covering 25% of the planning area. Land cover considered urban consists of roadways, Aurora, and other residential and commercial developments. Forest and woodlands are common near streams and creeks. Small pockets of recently disturbed or modified land and open water are also present within the planning area. Pasture land cover constitutes approximately 9% percent of the planning area.

Table 3. Land cover within the planning area in acres (USGS 2019).

Cropland	Pastureland	Urban	Forest	Water	Other	Total Area
5,001	663	1,913	100	3	9	7,689

3.5 Soils

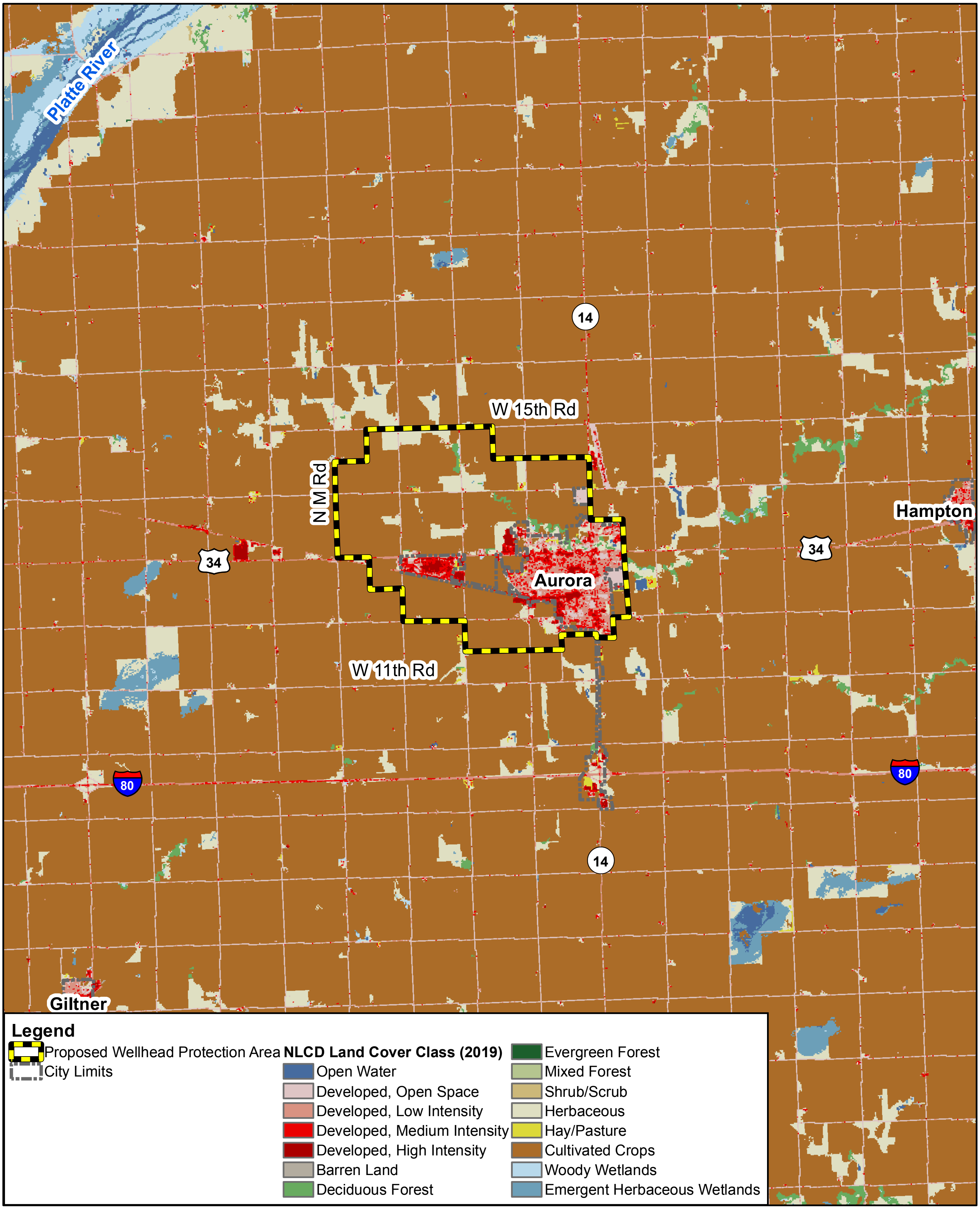
A review of the Natural Resources Conservation Service (NRCS) Web Soil Survey was completed to evaluate the major soil units within the planning area (NRCS 2023). The five major soil units that comprise approximately 88 percent of the planning area are all described as silty clay loam (hydrologic soil group C). The unit breakdown is as follows:

- Crete silt loam, 0 to 1 percent slopes – 3 percent of the planning area
- Hastings silt loam, 0 to 1 percent slopes – 62 percent of the planning area
- Hastings silt loam, 1 to 3 percent slopes – 6 percent of the planning area
- Hastings silty clay loam, 3 to 7 percent slopes, eroded – 14 percent of the planning area
- Hastings silty clay loam, 7 to 11 percent slopes, eroded – 3 percent of the planning area

Each of these soil units is described as having a slow infiltration rate with medium runoff potential. This indicates that recharge to underlying groundwater is relatively impeded.

3.6 Surface Water

Aurora lies close to the watershed divide between two major river systems: the Platte River and the Big Blue River. The Platte River flows from west to east approximately 10 miles northwest of Aurora. Lincoln Creek, a tributary of the Big Blue River, enters the existing WHP area from the north and exits to the east. Two miles to the south of the existing WHP area lies Beaver Creek, running from west to east and approximately nine miles to the south is the North Branch of the West Fork Big Blue River, which also flows from west to east (see **Figure 11**). The confluence of the West Fork Big Blue River and Beaver Creek is approximately 33 miles to the east of Aurora. The Big Blue River is a perennial stream with baseflow sustained from surface water runoff from adjacent land uses and major confluences upstream, including the perennial streams Turkey Creek and West Fork Big Blue River.



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LAND COVER
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
12

3.7 Groundwater and Aquifers

Groundwater is the water that flows in pore spaces between soil and rocks beneath the earth's surface (**Figure 13**). Because the water is beneath the surface, it can be difficult to predict the flow paths the groundwater will take. Groundwater in the Aurora area ranges in depth from a few feet to over 100 feet below the ground surface. The depth to groundwater varies because of the topography and the subsurface geology. In the following sections, hydrogeologic information is provided to illustrate the nature and extent of Aurora's groundwater resources. Aurora is underlain by sediments deposited by rivers, wind, and glaciers (Divine et al. 2009). These sediments are unconsolidated and typically consist of sand, gravel, silt, and clay. The thickness of these unconsolidated materials varies across the WHP area. The unconsolidated sediments are generally thinnest in the valleys where the sediments were eroded away by the creeks and streams and thickest on the hilltops.

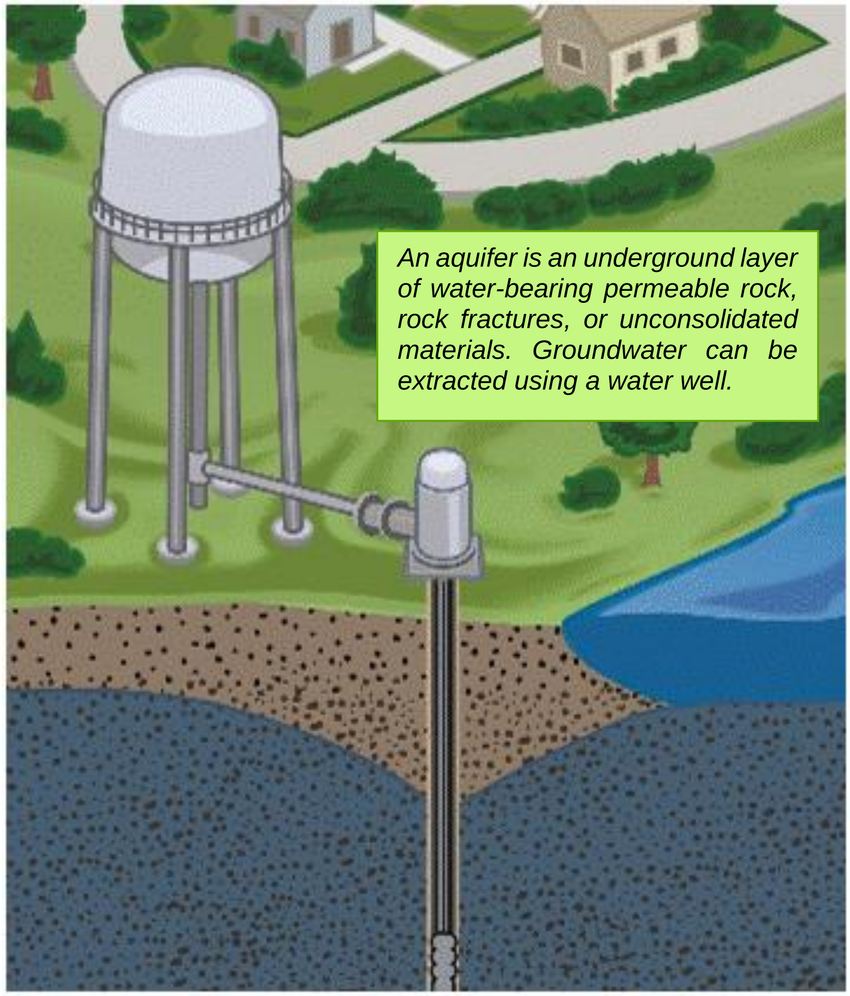


Figure 13. The Groundwater Foundation educational illustration of an alluvial aquifer supplying water to a community water system.

Beneath the unconsolidated sediments is the Niobrara bedrock formation (**Figure 14**)**.** The Niobrara Formation is from the late Cretaceous period (66 to 145 million years in age). Unlike other bedrock formations in Nebraska like the Dakota Formation, the Niobrara Formation is not considered as a viable source for groundwater in Aurora due to its hydrogeologic properties in this area.

The following sections provide Information on the overall geologic setting of the planning area and more detailed information on the aquifers present. This information is summarized from the research completed by the Eastern Nebraska Water Resources Assessment (ENWRA). In the publication titled *Introduction to a Hydrogeological Study* (Divine et al. 2009), the ENWRA team describes the types of aquifers encountered in Nebraska. The two major types of aquifers in and around the planning area are described below.

3.7.1 Alluvial Aquifers

Sand and gravel deposits associated with modern stream valleys such as the Big Blue, Platte, and Missouri Rivers are known for their excellent water production capabilities. Because of their coarse-grained sediments, alluvial aquifers are often used as groundwater sources. The alluvial aquifers have a relatively shallow depth to groundwater and are therefore highly vulnerable to contaminants leaching from the ground surface. The aquifers are hydrologically connected to the streams, which means when river flows are high, groundwater levels are typically also high. The alluvial aquifers of the Big Blue River and the Platte River extend close to the existing WHP area but are not the primary sources of water for Aurora.

3.7.2 High Plains Aquifer

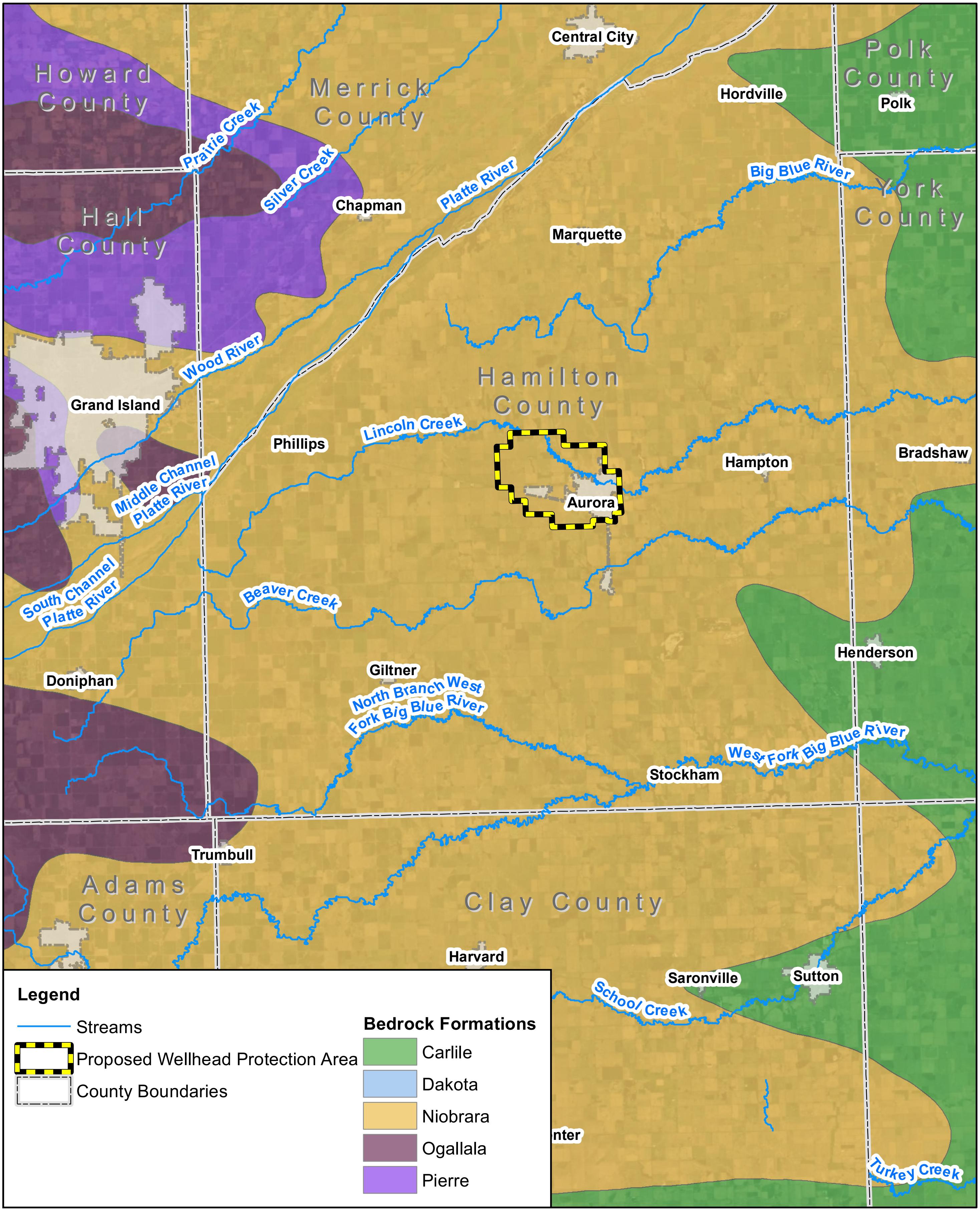
The High Plains Aquifer, commonly referred to as the Ogallala aquifer, is a system of geologically similar and hydrologically connected units that spans across 84% of Nebraska (Korus et al. 2013). The age of the groups that make up the High Plains Aquifer vary from 2.6 million to 10,000 years. The water saturation thickness of the system varies between greater than 1,000 feet in some areas to less than a few feet in others. The High Plains Aquifer consists of multiple different hydrogeologic units, including the alluvial aquifers mentioned above as well as consolidated layers of sandstone and siltstone. The High Plains Aquifer's unconsolidated sands and gravels from the Quaternary period are Aurora's primary source of water.

3.8 Groundwater Use

As illustrated in **Figure 15**, 94 wells are registered with the NeDNR in the proposed WHP area. Currently there are 47 irrigation, 13 domestic, and seven municipal water supply wells. The density of irrigation wells in the planning area is four to five wells per square mile, which is low compared to other parts of the Upper Big Blue NRD where well density is over 10 wells per square mile (NeDNR 2023).

Table 4. Registered wells within proposed wellhead protection area.

Well Type	Amount
Domestic	13
Irrigation	47
Injection	1
Livestock	1
Monitoring (Groundwater Quality)	20
Observation (Groundwater Levels)	5
Municipal	7
Total	**94**



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NAD 1983 StatePlane Nebraska FIPS 2600 Feet
Credits: ESRI World Topographic Map

BEDROCK GEOLOGY
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
14

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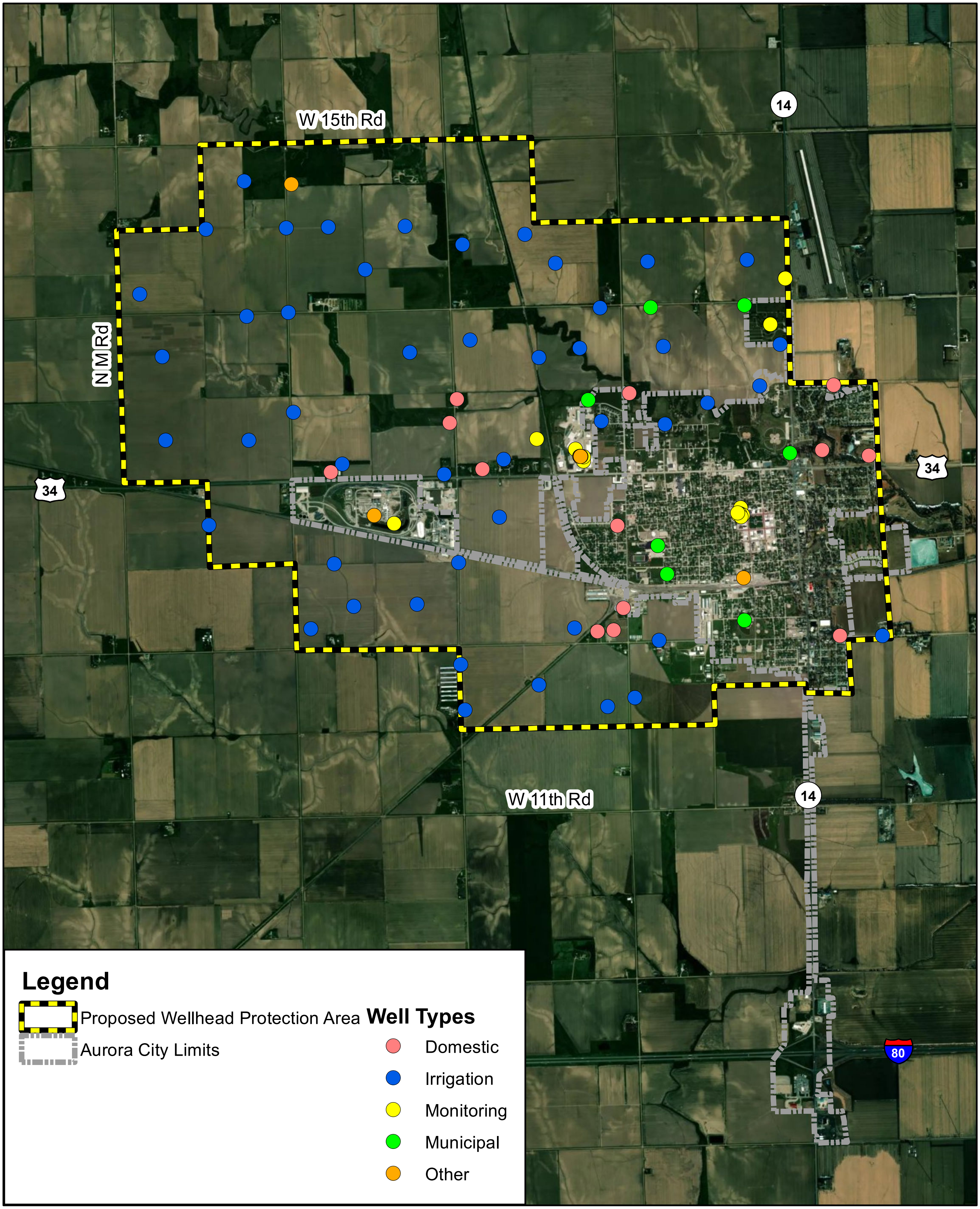

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1 inch = 4,000 feet

NAD 1983 StatePlane Nebraska FIPS 2600 Feet
Credits: ESRI World Topographic Map

REGISTERED WELLS
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
15

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3.9 Vulnerability Assessment

The DRASTIC method, developed by the US EPA, provides a methodology for evaluating the vulnerability of groundwater resources to pollution based on hydrogeologic parameters. This method provides a framework for evaluating an area based on available spatial datasets without the need for extensive, site-specific pollution data (Bataineh et al 2022). Identifying vulnerable locations in the planning area will aid Aurora in prioritizing areas for BMP implementation. DRASTIC stands for:

- D: Depth to Groundwater
  The depth from the ground surface to the water table in an unconfined aquifer.

- R: Net Recharge
  The quantity of water applied to the ground surface that infiltrates to reach the aquifer.

- A: Aquifer Media
  The consolidated or unconsolidated sediments which serve as the aquifer (e.g. sand, gravel, limestone).

- S: Soil Media
  The uppermost portion of the vadose zone characterized by significant biological activity.

- T: General Topography or Slope
  The slope and slope variability of the land surface.

- I: Vadose Zone
  The zone above the water table which is unsaturated or discontinuously saturated.

- C: Hydraulic Conductivity
  The ability of the aquifer materials to transmit water.

Spatial datasets of each of the above parameters were overlaid in GIS software and weighted based on their assumed influence for the area. Influence was determined based on modeling and engineering judgement. Unless indicated otherwise, parameters were given a weight of one. The final DRASTIC score for the planning area was based on the following equation:

$$\text{DRASTIC Index} = D_r \times D_w + R_r \times R_w + A_r \times A_w + S_r \times S_w + T_r \times T_w + I_r \times I_w + C_r \times C_w$$

Where r = the rating for the parameter and w = an assigned weight for the parameter.

DRASTIC was developed based on four major assumptions:

1. The contaminant is introduced at the ground surface;
2. The contaminant is flushed into the groundwater by precipitation;
3. The contaminant has the mobility of water; and
4. The area evaluated is 100 acres or larger.

When these assumptions are met, DRASTIC is a very useful tool. Further information on methodology development and special conditions when using DRASTIC can be found on the EPA website. Assumptions for this DRASTIC analysis have been met.

3.9.1 Depth to Groundwater

Water levels for the DRASTIC modeling were gathered through a combination of the static water levels recorded in NeDNR's Registered Well Database and UNL-CSD's groundwater monitoring wells. Water levels calculated by the COHYST and Blue Basin groundwater models were not used to represent the depth to groundwater parameter because of the difference in scale between the proposed WHP area and the models' coverage. The final head values from the COHYST and Blue Basin models were compared against the statistically interpolated water levels, calculated from UNL-CSD monitoring well measurements and NeDNR well registrations. Depths were categorized and rated according to **Table 5** and are displayed in **Figure 16**. As depth to water decreases, the groundwater resource becomes more vulnerable to pollution due to activities occurring on the land surface.

Table 5. Categories and ratings for the depth to groundwater parameter.

Depth to Groundwater Category	Percentage of Planning Area	Rating
60-80 ft	87%	3
80-100 ft	13%	2

3.9.2 Net Recharge

Net recharge values across the planning area were taken from a study completed by the USGS in 2011. Net recharge is actual recharge minus discharge to other sources such as evapotranspiration. Actual recharge can be defined as applied water to the ground surface which includes precipitation and irrigation. Net recharge can be negative in areas where the groundwater table is close to the land surface and evapotranspiration exceeds precipitation. In the 2011 study completed by the USGS, net recharge was estimated using the Soil-Water-Balance (SOWAT) Model developed by the Columbia Plateau Water-Availability Study (Kahle et. al 2011). The SOWAT Model uses information about precipitation, evapotranspiration, soil properties, land cover, and irrigation practices to compute groundwater withdrawals for irrigation and net recharge. Calculations were performed for each year between 2000-2009. The average annual net recharge over this timeframe is used for this DRASTIC analysis. Although tools like the SOWAT Model represent the best available science, it can be very difficult to quantify net recharge at the local scale due to many uncertainties associated with generalizing hydrologic parameters. For this reason, the net recharge parameter is weighted lower than the other parameters used in this DRASTIC analysis. Categories, ratings, and weights for the net recharge term are given in **Table 6** and displayed in **Figure 17**. Areas that experience less recharge are typically less susceptible to pollution of the groundwater resource.

Table 6. Categories, ratings, and weights for the net recharge parameter.

Net Recharge Category	Percentage of Planning Area	Rating	Weight
2-4 in.	19%	5	0.8
4-6 in.	25%	6	0.8
6-8 in.	39%	7	0.8
8-10 in.	15%	8	0.8
>10 in.	3%	9	0.8

3.9.3 Aquifer Media

Aquifer media refers to the consolidated or unconsolidated sediments which serve as the primary aquifer (e.g. sands, gravels, limestone). The aquifer medium influences the amount of effective surface area of materials with which a contaminant may come in contact within the aquifer. The larger the grain size and more fractures or openings within the aquifer, the higher the permeability and susceptibility to pollution. In the planning area, the primary aquifer is the High Plains aquifer, which consists of sands, gravels, silts, and clays. Since the aquifer in the planning area is homogenous, it is not necessary to assign variable ratings. In some areas around the country, the degree of fracturing can make a significant difference in the path of contaminant transport. In the case of the planning area, there are no known fractures within the aquifer that would influence pollution pathways. The rating for the aquifer medium is given in **Table 7** and displayed in **Figure 18**.

Table 7. Category and rating for the aquifer media parameter.

Aquifer Media Category	Percentage of Planning Area	Rating
Unconsolidated sands and gravels	100%	8

3.9.4 Soil Media

Soil media refers to the uppermost portion of the vadose zone characterized by significant biological activity. This is typically at a depth of six feet or less from the ground surface. Soil can have a significant impact on the ability of a contaminant to move vertically within the vadose zone. Fine-textured materials such as silts and clays can decrease soil permeability and restrict contaminant transport. The upper vadose zone provides filtration, biodegradation, sorption, and volatilization of contaminants, which can be very important in reducing pollution potential. Much of the land use within the planning area is agricultural, making the application of pesticides a major source of contamination. The presence of fine-textured materials (i.e. clay) makes a large difference in the pollution potential of applied pesticides. For this reason, the soil media parameter was given a weight greater than one. Soil media was determined in the planning area using the Soil Survey Geographic (SSURGO) Database. Soil media is fairly homogenous across the planning area, with almost all areas falling in one of two categories: silt loam or silty clay loam. The categories, ratings, and weights are provided in **Table 8** and displayed in **Figure 19**.

Table 8. Categories, ratings, and weights for the soil media parameter.

Soil Media Category	Percentage of Planning Area	Rating	Weight
Undefined/Open water	<1%	0	1.2
Clay	1%	2	1.2
Silty clay	<1%	3	1.2
Silty clay loam	86%	4	1.2
Silt loam	12%	6	1.2

3.9.5 General Topography or Slope

General topography or slope is a characteristic of the land surface. Variability in slope across the planning area can help determine the likelihood that a pollutant will run off or remain in one area long enough to infiltrate. Percent slope is equal to the vertical “rise” divided by the horizontal “run.” A lower percent slope allows water to pond on the land surface and increases potential loading of contaminants to groundwater through infiltration. Percent slopes were calculated using Light Detection and Ranging (LiDAR) data and ArcGIS software. Categories, ratings, and weights for percent slope are provided in **Table 9** and displayed in **Figure 20.**

Table 9. Categories and ratings for the topography parameter.

Percent Slope Category	Percentage of Planning Area	Rating
0-2%	68%	10
2-4%	15%	9
4-6%	8%	7
6-8%	4%	5
8-10%	2%	3
>10%	2%	1

3.9.6 Vadose Zone

The vadose zone refers to the zone above the water table and below land surface, which is either unsaturated or discontinuously saturated. The type of vadose zone media determines the attenuation characteristics between the soil horizon and the water table. Similar to the soil media parameter, the texture of the materials in the vadose zone influences the path length and routing of any infiltrating particles and thus affects the time available for attenuation of a contaminant. The materials in the vadose zone are responsible for the biodegradation, neutralization, mechanical filtration, chemical reaction, volatilization, and dispersion processes that influence the pollution potential of contaminants to the aquifer. UNL-CSD test borehole logs and NeDNR’s Registered Well Inventory well logs were used to create a kriged map of vadose zone materials across the project area using ArcGIS software. The well logs show areas with primarily sand and gravel above the water table, while others have substantial fine-textured clay layers in the vadose zone. Vadose zone material selection for an unconfined aquifer is based on the most significant media which influences pollution potential from the surface. The vadose zone material throughout the planning area is dominated by clays and unconsolidated sands and gravels. Data from the well logs are statistically interpolated to fill in areas between registered wells. This data was then split into the four vadose zone categories and ratings provided in **Table 10** and is displayed in **Figure 21**.

Table 10. Categories and ratings for the vadose zone parameter.

Vadose Zone Media	Percentage of Planning Area	Rating
Silt/Clay	15%	3
Silt/Clay with some gravel & sand	52%	4
Gravel & sand with significant clay	32%	5
Sand & gravel	2%	6

3.9.7 Hydraulic Conductivity

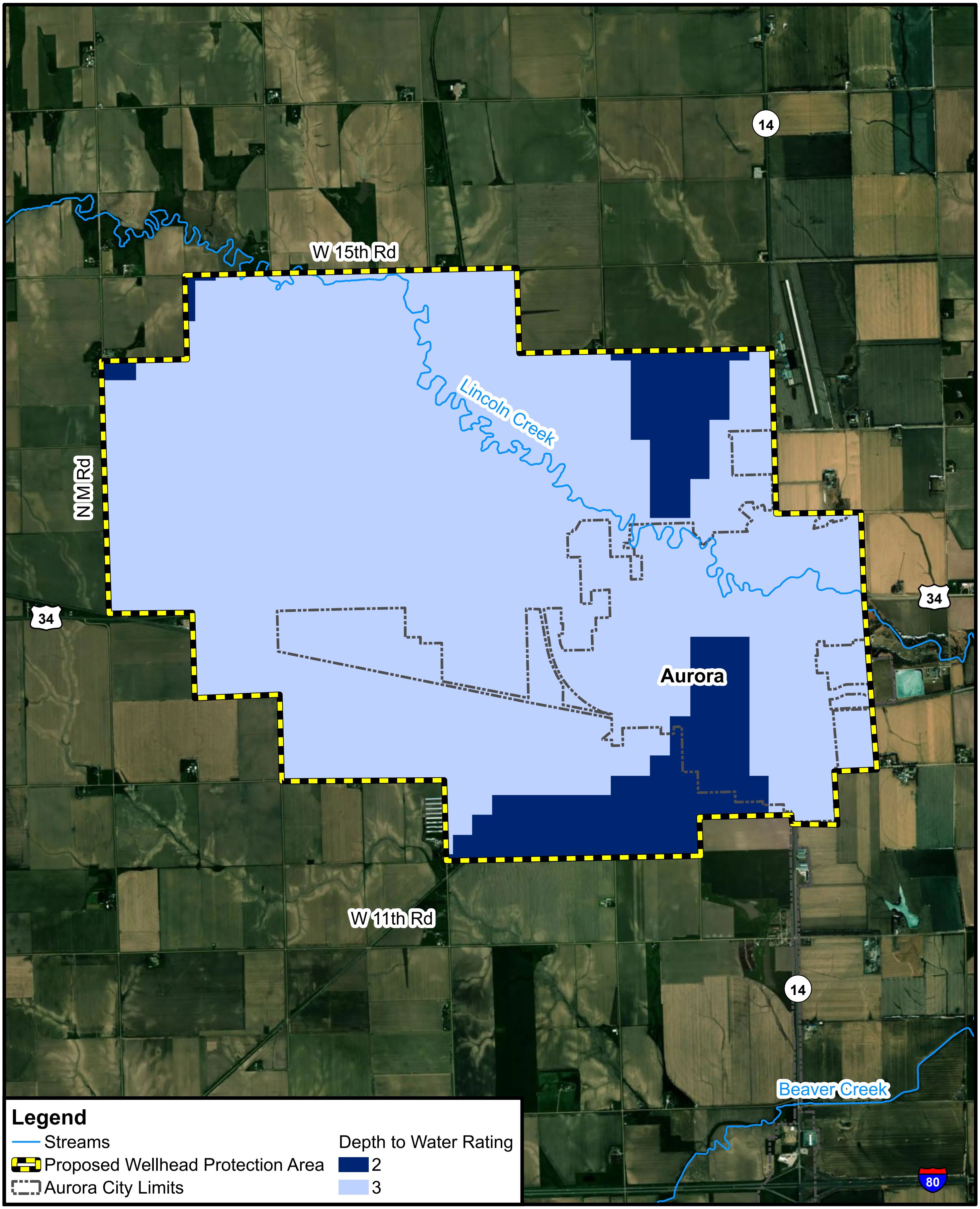
Hydraulic conductivity refers to the ability of the aquifer materials to transmit water. This rate at which groundwater flows affects the rate at which a contaminant moves through the aquifer away from the point it entered. Hydraulic conductivity is determined by the intergranular porosity, fracturing, and bedding planes in an aquifer. High hydraulic conductivity values are associated with a higher pollution potential value because contaminants can move through the aquifer much quicker than areas with low hydraulic conductivity. Hydraulic conductivity values in **Table 11** and those displayed in **Figure 22** were pulled from the COHYST groundwater model.

Table 11. Categories and ratings for the hydraulic conductivity parameter.

Hydraulic Conductivity Category	Percentage of Planning Area	Rating
700-1000 feet/day	100%	6

3.9.8 DRASTIC Modeling Results

The DRASTIC methodology outlined by the EPA was used in the creation of the Vulnerability Index results displayed in **Figure 23**. The DRASTIC modeling results display an estimation of where the hydrologic resources within the planning area would be the most threatened by contamination. It is important to note that the results are not depictive of where pollution has or does occur, instead they provide a spatial representation of hydrogeologic vulnerability within the planning area.



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1" = 4000'

Original Published Resolution
NAD 1983 StatePlane Nebraska FIPS 2600 Feet
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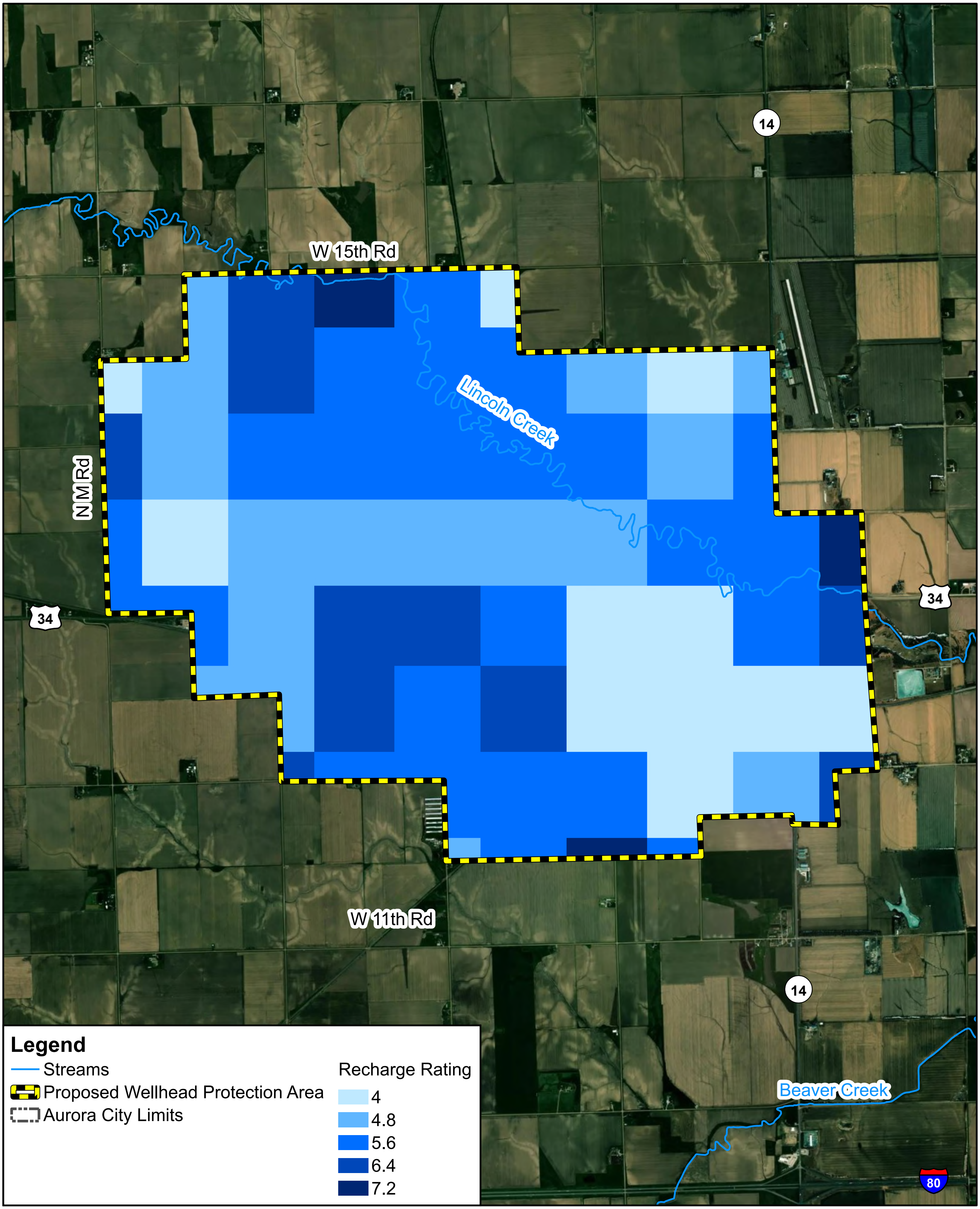
DEPTH TO GROUNDWATER RATING
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
16



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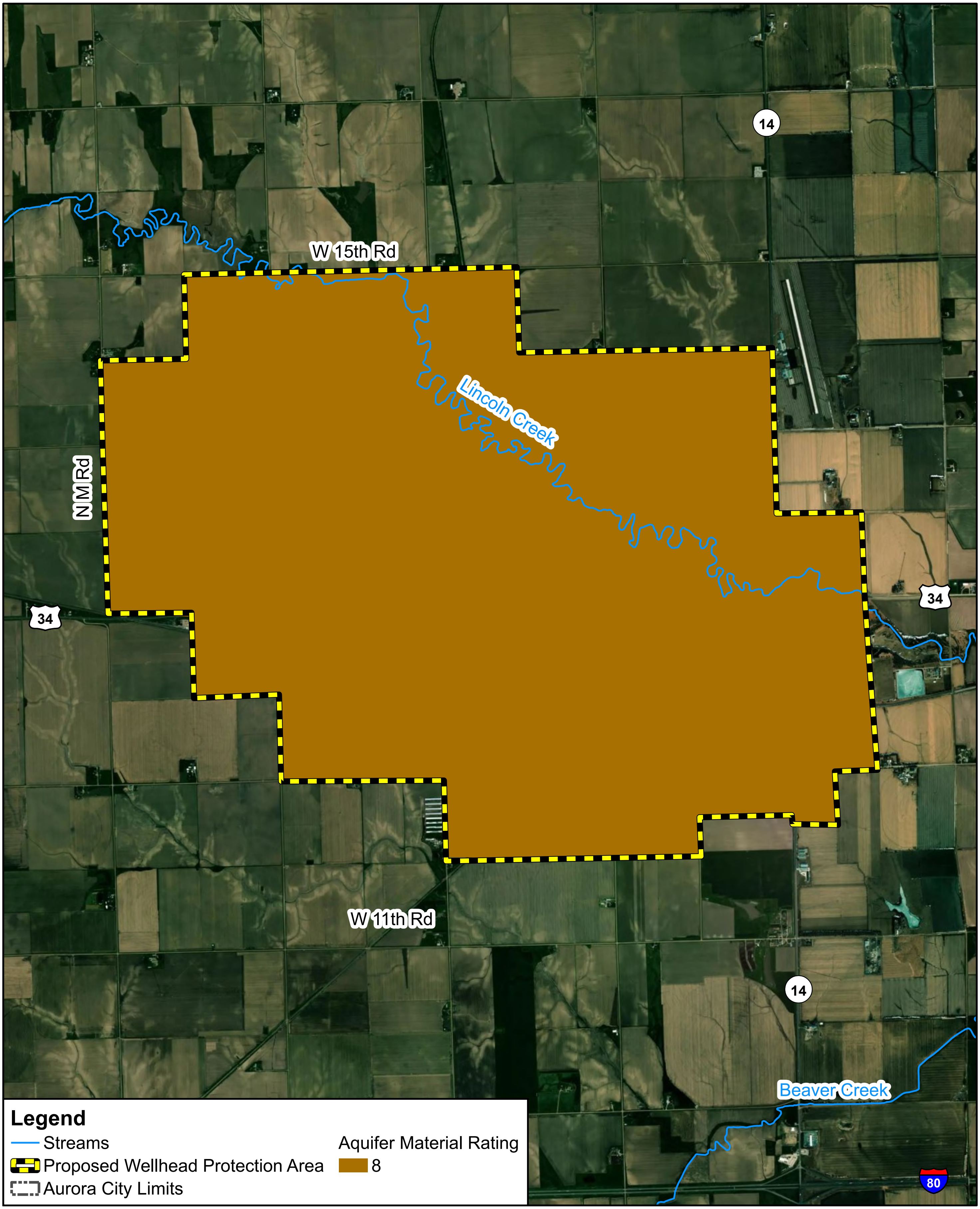
NET RECHARGE RATING
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
17



Legend

Streams

Proposed Wellhead Protection Area

Aurora City Limits

Aquifer Material Rating

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AQUIFER MATERIALS RATING

Drinking Water Protection Management Plan

Aurora, Nebraska

FIGURE

18

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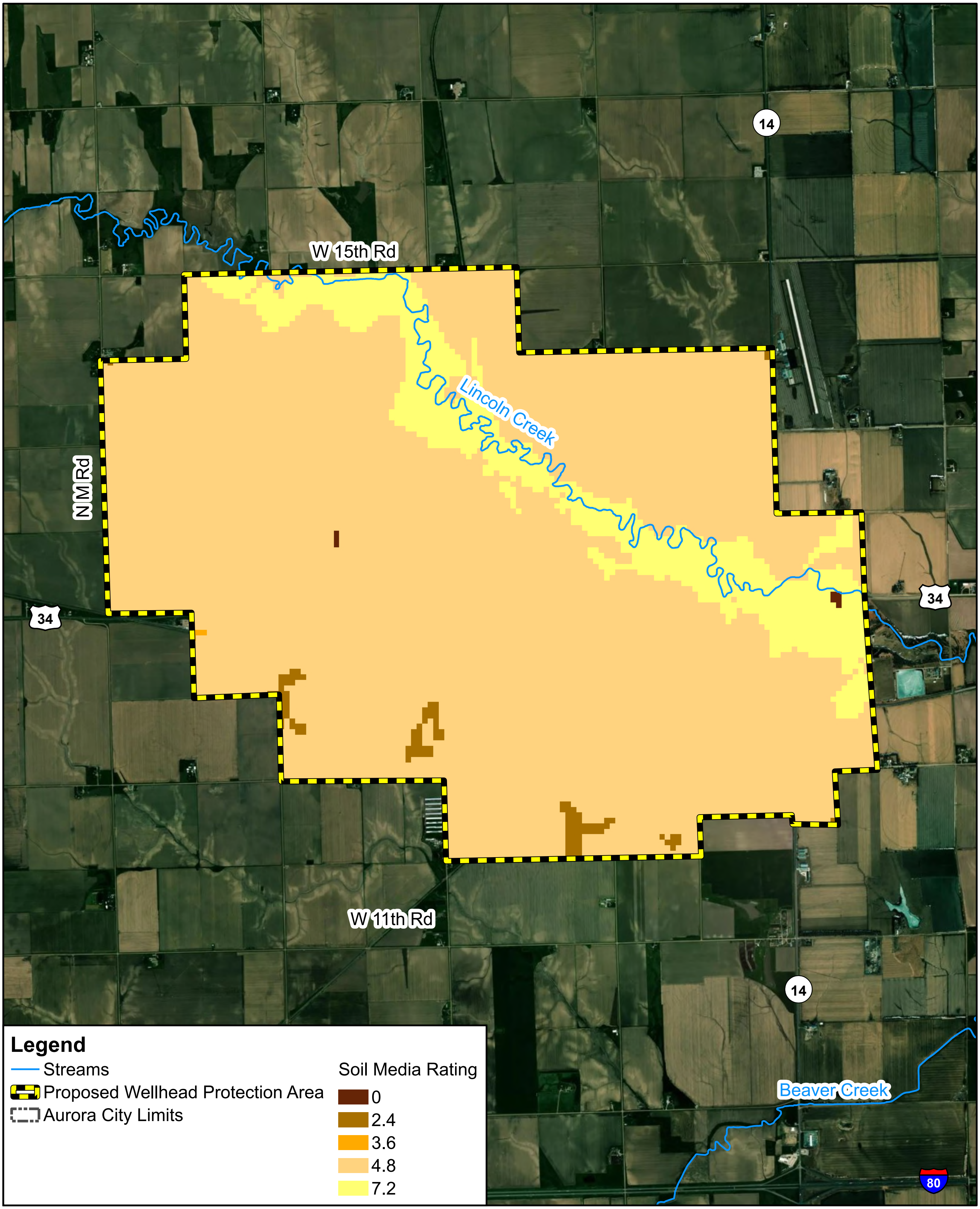

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SOIL MEDIA RATING
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE 19

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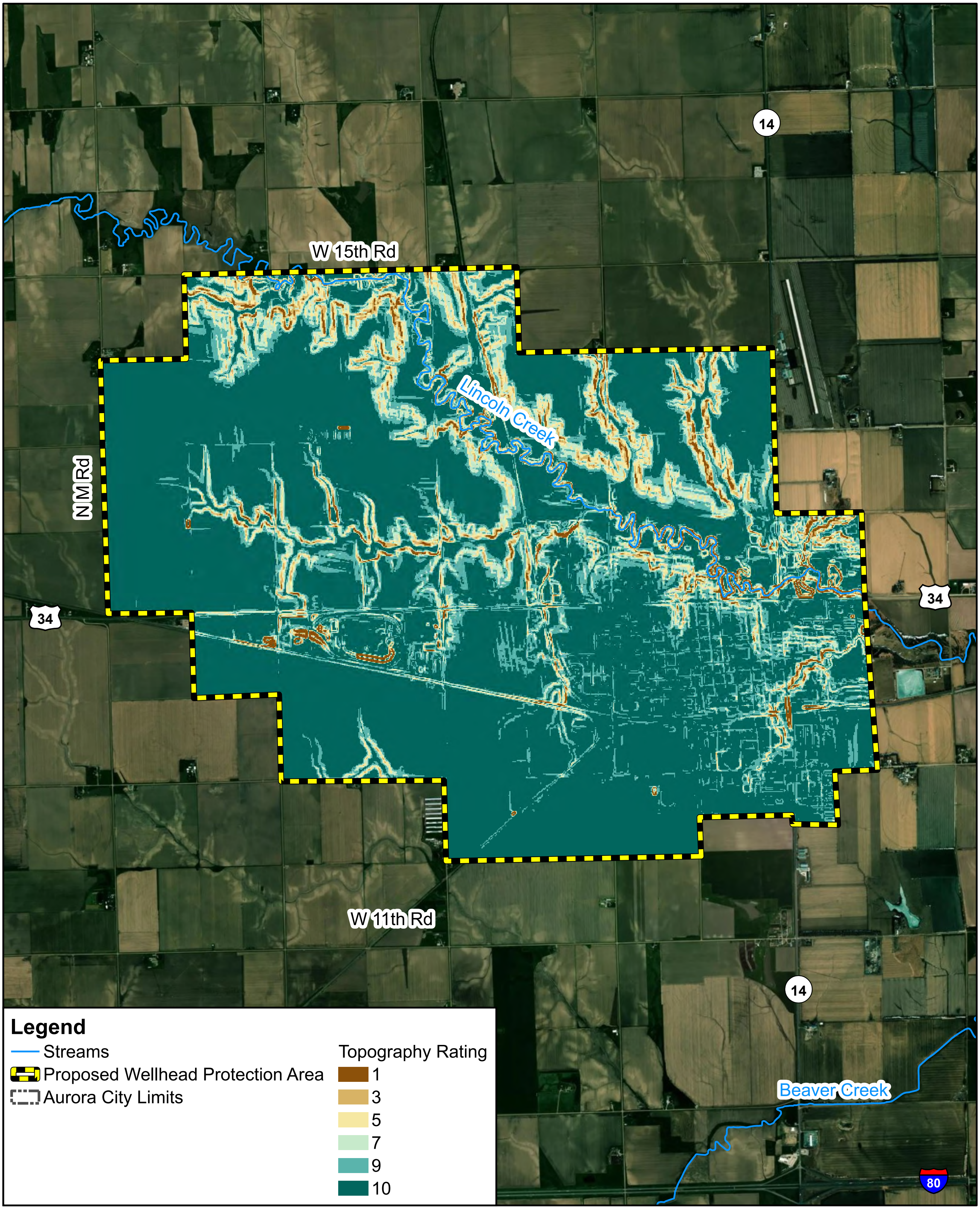

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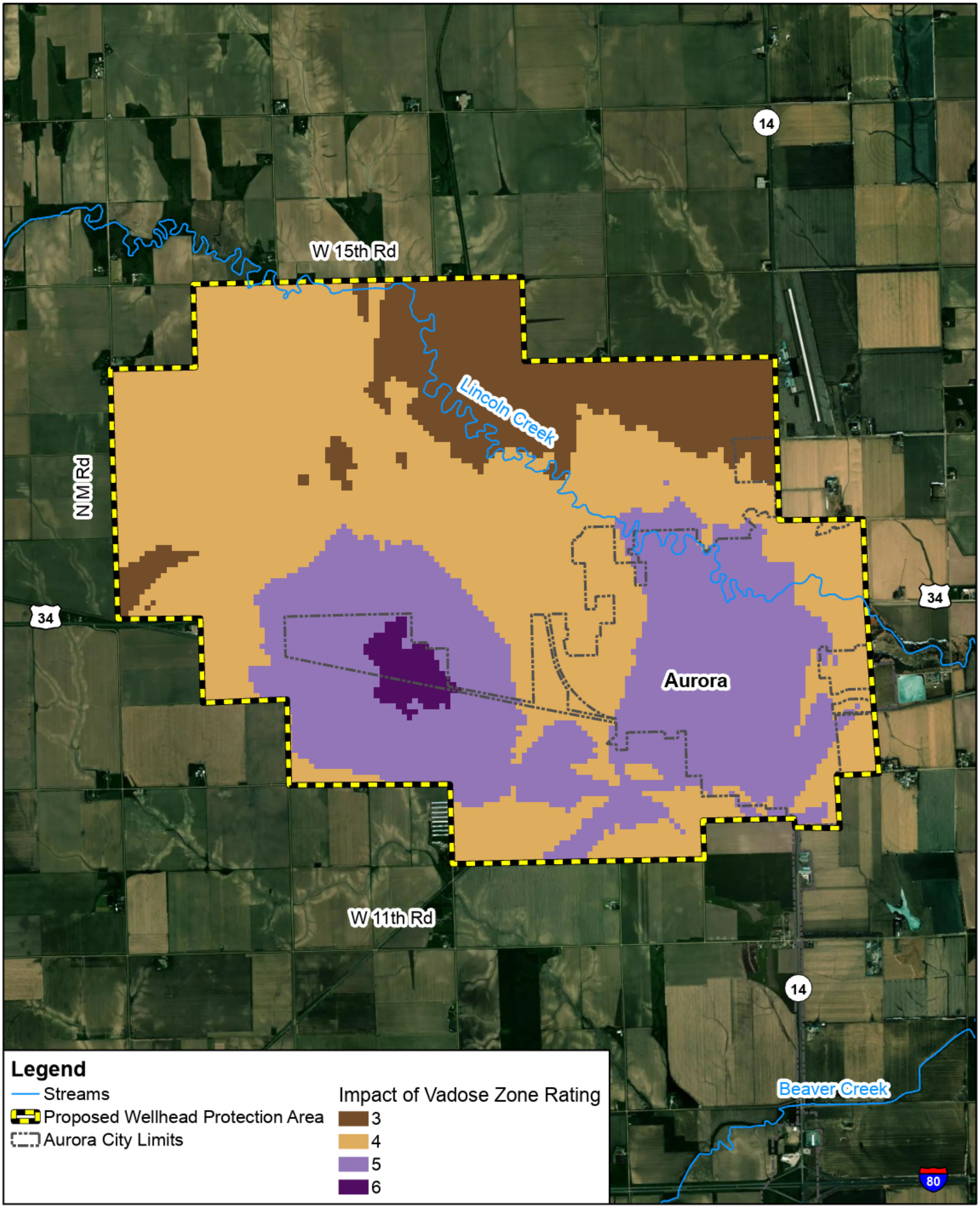
TOPOGRAPHY RATING
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
20



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IMPACT OF VADOSE ZONE RATING
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
21

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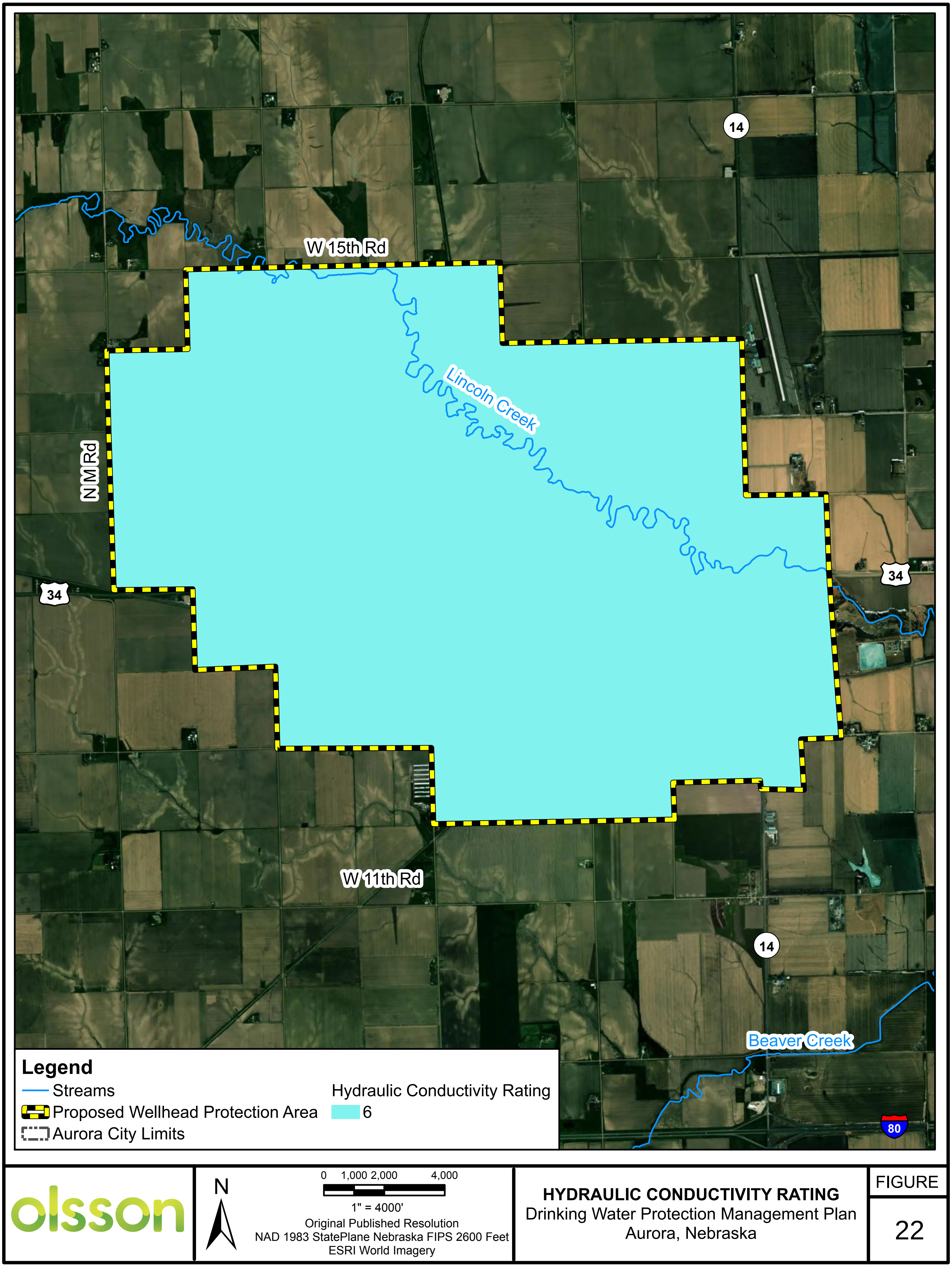

HYDRAULIC CONDUCTIVITY RATING
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE 22

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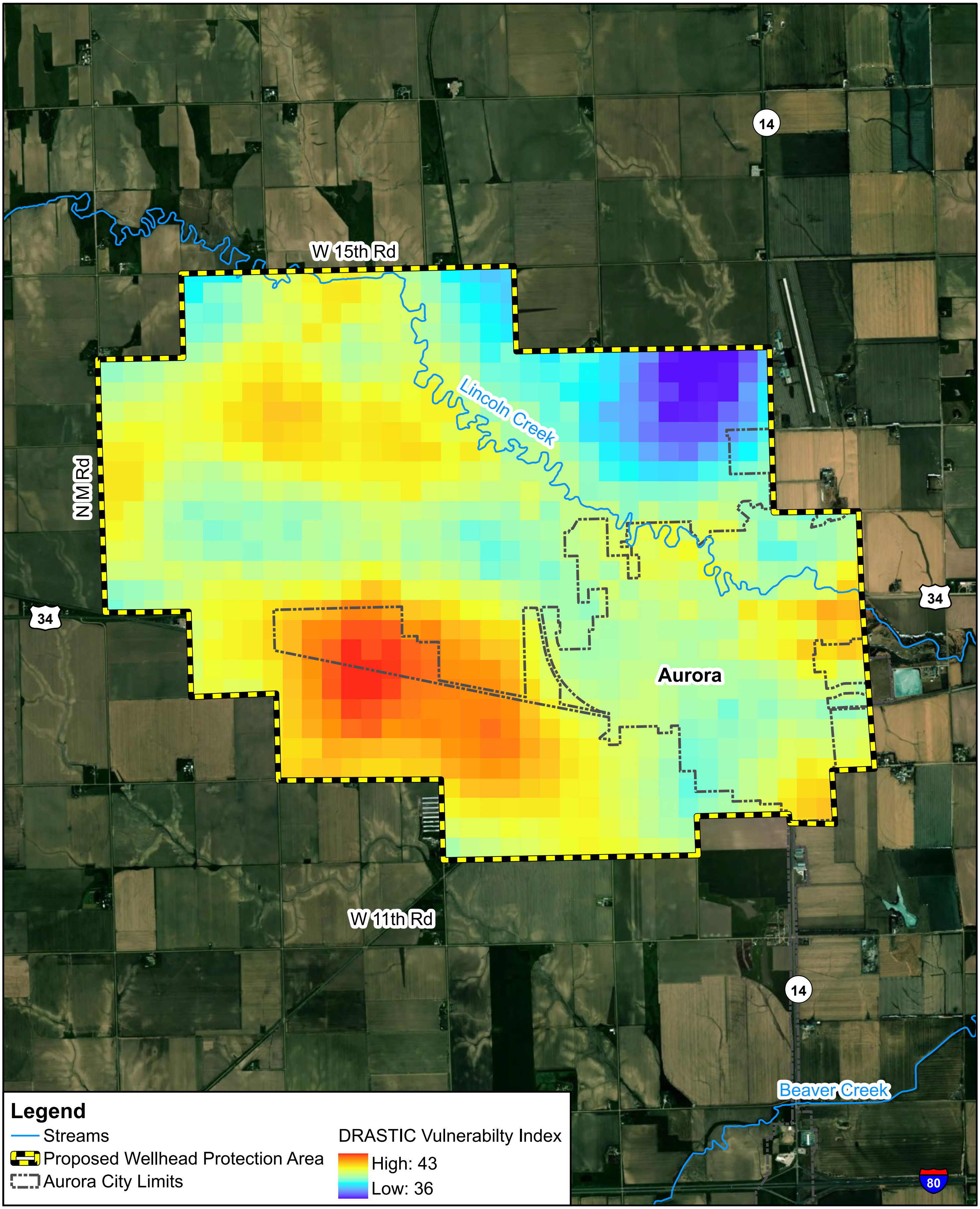

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DRASTIC MODEL VULNERABILITY INDEX
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
23

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4.0 POLLUTION SOURCES

Pollution sources are often categorized as either point sources or nonpoint sources. The distinction is important to explain because the type of pollution can have significant impacts on the distribution and migration of the pollution. Nonpoint source pollution results from many diffuse sources, which is in direct contrast to point source pollution which results from a single source.

According to the EPA, nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification (USEPA 2019a). Nonpoint source pollution can be deposited as rainfall or snowmelt moves across the ground surface and through soil and rock underground. As runoff moves, it picks up and can transport both natural and human-made pollutants. The pollutants can be deposited in lakes, rivers, coastal waters, and groundwater. Examples of nonpoint source pollution include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas
- Oil, grease, and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop, and forest lands, and eroding streambanks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems
- Atmospheric deposition
- Hydromodification (stream channel and habitat modification)

Point sources of pollution are easier to describe and often easier to detect than nonpoint sources. Simply put, point sources of pollution result from a single source, and if the source is a release or a pipe discharge, the source is much easier to identify. As described earlier in this plan, the primary issue of concern for Aurora's drinking water supply is the concentration of nitrate in groundwater.

4.1 Nitrate Loading – A Complex Issue

Protection of groundwater sources from leaching nitrate-nitrogen is a complex issue. the leaching of nitrate to groundwater is dependent on several factors, including precipitation amount, soil type and depth, chemical and adsorption of nitrate-nitrogen in the soil, and biological fixation of nitrate. Typically, however, nitrate-nitrogen that leaches below the root zone – about 4- to 6-feet below the soil surface – is not considered recoverable by plants and it is subject to leaching to the groundwater table (Shaver, TM. 2014). How much nitrate-nitrogen is in the soil that will be prone to leaching is primarily dependent on how much excess nitrogen is applied to the soil that is greater than plant and biological needs and the timing of fertilizer applications (Wortman, et. Al. 2020). This regularly occurs with corn production in Nebraska.

According to the EPA guidance document called the *National Management Measures to Control Nonpoint Source Pollution from Agriculture*, commercial fertilizers and manure are the primary sources of crop nutrients for agriculture (USEPA 2003). The crop nutrient nitrogen is naturally present in soils. But in most areas, it must be added to the soil to meet the crop production needs. Nitrogen is added to the soil by applying commercial fertilizers and manure. As reported in the guidance document, in parts of the country, it is assumed that only 50 percent of the applied nitrogen is assimilated by crops during the year of application (USEPA 2003).

As excess nitrate leaches into deep soil, it may accumulate at varying depths depending on soil conditions and density (Wortman, et. Al. 2020). The rate of nitrate movement does not necessarily correlate to the rate of water movement to the aquifer. In fact, leaching of nitrate in silt loam soils over aquifers may take 25 to 30 years to travel to the aquifer about 100 ft below the soil surface (Shaver, T.M. 2014). It is possible that even with no excess nitrogen applied for crop production or from other sources, nitrate-nitrogen may continue leaching into the groundwater for several years. But that does not mean that no action should be taken to reduce the nitrate load that will be leaching down into the aquifer. It indicates that the need is only greater to reduce the current load for the long-term mitigation needed to protect the community's source of drinking water.

As will be demonstrated in this chapter, the largest contributor to nitrate in the system is agricultural inputs. But by how much will the nitrate load need to be reduced to reverse the trend of increasing nitrate concentrations in groundwater? With the goal to reduce peak groundwater nitrate concentrations below the 7 mg/L threshold for a Phase II Groundwater Quality Management Area set by the Upper Big Blue NRD and meet the objective of protecting the community's drinking water source, the estimated percent reduction of nitrate in groundwater is 27 percent. This percentage is based on the highest average nitrate level measured in the municipal wells in 2022, which was 9.6 mg/L at Well #7, as reported by Aurora (Aurora 2023). Reaching this goal requires a reduction in the anthropogenic nitrate load. The following detailed analysis provides insight into what the current anthropogenic nitrate load is emanating from. This will help guide the community to implement solutions that will reduce the nitrate load in the area to be protective of its source of drinking water.

4.2 Estimation of Nitrate Loading

To estimate the nitrate and other pollutant loads in an area, three model approaches were evaluated:

1. US EPA Pollutant Load Estimation Tool (PLET)
2. University of Nebraska Economically Optimum Nitrogen Rate Algorithm, or EONR Algorithm
3. Environmental Policy Integrated Climate, or EPIC model developed by Texas A&M University and used by the NRCS to estimate nitrogen losses in the U.S.

4.2.1 Nitrogen Sources and Loading Estimates Using PLET

According to the EPA website for PLET (USEPA 2023), the model uses algorithms in a Microsoft Excel spreadsheet to estimate the following:

- Watershed surface water runoff
- Nutrient loads including nitrogen, phosphorus, and biological oxygen demand
- Sediment delivery based on various land uses and management practices

Using PLET, the annual nutrient load is estimated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as land use distribution and management practices (USEPA 2023). The annual sediment load from sheet and rill erosion is calculated based on the Universal Soil Loss Equation and the sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using the known BMP efficiencies.

Thus, the model can be used to estimate nutrient load reductions in runoff after application of specific BMPs such as no-till, cover crops, and terracing. The PLET was developed to replace the Spreadsheet Tool for Estimating Pollutant Loads (STEPL), which was a spreadsheet-based modeling approach for the same computations as the PLET (USEPA 2017). Simply, the PLET is a user-friendly, web-based version of STEPL with some additional features. A limitation of the PLET tool is that it does not have the capability of estimating nutrient loads in groundwater, only runoff. Although PLET cannot calculate the dissolved nutrient load for nitrate in groundwater, it can estimate the dissolved nutrient load for runoff in specific areas based on land use. For this evaluation, the man-made nitrate load was estimated to evaluate the reductions needed to achieve the nitrate load reduction goals.

The PLET works by calculating annual nutrient loads by watershed using the HUC 12. The planning area covers three HUC 12 watersheds: the Prairie Gem Cemetery (102702030402), City of Hampton (102702030403), and Upper Lincoln Creek (102702010202). The Upper Lincoln Creek watershed covers the largest portion of the planning area at around 93 percent, the Prairie Gem Cemetery watershed covers about 5 percent of the planning area, and the City of Hampton watershed covers only 2 percent of the planning area. Data is presented at the watershed scale, which is the only area that can be analyzed by the PLET. These HUC 12 watersheds used in the PLET model are illustrated in **Figure 24**. The input and output data from the PLET extends beyond the planning area and is an overestimate of the total nitrogen load. To account for this overestimation, the input and output data were scaled to match the proportion of the HUC 12 acreage that is inside the planning area to the total HUC 12 acreage. Approximately 25 percent of the Upper Lincoln Creek Watershed is within the project area. About 1 percent of the Prairie Gem Cemetery Watershed is within the project area and less than 1 percent of the City of Hampton Watershed is within the project area. The following information presented gives a more accurate representation of the nutrient loads within the planning area as opposed to the entire three watersheds.

The following inputs were used to estimate the natural versus anthropogenic nitrate load:

- Land use data (USGS 2011) – from the PLET Input Data Server
- Nitrate concentration in groundwater from Aurora
- Agricultural census data of crop acreages and livestock counts (USDA 2017)
- Hydrologic soil groups (NRCS 2019)

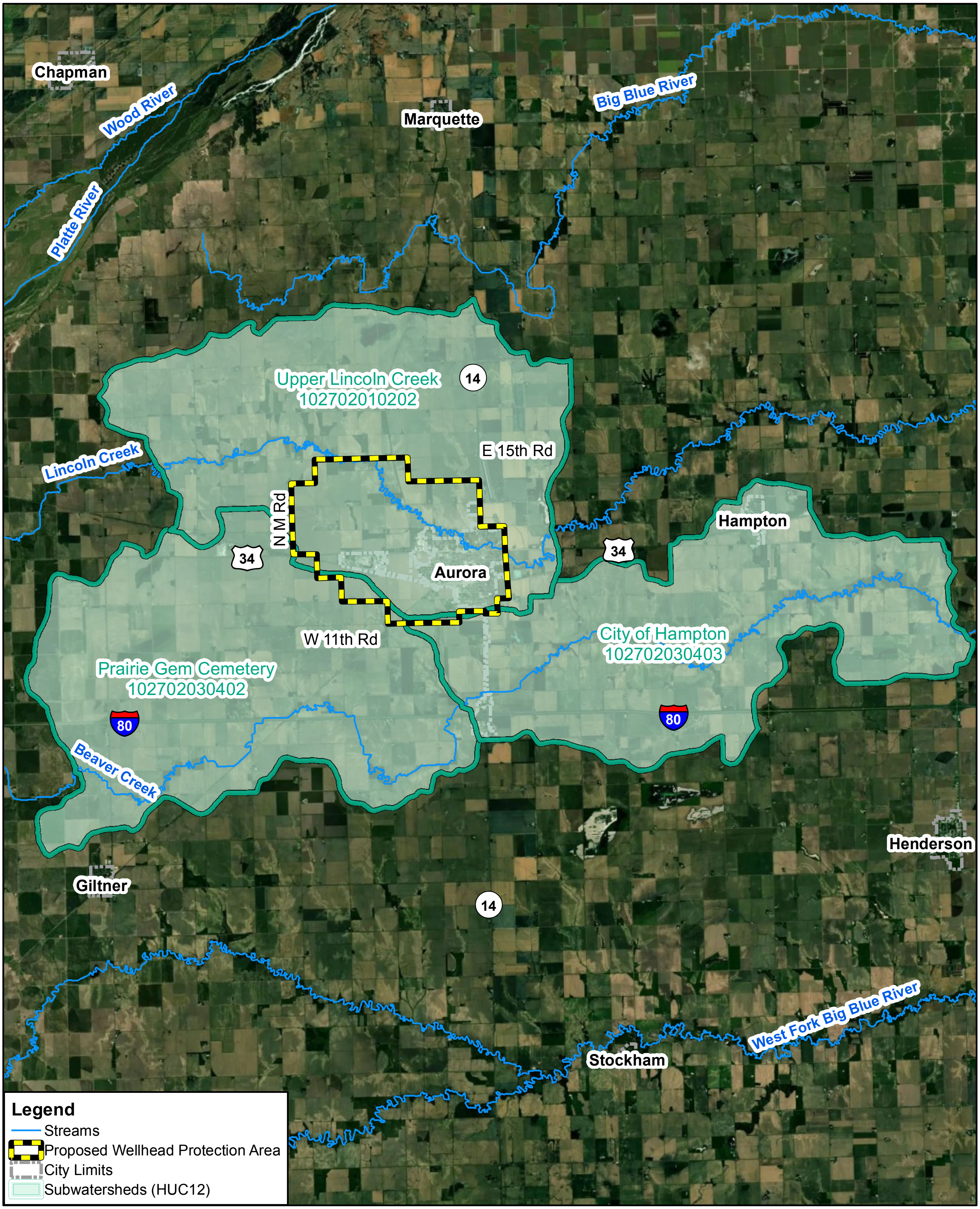
The tabular data is summarized in **Tables 12** and **13,** and the groundwater nitrate concentrations and land use data are illustrated in **Figures 25** and **12**. The crop type is estimated and based on crop rotations; the percentages of corn versus beans will vary each year.

Table 12. Scaled land use data for Prairie Gem Cemetery watershed, City of Hampton watershed, and Upper Lincoln Creek watershed (Hydrologic Unit Code [HUC] 12).

Land use	Acres	Percent of Total Area (%)
Urban	692	9
Cropland (corn)	4,821	63
Cropland (beans)	1,607	20
Pastureland	473	6
Forest	70	1
Feedlots	1	<1
Total	**7,664**	**100**

Table 13. Scaled agricultural animal estimate for Prairie Gem Cemetery watershed, City of Hampton watershed, and Upper Lincoln Creek watershed (Hydrologic Unit Code [HUC] 12).

Animal	Count
Beef cattle	785
Swine	340
Sheep	7
Horse	10
Chicken	15



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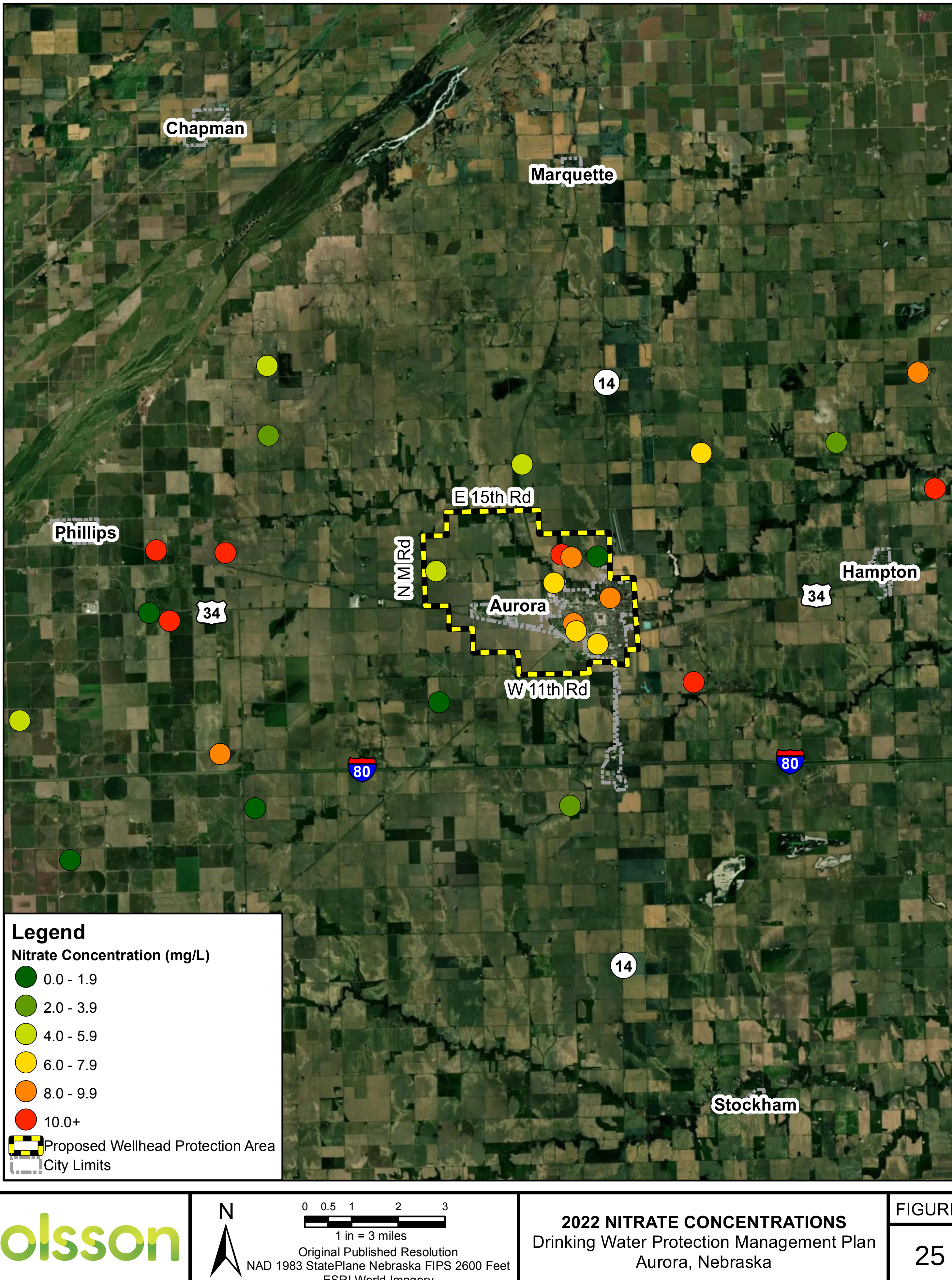
0 1 2 4

1 in = 3 miles

Original Published Resolution
NAD 1983 StatePlane Nebraska FIPS 2600 Feet
ESRI World Imagery

SUBWATERSHEDS USED IN PLET
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
24



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2022 NITRATE CONCENTRATIONS
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
25

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Using these inputs, the scaled total annual nitrate load across the 7,618-acre area was calculated to be 131,512 pounds per year (lbs/yr). The percent contribution by each source is presented in **Table 14**. Using this estimate, the urban contribution to the nitrate load is approximately 2 percent, the pasture contribution is 1 percent, and the agricultural contribution is 15 percent.

Table 14. Scaled total nitrogen load by source as calculated using the Pollutant Load Estimation Tool (PLET) for Prairie Gem Cemetery watershed, City of Hampton watershed, and Upper Lincoln Creek watershed (Hydrologic Unit Code [HUC] 12).

Sources	Scaled Total Nitrogen Load* (lbs/yr)	Percent Contribution per Source (%)
Urban	2,667	2
Cropland	19,170	15
Pastureland	1,418	1
Forest	8	<1
Feedlots	1,911	2
Septic	7	<1
Groundwater	79,108	81
Total	**131,512**	100

* Total Nitrogen Load includes nitrogen in soil, groundwater, and surface water

With this DWPMP, the intent is to identify potential areas for the implementation of BMPs to reduce the primary source of nitrate in the system. As shown in the PLET results, 81 percent of the nitrate load is from existing groundwater nitrates followed by cropland at 15 percent of the load. Existing groundwater nitrate and cropland combine for 96 percent of the nitrogen load contribution. To eliminate or reduce nitrate leaching from crop production as a source, a reduction in the nitrogen fertilizer application rate is likely required.

4.2.2 Nitrogen Sources and Loading Estimates Using the University of Nebraska EONR Algorithm

The University of Nebraska developed an algorithm for determining the Economically Optimum Nitrogen Rate (EONR) for crop production in Nebraska (Wortman, et. al. 2020). The algorithm is supported by the following nitrogen management concepts:

1. **Timing of application**. Often, much of a corn crop's nitrogen fertilizer needs are applied in the early spring before the crop need for the nitrogen occurs. This coincides with the heaviest rainfall period, often resulting in leaching of nitrogen deep into the subsoil before it can be accessed by the plant. This is illustrated in **Figure 26**.

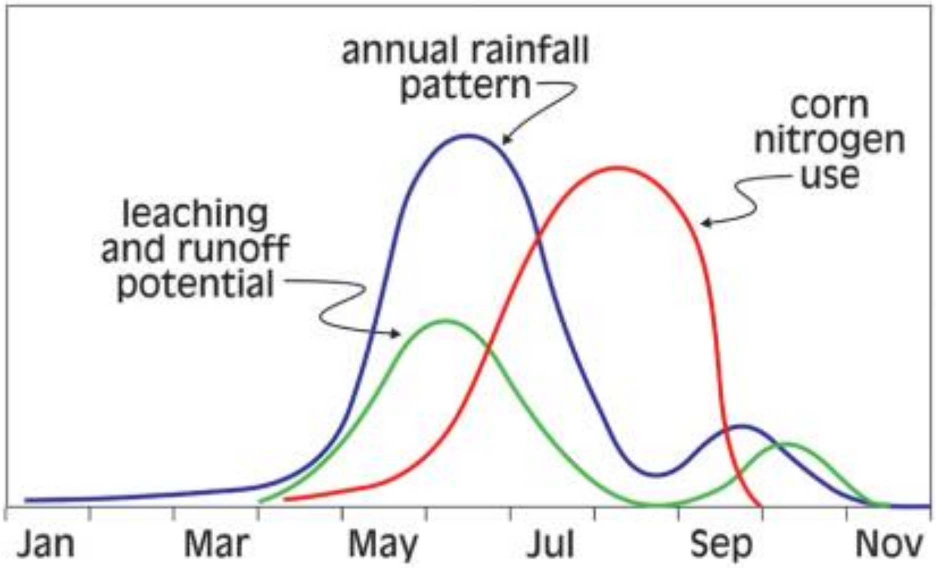


Figure 26. An illustration of the potential nitrogen loss to leaching and runoff relative to rainfall and crop N uptake (Wortmann et al. 2020).

From the figure above, most leaching is expected to occur from May to June. This information also demonstrates that fertilizer nitrogen used in split applications, with a smaller amount of nitrogen applied in the spring with supplemental nitrogen needs applied in the summer as the crop is growing both reduces nitrogen losses while increasing fertilizer use efficiency (net economic return).

2. **Fertilizer use efficiency**. Fertilizer-N recovery is defined as the increase in pounds (lbs) of N uptake by the aboveground crop per pound of fertilizer-N applied. According to Wortman, et al (2020) “The average amount of grain-nitrogen removed in harvest for Nebraska is about 0.7 pound per pound (lb/lb) of fertilizer-nitrogen applied for continuous corn but near 1.0 lb/lb for the corn-soybean rotation. The amount of nitrogen fertilizer applied with the corn-soybean rotation is about 40 percent of that applied with continuous corn. The greater recovery efficiency and the greatly reduced fertilizer-nitrogen applied is expected to reduce nitrate loading of the vadose zone (the depth from the rooting zone to the top of the water saturated aquifer) and movement to groundwater. In a 20-year study in Nebraska, nitrate accumulated to 60-foot depth was 28 percent less with the corn-soybean rotation compared with continuous corn, but this (the amount of the reduction that could accumulate in the subsurface) was an underestimate because of over-irrigation of soybean and over-application of nitrogen to corn following soybean. The study concluded that *a 40-50 percent reduction in NO3-leaching is more likely* (emphasis added).”

   Fertilizer-nitrogen recovery by crops has nearly doubled in the past 50 years because of greatly increased yields without the need for increases in fertilizer nitrogen applied (Wortman et al. 2020). As a result, according to the University of Nebraska, the average nitrogen application rates by growers may be 20-30 lbs/ac more than the economically optimum nitrogen rate needed for the crop. The excess fertilizer nitrogen has an average recovery efficiency of only 24 percent for corn after corn and 28 percent for corn after soybean, with much of the excess nitrogen lost to leaching of nitrate (Wortman et al. 2020).

3. **Reduction of nitrogen fertilizer use**. Using this EONR algorithm, researchers at the University of Nebraska have determined that the optimal nitrogen fertilizer rate for corn production is approximately 174 lbs/ac on fine-textured (silty loam or finer texture) soils, as is typically found in southeast Nebraska. Use and validation of the algorithm by University of Nebraska agronomists has resulted in recommendations that much of the fertilizer-nitrogen needs for a crop should be applied during the growing season according to crop condition to better maximize the EONR and to reduce nitrate leaching.

The EONR algorithm has been tailored to Nebraska and offers science-backed guidance on the optimal timing of nitrogen application to maximize yield efficiencies while minimizing the cost of unnecessary nitrogen application. This offers growers in Nebraska a tool to help them run a more profitable operation and reduce nitrate leaching. The University of Nebraska has a spreadsheet tool on its website that uses the EONR algorithm and gives recommended fertilizer amounts and average costs for fertilizer and application. The Upper Big Blue NRD requires growers to use the EONR algorithm to calculate their recommended nitrogen fertilizer amount in Phase II and III groundwater management areas (Upper Big Blue Natural Resource District 2022). The entirety of the planning area is within a Phase II management area (**Figure 7**), so growers within this boundary are likely already familiar with this method.

4.2.3 Nitrogen Sources and Loading Estimates Using the NRCS EPIC Model

In a 2006 report modeling simulations of soil and nutrient losses and changes in soil organic matter content associated with crop production, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) provided estimates of nitrogen losses to varying environmental pathways (Potter et al, 2006). The NRCS uses the physical process model EPIC (Environmental Policy Integrated Climate) to estimate surface water runoff, percolation, wind erosion, sediment loss, nutrient loss, and changes in soil organic carbon for several regions and cropland types throughout the U.S. Their work involved over 750,000 EPIC model runs that were completed to obtain the results summarized.

EPIC simulates nitrogen exports from the field in two forms: crop removal and losses to the air and water. Nitrogen contained in the plant material is partitioned between that which is removed from the field with the harvested crop yield and that portion remaining in the residue which is added into the organic pools. Nitrogen losses include nitrate dissolved in surface runoff, percolation (leachate), and lateral subsurface flow; organic nitrogen attached to wind and waterborne sediment; and ammonia and nitrogen oxides lost to the atmosphere.

Selected results specific to corn and soybean production in the Upper Midwest and Northern Great Plains of the U.S. from the NRCS EPIC model runs are shown in **Table 15**. Eastern Nebraska is within the Northern Great Plains, adjacent to the Upper Midwest region. It is appropriate to consider both regions in estimating nitrate losses and leaching.

The data show that typical nitrogen losses in the Northern Great Plains and the Upper Midwest averages approximately 51 lbs/acre/year for corn crops, and approximately 28 lbs/acre/year for soybean crops. About 50 percent of the nitrogen loss is from volatilization to the atmosphere (average 25.6 lbs/acre/year from corn to about 14 lbs/acre/year from soybean crops). The NRCS modeling study indicates that an average of approximately 12.5 percent of nitrogen loss for corn crops is leached to groundwater, or approximately 6.38 lbs of nitrogen per acre per year. The modeling also shows that approximately 9 percent of nitrogen loss in soybean crops is leached to the subsurface, or about 2.52 lbs/acre/year.

Table 15. Nitrogen loss pathways and estimated amounts from Environmental Policy Integrated Climate (EPIC) model simulation runs (Potter et al. 2006).

Region	Crop		Volatilized	Dissolved in surface water runoff	Dissolved in leachate	Dissolved in lateral subsurface flow	Lost with waterborne sediment	Lost with windborne sediment	Sum of all loss pathways
	(1,000s of Acres)		(lb/acre)	(lb/acre)	(lb/acre)	(lb/acre)	(lb/acre)	(lb/acre)	(lb/acre)
Northern Great Plains	Corn	15,466	28.2	2.7	3.6	0.8	8.0	7.7	50.9
	percent loss		*55.4*	*5.3*	*7.1*	*1.6*	*15.7*	*15.1*	
	Soybeans	9,562	13.3	0.5	0.7	0.2	5.7	3.7	24.2
	percent loss		*55.0*	*2.1*	*2.9*	*0.8*	*23.6*	*15.3*	
Upper Midwest	Corn	47,941	23.0	2.3	9.3	0.6	16.0	0.6	51.7
	percent loss		*44.5*	*4.4*	*18.0*	*1.2*	*30.9*	*1.2*	
	Soybeans	40,049	14.6	1.4	4.8	0.5	11.1	0.2	32.5
	percent loss		*44.9*	*4.3*	*14.8*	*1.5*	*34.2*	*0.6*	

4.2.4 Comparisons of Modeled Nitrate Leachate Loading

In **Table 16**, information from the three models or algorithms described above have been compared to provide an understanding and realistic estimate of nitrate loading in the planning area. The PLET model is the only model listed in **Table 16**, in which all land cover types within the planning area are accounted for, while the EONR algorithm and the NRCS EPIC model only allow for a single crop type to be analyzed. The EONR algorithm is combined with the use of the NRCS EPIC model for estimated nitrate loss associated with acres of corn in the planning area (**Table 16**). In this combination, total nitrogen loss was calculated using 30 lbs/acre excess nitrogen with a 24 percent recovery rate from the EONR algorithm, and the loss pathways were all calculated using the average of the percentage loss in both the Northern Great Plains and the Upper Midwest. Further supporting information showing how these results were calculated using the three methods is available in **Appendix B**.

Table 16. Comparison of modeled nitrogen losses and nitrate leaching load estimates.

Model	Crop	Total N Loss per Year (lbs)	N lost to Leaching (lbs)	N loss to Leaching (lbs/acre/year)	N Loss to Runoff (lbs)	N Loss to Volatilization (lbs)
PLET	Corn and Soybeans	131,512	N/A	N/A	131,512	N/A
EONR Algorithm[1]	Corn (3,591 acres)	81,875	21,546	6	N/A	N/A
EONR algorithm with EPIC partitions[2]	Corn (3,591 acres)	81,875	10,275	2.86	20,100	40,896
NRCS EPIC Model	Corn (3,591 acres)	184,218	23,119	6.44	45,226	91,280
NRCS EPIC Model	Soybeans (1,216 acres)	34,474	3,051	2.51	13,186	17,082

Notes:
1. EONR algorithm nitrogen loss is based on the use of 30 pounds (lbs) of N fertilizer in excess of the EONR determined by University of Nebraska-Lincoln (174 lbs/acre/year). N loss determined on reported N recovery rate of 24 percent of excess fertilizer above the EONR by corn.
2. Using the EONR algorithm nitrogen loss is based on the use of 30 lbs of N fertilizer in excess of the EONR, N losses are partitioned based on the estimated percentages of loss pathways determined by an average of the NRCS EPIC model for the Upper Midwest and Northern Great Plains regions of the U.S.

Results of the three models or algorithms indicate that 2.9 to 6.4 lbs of nitrate-nitrogen is lost to leaching per acre per year in the crop production areas within the planning area, for corn production. With an average of 3.0 surface inches of water migrating to the groundwater per year, this represents nitrate concentrations of 4.3 to 9.4 mg/L in water migrating to the groundwater table. To achieve the goal of reducing nitrate concentrations in groundwater by 27 percent (from 9.6 mg/L to 7 mg/L), a leaching reduction of 0.78 to 1.73 lbs of nitrate-nitrogen per acre per year – or a concentration of 1.2 to 2.5 mg per liter - is required across the entirety of the planning area.

4.3 Management Factors Affecting Nitrate Leaching

According to information in the publication *Agronomic Management for Reduced Nitrate Leaching* (Wortman et al. 2020), a reduction of nitrogen fertilizer by 25 lbs/acre can reduce nitrate leaching by approximately 5 lbs/acre, or about 1 lb of nitrate for every 5 lbs of nitrogen applied greater than the EONR. These 5 lbs/acre reductions in nitrate leaching equal a reduction of approximately 7.4 mg/L of nitrate entering the groundwater table given the 3.0 inches of groundwater recharge in the planning area if recharge rates remained consistent with water movement in the soil. This reduction in nitrate concentrations is applicable to situations where fertilizer application inputs can be reduced by 25 lbs/acre and remain greater than or equal to the EONR of 174 lbs/acre.

As will be discussed in more detail in **Sections 5.0** and **6.0**, several agronomic BMPs are recommended for reducing nitrate leaching to the groundwater, including:

1. **Split applications of fertilizer during the growing season**. Partitioning nitrogen fertilizer applications with less fertilizer used in the early spring, and then applying fertilizer during the growing season as the crop needs it will substantially improve fertilizer use efficiency and reduce nitrate leaching.
2. **Rotate crops**. Rotating corn after soybeans improves nitrogen use efficiency, with much less nitrogen loss to leaching. This is because less fertilizer is typically used for the soybean crop and residual nitrogen credits remain in the soil for the succeeding corn crop, reducing fertilizer needs.
3. **Use less fertilizer**. Using the University of Nebraska EONR algorithm, optimum nitrogen fertilizer rates can be determined that will optimize producer economic return with less nitrogen fertilizer inputs and resulting reduction in fertilizer loss through leaching.
4. **Identify potential leaching "hot spots."** Fertilizer leaching hot spots may be fields that have sandier soil texture, are locations of chronic excess fertilizer applications, or have a shallow depth to groundwater (Wortman et al. 2019).

Nitrate concentrations in soils tend to vary based on soil types, depths, and history of nitrogen fertilizer inputs. It is possible that high concentrations of nitrate have built up in subsoils that will be released with time. If the groundwater quality improvement rate of 0.15 mg nitrate-nitrogen per liter of water per year can be applied with improved fertilizer BMPs as described in the publication *Groundwater Quality and Nitrogen Use Efficiency in Nebraska's Central Platte River Valley* (Ferguson 2014), it is possible that nitrate concentrations in groundwater may be reduced by 2.6 mg/L in less than 18 years. If corn producers plan fertilizer applications using the EONR-calculated nitrogen fertilizer rate and reduce fertilizer applications by 25 lbs/acre it is possible that the reduction of 5 lbs of nitrate-nitrogen leaching to groundwater (equating to nitrate concentrations of 7.4 mg/L leaching to groundwater) and practicing consistent implementation of agronomic BMPs that result in increased reduction of nitrate concentrations leaching to the subsoil may reduce nitrate concentrations in groundwater in a shorter time period.

5.0 MANAGEMENT STRATEGIES

To ensure a reliable, clean source of drinking water is available to Aurora now and into the future, land and water management strategies that are protective of groundwater will need to be implemented in the rural and urban setting. This section begins with a description of the BMPs that have been tested and proven to be effective in reducing nitrate loads. Many of these practices are already being used by producers in the Aurora area, and they are described here to illustrate the range of options that can be implemented within the planning area to protect groundwater resources. The two largest percentages of the planning area are designated as either cropland or urban, for this reason both rural and urban BMPs are discussed below.

5.1 Rural and Urban Best Management Practices

Research on soil and water quality protection and enhancement has been the focus of the NRCS and the University of Nebraska-Lincoln (UNL), and the information presented in this section is summarized from their research studies and publications (NRCS 2013; NDEQ 2015). The UNL extension has developed a list of the NRCS core BMPs and the contaminants they are designed to address. Most of the research is focused on reducing nutrient loads on runoff which will be discussed in more detail in **Section 7.0**. For now, the nutrient-reducing BMP tables below are divided into practices designed primarily for rural, urban, or other settings. **Table 17** lists the common BMPs for cropland and livestock and the action the practice will address (avoid, control, or trap). **Table 18** lists the common BMPs for urban settings. It is important to understand that not all these practices are beneficial to groundwater quality. For example, contour farming reduces nutrient loading on runoff but increases infiltration, which may have detrimental effects on groundwater quality (NDEE 2021).

Table 17. Common conservation practices for nutrient management in rural settings.

Common Practices	Mode of Action
Cropland	
Contour farming	Control, Trap
Cover crop	Avoid, Control
Crop to grass conversion	Avoid
Crop to habitat conversion	Avoid
Irrigation management	Avoid, Control
No till	Control, Trap
Nutrient Management	Avoid Control
Terrace	Control, Trap
Underground outlet/grass waterway	Control, Trap
Livestock	
Alternate water supply	Avoid
Controlled stream crossing	Avoid
Exclusion fencing	Avoid
Manure management	Avoid, Control
Prescribed grazing	Avoid, Control
Vegetative treatment system	Control, Trap

Table 18. Common conservation practices for nutrient management in urban settings.

Common Practices	Mode of Action
Urban	
Bioswale	Control, Trap
Detention basin	Control, Trap
Fertilizer management	Avoid, Control
Enhanced infiltration (soil amendment)	Avoid, Control, Trap
Irrigation management	Avoid, Control
Low impact landscaping	Avoid
Porous pavement	Control, Trap
Rain garden	Control, Trap
Rainwater harvesting	Avoid, Control
Other	
Constructed wetland	Control, Trap
Filter/buffer strip	Not rated
Grass seeding	Avoid, Control
Habitat improvement	Avoid, Control
Riparian restoration	Avoid, Control, Trap
Sediment control basin	Control, Trap
Sediment removal	Control
Shoreline stabilization	Control
Streambank stabilization	Control
Water diversion	Avoid, Control
Water retention basin	Control, Trap
Well closure	Avoid

NRCS suggests developing a nutrient management plan to identify nitrogen and phosphorus management actions that will reduce losses of nitrogen and phosphorus (**Photo 2**; NRCS 2022). When calculating the optimal rate of application, it is important to credit other sources that contribute nitrogen and phosphorus to the soil, such as previous legume crops, irrigation water, and organic matter. Other ways to avoid excess nutrient loads entering the soil, surface water, and groundwater include properly storing fertilizer (i.e., in a storage building with impermeable floors) and composting manure to reduce the overall volume for disposal.

The planning considerations to support controlling include several agronomic techniques including:

- Plant cover crops in the fall to absorb and store excess nitrogen and phosphorus and to prevent soil erosion.
- Use no-till, ridge-tillage, or other reduced tillage practices in place of conventional tillage.
- Use irrigation systems to apply water uniformly and with greater efficiency. This reduces water loss and transport of nitrogen and phosphorus out of the field.
- Use crop rotation to minimize fertilizer use.
- Use stream crossings, fencing, and watering facilities to keep pastured animals out of water bodies.
- Divert roof runoff and other uncontaminated runoff away from animal confinement and manure storage areas.

In general, the BMPs included in **Tables 17** and **18** that are most beneficial to groundwater in agricultural settings are cover crops, crop to grass conversion, crop to habitat conversion, irrigation management, and underground outlet/grass waterways (NDEE 2021).

Photo 2. Developing a nutrient management system can be an effective way to avoid increasing nutrient loading on soil and water resources.

6.0 IMPLEMENTATION STRATEGY

Section 5.0 provided a list of BMPs that can be employed to reduce nitrate loads. Now the questions are, what BMPs have the best chance of reducing the nitrate load on groundwater in the Aurora area, and how will they be implemented? The "best BMPs" can be described on their technical merits and the characteristics of the area including the soil type and irrigation methods. However, another important factor is often the human factor. So, a follow-up question should be this: **what BMPs are most likely to be adopted by landowners and producers in the area?** This section provides an overview of Aurora's DWPMP implementation strategy based on NRCS technical guidance, field research indicating the effectiveness of certain BMPs on reducing nitrate loads, and input from stakeholders on what practices are likely to be accepted by producers in the area.

6.1 NRCS Recommended Practices

The NRCS has made recommendations on the BMPs that can be used to enhance groundwater quality by reducing nutrient loads. **Table 19** lists the BMPs that the NRCS has listed as Priority Practices under the 2018 Farm Bill Source Water Protection Initiative and provides a synopsis of the groundwater benefits (The Agricultural Improvement Act of 2018, Pub. L. 115-334, Title II (2018)). The 2018 Farm Bill directs 10% of NRCS conservation funds to Source Water Protection, and these funds can be used to cover costs associated with BMP implementation. Nebraska's NRCS source water protection subcommittee met to conclude what practices would be priority practices during the 2022 fiscal year. The practices written in green italics below were identified as high-priority practices that would likely provide the greatest benefit to community water system source water protection and are eligible for higher cost-share. **Table 20** includes an approximate reduction in nitrogen loading for each of the BMPs based on literature review. The NRCS priority practices focus BMP implementation towards rural and agricultural areas because of their broader impacts on source water protection as compared to urban areas. For this reason, the focus of **Tables 19** and **20** are rural BMPs.

Table 19. Priority practices and groundwater benefits.

BMP Title	Groundwater Benefits
Nutrient Sampling, Reporting and Management BMPs	
Annual Crop Reports for Better Nutrient Management	*Producers record the amount of nitrogen fertilizer used on Natural Resources District end-of-season reporting forms. This educational tool allows the producer to know how much fertilizer was used and the corresponding yield. This information helps the producer make fertilizer decisions for the following season. If less nitrogen could be used to obtain the same yield, this will reduce the risk of nitrogen leaching into the groundwater (NDEQ 2016).*
Soil Sampling for Better Nutrient Management	*Nitrogen credits identified in the soil translate to less nitrogen fertilizer being applied which reduces nitrogen loading to the groundwater (NDEQ 2016).*

BMP Title	Groundwater Benefits
Irrigation Water Well Sampling for Better Nutrient Management	*By using available nitrogen credits in the irrigation water supply, less nitrogen fertilizer must be applied, reducing the quantity of nitrogen percolating back into the groundwater with recharge occurring under the field (NDEQ 2016).*
No Till	By not tilling and limiting soil disturbance, reside from crops and plants are able to reside on the soil surface year round. This cover helps to retain soil moisture, sub-surface organic material, and can help reduce runoff (NRCS 2022).
Cover Crop and Crop Rotations	
Cover Crops	*Cover crops protect bare soil because they use excess nutrients in the soil, which prevents leaching below the root zone outside of the growing season. Cover crops also promote healthy microbial communities and soil structure (NDEQ 2016).*
Crop Rotations (corn soybean)	*Corn-soybean have been found to have high N use efficiency and can reduce the residual N available for leaching when compared to continuous corn (Ruan & Schepers 2008) .*
Crop Rotations (alfalfa)	Deep-rooted crops such as alfalfa can effectively retrieve nitrate that has leached below the rooting depth of annual crops such as corn (Ruan & Schepers 2008).
Range Planting	The seeding and establishment of herbaceous and woody species can reduce erosion, improve water quantity, and restore hydrologic function to an area when the site is insufficient for management goals (NRCS 2022).
Critical Area Planting	Establishing permanent vegetation on sites that have high erosion rates reduces transportation of sediments, sheet, and rill erosion (NRCS 2022).
Contour Buffer Strips	Contour buffer strips slow runoff water, trap sediment, and reduce erosion. Sediments, nutrients, pesticides, and other potential pollutants are filtered out as water flows through the grass strips (NRCS 2022).
Conservation Cover	Conservation cover is establishing and maintaining perennial vegetative cover to protect soil and water resources on lands needing permanent protective cover that will not be used for forage production, which reduces soil erosion and sedimentation and improves water quality (NRCS 2022).
Irrigation Methods, Scheduling and Management	

BMP Title	Groundwater Benefits
Soil Moisture Sensors and Irrigation Scheduling	*Using soil moisture sensors and irrigation scheduling gives the producer more resources to make educated irrigation management decisions. This will reduce the amount of irrigation water applied, reducing the risk of nitrogen leaching caused by overwatering (NDEQ 2016).*
Variable Rate Application and Precision Farming	*Variable rate applications and precision farming allows the producer to adjust the irrigation system speed for different soil types. The system can be sped up over sandy soils or grasses water ways, which reduces the likelihood of over-irrigating and allowing leaching to occur (NDEQ 2016).*
Irrigation Pipeline	Having a flow meter installed on an irrigation system takes the guesswork out of determining how much water is being applied per irrigation event. Flow meters give the producer more control over irrigation events, reducing the amount of water applied, which will reduce the risk of leaching caused by overwatering (NDEQ 2016).
Micro-Irrigation System	Micro irrigation systems are installed to apply irrigation water efficiently and uniformly and/or chemicals directly to the plant root zone and maintain soil moisture for optimum plant growth, preventing contamination of ground and surface water (NRCS 2022).
Sprinkler System	The controlled application from a sprinkler system improves plant productivity, prevents nutrient and other chemicals from leaving the root zone, and improves soil where salt and other chemicals adversely impact the land (NRCS 2022).
Urban BMPs	
Bioswale	Bioswales are any vegetated swale, ditch, or depression that conveys stormwater. Bioswales provide treatment of stormwater by removing pollutants from surface water runoff through uptake by vegetation (Jurries 2003).
Urban Fertilizer Management	Abiding by manufacturer recommendations or further limiting the use and overapplication of nitrogen fertilizers can prevent excess nitrate-nitrogen from leaching from urban lawns (Trenholm et al. 2012).
Other BMPs	

BMP Title	Groundwater Benefits
Well Abandonment	Closing abandoned or illegal wells reduces aquifer vulnerability from potential pollutants and removes public health and safety concerns (NDEQ 2016). Note that wells within the wellhead protection area should be abandoned using enhanced decommissioning techniques. For example, well casings can be penetrated at an aquitard to seal off the primary aquifer and preclude vertical water movement (cross-contamination).
Field Border	A strip of permanent vegetation at the edge or around the perimeter of a field reduces sedimentation offsite and protects water quality and nutrients in surface and ground waters (NRCS 2022).
Riparian Herbaceous Cover	Planting herbaceous riparian cover can help prevent sediments and pollutants from reaching surface and ground waters (NRCS 2022).
Riparian Forest Buffer	The establishment of trees and shrubs adjacent to a water body reduces transport of sediment to surface water and reduces transport of pathogens, chemicals, pesticides, and nutrients to surface and ground waters (NRCS 2022).
Filter Strip	These strips of herbaceous vegetation remove contaminants like suspended solids and associated contaminants from overland flow (NRCS 2022).
Grassed waterway	These vegetated channels remove contaminants like suspended solids and associated contaminants from runoff (NRCS 2022).
Pest Management Conservation System	Combining integrated pest management with natural resource conservation reduces the transport of pesticides to surface and ground waters (NRCS 2022).
Vegetated Treatment Area	Vegetated treatment areas improve water quality by using vegetation to reduce the loading of nutrients, organics, pathogens, and other contaminants associated with agricultural operations (NRCS 2022).
Constructed Wetland	Constructed wetlands treat wastewater or contaminated runoff from agricultural operations (NRCS 2022).
Wetland Restoration & Enhancement	Restoring or enhancing wetlands improves water quality by reducing transport of sediment to surface water and reducing transport of pathogens, chemicals, pesticides, and nutrients to surface and ground waters and increasing groundwater recharge (NRCS 2022).
Note: The practices written in *green italics* were identified as high-priority practices that would likely provide the greatest benefit to community water system source water protection (Nebraska's NRCS source water protection subcommittee, personal communication, April 2022).	

Table 20. Field documented reduction in nitrate-nitrogen from priority practices and data source references.

Best Management Practice (BMP) Title	Field-documented Reduction in N and Data Source References
Nutrient Sampling, Reporting and Management BMPs	
Annual Crop Reports for Better Nutrient Management	**26%** N reduction for nitrogen management practices that change the timing and rate of N application.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Soil Sampling for Better Nutrient Management	**26%** N reduction for nitrogen management practices that change the timing and rate of N application.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Irrigation Water Well Management	**26%** N reduction for nitrogen management practices that change the timing and rate of N application.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
No Till	**26%** N reduction in leaching when compared to conventional tillage.
	Constantin et al 2010 available at: *https://www.sciencedirect.com/science/article/abs/pii/S0167880909003089*
Cover Crop and Crop Rotations	
Cover Crops	**30%** reduction in nitrate leaching is the consensus although reduction up to 80% has been reported. A 26-51% N reduction was documented in Iowa, Minnesota, and Illinois.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Crop Rotations (corn soybean)	**28%** reduction in Nitrate accumulation documented at 60-foot depth. Note that during the investigation, overirrigation caused underestimation of load reduction and a 40-50% reduction is more likely.

Best Management Practice (BMP) Title	Field-documented Reduction in N and Data Source References
	Wortmann et al. 2020 available at: *https://cropwatch.unl.edu/2020/agronomic-management-reduced-nitrate-leaching*
Crop Rotations (alfalfa)	**42%** less nitrate loss to tile drainage compared with corn-soybean rotation.
	Iowa State University Nutrient Reduction Strategy, 2020 available at: *http://www.nutrientstrategy.iastate.edu/*
Range Planting	**30%** reduction in nitrate leaching is the consensus although reduction up to 80% has been reported. A 26-51% N reduction was documented in Iowa, Minnesota, and Illinois.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Critical Area Planting	**30%** reduction in nitrate leaching is the consensus although reduction up to 80% has been reported. A 26-51% N reduction was documented in Iowa, Minnesota, and Illinois.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Contour Buffer Strips	**56-98%** reduction in nitrate concentrations to tile drainage.
	Janssen et al. 2018 *available at:* https://www.sciencedirect.com/science/article/abs/pii/S037837741830859X
Conservation Cover	**30%** reduction in nitrate leaching is the consensus although reduction up to 80% has been reported. A 26-51% N reduction was documented in Iowa, Minnesota, and Illinois.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Irrigation Methods, Scheduling and Management	
Change in irrigation practices	0.15 milligrams per liter (mg/l) N reduction per year in groundwater nitrate concentrations. **21%** reduction in groundwater nitrate concentrations.
	Ferguson 2014. *https://pubmed.ncbi.nlm.nih.gov/26023964/*

Best Management Practice (BMP) Title	Field-documented Reduction in N and Data Source References
Soil Moisture Sensors and Irrigation Scheduling	**26%** N reduction for nitrogen management practices that change the timing and rate of N application.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Variable Rate Application and Precision Farming	**26%** N reduction for nitrogen management practices that change the timing and rate of N application.
	Christianson et al. 2018 available at: *https://www.sciencedirect.com/science/article/pii/S0301479717311271*
Irrigation Pipeline	0.15 mg/l N reduction per year in groundwater nitrate concentrations. **21%** reduction in groundwater nitrate concentrations.
	Ferguson 2014. *https://pubmed.ncbi.nlm.nih.gov/26023964/*
Microirrigation System	0.15 mg/l N reduction per year in groundwater nitrate concentrations. **21%** reduction in groundwater nitrate concentrations.
	Ferguson 2014. *https://pubmed.ncbi.nlm.nih.gov/26023964/*
Sprinkler System	0.15 mg/l N reduction per year in groundwater nitrate concentrations. **21%** reduction in groundwater nitrate concentrations.
	Ferguson 2014. *https://pubmed.ncbi.nlm.nih.gov/26023964/*
Urban BMPs	
Bioswale	**25%** reduction in nitrate concentrations from urban surface water runoff transported over a wet bioswale.
	Miner et al. 2016 available at: http://library.isgs.illinois.edu/Pubs/pdfs/ofs/2016/ofs2016-2a.pdf
Urban Nutrient Management	N reduction not well predicted based on variable application and irrigation rates.
	Hochmuth et al. 2012 available at: https://journals.ashs.org/horttech/view/journals/horttech/22/5/article-p600.xml
Other BMPs	

Best Management Practice (BMP) Title	Field-documented Reduction in N and Data Source References
Well Abandonment	Not well predicted because of variables including geology and well construction.
Field Border	**56-98%** reduction in nitrate concentrations from tile drainage to groundwater.
	Janssen et al. 2018 available at: https://www.sciencedirect.com/science/article/abs/pii/S037837741830859X
Riparian Herbaceous Cover	**56-98%** reduction in nitrate concentrations to tile drainage.
	Janssen et al. 2018 available at: https://www.sciencedirect.com/science/article/abs/pii/S037837741830859X
Riparian Forest Buffer	**56-98%** reduction in nitrate concentrations to tile drainage.
	Janssen et al. 2018 available at: https://www.sciencedirect.com/science/article/abs/pii/S037837741830859X
Filter Strip	**56-98%** reduction in nitrate concentrations to tile drainage.
	Janssen et al. 2018 available at: https://www.sciencedirect.com/science/article/abs/pii/S037837741830859X
Grassed Waterway	**53%** reduction in total nitrogen loads in runoff.
	Abimbola et al. 2020 available at: https://www.mdpi.com/2071-1050/13/1/103
Pest Management Conservation System	Pesticide reduction not well predicted because of variances in integrated pest management actions.
Vegetated Treatment Area	**94%** reduction in nitrogen loads from runoff of feedlots in Nebraska.
	Powers et al. 2010 available at: https://elibrary.asabe.org/abstract.asp?aid=32671
	Removal of **32-81%** of nitrate from runoff.

Best Management Practice (BMP) Title	Field-documented Reduction in N and Data Source References
Constructed Wetlands	Dal Ferro et al. 2018 available at: https://www.sciencedirect.com/science/article/abs/pii/S0048969718318424
Wetland Restoration & Enhancement	**40-45%** reduction in nitrogen leaching when paired within improved nitrogen fertilizer applications.
	Liu et al. 2018 available at: https://docs.lib.purdue.edu/gpripb/vol4/iss1/9/

6.2 Stakeholder's Views on Best Management Practice (BMP) Implementation

The potential BMPs for both rural and urban settings were discussed in a series of two stakeholder meetings and two public meetings. Input on potential BMPs from stakeholders was captured in meeting minutes, which can be found in **Appendix C**. Comments from public meeting attendees were incorporated into the following list along with those from the discussions held during stakeholder meetings. These comments are summarized as follows:

Urban:

- Education events targeted for urban community members to spread knowledge about the sources and effects of nitrate in groundwater, including specific examples of how to implement urban BMPs at the individual level.
- Promote nitrate sampling in domestic wells.
- Reduce lawn fertilizer over application through soil testing and education.
    - Using commercial applicators within the city.
- Promote stormwater management BMPs and native vegetation to hold and treat runoff before it enters the soil or runs off.
- Use deep-rooted native vegetation and trees to help actively use nutrients near the surface before they can be infiltrated into the groundwater.

Rural:

- Outreach events targeted for growers to offer information and assistance in applying for cost-share for BMP implementation.
- Demonstration field outreach events targeted for growers to highlight growers that are implementing BMPs and allow growers to ask questions about practical implementation.
- Provide more cost-share for sampling and testing.
    - Soil sampling
    - Irrigation water well sampling
    - Monitoring well sampling
    - Home test kits for water sampling
- Encourage crop rotations.

- Encourage use of deep rooting plants as cover crops.
- Provide high-cost share rates for cover crops, possibly including seed drill.
- Volatile pricing for cover crop termination methods is risky for farmers. Cost share for cover crop termination should follow market trends.
- Manage fertilizer and nutrients.
    - Use annual crop reports.
    - Promote no, reduced, and/and delayed fall fertilizer application.
    - Promote split fertilizer application (after planting or aerial application).
    - Promote encapsulated fertilizers to reduce leaching.
    - Encourage soil testing and calculation of appropriate nutrient needs.
    - Employ variable rate application.
    - Demonstration fields for minimal fertilizer use
- Encourage use of Upper Big Blue NRD cost-share for soil moisture sensors.
- Encourage use of Upper Big Blue NRD cost-share for well decommissioning.
- Encourage no-till or reduced tillage growing.
- Host field days with demonstrations or workshops on BMPs.
- In general, several members of the public voiced their support for expanded cost-share programs for the implementation of BMPs. Stakeholders specifically wanted an easier way to assess all the cost-share programs available, including those that this DWPMP would provide them with access to.

6.3 Implementation Recommendations

This section provides implementation recommendations that consider the NRCS technical recommendations and stakeholder input.

6.3.1 Recommendations

These recommendations are not in an order of priority and can be implemented as funding and landowner support is granted:

- Encourage nutrient management by maximizing incentives paid to producers.
- Encourage use of cover crops by maximizing incentives paid to producers, including incentives for cover crop termination.
- Encourage use of crop rotations by maximizing incentives paid to producers.
- Encourage conversion to a Conservation Reserve Program (CRP) within the 50-year capture zone of community wells by maximizing incentives paid to producers.
- Encourage safe handling and storage of chemicals through pesticide management incentive programs.
- Host field days with demonstrations or workshops on BMPs.
- Work with the Upper Big Blue NRD to provide home test kits for sampling domestic wells in the planning area.
- Use Upper Big Blue NRD’s cost-share programs to sample irrigation wells yearly to monitor BMP implementation.
- Promote abandonment of wells within the planning area that are no longer in use through decommissioning reimbursement by the Upper Big Blue NRD.
- Encourage yearly soil sampling to monitor impact of BMP implementation.

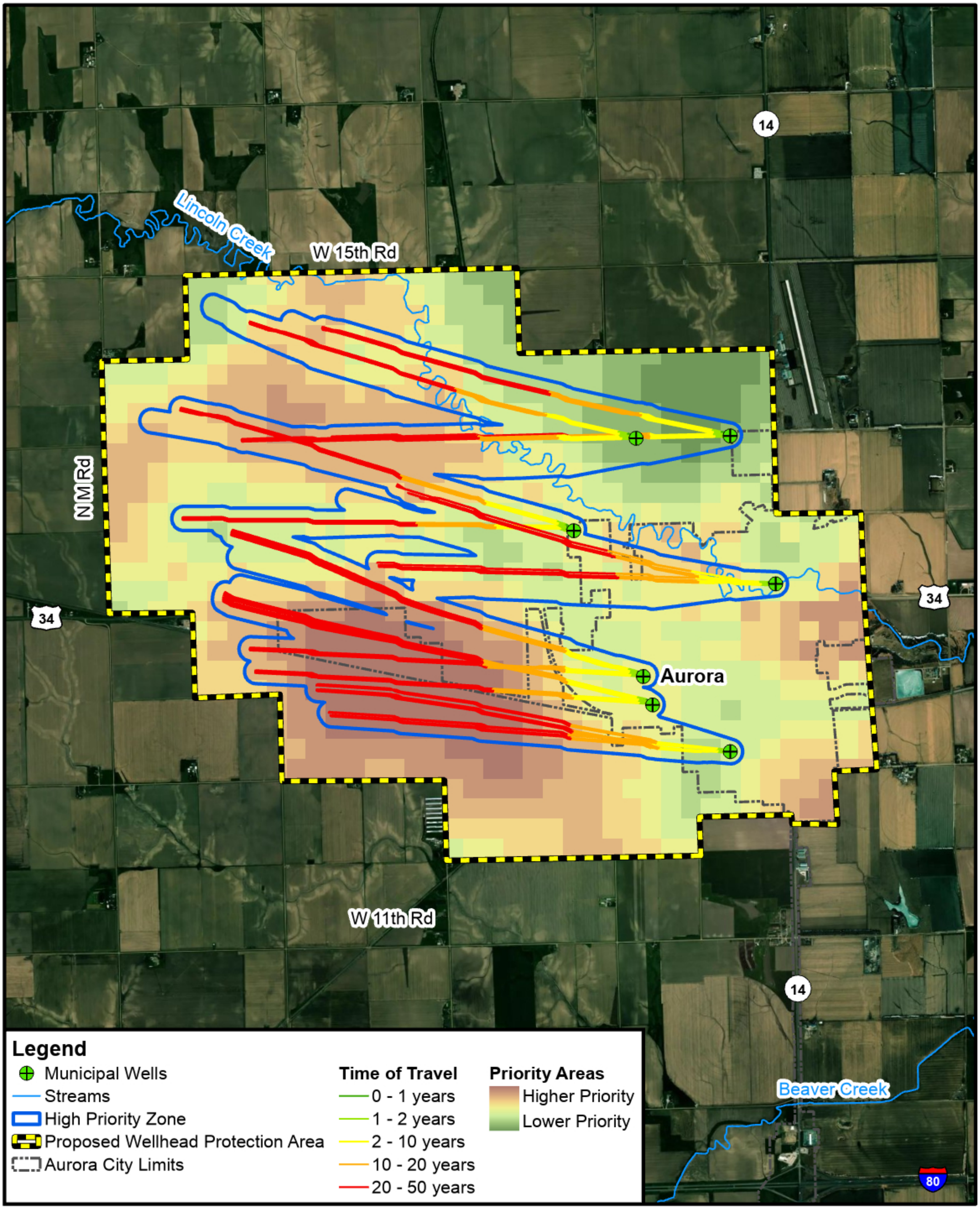
6.3.2 Management Practice Recommended Acres and Incentive Programs

For each of these recommended BMPs, the question is which BMPs and across how big an area would they need to be implemented to make a difference? As first mentioned in **Section 2.0** and further broken down in **Section 4.0**, the goal for this DWPMP is to reduce the highest average nitrate concentration in groundwater to less than 7 mg/L. That would require a 27 percent reduction in the concentration of nitrate in groundwater within the planning area. One way to achieve the 27 percent reduction in nitrate loading would be to convert 27 percent of the cropland to the CRP. However, the reality of converting 2,076 acres of productive farmland to CRP is unlikely. A more likely scenario would be a combination of nitrate reducing BMPs that are effective and accepted by local producers to gradually lower nitrate concentrations by 0.13 mg/L per year over a 20-year period. This annual rate of change was calculated by taking a weighted average of nitrate reduction percentages from the BMP recommendations in **Table 21** and findings from Ferguson (2014) which led to a maximum weighted average yearly reduction rate of 0.19 mg/L. At this rate, if implementation of all recommended BMPs happened immediately, the highest average nitrate concentrations would fall below the Upper Big Blue NRD's Phase II trigger or 7.0 mg/L in approximately 14 years. Due to the nature of groundwater flow and the delay of BMP funding and implementation, the nitrate reduction rate is lowered from the theoretical maximum rate by extending the timeline from 14 years to 20 years. This provides the goal of averaging a 0.13 mg/L reduction over a 20-year period to reduce peak average nitrate concentrations in the planning area from 9.6 mg/L to 7.0 mg/L.

Agronomic practices on cultivated cropland have the greatest impact on nitrate concentrations in groundwater. For the Aurora area, with approximately 5,000 acres of cultivated cropland in the planning area, **Table 21** presents a proposed combination of agricultural BMPs that if implemented, should provide a reduction in the nitrate load leaching into the source water area for the Aurora municipal supply wells. The nitrate reductions are based on the currently accepted consensus of potential reduction in nitrate loading for cover crops and nutrient management. The implementation of the BMPs proposed in **Table 21** should be focused within the high priority zone, outline in blue in **Figure 27**. The 3,183 acre high priority zone delineates a 100 meter area buffering the 50-year time of travel pathway for all existing municipal well locations. This high priority zone is identical to the capture zone presented in **Figures 2** & **10** of **Appendix A**, the groundwater modeling report. The high priority zone in **Figure 27** overlays the spatial distribution of recommended locations for BMP implementation, both of which should be considered for assessing the locations of BMP implementation. The spatial distribution of priority areas in **Figure 27** mirrors the DRASTIC Vulnerability Index from **Figure 22**, with more vulnerable areas displayed as higher priority areas for BMP implementation and less vulnerable areas displayed as lower priority areas. Locations where the high priority zone overlays a high priority area should be highly considered first when considering the location of BMP implementation, this includes the southwestern portion of the WHP area, and the area approximately 1.5 miles to the west of Well 7. It would be Olsson's recommendation to prioritize BMP implementation in these areas with methods that have shown greater decreases in nitrate concentrations according to previous studies, such as more precise irrigation application, no till operations, and using cover crops. BMP implementation within the high priority zone has the greatest opportunity to lower nitrate concentrations at Aurora's municipal wells and therefore implementation should be focused within the high priority zone. Further BMP implementation should emanate out from the high priority zone following the higher priority areas outlined in **Figure 27**. The agricultural practices listed in **Table 21** would be the most applicable to the area within the high priority zone because the area within the high priority zone is dominated by cultivated crop land use. Urban BMPs are included in **Table 21**, but because of the discrepancy in coverage and impact of this land cover type in the planning area, less of these BMPs will be included in the table.

Table 21. Proposed best management practices (BMPs) implementation quantities for Aurora.

Practice Name	Affected Area	Unit Type	Estimated Nitrate Load Reduction (percent)	Estimated Nitrate Load Reduction (pounds)[1]	Estimated Nitrate Load Reduction (pounds/acre)[1]
Cover crop	1,760	Acre	30	3,091	1.9
Soil Moisture Sensors and Irrigation Scheduling	2,880	Acre	21	3,895	1.4
Residue and Tillage Management (No Till)	1,760	Acre	26	2,947	1.7
Riparian Forest Buffers	100	Acre	56	433	3.6
Field Borders	400	Acre	56	2,020	3.6
Bioswale (urban)	20	Acre	25	32	1.6
Urban Education Event	1	Each	N/A	N/A	N/A
Rural Demonstration & Outreach Event	2	Each	N/A	N/A	N/A
Note: Estimated nitrate load reduction based on Natural Resources Conservation Service (NRCS) EPIC model N loss to leaching per acre per year (corn)					



olsson

N

0 1,000 2,000 4,000

1" = 4000'

Original Published Resolution
NAD 1983 StatePlane Nebraska FIPS 2600 Feet
ESRI World Imagery

PRIORITY AREAS FOR BMP IMPLEMENTATION

Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
27

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6.3.3 Upper Big Blue NRD Phase II Groundwater Management Area Restrictions

The planning area is already subject to increased regulations because of water quality concerns. As explained in **Section 1.3** the Phase II groundwater management area regulated by the Upper Big Blue NRD is an area where the median groundwater nitrate concentration exceeds 7 mg/L. The entire 7,689 acres of the planning area fall in the Phase II groundwater management area (**Figure 7**). There are five major requirements that a grower must abide by in these Phase II areas:

(1) farm operators must attend a nitrogen certification course once every four years be refreshed on nutrient management;

(2) capacitance probes or resistance blocks are required on the largest field operated and used to schedule irrigation;

(3) one 0-8” soil sample and one 8-24” soil sample for each field in years when corn or sorghum will be grown following a non-legume crop and/or when livestock, municipal, or industrial waste has been applied within the last 12 months;

(4) prior to applying nitrogen fertilizers, the operator must calculate the recommended application rate based on the UNL nitrogen fertilizer recommendation equation; and

(5) an annual report of fertilizer and irrigation management practices sent to the Upper Big Blue NRD.

More information regarding the Upper Big Blue NRD’s Groundwater Management Areas is in **Section 8.2.**

6.3.4 BMP Total Project Cost Estimating

To estimate the cost to implement the recommendations listed in **Table 21**, several of the top BMPs for groundwater nutrient reduction were selected for implementation across the 7,689 acres with a focus on the agricultural acres. The costs to implement are based on the current NRCS costs published for the state of Nebraska (USDA 2023). The cost estimates for the proposed BMPs are listed in **Table 22**. These costs are derived from the estimated costs provided by the NRCS Environmental Quality Program (EQIP; USDA 2023). As shown in **Table 22**, the total estimated cost to implement six of the top BMPs across 7,689 acres is approximately $621,800.

Table 22. Estimated best management practices (BMPs) project costs.

Practice Name	Effective Quantity	Unit Type	NRCS Estimated Cost Per Unit ($)	Estimated Total ($)
Cover crop	1,760	Acre	54.51	95,931.73
Soil Moisture Sensors and Irrigation Scheduling	18[1]	Each	2,699.77	48,595.92
Residue and Tillage Management (No Till)	1,760	Acre	14.65	25,789.87
Riparian Forest Buffers	100	Acre	1,447.03	144,702.67
Field Borders	400	Acre	584.08	233,632.00
Grassed Waterways (Bioswale)	20	Acre	3,357.59	67,151.73
Urban Education Event	1	Each	2,000.00	2,000.00
Rural Demonstration & Outreach Event	2	Each	2,000.00	4,000.00
			Total	621,803.92
1. Assuming coverage of acres listed in **Table 21** with 160-acre parcels				

6.3.5 Potential Project Funding Sources

As illustrated in **Table 23** through **25**, the NRCS EQIP program and Upper Big Blue NRD cost-share programs can provide significant incentives that will encourage producers to implement the BMPs within the planning area by reducing the costs for the producers. Furthermore, numerous other funding options are available to support groundwater protection. Funding sources include:

- NRCS – EQIP, EQUIP, CRP, Conservation Reserve Enhancement Program (CREP) are all USDA programs administered through local NRCS offices.
- NDEE – Clean Water Act Nonpoint Source Water Quality Grants (Section 319) are available through NDEE for various projects as they relate to the effects of nonpoint source pollution on surface and groundwater quality.
- NDEE – Source Water Protection Grants Program can provide funding for projects that provide long-term benefits to drinking water quality, quantity, education, and/or security.
- Nebraska Environmental Trust grants funding for actions to preserve, restore, research, design, manage, or conserve water.
- Upper Big Blue NRD has numerous cost-share programs that ensure groundwater conservation practices are implemented, see **Table 24**.
- Nebraska's Natural Resources Commission oversees several grant programs including the Water Sustainability Fund and the Well Abandonment Fund.

The NRCS and Upper Big Blue NRD both have incentive programs that promote implementation of BMPs that are protective of drinking water source areas. **Table 23** provides examples of the types and amounts of incentives available to producers through the NRCS Environmental Quality Incentives Program (EQIP; USDA 2023). EQIP provides payments up to 75% of the incurred costs and income foregone of certain conservation practices and activities (USDA 2023). However certain historically underserved producers (limited resource farmers/ranchers, beginning farmers/ranchers, socially disadvantaged producers) may be eligible for payments up to 90 percent of the estimated incurred costs and income foregone (USDA 2023). It should be noted that applications for Source Water Protection cost share through EQIP are not guaranteed to the producer and therefore the producer should seek out other cost share and funding opportunities. **Table 24** provides information on cost-share programs provided by the Upper Big Blue NRD, including the BMPs proposed in **Table 21** and other BMPs that would be advantageous in protecting Aurora's source water by reducing nitrate contamination.

Table 23. Example financial incentive rates for Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) practices.

Practice Name	NRCS Number	Component	Unit Type	Estimated Cost Per Unit ($)	EQIP Incentive Rate* (%)	EQIP Payment per Unit ($)
Cover crop	340	Cover crop multi species	Acre	54.51	75	40.88
Soil Moisture Sensors and Irrigation Scheduling	449	Advanced Technique Incorporating Precision Irrigation	Each	2,699.77	75	2,024.83
Residue and Tillage Management (No Till)	329	No-Till / Strip-Till	Acre	14.65	75	10.99
Riparian Forest Buffers	391	Direct Seeding	Acre	1,447.03	75	1,085.27
Field Borders	386	Field Border, Native Species (Forgone Income)	Acre	584.08	75	438.06
Grassed Waterways (Bioswale)	412	Waterway 25 to 50 ft^2	Acre	3,357.59	75	2,518.19
*Certain historically underserved producers may be eligible for up to 90 percent EQIP cost-share rate						

Table 24. Example financial incentive rates for Upper Big Blue NRD cost-share programs.

Practice Name	Cost-Share Rate (%)	Cost-Share per Acre ($)	Maximum Cost-Share Amount ($)
At-Home/Walk-In Water Well Testing	100	N/A	N/A
Cover crop	50-100	50	7,500
Irrigation Scheduling Equipment	50	N/A	N/A
Subsurface Drip Irrigation Systems	50	N/A	7,500
Riparian Forest Buffers	25-100	N/A	2,500 per landowner per year
Field Borders	50	20-250*	250 per acre*
Grassed Waterways (Bioswale)	75	N/A	7,500
Well Abandonment	60	N/A	750
Flow Meter	100	N/A	N/A
Flow Meter Repairs	50	N/A	1,000
Municipal Assistance Program	N/A	N/A	100,000
*Cost-share program in partnership with Nebraska Department of Agriculture's filter strip program			

Table 25 displays the local costs for the proposed BMP implementation if maximum cost-share is received solely from NRCS EQIP cost-share programs. The estimated costs for Aurora to implement the proposed BMPs prior to any potential cost-share from Upper Big Blue NRD, Clean Water Act Nonpoint Source Water Quality Grants (Section 319), or Source Water Protection Grants from NDEE would be $159,950. If the full $100,000 from Upper Big Blue NRD's Municipal Assistance Program were granted to Aurora, the estimated local costs to Aurora would be $59,950.98.

Table 25. Share of Environmental Quality Incentives Program (EQIP) and local costs for implementation of best management practices (BMPs).

Practice Name	EQIP Share in Percent (%)	EQIP Cost Share ($)	Remaining Local Costs ($)
Cover crop	75	71,948.80	23,982.93
Soil Moisture Sensors and Irrigation Scheduling	75	36,446.94	12,148.98
Residue and Tillage Management	75	19,342.40	6,447.47
Riparian Forest Buffers	75	108,527.00	36,175.67
Field Borders	75	175,224.00	58,408.00
Bioswale	75	50,363.80	16,787.93
Urban Education Event	N/A	N/A	2,000.00
Rural Demonstration & Outreach Event	N/A	N/A	4,000.00
	Total	461,852.94	159,950.98
*Cost-share program in partnership with Nebraska Department of Agriculture's filter strip program			

6.4 Scheduling and Milestones

A proposed schedule of implementation and implementation milestones has been developed for this five-year program (**Tables 26** and **27**). In 2028, or approximately five years after the plan is implemented, a review of the effectiveness of the program will be completed by Aurora. The plan may be revised, and a new plan may be issued after the comprehensive program review. Revision to and review of the plan will be conducted at the discretion of Aurora, with the Upper Big Blue NRD sharing jurisdiction over the frequency at which water quality monitoring takes place outside of city limits if groundwater nitrate concentrations exceed the MCL of 10.0 mg/L.

Documentation of BMP implementation within the expanded WHP area will help Aurora evaluate the success of this plan and the schedules listed in **Tables 26** and **27**, **Section 6.5** details recommendations of this documentation. **Table 28** lists scaled water quality goals to be met, including a goal for the comprehensive review of the success of this plan in 2028. The goal of reducing peak nitrate concentrations by 0.5 mg/L by 2028 shall be used as a benchmark to evaluate the plan. The schedules listed in **Tables 26** and **27** are to be tools that help Aurora and the Upper Big Blue NRD focus efforts on certain BMP implementations. If BMP implementation is off schedule or the water quality goal of a 0.5 mg/L reduction in peak nitrate concentrations has not been met, Aurora should revise these schedules to reflect feasible timelines regarding BMP implementation and project milestones. The time it takes to make producers within the expanded WHP area aware of the funding available to them and the time it takes to implement these BMPs call for a sense of urgency on behalf of Aurora so the 2028 water quality goal can be met.

Table 26. Implementation schedule including year, quarter (1,2,3,4), and activity scheduled.

Scheduled Activities	2023				2024				2025				2026				2027				2028			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1. Drinking Water Protection Plan completed		X																						
2. Application for 319 funding for rural conservation practices						X																		
3. Residual soil sampling in areas with BMPs and no BMPs				X				X				X				X				X				X
4. Install signage demarking new WHP area			X																					
5. Sample vadose zone monitoring sites							X																X	
6. Resample groundwater monitoring sites							X				X				X				X				X	
7. Implement rural and urban nitrate reduction BMPs with incentives from NRCS and UBBNRD			X			X				X				X				X				X		
7a. Cover crop implementation			X	X			X	X			X	X			X	X			X	X			X	X
7b. Deploying soil moisture sensors and implementing irrigation scheduling						X	X			X	X			X	X			X	X			X	X	
7c. Residue and tillage management (no till) implementation				X				X				X				X				X				X
7d. Riparian forest buffers implementation														X				X				X		
7e. Field borders implementation										X				X				X				X		
7f. Grassed waterways (bioswale) implementation in urban areas										X				X				X				X		
7g. Urban Education Event								X																
7h. Rural Demonstration & Outreach Event							X			X														

Table 27. Implementation milestones with year and quarter (1,2,3,4) to be completed.

Implementation Milestones	2023				2024				2025				2026				2027				2028			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1. Drinking Water Protection Plan Approval by NDEE and EPA				■																				
2. Acquire grant funding from at least one agency (NDEE, UBBNRD, NRCS, Nebraska Environmental Trust)							■																	
3. Residual soil sampling assessments				■				■				■				■				■				■
4. Complete BMPs outlined in this plan																								■
4a. Cover crop implemented across high priority zone												■												
4b. Soil moisture probes deployed in high priority zone												■												■
4c. Residue and tillage management (no till) implementation across WHP area																								■
4d. Riparian forest buffers implementation complete																							■	
4e. Field borders implementation complete																							■	
4f. Grassed waterways (bioswale) implemented in urban areas																							■	
4g. Held Urban Education Events									■															
4h. Held two Rural Demonstration & Outreach Events												■												
5. Assess vadose zone and groundwater monitoring data																								■
6. Review effectiveness of BMPs on nitrate reduction in groundwater																								■

To reduce the highest average nitrate concentration of 9.6 mg/L at an average reduction rate of 0.19 mg/L over a 14-year period would require the instantaneous implementation of all recommended BMPs in **Table 21**, which is not feasible. Instead, assuming slower BMP implementation immediately following the completion of this report, goals will be set incrementally with lower nitrate reduction goals at the beginning of the proposed 20-year timeline, and progressively increase the reduction goals with time given for the delay of BMP implementation and for the delayed results of those practices. These goals are outlined in **Table 28**.

Table 28. Peak average nitrate concentration reduction goals.

Years	Peak Nitrate Concentration Reduction Goal (mg/L)	Average Rate of Change (mg/L/year)
0-5	0.5	0.10
5-10	1.1	0.12
10-15	1.8	0.14
15-20	2.6	0.16

6.5 Current and Future Roles and Responsibilities

Aurora is looking forward to the opportunity to engage with regional, state, and private stakeholders to identify and implement long-term solutions to protect the Aurora's drinking water supply. Ultimately, the onus of addressing water quality concerns to a stricter degree than that required by EPA, falls to Aurora. These responsibilities includes the maintenance, evaluation, and future efforts of meeting the water quality goals of this DWPMP. To accomplish the goals of this project, the following groups will be asked to participate in further efforts:

- **City of Aurora** – Aurora has been involved in hosting public meetings and coordinating among the other partners in this project. Aurora has and will continue to monitor the groundwater quality among the municipal wells to meet the water demands of its population. One of the primary responsibilities of Aurora will be to alert growers within the expanded WHPA of the cost-share and new funding available to them to implement the BMPs outlined in this document. Additionally, Aurora will need to collaborate with Upper Big Blue NRD to document the changes in nitrate concentrations over time. Documentation of BMP implementation within the WHPA will allow Aurora to understand what efforts have been made to address water quality and determine what actions need to be taken to meet the water quality goals of this DWPMP.
- **Upper Big Blue NRD** – The Upper Big Blue NRD will be involved in aspects of the project including attending meetings, managing Phase II soil testing, and assisting with groundwater protection monitoring and program implementation strategies. In the future, the NRD will continue in its role overseeing the Phase II soil sampling and groundwater quality and quantity monitoring. As Aurora remains in a Phase II area, the Upper Big Blue NRD has the potential to keep track of changes in irrigation and nutrient management with the Phase II Groundwater Quality Management Area requirement of an annual report. Sharing a summarization of the annual reports within Aurora's expanded WHP area would be invaluable to Aurora in keeping track of how management practices have changed, as it gives a measurement of efforts taken to evaluate the success of this plan.
- **Hamilton County Zoning** – Hamilton County Planning and Zoning is responsible for the zoning and regulation of Hamilton County. There is currently no Wellhead Protection Overlay that covers the WHP areas outside of a city's extraterritorial jurisdiction (ETJ), including Aurora. Developing a Wellhead Protection Overlay would provide legal backing for source water protection outside of a community's ETJ within Hamilton County, this would expand the area of source water required to be protected within Aurora's expanded WHP area.

7.0 MONITORING AND EVALUATION

This section provides an overview of the ongoing groundwater monitoring completed by several agencies including the Upper Big Blue NRD, University of Nebraska, and NDEE. Much of the data is available through UNL's Quality-Assessed Agrichemical Contaminant Database for Nebraska Ground Water, which is also known as the Clearinghouse Database (NDEE 2022b). Data for the municipal wells are not made publicly available in the interest of public safety.

7.1 Ongoing Groundwater Monitoring

Many agencies will collaborate to monitor groundwater within the planning area, including the Upper Big Blue NRD, NDEE, and Aurora. This section describes previously completed and ongoing groundwater monitoring efforts.

7.1.1 Upper Big Blue NRD Monitoring

No specific vadose zone studies have been conducted in the planning area, although the Upper Big Blue NRD has conducted a long-term vadose zone study near Hastings, which lies approximately 25 miles to the southwest of Aurora. The NRD is currently continuing a vadose zone study that covers the entire NRD. This study could offer more information on nitrate levels in and around the planning area. Additionally, Aurora falls within a Phase II Groundwater Management Area which requires surface and deep soil samples at all fields within the NRD where corn or sorghum follow corn or sorghum and allows for the trends of soil nitrate concentrations to be followed over time. Even if Aurora's median nitrate concentration falls below the threshold for a Phase II area, there would be value in continuing soil sampling to see trends beyond those in the sampled wells. The NRD's vadose zone study, soil sampling requirements, and groundwater well sampling all provide information that can be used to measure the effectiveness of BMP implementation suggested in this DWPMP. Two locations previously sampled by Upper Big Blue NRD for groundwater nitrate concentrations are displayed in **Figure 28**, these locations will be sampled quarterly to monitor long term trends in groundwater nitrate concentrations. Residual soil sampling, as required by the Phase II GWMA designation by Upper Big Blue NRD, may vary spatially around Aurora as it is contingent upon the planting of corn or sorghum following corn or sorghum.

7.1.2 NDEE Groundwater Monitoring

The NDEE has the responsibility of reporting annually to the Nebraska State Legislature on the groundwater quality across the state and has done so since 2001 (NDEE 2022b). For its annual report, NDEE collects groundwater samples and uses collected groundwater sampling results from other agencies including NRDs, the Nebraska Department of Agriculture, the Nebraska Department of Health and Human Services (NDHHS), public water suppliers, UNL, and the USGS. The collected sample results are combined into a central data repository of groundwater quality information and commonly referred to as the Clearinghouse Database (**Photo 3**; NDEE 2022b). The database provides public access to the collected sampling results, information on the methods used in sampling and analysis, and an indicator of the quality assurance/quality control of the sample. Statewide statistics and maps are developed from the groundwater sampling results to illustrate concentrations and trends in groundwater contaminants. The primary contaminants for which statistics and maps are generated are nitrate-nitrogen, atrazine, alachlor, metolachlor, and simazine. The annual reports can be found on the NDEE website. Overall, the report concludes there has been no clear trend in median nitrate concentration since 2000, and data for the other contaminants is insufficient to perform a trend analysis on a statewide level (NDEE 202b).

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1 " = 4,000 '

Original Published Resolution

NAD 1983 StatePlane Nebraska FIPS 2600 Feet

ESRI World Imagery

LONG TERM MONITORING LOCATIONS

Drinking Water Protection Management Plan

Aurora, Nebraska

FIGURE

28

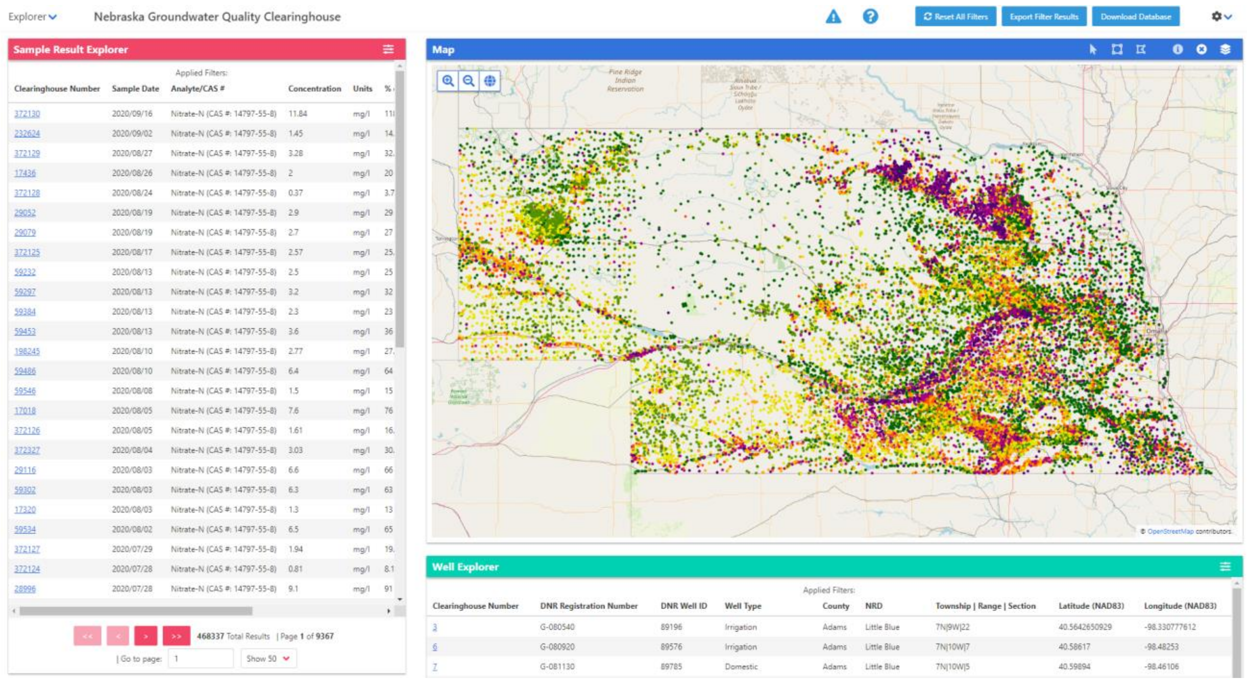

Photo 3. Screen capture of Nebraska Department of Environment and Energy's (NDEE's) Quality-Assessed Agrichemical Contaminant Database for Nebraska Ground Water, or Clearinghouse Database (NDEE 2022b).

NDEE also maintains the Groundwater Management Area (GMA) program, which focuses on assessing areas with documented impacts from nonpoint source contaminants or areas that have a high potential for impacts (NDEE 2022a). Detailed field studies with collection and analysis of groundwater samples are used to determine whether a correlation exists between land use practices and contamination trends. NDEE staff work with NRDs for the assessment of areas affected by or at risk for impacts and on implementation strategies for GMAs. NRDs are primarily responsible for the designation of GMAs and the implementation of rules and regulations for the management of the GMA. If an NRD does not designate and implement a GMA where there is a need, NDEE may take on the responsibility of designation and implementation. NDEE reviews and comments on all proposed GMA rules and regulations prior to public notice.

7.1.2 City of Aurora Drinking Water Monitoring

As required by NDHHS and the Safe Drinking Water Act, Aurora monitors the quality of drinking water on a quarterly basis (Safe Drinking Water Act of 1974. 42 United States Code § 300f amended and reauthorized in 1986 and 1996.). The results of the monitoring are reported to NDHHS and are available to the citizens of Aurora each year.

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7.2 Vadose Zone Monitoring

UNL-CSD is the Nebraska research, service, and data collection organization, established by statute in 1921, that develops geological, groundwater, and soils surveys (**Photo 4**). Studies by UNL-CSD examine the physical and geochemical characteristics of aquifers and the quality of groundwater. The UNL-CSD also monitors groundwater levels, integrates geochemistry with studies of groundwater geology, and maintains the statewide test hole database. The overall UNL-CSD test hole database includes 5,550 test holes and information on total depth, depth to water, and geophysical characteristics (UNL-CSD 2022). UNL-CSD also prepares *The Groundwater Atlas of Nebraska* (UNL-CSD 2013), which is used by all NRDs as a reference to the groundwater resources across the state.

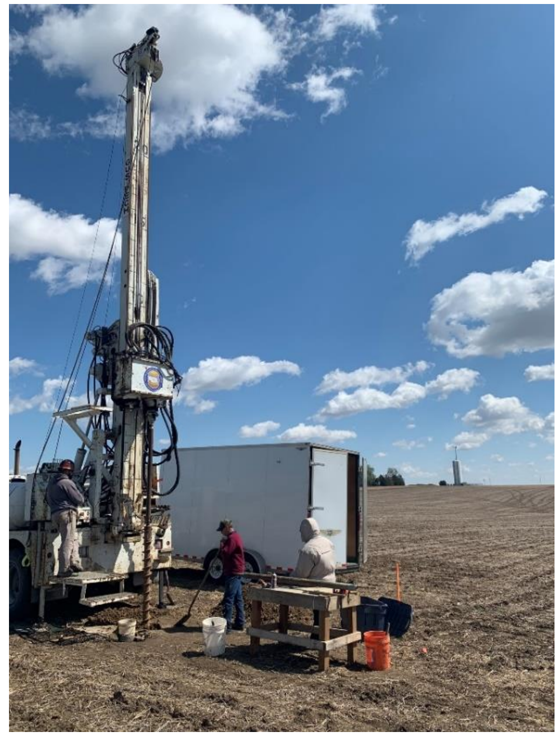
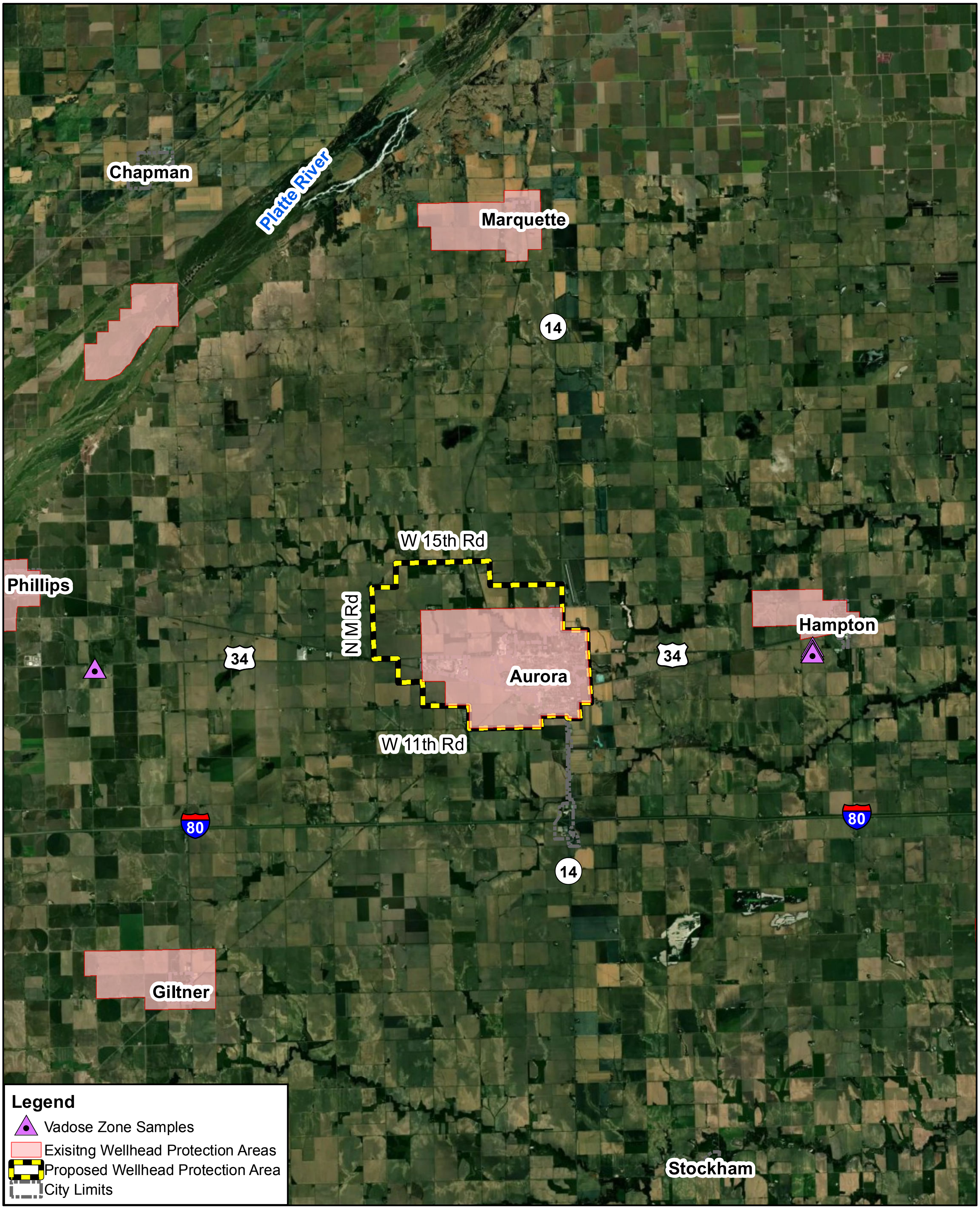


Photo 4. University of Nebraska-Lincoln, Conservation and Survey Division (UNL-CSD) collecting soil samples.

UNL-CSD has not previously collected vadose zone samples within the planning area. The closest UNL-CSD vadose zone samples have been taken to the south of Hampton, and to the southeast of Phillips as seen in **Figure 29** (Nebraska Water Center 2022). Upper Big Blue NRD recently concluded a vadose zone study of the Hastings area which examined trends in nitrate concentrations in and around Hastings, Nebraska. Although these samples are not within the planning area, they still provide useful information on the hydrology and nitrate situation in the broader context of the Upper Big Blue NRD. The Upper Big Blue NRD is currently accepting volunteers for the continuation of the previously mentioned vadose zone study throughout the NRD. The Upper Big Blue NRD will be taking vadose zone samples from most of the zones within the NRD as displayed in **Figure 5**, which will allow for an examination of spatial trends in nitrate concentrations across the NRD.



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1 in = 3 miles

Original Published Resolution

NAD 1983 StatePlane Nebraska FIPS 2600 Feet

ESRI World Imagery

VADOSE ZONE SAMPLE LOCATIONS

Drinking Water Protection Management Plan

Aurora, Nebraska

FIGURE

29

7.3 Monitoring Strategy and Assessment of Results

There are three facets to the monitoring strategy that this DWPMP proposes. Because the goal is to protect the source water supply for Aurora by reducing the nitrate load on groundwater, nitrate will be the compound that will be assessed throughout the monitoring program. The goal of the DWPMP is to reduce the highest nitrate concentrations 27 percent, by lowering peak concentrations an average of 0.13 mg/L/year over a 20-year time period. Upper Big Blue NRD requires shallow and deep soil nitrate sampling within a Phase II Groundwater Quality Management Area when certain crop or nutrient application triggers are met. In the short term, nitrate reduction will be monitored and assessed through these residual soil nitrate tests on rural properties that have implemented BMPs, the location of these tests will vary in accordance with the regulations of the Phase II GWMA designation of Zone 2, which includes Aurora, by Upper Big Blue NRD. This monitoring will be coordinated with local landowners and overseen by the Upper Big Blue NRD. Assessing the level of residual soil nitrate each year will provide information on individual BMP effectiveness, if producers are following a traditional corn-soybean rotation the same locations will be sampled in the Aurora area as long as the Phase II GWMA designation remains for Zone 2. Utilizing existing Upper Big Blue NRD programs as a mechanism for nitrate monitoring, the long-term progress of the program will be assessed by reviewing the quarterly groundwater monitoring sample results collected from nearby irrigation, domestic and Aurora's public supply wells. Upper Big Blue NRD cost-share allows for free sampling of all irrigation and domestic wells regardless of location or Groundwater Quality Phase designations. If necessary, the frequency of sampling may be increased to provide more detail on BMP effectiveness regarding lowering nitrate concentrations. If groundwater nitrate concentrations continue along an upwards trend over the timeline outlined in **Section 6**, Upper Big Blue NRD may recommend an increase to the sampling frequency in the Aurora area. All monitoring will be coordinated between Aurora and Upper Big Blue NRD and remain consistent and use the same sampling/analytic methodology over time so that conclusions are meaningful. As mentioned in **Section 6.4** and **6.5**, Aurora will be responsible for the operation, maintenance, and evaluation of this DWPMP.

8.0 WELLHEAD PROTECTION PLAN ELEMENTS

8.1 Regulatory Authority

Several entities support implementation of this dual-purpose DWPMP and WHP plan including Aurora, the Upper Big Blue NRD, and the NDEE. Additionally, the NDHHS oversees drinking water systems in the state. Lastly, Hamilton County would be in charge of enforcing regulations within the Wellhead Protection Overlay District area for the county should one be established. The authority granted to each is presented in the following subsections.

8.1.1 City of Aurora

The Safe Drinking Water Act, enacted in 1974 and amended and reauthorized in 1986 and 1996, applies to every public water system in the United States. Aurora provides clean drinking water through its Department of Public Works, Water Department by providing water to the citizens that meet the water quality standards set in the act. This project will assist Aurora in its long-term planning and in its source water protection so the city can continue to provide reliable and clean drinking water to the community. Aurora has the authority to implement the proposed actions of this DWPMP within the city’s ETJ, which extends one mile from the city limits. From there the authority to implement actions within the planning area are deferred to Hamilton County and the Upper Big Blue NRD.

8.1.2 Upper Big Blue Natural Resources District (NRD)

The Upper Big Blue NRD manages the groundwater resources within its district under the authority granted by Nebraska’s Groundwater Management and Protection Act, 1985:

> *“The Legislature finds that ownership of water is held by the state for the benefit of its citizens, that ground water is one of the most valuable natural resources in the state, and that an adequate supply of ground water is essential to the general welfare of the citizens of this state and to the present and future development of agriculture in the state. The Legislature recognizes its duty to define broad policy goals concerning the utilization and management of ground water and to ensure local implementation of those goals. The Legislature also finds that natural resources districts have the legal authority to regulate certain activities and, except as otherwise specifically provided by statute, as local entities are the preferred regulators of activities which may contribute to ground water depletion.*
>
> *Every landowner shall be entitled to a reasonable and beneficial use of the ground water underlying his or her land subject to the provisions of Chapter 46, article 6, and the Nebraska Ground Water Management and Protection Act and the correlative rights of other landowners when the ground water supply is insufficient to meet the reasonable needs of all users. The Legislature determines that the goal shall be to extend ground water reservoir life*

to the greatest extent practicable consistent with reasonable and beneficial use of the ground water and best management practices."

8.1.3 NDEE

NDEE serves as the lead agency for the Wellhead Protection Program in Nebraska and is responsible for WHP plan reviews and approvals. Nebraska's Wellhead Protection Program is a voluntary program assisting communities and other public water suppliers in preventing contamination of their water supplies. The Wellhead Protection Area Act of 1998 sets up a process for public water supply systems to implement a local WHP plan (Nebraska Wellhead Protection Act, 1998. Nebraska Revised Statute § 46-1501 – 46-1509.). As stated on the NDEE webpage, "…the goal of Nebraska's Wellhead Protection Program is to protect the land and groundwater surrounding public drinking water supply wells from contamination. Since approximately 85 percent of Nebraskans receive their drinking water from groundwater, preventing groundwater contamination is vital." (NDEE 2022c).

8.1.4 NDHHS

Effective in 2021, the Nebraska State Legislature merged the NDHHS Drinking Water Program with the NDEE. The Drinking Water Division was housed under the NDHHS at the time this report was written. The Drinking Water Division is focused on addressing the quality of public water and its mission is: "… to protect the public health and welfare of Nebraskans by assuring safe, adequate, and reliable drinking water." (NDEE 2022c).

Public water systems provide water to approximately 80 percent of Nebraskans. Private domestic wells provide water for the rest (NDEE 2022c). More than 90 percent of the state's public water systems use groundwater sources. Many water sources have such good water quality that it can go straight from the ground to the tank to the tap without any sort of treatment.

At NDHHS, the Office of Drinking Water's role is to inspect every public drinking water system in the state, make sure samples are collected, monitor results, ensure systems comply, and take appropriate enforcement action if there are any issues. In accordance with NDHHS regulations, public water systems, like the one in Aurora, must sample their water monthly, quarterly, or annually – more frequently if there are any water quality issues.

Across Nebraska, monitoring in 2021 indicated 50 occasions where nitrate levels were above 10 mg/L (NDEE 2022c). These numbers are down considerably from 101 exceedances by public water systems across Nebraska in 2011. When two nitrate violations occur within a nine-month period, NDEE issues an "administrative order" directing the local water system to take remedial action. As will be discussed in more detail below, Aurora follows NDHHS and NDEE's safe drinking water standards.

8.2 Groundwater Ordinances, Management, and Regulations

Management of a groundwater supply by local communities and NRDs can involve a number of possible steps. These may include the enactment of sanitary and water ordinances, public nuisance laws, and zoning restrictions on specific land uses; the purchase of land or conservation easements; cooperative efforts with local NRDs; or voluntary actions. BMPs can be encouraged throughout the WHP area by offering incentive programs. The incentive programs subsidize the cost of implementing these important source water protection programs, practices, and activities.

8.2.1 Aurora Ordinances

Aurora has adopted the setback distances for community public water supply wells as defined by the state (**Table 29)**. These setback distances were developed to ensure that community drinking water wells are protected from potential sources of contamination. No setback distance can be completely protective because groundwater flow is highly dependent on local conditions. For example, a well in one community that is set 1,000 feet from a sewage lagoon may be isolated from the leakage from the lagoon because the water well is installed in a deeper aquifer. On the other hand, the community well may be at risk over time if the well is completed in a shallow aquifer 1,000 feet downgradient from the lagoon, especially if the groundwater flow rates are high and the lagoon continues to leak into the shallow aquifer. For this reason, the setback distances are a minimum and work as a good starting point for discussing new public water supply locations.

Table 29. Title 179 NAC 7.007 – setback distances for community public water supply wells.

Category	Distance (feet)
Water Well	1,000
Sewage Lagoon	1,000
Land Application of Municipal / Industrial Waste Material	1,000
Feedlot or Feedlot Runoff	1,000
Underground Disposal System (septic system, cesspool, etc.)	500
Corral	500
Pit Toilet / Vault Toilet	500
Wastewater Holding Tanks	500
Sanitary Landfill / Dump	500
Chemical or Petroleum Product Storage	500
Sewage Treatment Plant	500
Sewage Wet Well	500
Sanitary Sewer Connection	100
Sanitary Sewer Maintenance Hole	100
Sanitary Sewer Line	50

Allowable actions and uses within the portion of the WHP area that lies outside of Aurora's ETJ would be determined by the Hamilton County Zoning Regulations if they were to establish a WHP Overlay. These regulations would define the prohibited uses and structures, restrictions, and permits within the WHP area. The Hamilton County Zoning Regulations would come secondary to the requirements of the Wellhead Protection Act (Neb. Rev. Stat. §46-1501 through 46-1509). Since a WHP Overlay does not exist within the Hamilton County Zoning Regulations at the time of writing, there would be no regulations for properties outside of Aurora's ETJ but within the WHP area.

8.2.2 NRD Groundwater Management Areas

The Upper Big Blue NRD follows a three-phase approach concerning groundwater quality in the NRD's groundwater management areas (GMA) as stated in the groundwater management plan (Upper Big Blue NRD 2022). Based on an analysis of the current groundwater quality monitoring data, the following triggers and phases are established for the protection of groundwater quality across the entire Upper Big Blue NRD:

- A Phase I GMA is currently established for the entire NRD.
- A Phase II GMA will be established if the median groundwater nitrate concentration is greater than 7 mg/L.
- A Phase III GMA will be established if the median groundwater nitrate concentration is greater than 10 mg/L.

Figure 7 illustrates the extent of the Phase II GMA established in Zone 2, containing Aurora. **Table 30** lists the groundwater controls that are enforced by the Upper Big Blue NRD. All phases of GMAs address the use and application of nitrogen fertilizers with additional controls as the phases increase.

Table 30. Groundwater management area controls.

GMA Designation	Description of Control
Phase I	Fall application of commercial nitrogen fertilizer is delayed until after November 1. Pre-plant nitrogen applications in liquid or dry form are delayed until after March 1.
Phase II	Operators must attend a nitrogen certification course every four years, irrigation scheduling equipment is required on the largest operated field, surface and deep soil sampling is required for every field, the UNL nitrogen recommendation equation must be used before applying any nitrogen fertilizers, and annual reporting is required for all fields.
Phase III	Surface and deep soil sampling is required for every 40 acres, all irrigation wells must be sampled and tested for nitrate every three years, and nitrification inhibitors must be applied with all anhydrous ammonia applied between November 1 and February 29.

8.3 Public Involvement

The partners developing this DWPMP recognize that members of the public need to be informed throughout the planning process and educated about what can be done to protect groundwater and their drinking water. For this reason, the team prepared a public involvement plan (PIP) to guide public participation activities over the duration of the project (Olsson 2022). The goal of the PIP was to define a process where the stakeholders and community leaders are encouraged to engage in the DWPMP development processes. Involving the public in developing the DWPMP will lead to the public having a better understanding of why the plan is important for the future of the community. Aurora's PIP included the following components:

- Coordination meetings with Aurora, Upper Big Blue NRD, NDEE, and Olsson
- Stakeholder committee meetings
- Public open house meetings
- Status updates with Aurora

8.3.1 Stakeholder Committee

The stakeholder committee included two groups of representatives (**Photo 5)**. The first group listed in **Table 31** includes the local representatives invited to attend the planning meetings to represent water users from the following groups: agriculture, well drillers, city residents, commercial interests, and educators. **Table 32** lists the agency representatives included to provide specific expertise in water quality, water supply, soil and best management practices, education, and outreach.

Photo 5. Stakeholder committee participation in Aurora.

Table 31. Aurora stakeholder list.

First Name	Last Name	Affiliation	Representing
Chris	Beins	Agricultural producer	Agriculture
Matthew	Grosshans	Agricultural producer	Agriculture
Andrew	Willis	Diamond J Agricultural Services	Agriculture/Commercial
Anthony	Sigler	Teacher	Educator
Dustin	Nissen	Sargent Drilling	Well driller
Steve	Anderson	Heartland Bank	Local resident/water user
Jeremy	Brandt	Hamilton County	Local resident/water user
Keith	Wasem	Local water user/resident	Local resident/irrigation expert
Eric	Melcher	City of Aurora, City Administrator	Local official
Adam	Darbro	City of Aurora, Utility Superintendent	Water operator
Marlin	Seeman	City of Aurora, Mayor	Local elected official

Table 32. Agency representatives working with Aurora stakeholders.

First Name	Last Name	Affiliation	Expertise
Amanda	Osborn	NDEE	Source Water Protection Coordinator
Brandon	Beethe	NDEE	319 State Coordinator
Erinn	Wilkins	Upper Big Blue NRD	Water quality, outreach

8.3.2 Meeting Summaries

Two stakeholder meetings and two open house meetings were held to facilitate discussion and education on development of the DWPMP. The goals of each meeting were as follows:

- **Open House, June 8, 2022**: Attendees received a variety of information provided by the different agencies that hosted informational booths at the open house. This information included the purpose of the DWPMP, water quality issues, and the benefits of completing a DWPMP.
- **Meeting 1, October 4, 2022:** Introduction of the stakeholder committee including roles/responsibilities and DWPMP background and objectives. Discussed ongoing groundwater monitoring and wellhead protection areas. Information was shared to

educate the stakeholders on the water quality issues facing Aurora. Finally, the stakeholders were asked to identify their main concerns regarding safe drinking water and provide suggestions for BMPs in the area.

- **Meeting 2, January 17, 2022:** Presented results from the contaminant source inventory (CSI), DRASTIC vulnerability modeling, and the updated WHP/planning area. The stakeholder committee provided additional input on the updated planning area, additional ideas towards BPMs, and how to encourage BMP implementation (**Photo 6**).
- **Open House, May 2023**: Provided information on the background and overview of the DWPMP. Presented the proposed WHP/planning area, DRATSIC vulnerability modeling results, and answers to questions raised by the stakeholder committee. Received any final comments from the public.

8.3.3 Future Public Engagement

Photo 6. Public engagement from stakeholder group in Aurora.

Future and continued support from the local community is essential to meet the goals set out in this DWPMP. The stakeholder committee established for this DWPMP is a valuable group for representing different interests among the Aurora community and could be used for future public involvement. The International Association for Public Participation (IAP2) is an organization that is centered around public involvement and provides resources and guidance for entities interested in public participation (IAP2 2023). IAP2 describes a spectrum of public participation with categories of increasing public impact on decision-making beginning at ‘Inform’ and ending with ‘Empower’ (IAP2 2023). Future public engagement with BMP implementation and achieving the goals described in **Section 2.0** should involve participation in each of the categories outline by IAP2, including those not mentioned above, being ‘Consult’, ‘Involve’, and ‘Collaborate’ (IAP2 2023). BMP implementation across the entire planning area cannot happen without public engagement because part of the DWPMP lies outside of Aurora’s ETJ and Hamilton County does not currently have a WHP Overlay district covering Aurora, meaning the decision to implement BMPs within this area lies with the landowners. If landowners are brought into the decision-making process and are informed on the cost-share opportunities available to them, they could be more likely to implement the BMPs that would protect Aurora’s source water. This DWPMP encourages Aurora to continue to keep the community informed and engaged in the efforts to achieve the nitrate reduction goals of this DWPMP and protect their source water.

8.4 Contaminant Source Inventory

The purpose of a potential CSI is to identify both existing contaminant sources and sources that have the potential to pollute groundwater within the WHP area. Identification of these sources provides a framework for the community to respond to accidental releases. Additionally, the CSI can provide the community with a better understanding of what constitutes a potential source of contamination. The CSI for Aurora was compiled from existing databases and on-the-ground observations.

As identified by the NDEE, common potential contaminant sources include and are illustrated in **Figure 30**:

- **Agricultural** - Fuel storage, grain storage, water wells, chemigation, livestock operations, and chemical storage
- **Commercial/Light Industry** - Auto repair facilities, dry cleaners, fuel stations/storage, machine shops, rail yards
- **Industry** - Manufacturing facilities, oil and gas wells, junk yards, landfills, sewage treatment plants
- **Others** - Cemeteries, golf courses, highway maintenance yards, transportation corridors

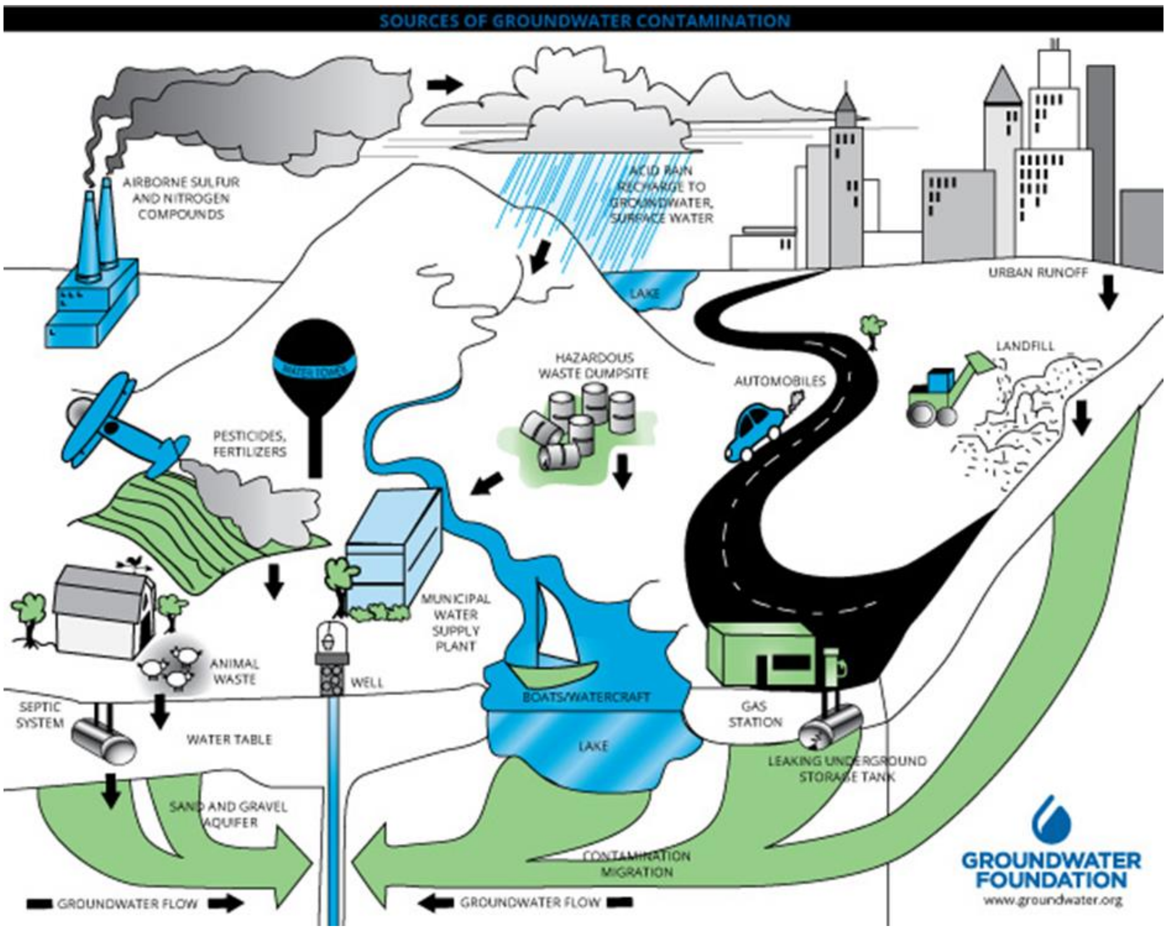


Figure 30. Illustration of potential sources of groundwater pollution (The Groundwater Foundation 2022).

Note that although potential sources were identified in the following CSI, they may not presently be contributing to contamination. It is important to note that this inventory only represents a snapshot in the history of the WHP area. Features that may have already contributed to groundwater contamination may not be present any more or they may have no record of occurrence. Because of the time it takes for contaminants to migrate through the aquifer, it is important to record historical land uses and land use activities.

8.5 Contaminant Source Inventory Results

The CSI was compiled from a combination of online databases and an on-the-ground field inventory. The following online sources were used to complete the CSI:

- NDEE interactive mapping system (NDEE 2022)
- Nebraska State Fire Marshall database of registered underground storage tanks (NSFM 2022)
- NeDNR database of registered water wells (NeDNR 2022)
- USGS NLCD (USGS 2019)

8.5.1 Potential Point Sources of Pollution

Using the NDEE interactive mapping system, facilities that are associated with specific NDEE programs were identified as potential sources of contamination. In total, 81 sites were identified during the online database review. Many of the sites were listed under more than one program, and the most common listing was for documented leaking storage tanks (LST) as seen in **Table 33**. NDEE uses the LST listings to document releases from registered storage tanks. Typically, these listings document the discovery, investigation, and cleanup of release from underground storage tanks (UST) systems that store and distribute petroleum products.

The second most common listing was for National Pollutant Discharge Elimination System (NPDES) permits and compliance. All persons discharging or proposing to discharge pollutants from a point source into any waters of the state are required to have a permit under NPDES, including all significant industrial uses (NDEE 2022). This permitting keeps record of where and what pollutants could enter the waters of the State of Nebraska.

Table 33. Nebraska Department of Environment and Energy (NDEE) program name, acronym, and descriptions.

NDEE Program Name	Acronym	Program Description	Count
Leaking Storage Tanks (LST):	LST	Above or underground storage tanks of petroleum substances.	38
National Pollutant Discharge Elimination System (NPDES) Permits and Compliance	PCS	Discharge of monitored pollutants to waters of the state, including: Wastewater treatment facilities for industrial or domestic wastewater. Remediation wells. Discharge of cooling water Discharge of monitored pollutants (as above), specifically from storm water runoff. Construction sites which are 5 acres or larger.	36
State Fire Marshall (SFM):	SFM	Not an NDEQ program, provided for reference only. State Fire Marshall facility information, usually associated with the storage of petroleum and flammable liquids	29

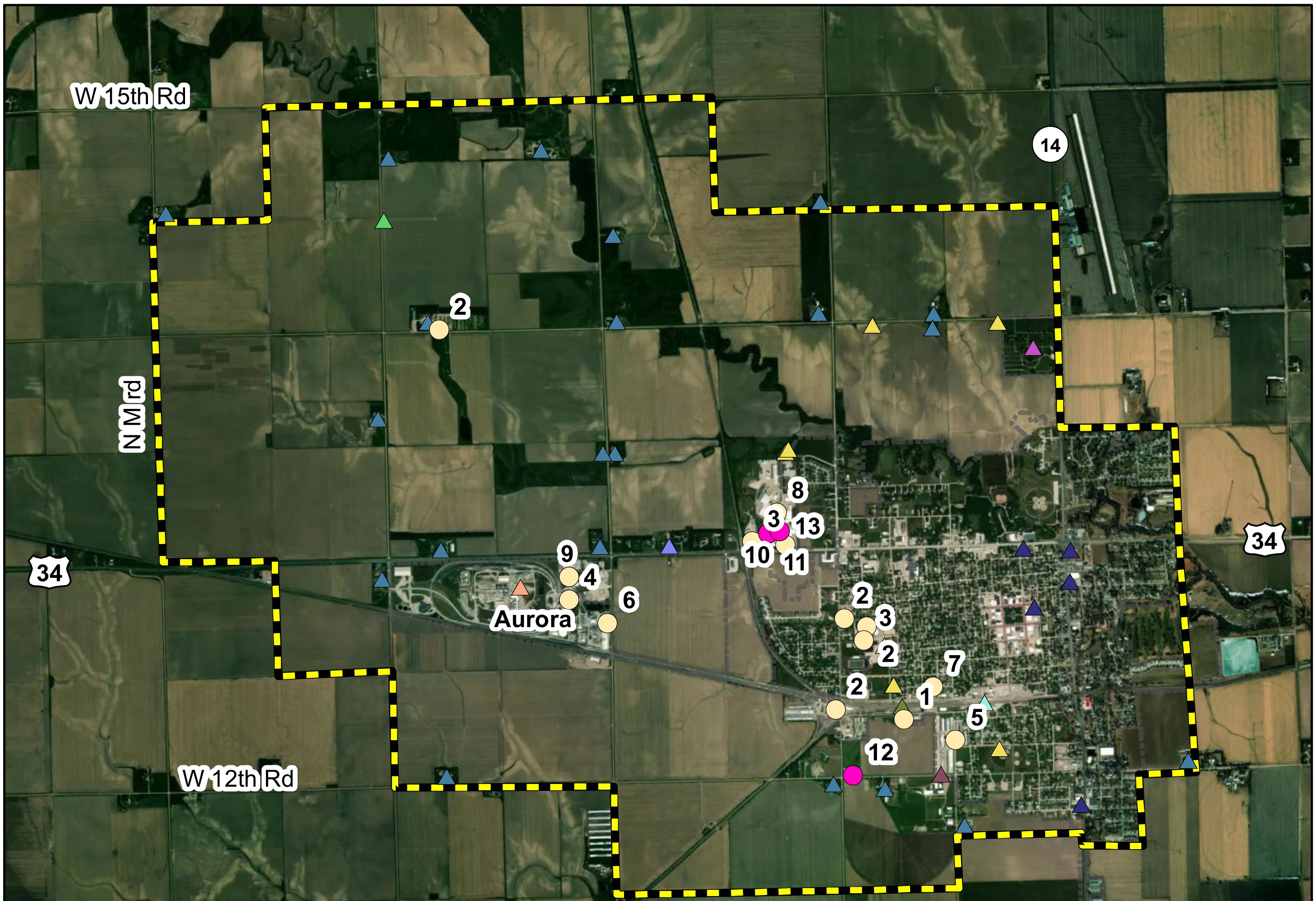
NDEE Program Name	Acronym	Program Description	Count
SARA Title III (TL3):	TL3	Voluntary reporting of hazardous chemical storage.	20
Resource Conservation Recovery (RCR):	RCR	Hazardous waste contamination of groundwater, soils, or other materials	18
Clean Air Act (AIR):	AIR	Ambient air monitoring not associated with point sources. Emissions from point sources.	16
Underground Injection Control (UIC):	UIC	Septic tanks that handle things other than domestic waste (shop drains that lead into a septic tank) or that are large capacity. Injection or discharge of monitored fluids into a well, including non-domestic wastewater and open loop heat pumps.	12
Release Assessment (RA):	RA	Receives notification of spills, leaks, and other environmental emergencies, and provides technical assistance and regulatory oversight to those that pose an immediate hazard to either the environment or public health.	11
Livestock Waste Control (LWC):	LWC	Prevent the discharge of waste from livestock operations to waters of the State.	9
Integrated Waste Management (IWM):	IWM	Facilities for the disposal of municipal solid waste (landfills). Construction and demolition debris, fossil fuel ash, and industrial waste	8
Superfund (SF):	SF	Identifies, assesses, and characterizes sites where hazardous substances are known or suspected to pose a threat to public health and/or the environment.	6
Asbestos Abatement Remediation (ASB):	ASB	Notification from facilities doing demolition and renovation involving asbestos	5
Toxic Release Inventory System (TRI):	TRI	Increase the public's access to information concerning the presence and release of hazardous chemicals in their communities. Provide information for emergency planning and response. Provide information on toxic chemical releases into the environment.	5

NDEE Program Name	Acronym	Program Description	Count
Onsite Wastewater Treatment (OWT):	OWT	Any type of individual septic tank or domestic lagoons Any facility that is not connected to a community wastewater treatment plant.	4
Ground Water (GW):	GW	Sites undergoing clean-up of ground water under Title 118, Ground Water Quality Standards and Use Classification	2
Remedial Action Plan Monitoring (RAP):	RAP	Voluntary cleanup of any site.	2
Wastewater Facilities (WWF):	WWF	Review of plans for a change in sewer systems.	2
Environmental Assistance (EA):	EA	Assistance and coordination offered for environmental issues.	1
Brownfields (BF):	BF	Redevelopment of abandoned or underused industrial or commercial properties	1

To verify the data that was collected through online resources, a field inventory was completed on November 30, 2022. In addition to validating the online data, the field inventory was completed to identify any potential contaminant sources that were not listed online. The field inventory was completed by physically and visually surveying the DWPMP area from public right-of-way and county roads. Based on NDEE guidance, the types of features identified during the field inventory included fuel storage, grain storage, water wells, livestock, auto repair, dry cleaners, fuel stations, machine shops, rail yards, landfills, sewage treatment facilities, cemeteries, and more. During the field inventory, the most common site noted was residential farmsteads. For the purpose of this review, the farmsteads were assumed to have septic systems, water wells, and fuel/chemical storage.

Further information on the sites identified during the online database review and field inventory is included in **Appendix D**.

Of the sites identified in the CSI (NDEE database review and field inventory) 13 were identified for further evaluation because of their locations in relation to the locations of the current municipal water supply wells and because of their histories as potential sources of contamination. These sites are shown in **Figure 31** and summaries based on available NDEE documents are provided below.



Legend

Field Inventory

- Agricultural Systems Technology
- Cemetary
- Ethanol Plant
- Farmstead
- Fertilizer Storage
- Fuel Station
- Well House
- Grain Bins/Fertilizer
- Rail Yard
- Rural Residences
- Proposed Wellhead Protection Area
- City Limits

Active Contamination Site

NDEE Programs

1 - Integrated Waste Management
2 - Leaking Storage Tank
3 - Leaking Storage Tank, Resource Conservation Recovery
4 - Release Assessment
5 - Release Assessment, Resource Conservation Recovery
6 - Integrated Waste Management, Release Assessment, Toxic Release Inventory System
7 - Resource Conservation Recovery
8 - Toxic Release Inventory System
9 - Resource Conservation Recovery, Toxic Release Inventory System
10 - Release Assessment, Resource Conservation Recovery, Toxic Release Inventory System
11 - Resource Conservation Recovery, Superfund, Toxic Release Inventory System
12 - Superfund, Remedial Action Plan Monitoring
13 - Brownfield, Remedial Action Plan Monitoring, Underground Injection Control

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N

0 2,000 4,000 8,000 Feet

1 inch = 4,000 feet
Original Published Resolution
NAD 1983 StatePlane Nebraska FIPS 2600 Feet
ESRI World Imagery

Potential Contaminant Source Inventory
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE 31

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Aurora Public Schools

LST, SFM, RCR, and ASB listings were identified for the Aurora Public Schools facility located at 300 L Street. This facility lies in close proximity upgradient of PWS wells #1 and #3. Notable listings are discussed below.

The LST (110498-TH-1243) and SFM listings detail the closure of three heating oil UST's and piping in May 1998. The closure report indicates that field analysis conducted on soils during the excavation showed signs of petroleum contamination. NDEE reviewed the closure documents and determined that a release of petroleum had occurred, but the nature and extent of the petroleum contamination appear to be minimal. NDEE closed the LST listing with no further action required.

The RCR listing identifies the facility as a conditionally exempt small quantity generator. No violations are noted in the RCR file.

Hauf Repair

A RCR listing was identified for the Hauf Repair facility located at 703 7th Street. This facility lies approximately 0.4 miles northwest of PWS Well # 2.

The RCR listing details a complaint regarding the improper disposal of solid waste at the facility. The complaint was investigated by NDEE, and it was determined that waste oil produced at the facility was reused or recycled through the City's recycling program, given to another facility for burning in a space heater, or stored in 55-gallon drums. It appeared that no waste oil was being disposed of at the facility. NDEE closed the file with no further action required.

Aurora Co-op Elevator Agronomy

LST, SFM, PCS, and OWT listings were identified for the Aurora Co-op Elevator Agronomy facility located at 109 W Burlington Road. This facility lies approximately 0.75 miles west-northwest of PWS Well #2. Notable listings are discussed below.

The LST (082698-99-0003) and SFM listings detail the removal of a waste oil tank in 1997. Soil contamination was noted during the removal. NDEE reviewed the closure documents and determined that a release of petroleum had occurred, but the nature and extent of the petroleum contamination appear to be minimal. NDEE closed the LST listing with no further action required.

International Sensor Systems

BF, RAP, UIC, RCR, and PCS listings were identified for the International Sensor Systems facility located at 103 Grant Street. This facility lies approximately 0.35 miles south of PWS Well #4.

The BF, RAP, UIC and RCR listings are all related to contamination that has been identified at and downgradient of the site. The most recent information in the NDEE files indicates that groundwater, soil, and soil vapor at and downgradient of the site have been contaminated as a result of previous operations. Interim remedial actions that will address on-stie soil and groundwater contamination have been approved and will be completed by November 2024. The interim remedial actions include excavation, soil vapor extraction, and in-situ air sparging. They will also include groundwater and air monitoring and on-site inspections with additional sampling or mitigation as warranted.

Final remedial actions will address off-site contamination following the completion of the interim remedial actions.

The RCR listing also identifies the facility as a conditionally except small quantity generator of hazardous waste. These generator documents are from the late 1990s and early 2000s. Later RCR documents are related to the contamination identified at the site discussed above.

The PCS listing documents back and forth conversations between the facility, NDEE, and the City of Aurora concerning the disposal of wastewater. A preliminary investigation report from July 1987 indicates that all water used by the facility will be routed to the City of Aurora Sanitary Sewer. The last document in the NDEE files, dated July 31, 1987, indicates that clean water discharge to the City of Aurora Wastewater Treatment Facility is disallowed.

Aurora Co-op Elevator Company

RA, RCR, AIR, and TL3 listings were identified for the Aurora Co-op Elevator Company facility located at 615 A Street. The facility lies 0.28 miles west-southwest of PWS Well #2. Notable listings are discussed below.

RA listing 040491-GB-0910 indicates that a release of 550 gallons of anhydrous ammonia fertilizer occurred at the facility in March 1989. The release was addressed at the time of the incident and NDEE confirmed that the appropriate remedial actions were taken.

RA listing 03099-DBH-1550 indicates that a release of 600 gallons of anhydrous ammonia occurred at the facility in March 1989. No additional information was available. The listing currently has an inactive status with NDEE.

RA listing 031792-KM-0930 indicates that a release of anhydrous ammonia as an air release occurred in March 1992. The release was noted as a large cloud that irritated the eyes. The file was closed due to the nature of the release.

The RCRA listing details the disposal of hazardous waste generated at the facility. No releases or violations were noted.

Grosshans International Inc

RCR, LST, and SFM listing were identified for the Grosshans International Inc facility located at 1471 W Highway 34. This facility lies approximately 0.41 miles southwest of PWS Well #4.

The RCR listing indicates that in April 1993 the facility notified NDEE of its status as a small quantity generator of hazardous waste. NDEE responded with a letter of acknowledgement that the facility had filed a Notification of Hazardous Waste Activity and issued the facility an ID number. No RCR documents indicate that a release has occurred at the facility.

LST listing AP10653 indicates that on May 2, 1991, a UIC inspection was conducted at the facility. During the UIC inspection the facility reported their use of a UST to store waste oil. In addition to this tank another UST was used to store floor drain water prior to disposal. The floor drain water tank's access pipe and surrounding area adjacent to pipe was saturated with waste oil and/or solvent. Following the inspection NDEE requested that the USTs be registered.

The SFM listing details a site inspection that was conducted in March 2018. Onsite personnel indicated that the UST connected to the floor drain had been connected to sanitary sewer. They also indicated that the waste oil UST had been removed approximately 18 years prior. The SFM report concluded that a tank was removed and that no soil testing was conducted.

The LST and SFM listings are considered closed by NDEE.

J&B Industrial Services Inc

RCR, TRI, SF, AIR, PCS, and UIC listings were identified for the J&B Industrial Services Inc facility located at 105 Hamilton Street. This facility is located 0.36 miles south-southwest of PWS Well #4. Notable listings are discussed below.

The RCR listing details two notice of violations issued to the facility in 2013 and 2014. The violations were related to the placement of waste material in locations where it is likely to cause pollution, disposal of solid waste at a location other than a solid waste management facility, and failure to conduct a hazardous waste determination of sandblast waste. Waste disposal receipts were received by NDEE after the 2013 notice of violation. No follow-up documentation was available following the 2014 notice of violation. Photos from a 2014 NDEE site visit also document what appears to be sandblasting dust accumulating outside and blowing off site.

The TRI listing is intended to increase the public's access to information concerning the presence and release of hazardous chemicals in their communities. There were no indications that a release has occurred at this site based on the information available in the NDEE records.

The SF details investigations at the facility and in the surrounding area (International Sensor Systems and Fiberglass Products Inc). Soil, groundwater, and soil vapor in the area has been impacted by previous operations in the area. The contamination is being addressed as discussed in the International Sensor Systems BF, RAP, UIC and RCR listings.

Fiberglass Products Inc

RCR, RA, TRI, AIR, and TL3 listings were identified for the Fiberglass Products Inc facility located at 102 Grant Street. This facility lies 0.42 miles south of PWS Well #4. Notable listings are discussed below.

The RCR listing identifies the facility as a small quantity generator of hazardous waste. Several notices of violation have been issued to the facility. Based on the information contained within the NDEE database, these violations appear to have been addressed by the facility to the satisfaction of NDEE.

Two individual RA listings were identified. RA listing 033094-MR-1445 documents the release of approximately 50 gallons of a polyester resin/styrene mixture. The release documents indicate that the material will solidify when exposed to air. The listing is considered closed by NDEE.

RA listing 091892-DT-1010 documents the release of approximately 1,500 gallons of a polyester resin/styrene mixture. The release reports indicate that the release was contained. The listing is considered closed by NDEE.

The TRI listing is intended to increase the public's access to information concerning the presence and release of hazardous chemicals in their communities. There were no indications that a release has occurred at this site based on the information available in the NDEE records.

Aurora East LLC

TRI, RCR, IWM, RA, AIR, TL3, PCS and WWF listings were identified for the Aurora East LLC facility located at 1205 S O Road. This facility is located 1.29 miles west-northwest of PWS Well #3. Notable listings are discussed below.

The TRI listing is intended to increase the public's access to information concerning the presence and release of hazardous chemicals in their communities. There were no indications that a release has occurred at this site based on the information available in the NDEE records.

The RCR listing indicates that the facility was a one-time large quantity generator of hazardous waste in 2002. The RCR listing was activated as part of the disposal process and is now considered closed by NDEE.

IWM listing details the disposal of the excavated material discussed in RA 072799-KM-1157. Approximately 900 cubic feet of the earthen material was disposed of at the York Area Solid Waste Agency Landfill.

RA listing 072799-KM-1157 details a release of approximately 500-600 gallons of gasoline in July 1999. The entire volume of spilled gasoline was contained within a containment dike. Cleanup included the recovery of 500 gallons of gasoline from the containment area. The containment structure was then excavated and replaced with new material. Excavated material was disposed of at the York Area Solid Waste Agency Landfill. The listing is considered closed by NDEE.

RA listing 041717-JB-1155 details a release of approximately 9,250 gallons of denatured alcohol in 2017. An emergency investigation including soil sampling and the installation of an interceptor trench near the release was conducted. Additional soil sampling was completed in April 2018. NDEE reviewed all the information and determined that the listing could be closed based on the current site conditions and property use.

Chief Custom Homes

TRI, AIR, TL3, and PCS listings were identified for the Chief Custom Homes facility located at 111 Grant Street. This facility lies approximately 0.25 miles south of PWS Well #4. Notable listings are discussed below.

The TRI listing is intended to increase the public's access to information concerning the presence and release of hazardous chemicals in their communities. There were no indications that a release has occurred at this site based on the information available in the NDEE records.

Aurora Head Start

LST and SFM listings were identified for the Aurora Head Start facility located at 409 J Street. The facility lies in close proximity to PWS Well #1.

The LST (021093-99-0004) and SFM listings detail the removal of one UST in September 1992. The closure report indicates that a release of petroleum resulting from the operation of this system has occurred. NDEE reviewed the closure documents and concluded that the nature and extent of the petroleum contamination appeared to be minimal and closed the LST listing with no further action required.

Aurora Landfill West

An IWM listing was identified for the Aurora Landfill West facility. The facility was located approximately 0.14 miles south of PWS Well #3 in the NDEE online database. However, upon further research this facility was found to actually be located approximately 1.34 miles east of PWS Well #3 and outside of the WPA. Based on this information, further research was not completed.

Aurora Public Schools Bus Barn

LST and SFM listings were identified for the Aurora Public Schools Bus Barn facility located at 111 M Street. This facility is located approximately 0.22 miles northwest of PWS Well #1.

The LST (021199-99-0015) and SFM listings detail the removal of a UST in June 1998. The closure report indicates that a release of petroleum resulting from the operation of this system has occurred. NDEE reviewed the closure documents and concluded that the nature and extent of the petroleum contamination appeared to be minimal and closed the LST listing with no further action required.

Bar Lazy B Farm

LST, SFM, LWC, OWT and UIC listings were identified for the Bar Lazy B Farm facility located at 1303 W 14 Road. This facility is located approximately 1.63 miles northwest of PWS Wells #4 and 5. Notable listings are discussed below.

The LST (AP3859) and SFM listings detail the removal of one UST in December 1999. The closure report indicates that no soil or groundwater contamination was encountered, and field analysis showed no evidence of petroleum contamination. NDEE reviewed the UST closure documents and concluded that no further action was needed.

EPCO Carbon Dioxide Products

RA, AIR, TL3, and PCS listings were identified for the EPCO Carbon Dioxide Products facility located at 1220 Lincoln Avenue. The facility is located approximately 1.48 miles northwest of PWS Well #3. Notable listings are discussed below.

RA listing 101904-PH-1410 documents the release of 1,600 pounds of gaseous anhydrous ammonia in October 2004. The release was addressed at the time of the incident and is considered closed by NDEE.

RA listing 062409-JB-0730 documents the release of 200 pounds of gaseous anhydrous ammonia in June 2009. The release was addressed at the time of the incident and is considered closed by NDEE.

USDA Grain Bin NE-021

SF and RAP listings were identified for the USDA Grain Bin NE-021 facility located at 100 A Street. The facility is located approximately 0.65 miles west of PWS Well #2. Although NDEE places that facility at 100 A Street, it appears that the majority of the investigative work has taken place east of Aurora along E 12th Street between South R Road and South S Road. It is noted that that location is outside of the WHPA. However, several potential source areas along E 12th Road are located within the WHPA.

The SF and RAP listings detail the discovery of a contaminant plume and follow up investigations at the facility. In 2012 sampling revealed contaminant concentrations that exceeded EPA Maximum Contaminant Levels (MCLs) in several private drinking water wells along E 12th Road between South R Road and South S Road. Additional assessment activities have been completed to confirm the presence of contaminants in the groundwater and soil vapor. Carbon tetrachloride has been detected in groundwater and indoor air samples at concentrations exceeding the EPA screening levels. Further sampling of both groundwater and soil gas is anticipated to assess conditions over time.

A-1 Fiberglass Aurora Inc

RCR, TRI, AIR, and TL3 listings were identified for the A-1 Fiberglass Aurora Inc facility located at 1318 Wilson Street. This facility is located approximately 1.43 miles northwest of PWS Well #1. Notable listings are discussed below.

The RCRA listing details violations that were identified on May 22, 2006, during a hazardous waste Compliance Evaluation Inspection. The violations included issues such as the failure to keep satellite accumulation containers of hazardous waste closed.

In July 2006, the facility notified NDEE that they had addressed the violations identified during the compliance inspection. NDEE reviewed the information provided by the facility and determined that all violations and areas of concern had been adequately addressed.

The TRI listing is intended to increase the public's access to information concerning the presence and release of hazardous chemicals in their communities. There were no indications that a release has occurred at this site based on the information available in the NDEE records.

8.5.2 Other Potential Point Sources

The NeDNR online registered groundwater well database information was used to create **Figure 14**, depicting registered wells in the planning area (NeDNR 2022). Improperly constructed wells can result in groundwater contamination when contaminants are introduced to the ground surface near the wellhead and are allowed to flow into the well. Additionally, wells that are improperly abandoned can serve as a conduit for contaminants to reach the aquifer.

8.6 Potential Nonpoint Sources of Pollution

Nitrate contamination is one of the most common groundwater contaminants in rural areas, and Nebraska is no different (NDEQ 2018). Data collected in the USGS National Water-Quality Assessment or NAWQA program sites showed that nitrate concentrations in groundwater were highest in samples from wells in agricultural areas, with concentrations exceeding the drinking water standard of 10 milligrams per liter (mg/L) in about 12 percent of domestic wells (USEPA 2003). Nonpoint sources of nitrates in groundwater often originate from the use of fertilizers. Excess nitrogen that is applied as fertilizer is not taken up by plants. The excess nitrogen is carried away by surface runoff and can leach into groundwater in the form of nitrate.

The Upper Big Blue NRD conducts groundwater quality monitoring data across the NRD. This data was used to create a map depicting nitrate concentrations detected in groundwater samples in the vicinity of the WHP area (**Figure 25**). Nitrate concentrations in the mapped groundwater samples range from less than 0.2 to 27.1 mg/L.

To evaluate the potential sources of this nonpoint source pollution, National Land Cover Database (NLCD) information was used to compile **Figure 12**, a land cover map for the planning area (USGS 2019). Land cover can be used to identify areas of nonpoint source pollution since the sources can often be tied to specific land uses. The land cover map shows that the majority of the WHP area is cultivated crops.

8.7 Emergency, Contingency, and Long-term Planning

Aurora has an emergency plan for its water supply, storage, and distribution system (JEO Consulting Group, Inc. 2021). The plan, included in **Appendix E**, was developed to provide a replacement source of drinking water as well as alternative storage and distribution systems in the event of:

- Power failures (temporary or long term) at well sites, or at the water storage standpipe
- Water main or service breaks
- Bacteriological or chemical contamination of supply, storage, or distribution system(s)
- Temporary or long-term loss of water storage capacity
- Reduction or loss of well capacity caused by drought conditions
- Natural disasters including, but not limited to, thunderstorms, tornadoes, flooding, earthquakes, or other acts of nature

A copy of the emergency plan is available at the following location:

- Aurora Utility Superintendent's Office

As stated in the plan, in the event of a short-term loss of groundwater supply, the water tower can provide a limited supply of water to the city. On average, this could translate to somewhere between 0.1 and 0.3 days of available storage at typical demands identified previously if the water tower is full at the time of the loss. The actual period could be much longer or much shorter depending upon the demand placed upon it. During periods of drought, a major leak, a system failure, or excessive consumption beyond the capacity of the system, the City of Aurora Water System has the ability to conserve and restrict water use to extend the time that Aurora's water storage and supply can provide to the community.

If a long-term loss of the groundwater supply would occur, and after short-term measures have been instituted and/or exhausted, additional emergency measures should be implemented. Local and state emergency operation directors should be contacted immediately.

Emergency water supply measures range from supplying bottled water for drinking and cooking purposes to hauling potable water from a nearby community for essential use only. Hauled water can either be dispensed to residents at a central location, although this location is not set by the City of Aurora Water System.

To ensure that water demands can be met even in the case of emergency, Aurora has recently installed two new high-capacity wells to help meet its long-term water supply demands.

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APPENDIX A

GROUNDWATER MODELING TECHNICAL INFORMATION

GROUNDWATER MODELING REPORT

Prepared for:

City of Aurora, Nebraska

June 2023

Olsson Project No. 021-05223

ACRONYMS AND ABBREVIATIONS

BGS	Below Ground Surface
DEM	Digital Elevation Model
HPRCC	High Plains Regional Climate Center
LiDAR	Light Detection and Ranging
NDEE	Nebraska Department of Environment and Energy
NIR	net irrigation requirement
NDNR	Nebraska Department of Natural Resources
NRD	Natural Resources District
TOT	Time of Travel
UNL-CSD	University of Nebraska – Lincoln Conservation and Survey Division
WHP	Wellhead Protection

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SUMMARY

Olsson was contracted to develop a groundwater model for the purpose of delineating the recommended wellhead protection (WHP) area for the municipal wellfield of the City of Aurora, Nebraska (Aurora). The final WHP area will be determined by the Nebraska Department of Environment and Energy (NDEE) following their review of this report and their discussions with Aurora, the Upper Big Blue Natural Resources District (NRD), and other project stakeholders. This report is included as a technical supplement to the Aurora Drinking Water Protection Management Plan (DWPMP).

Information was collected from Aurora or other local studies to model the Aurora's wellfields, historical water usage, and the hydrogeology of the area. An important source of data were the two regional models that overlap the WHP area—the Blue Basin and Cooperative Hydrologic Study (COHSYT) groundwater models. Using the particle tracing program, MODPATH, the 20-year and 50-year capture zones of the existing and proposed wells were analyzed to determine the final model selection. As explained in the DWPMP the 50-year capture zone will be used as the proposed WHP area and is designated and referred to as the planning area for the DWPMP. The 20-year time of travel (TOT) groundwater flow path refers to the path an imaginary "particle" of water takes as it moves through the aquifer over 20 years or less if it is captured by a well or other discharge point. The same is true of the 50-year. Several "particles" are added to the groundwater model at each municipal well location to identify the source area, or capture zone, for Aurora's wellfields. The Blue Basin and COHYST models were chosen as appropriate groundwater models to run the particle trace analysis because the planning area is located within both model domains. Two regional groundwater models were used rather than one to ensure that the proposed WHP area would encapsulate the 50-year TOT groundwater flow paths and protect the source water for Aurora.

Aurora currently uses seven wells to supply water to its residents. **Table 1** includes a summary of the seven wells along with their depths.

The general direction of the groundwater flow paths computed by both the Blue Basin and COHYST models is from the west to east and west-northwest to east-southeast towards Aurora's wells, respectively. The slight difference in flow path orientation is attributed to the differing aquifer properties of the models.

The sensitivity analysis completed as part of this report shows that the total length of the flow paths varies when adjusting model parameters (i.e., wet and dry scenarios). To address this uncertainty, the composite capture zone offers a conservative estimate of the area to be protected by combining results from the sensitivity analysis model runs. This analysis represents the best science and data available at this time and should be considered with a high degree of confidence.

1. GENERAL DESCRIPTIONS

This section provides an overview of the infrastructure Aurora uses to provide its water supply, as well as the physical characteristics of the area that has the potential to influence groundwater.

1.1. Description of the Water Supply System

Aurora currently obtains its drinking water supply from seven active wells, which are completed in various aquifer material (**Table 1**). The existing 7 wells are located in various locations in and around Aurora. Wells 1, 2, 3, 4, and 5 are located within city limits and were completed prior to 2006. Wells 1 and 3 are connected by a mainline connection that runs along 4th St. Well 2 has a mainline connection on C St. Wells 6 and 7 are located north of Aurora along W 14th Road. Well 6 has a mainline connection that routes south and east to 16th St. which connects to Well 4 just north of the intersection with Highway 34. Similarly, Well 7 has a mainline connection that routes south along 1st St. Well 5 connects with this line from Well 7 at the intersection of Highway 34 and 1st St.

Table 1. Water Supply Well Information for Aurora, NE.

Local Well Number	NDNR Registration Number	Well Depth (ft bgs)*	Year Completed	Aquifer/Material	Status
1	G-028309	170	1956	Unknown	Active
2	G-028310	223	2005	Fine/Medium Gravel and Medium/Coarse Sand	Active
3	G-035327	248	1973	Clay/Gravel & Coarse Sand	Active
4	G-028307	192	1978	Clay/Fine and Coarse Gravel and Sand	Active
5	G-101011	218	1999	Clay/Fine Gravel and Coarse Sand	Active
6	G-179922	187	2016	Clay & Fine Sand	Active
7	G-187475	203	2019	Clay & Fine Sand	Active
*feet below ground surface					

1.2. Description of the Planning Area

The regional groundwater model includes all surface areas that drain into the Big Blue River and the Little Blue River, and all aquifers that impact surface water flows in these basins. The regional model covers approximately 12,000 square miles and stretches 120 miles north to south, and 190 miles east to west. The COHYST regional model includes the portion of the Platte River basin that reaches from the Colorado border to Columbus, Nebraska. It also includes all the aquifers that impact the surface water flows in its model domain. The COHYST model covers approximately 19,000 sq. miles, covering nearly 140 miles north to south and 150 miles east to west. The extent of each regional model and the overlap between them can be seen in **Figure 1**. The topography around the planning area is characterized by plains with bluffs and escarpments that give way to the Platte River valley, approximately 10 miles northwest of Aurora. The region is dominated with soils comprising of silt and clay classified as silty clay loam soil. The average annual precipitation for the planning area totals about 30.5 inches per year (High Plains Regional Climate Center [HPRCC] 2022).

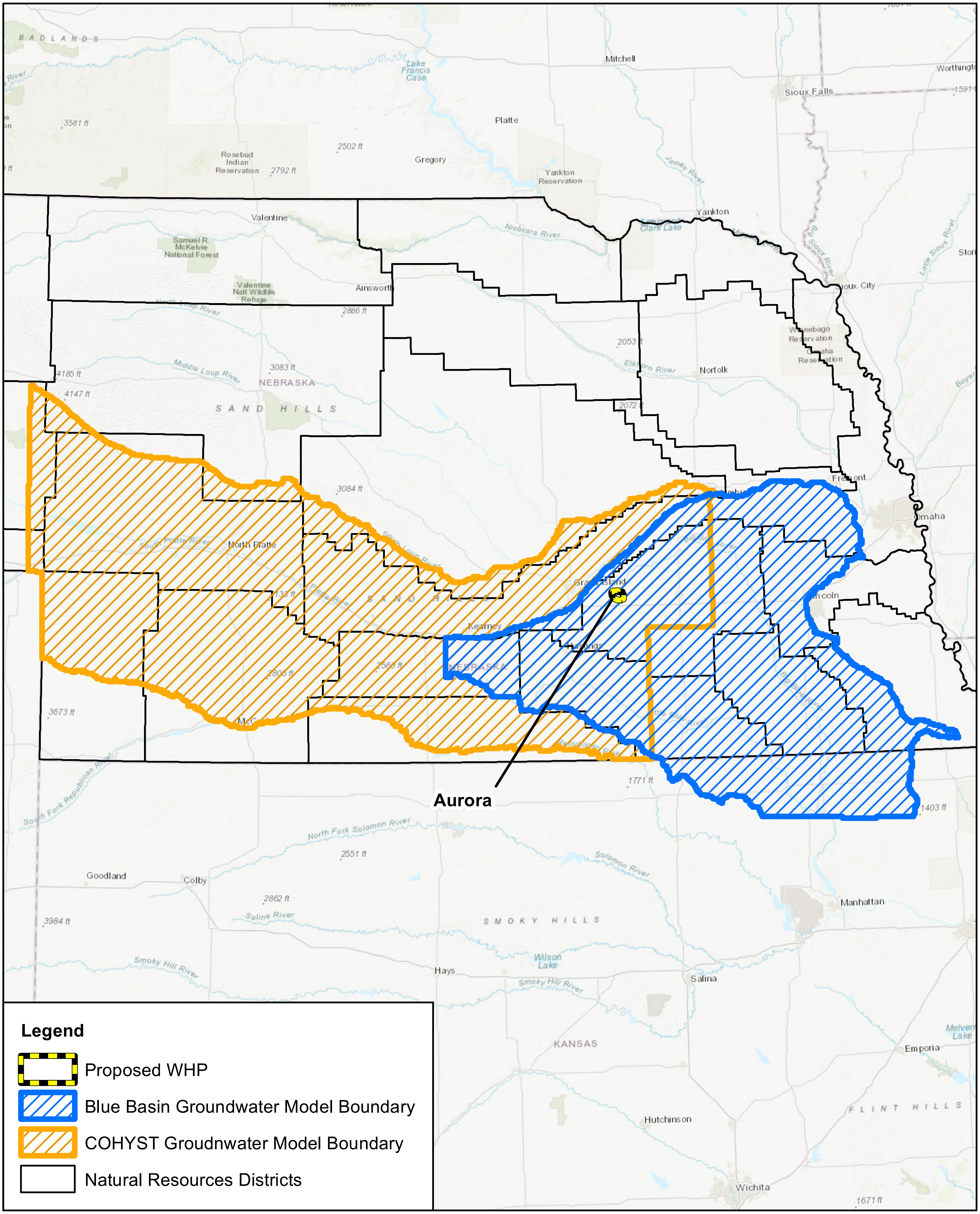
Aurora lies near the watershed divide of the Platte River and the Big Blue River. The Platte River flows northwest of Aurora, Big Blue River has a tributary, Lincoln Creek, that flows from the north through part of Aurora and its current WHP area and exits to the east. The Big Blue River is a perennial waterway that is included in the regional groundwater model and is fed by surface runoff and major confluences upstream but is not located within the current WHP area or planning area.

As part of the DWPMP, Aurora has updated the WHP area to include the source water area for two recently drilled municipal wells and proposed an extension of the WHP area to the 50-year time of travel (TOT) boundary. The planning area for this DWPMP is illustrated in **Figure 2**. The planning area covers 7,689 acres and extends well beyond the current 20-year WHP area as defined by NDEE, which was established in 2016 prior to the drilling of two new municipal wells. NDEE has encouraged communities completing a DWPMP to expand their WHP areas to the 50-year TOT boundary to be more protective of the resource and unlock funding resources for implementing BMPs in a larger area. The addition of two new municipal wells and the expansion to the 50-year TOT boundary results in an increase of 3,583 acres to the existing WHP area. The 50-year composite capture zone

Aurora has the authority to enforce the WHP area designation within their extraterritorial jurisdiction (ETJ), which extends 1 mile past the city limits. As of this writing, Hamilton County has not adopted a WHP overlay district. This causes any area outside of Aurora’s ETJ that is delineated within the proposed WHP area covering extending to the 50-year TOT boundary to not be enforced as the part of a WHP area. If Hamilton County does adopt a WHP overlay district, the part of the proposed WHP area outside of Aurora’s ETJ would be subject to Hamilton County zoning regulations regarding WHP areas.

1.3. Description of the Hydrogeologic Setting

Groundwater in the area in and around Aurora is encountered at depths ranging from a few feet to over 100 feet bgs (below ground surface). This large range in depth is due to the topography and subsurface geology in the area. Unconsolidated sediments deposited by rivers, wind, and glaciers overlay bedrock formations in and around Aurora. The unconsolidated sediments are thinnest in the valleys and thickest on the hilltops.



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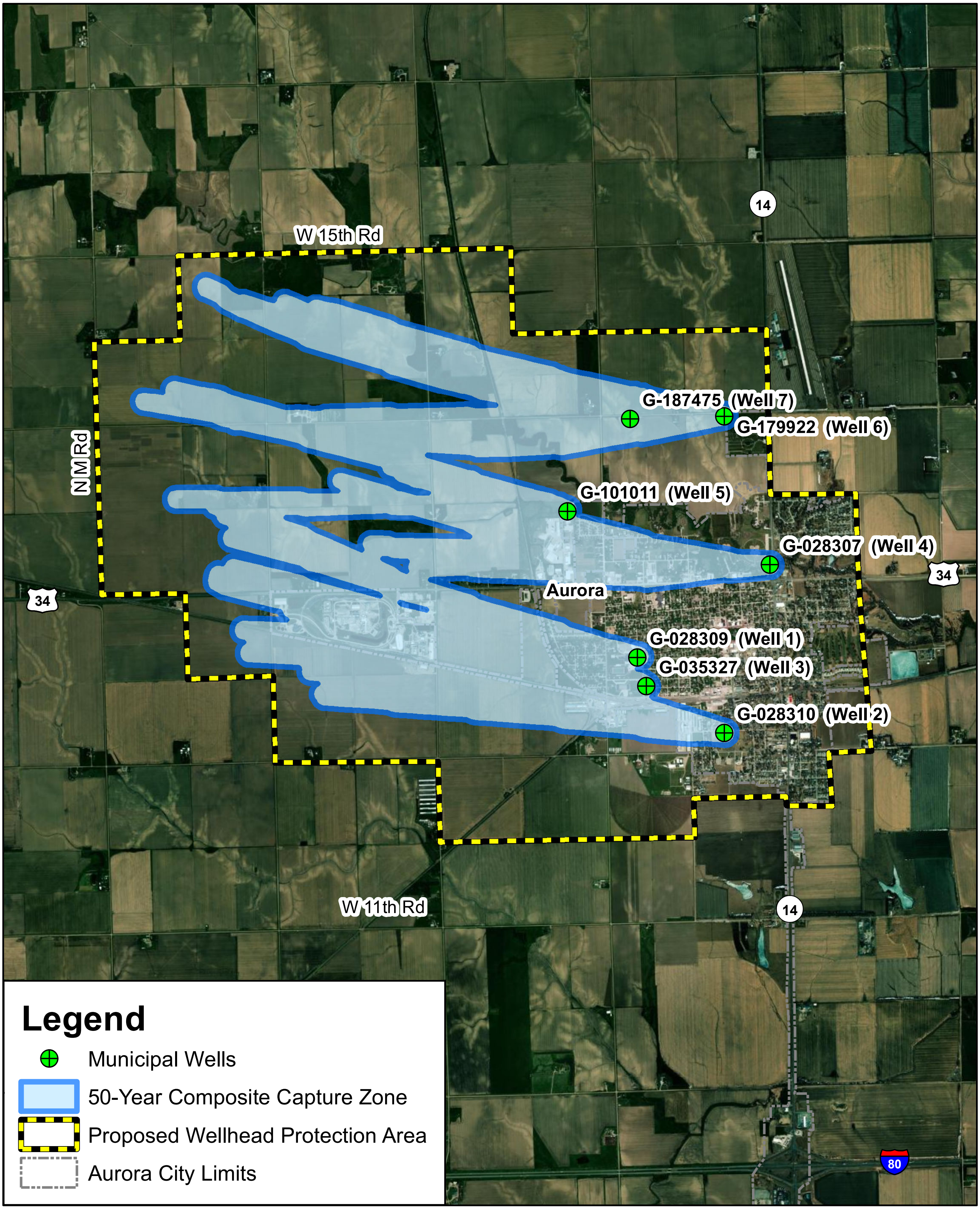
GROUNDWATER MODEL BOUNDARY COMPARISON

Groundwater Modeling Report
Aurora, Nebraska

FIGURE

1



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50-YEAR COMPOSITE CAPTURE ZONE

Drinking Water Protection Management Plan

Aurora, Nebraska

FIGURE

2

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The two types of aquifers in the Aurora area are unconsolidated sediments, called alluvial aquifers, and high plains aquifer which is made up of multiple hydrogeologic units. The primary source of water for Aurora is the High Plains aquifer also known as the Ogallala aquifer. It covers 84% of Nebraska and is a viable source of ground water due to its unconsolidated sands and gravel. Alluvial aquifers consist of sand and gravel deposits associated with modern stream valleys such as the Big Blue, Platte, and Missouri Rivers. These alluvial aquifers are hydrologically connected to the rivers above them, meaning that the water levels of the aquifer can fluctuate based on river flows. The alluvial aquifers of the Big Blue and Platte River come close to the current WHP boundaries but are not the primary source of water for Aurora.

1.3.1 Hydrostratigraphic Units

In the areas surrounding the Aurora municipal wells, Quaternary-aged deposits of unconsolidated sands and gravels make up majority of the planning area's geologic strata from depths of 10 to 350 ft in thickness (UNL-CSD 2022). These are underlain by the Niobrara Formation of the Late Cretaceous Period.

1.3.2 Groundwater Flow Direction

Modeling results show the primary groundwater flow direction to be from the west-northwest direction to Aurora's wells.

1.3.3 Aquifer Characteristics

Sand and gravel deposits associated with modern stream valleys such as the Big Blue, Platte, and Missouri rivers are known for their excellent water production capabilities. The aquifers are hydrologically connected to the streams, which means when river flows are high, groundwater levels are typically also high. The alluvial aquifers of the Big Blue River and Platte River extend close the WHP boundaries but are a not primary sources of water for Aurora. The High Plains Aquifer is a system of geologically similar and hydrologically connected units. The age of the water in the aquifer varies from 2.6 million to 10,000 years. The water saturated thickness also varies greatly, some areas are greater than 1,000 feet to less than a few feet in others. The High Plains Aquifer is made up of multiple hydrogeologic units, including the alluvial aquifers previously mentioned in addition to consolidated layers of sandstone and siltstone. The High Plains Aquifer's unconsolidated sands and gravels from the Quaternary period are Aurora's primary source of water.

All of Aurora's municipal wells are completed in the Quaternary-aged High Plains Aquifer which is the focus of this study and the Blue Basin and COHYST groundwater models, as detailed in **Table 2**. Information on the aquifer properties from the Blue Basin and COHYST models at the well locations is provided in **Tables 3 and 4**, respectively.

Table 2. Description of the major aquifers within the planning area.

Aquifer	Attribute	Descriptor	Data Source
Unconsolidated Quaternary Sands & Gravels	Aquifer Material	Sand and gravel	UNL-CSD and NDNR Well Logs
	Primary Porosity	0.15	Blue Basin & COHYST Model Data
	Aquifer Saturated Thickness	230-370 feet	Blue Basin & COHYST Model and UNL-CSD Data (2022)
	Stratigraphic Top Elevation	Variable	Blue Basin & COHYST Model Data
	Stratigraphic Bottom Elevation	Variable	Blue Basin & COHYST Model Data
	Hydraulic Confinement	Unconfined	Blue Basin & COHYST Model Data
	Hydraulic Conductivity	70-80 ft/d	Blue Basin & COHYST Model Data

Table 3. Aquifer characteristics used in the Blue Basin Model (NDNR 2013).

Local Well Number	NDNR Registration Number	Well Depth (ft bgs)	Aquifer Thickness (feet)	Horizontal Hydraulic Conductivity (feet per day)	Porosity (percent)
1	G-028309	170	358.6	75	15
2	G-028310	223	363.6	75	15
3	G-035327	248	358.2	75	15
4	G-028307	192	329.8	75	15
5	G-101011	218	326.4	75	15
6	G-179922	187	338.9	75	15
7	G-187475	203	329.4	75	15

Table 4. Aquifer characteristics used in the COHYST model (COHYST 2017).

Local Well Number	NDNR Registration Number	Well Depth (ft bgs)	Aquifer Thickness (feet)	Horizontal Hydraulic Conductivity (feet per day)	Porosity (percent)
1	G-028309	170	276.2	79.9	15
2	G-028310	223	281.9	79.9	15
3	G-035327	248	271.7	79.9	15
4	G-028307	192	257.5	79.9	15
5	G-101011	218	253.1	79.9	15
6	G-179922	187	238.3	79.9	15
7	G-187475	203	240.9	79.9	15

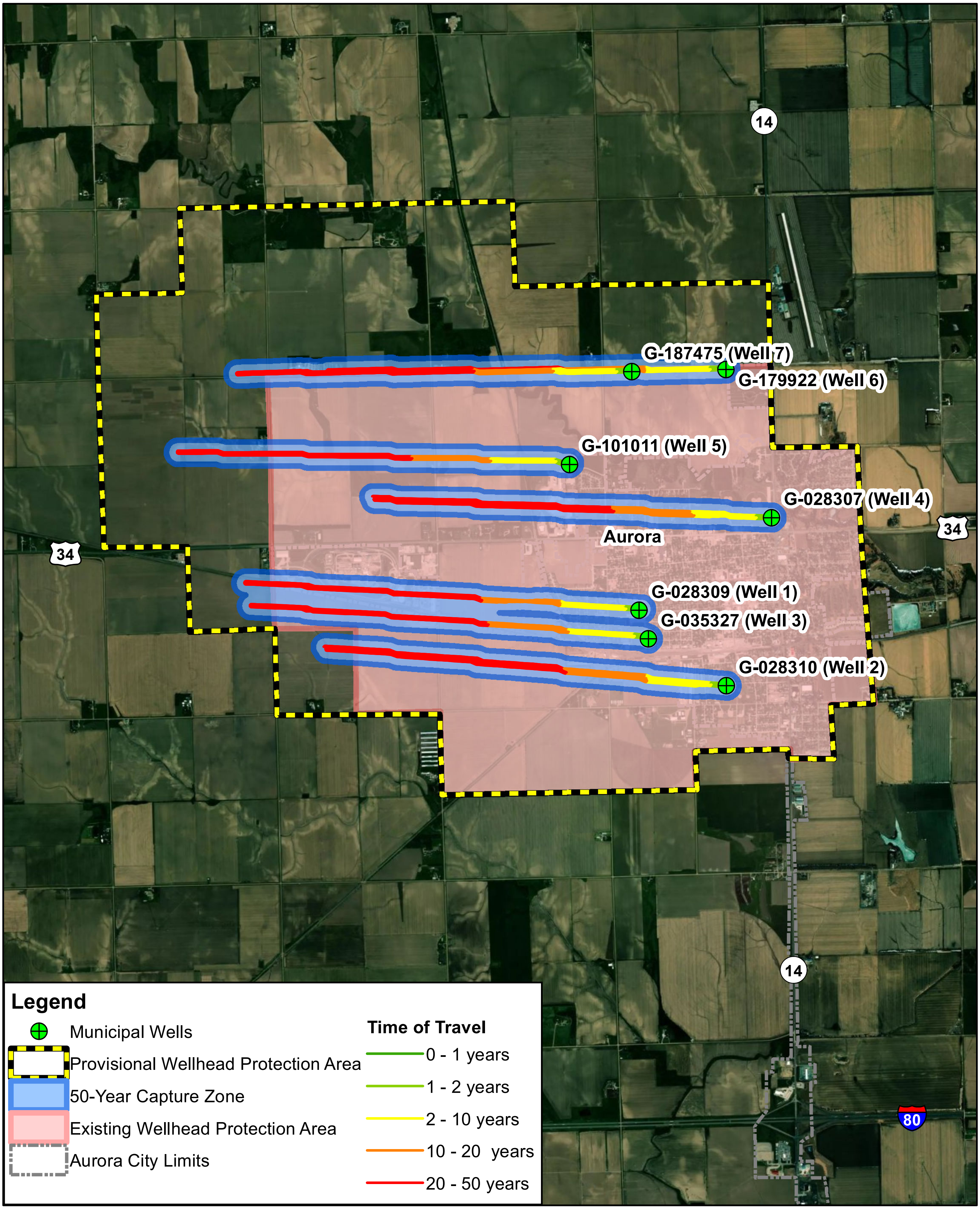
2. DELINEATION OF THE WELLHEAD PROTECTION AREA

This section includes information on how the recommended 50-year TOT capture zone was developed through groundwater modeling of the aquifer systems. NDEE will use this recommendation to determine the appropriate WHP area for Aurora.

2.1. Methodology

The development of a DWPMP requires the development of a three-dimensional groundwater model to estimate the 50-year time of travel groundwater flow paths. This DWPMP uses two three-dimensional groundwater models; the Blue Basin model was developed by the NDNR in contract with HDR Engineering, Inc and the COHYST model was developed by a collaboration of entities (NDNR 2013; COHYST 2017). These models were developed to match NDNR's methodology of evaluating a basin's situation. The methodology involves using historic stream gage and diversion records to compute the basin water supply for streams within the region. To compute the basin water supply, the historic streamflow, historic surface water consumptive use, and historic groundwater depletions must be known. Groundwater models were needed to compute historic groundwater depletions, as well as provide water supply and use analysis tools. The groundwater flow fields are calculated by MODFLOW using model parameters such as hydraulic conductivity and aquifer saturated thickness. MODPATH is a program that uses the groundwater flow field generated in a MODFLOW model to estimate the time of travel groundwater flow paths (Pollock 2016).

Figure 1 highlights the Blue Basin groundwater model in blue and the COHYST groundwater model in orange, both which were used for the proposed WHP area delineation. The 50-year time of travel flow paths from the Blue Basin and COHYST models run under normal, wet, and dry scenarios were combined to form a conservative estimate of the 50-year capture zone, as shown in **Figure 2**. In **Figures 3 and 4** the capture zones were drawn around the 50-year time of travel groundwater flow paths from the Blue Basin and COHYST groundwater models under normal climatic conditions, respectively.



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TIME OF TRAVEL PATHWAYS FROM BLUE BASIN MODEL
Groundwater Modeling Report
Aurora, Nebraska

FIGURE 3

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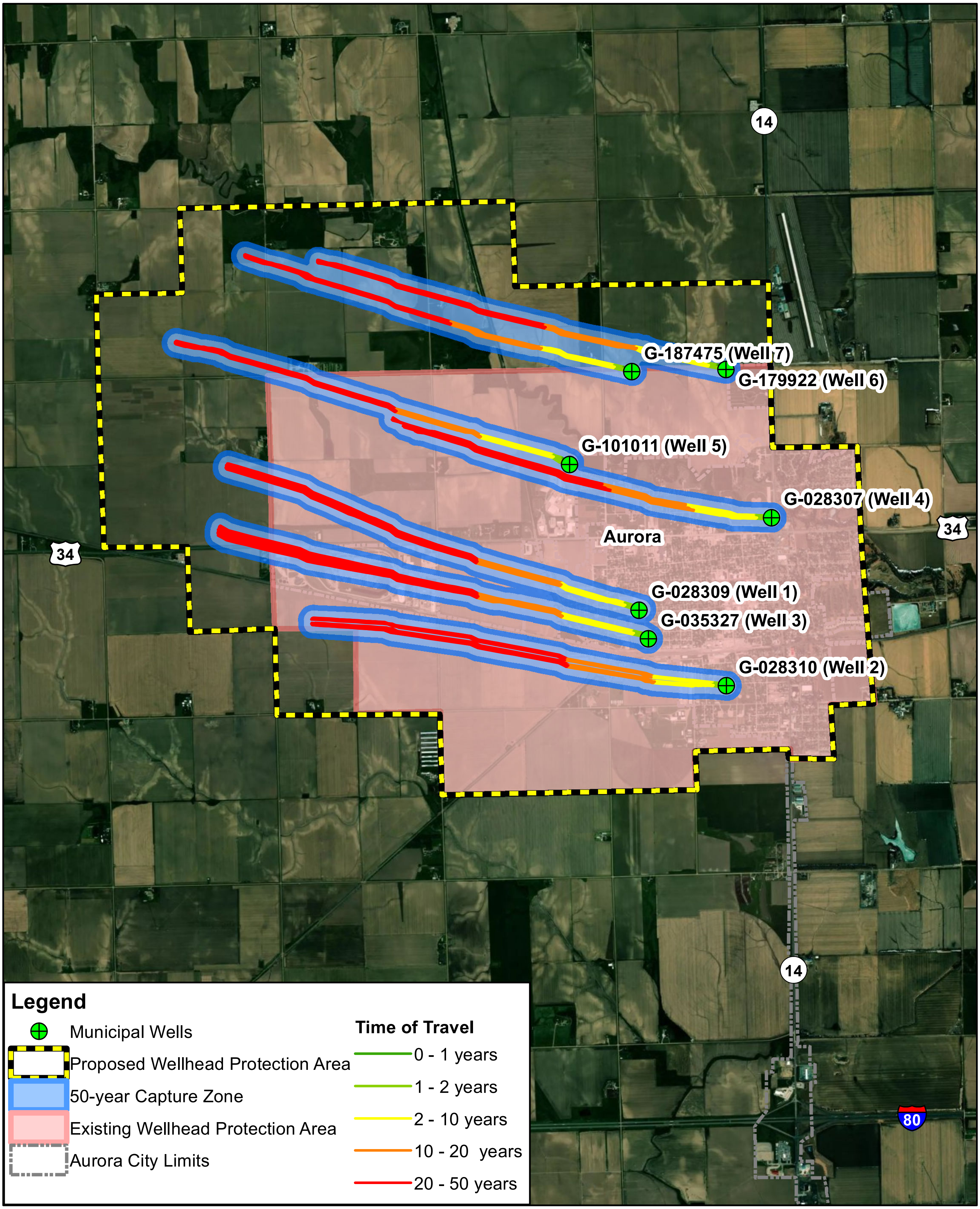

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TIME OF TRAVEL PATHWAYS FROM COHYST MODEL

Groundwater Modeling Report
Aurora, Nebraska

FIGURE 4

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2.2. Modeling Parameters

2.2.1 Blue Basin Model

The Blue Basin model domain includes all surface areas that drain into the Big Blue River and the Little Blue River, and all aquifers that impact surface water flows in these basins. Boundaries of the model were determined using physical boundaries where possible. The northern border of the model follows the Platte River. To the southwest, the model boundary traces the groundwater divide between the Little Blue and Republican River basins. The northeast boundary follows Salt Creek to its confluence with the Platte River. The southeast boundary coincides with the aquifer boundary at the South Fork and North Fork of the Big Nemaha River. Due west and south boundaries of the model do not follow physical boundaries because none were determined practical during model construction. The grid was aligned with cardinal directions in NAD 1983 Nebraska State Plane Coordinate System. The vertical datum used for the model was the North American Vertical Datum of 1988.

2.2.1.1. Hydrogeologic Model Layers

Beginning model development originally included a single layer to simulate the principal aquifer. However, dry model cells in the southern portion of the model area contributed to model convergence and stability issues. To address this, a second layer was added to better replicate areas where stream incision has gone through unconsolidated deposits and into bedrock. The second layer is meant to simulate bedrock underlying the principal aquifer. The top of layer 1 was taken to be the land surface, which was derived from a mix of Light Detection and Ranging (LiDAR) data and Digital Elevation Model (DEM) data. LiDAR data in the area has a 2-meter resolution, while the DEM data has a 10-meter resolution. The bottom of this first layer was determined to be the base of the principal aquifer, which was taken from the UNL Conservation Survey Division (UNL-CSD) contour map of the Base of the Principal Aquifer. For model areas in Kansas, aquifer thickness was estimated based on geologic cross sections and structural contour maps. A uniform thickness of 125 feet was used for layer 2.

2.2.1.2. Aquifer Properties

Initial horizontal hydraulic conductivity values were set using geologic data from the UNL CDS Test Hole database. A total of 465 test holes were used in the model area to create the hydraulic conductivity distribution. Vertical hydraulic conductivity was assumed to be one order of magnitude less than the horizontal hydraulic conductivity. Grouping of areas with homogenous hydraulic conductivity was done to improve calibration efficiency. In layer 2, which represents less permeable bedrock, horizontal hydraulic conductivity was set to 5 ft/day and vertical hydraulic conductivity was set to 0.5 feet per day. Calibrated horizontal hydraulic conductivities ranged from 25 to 200 feet per day in layer 2 (**Figure 5**).

2.2.1.3. Pumping and Recharge

Pumping for irrigation in Nebraska was determined using land use data and crop irrigation requirements. The land use dataset was updated for the purpose of this model and represents irrigated and dryland acres through time. The dataset was not meant to represent actual land use on a farm by farm basis. Crop net irrigation requirements (NIR) are estimates of the water required to grow a specific crop type. The soil-moisture balance model, called CropSim, used by the Blue Basin model computes NIR in inches for each crop type by model cell on a monthly basis. The NIR calculations use precipitation records from nearby weather stations to account for dry and wet periods (NDNR 2013). By combining land use data and NIR, volumetric groundwater pumping rates were computed. Domestic, municipal, and industrial pumping were not included in the model, but would constitute a small portion of the overall groundwater pumping in the model (NDNR 2013).

Recharge represents the portion of water that drains below the root zone and into the aquifer. Direct recharge, or field recharge, is calculated for each model cell by CropSim using soil type, precipitation, irrigation method, and soil water content data. Recharge in the Blue Basin model tends to be higher in the eastern portion of the model domain than in the west (**Figure 6**).

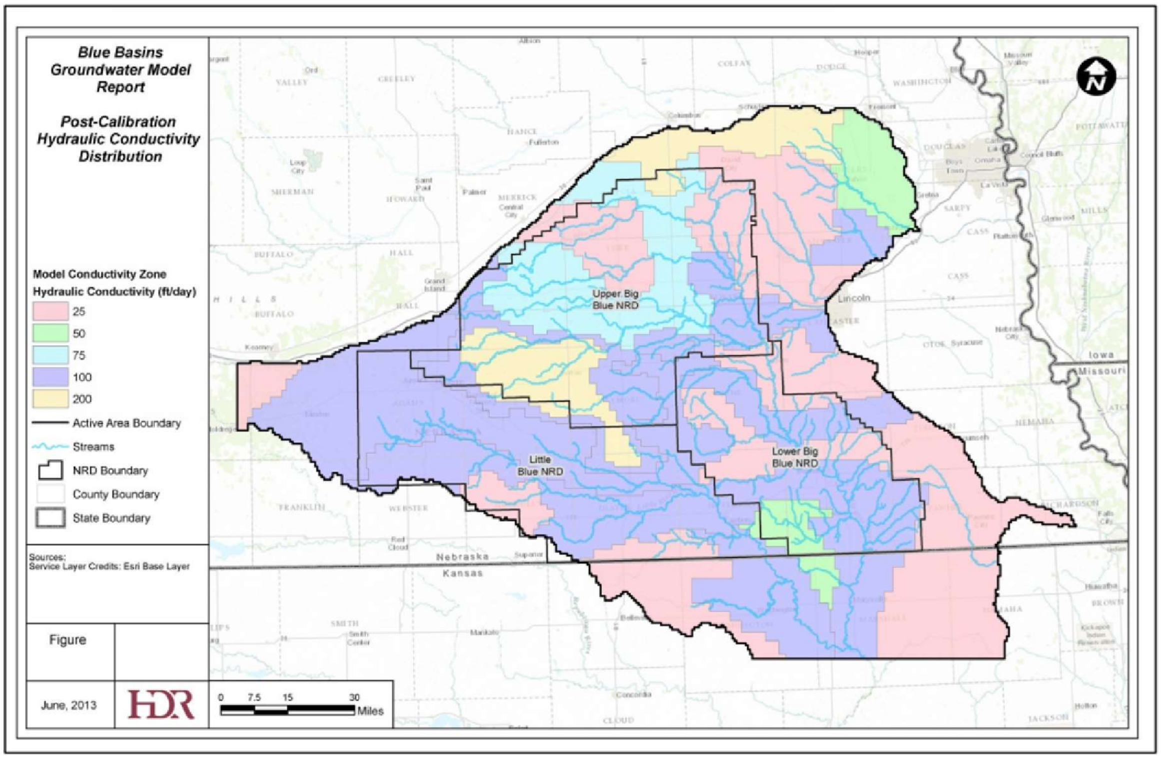


Figure 5. Calibrated horizontal hydraulic conductivity values used in the Blue Basin groundwater model (NDNR 2013).

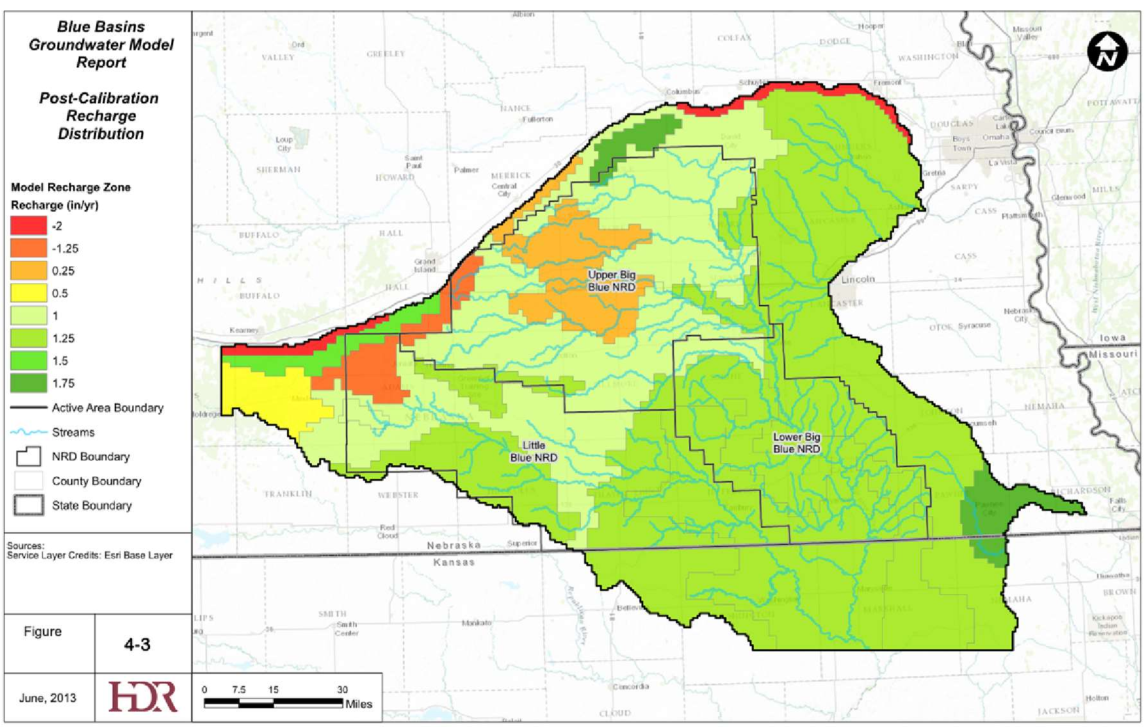


Figure 6. Calibrated recharge zones and average annual rates in the Blue Basin model (NDNR 2013).

2.2.2. COHYST MODEL

The COHYST model domain includes the surface areas that drain into the Platte River before Columbus, Nebraska and after the Colorado border. The domain also extends to include the inter-basin connections the Platte River has with the Loup, Blue and Republican River basins. The boundaries are geographic and political. To the north the model extends to the Loup River and continues south until the Republican River. The western border of the model is the Colorado border, and to the east it extends through Polk, York, Clay and Nuckolls County.

2.2.2.1. Hydrogeologic Model Layers

The COHYST model represents the High Plains Aquifer in the model area as a single layer. The base of aquifer coverage was constructed from a database of test hole logs from historical drilling programs conducted by the UNL-CSD and the USGS. Thirty-four new test holes were drilled by the UNL-CSD for the purpose of the COHYST model construction. Land surface elevation for the top of the model was taken from 10-meter DEM.

2.2.2.2. Aquifer Properties

Hydraulic conductivity values were calculated using data from Nebraska's database of registered wells. The ratio of specific capacity and developed aquifer thickness was found by dividing the well pumping rate by the static pumping level and well depth. Kriging was then used to develop a distribution of values across the model area from the well point data. Initial hydraulic conductivity zones were determined by grouping similar values. These initial zones were manually edited to address issues of small, isolated zones and adjacent areas with highly contrasting values.

Hydraulic conductivity values were adjusted during calibration by using computed and observed water levels for reference. The final calibrated hydraulic conductivity values used in the model range from 20 ft/day to 150 ft/day (**Figure 7**).

2.2.2.3. Pumping and Recharge

Groundwater pumping for irrigation was determined using land use data and crop irrigation requirements. The land use dataset developed for COHYST was created to represent irrigated and dryland acres through time and be validated at the county scale. The dataset was not meant to represent actual land use on a farm-by-farm basis. Land use for the model was developed for the years 1950 to 2007 and compared to Census of Agriculture information. To determine dryland and irrigated parcels, the COHYST model developers used data from the Center for Advanced Land Management Information Technologies (CALMIT) and remote sensing. Certified acres were used to determine if an irrigated parcel was irrigated using groundwater. In places where certified acres datasets were not available, taxable irrigated land information was obtained from the county assessor's office. Adjustments were made to land use based on the county-wide Census of Agriculture data.

Crop net irrigation requirements (NIR) are estimates of the water required to grow a specific crop type. The watershed model used by COHYST computed NIR in inches for each crop type by model cell on a monthly basis. The NIR calculations used precipitation records from nearby weather stations to account for dry and wet periods. By combining land use data and NIR, volumetric groundwater pumping rates were computed. Average annual groundwater pumping for irrigation amounts to just over 1.9 million acre-feet per year model wide.

Municipal, domestic, and industrial pumping in the model were included based on a dataset consisting of monthly pumping values. Information to build this dataset was gathered from the following sources:

- NDNR
- Central Platte, Tri-Basin, and Twin Platte Natural Resources Districts
- USGS
- NDEE
- U.S. Census Bureau

Actual pumping data for 48 municipalities within the model area was accounted for. Data was also compiled for 28 self-supplied industries and 9 industries whose use is supplied by a municipality (see Appendix A). Data was self-reported through information obtained from the NDNR through an industrial water survey or other means. If no data was available from a city for a particular year, an estimate of pumping was made using interpolated population data and a representative per capita demand estimate. There were many instances of missing data for smaller municipalities. Average annual municipal and industrial (M & I) pumping amounts to just over 67,000 acre-feet per year model-wide (**Figure 8**).

Recharge represents the portion of water that drains below the root zone and into the aquifer. Recharge in the COHYST model can be grouped into two categories: direct recharge from the field, and indirect recharge as a result of runoff. Direct recharge, or field recharge, was calculated for each model cell by the watershed model using soil type, precipitation, irrigation method, and soil water content data. Indirect recharge is calculated using a series of equations and partitioning models further explained in the COHYST model documentation (COHYST 2017).

Average annual recharge for the model area amounted to approximately 3 inches per year, specifically 2.58 inches of direct recharge and 0.42 inches of indirect recharge (see Figure 4). Spatially, recharge tends to be higher in the eastern half of the model domain than in the western half due to increased precipitation (**Figure 9**).

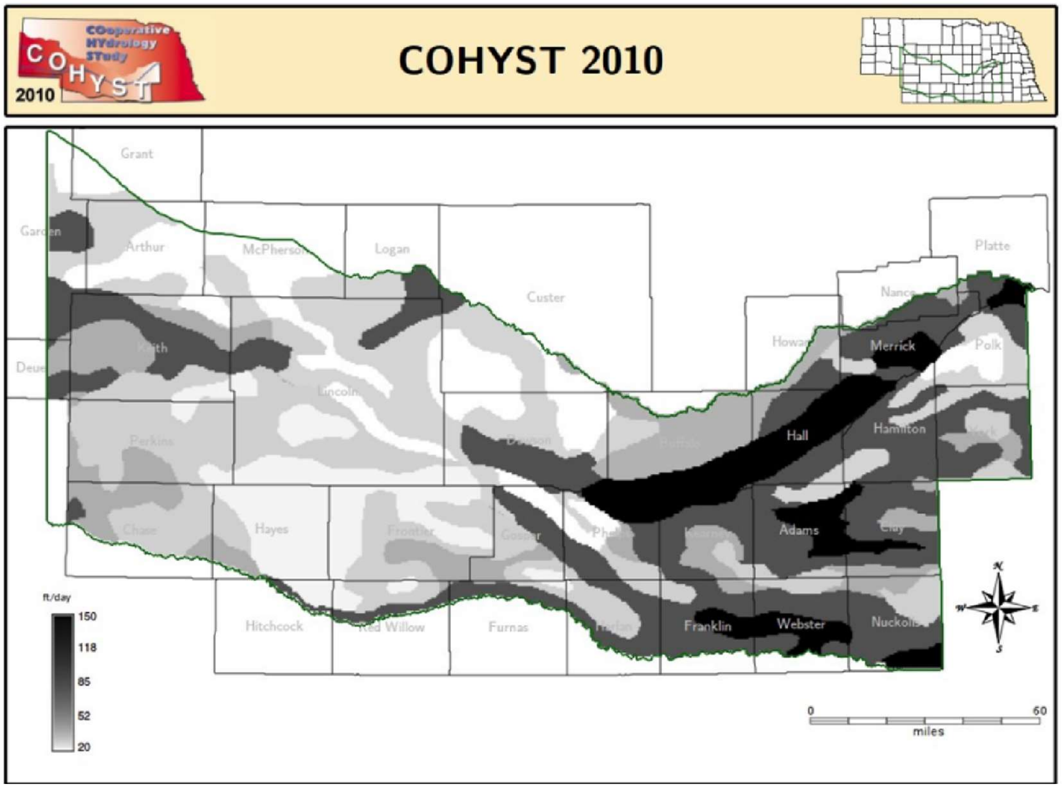


Figure 8. Calibrated horizontal hydraulic conductivity values used in the COHYST model (COHYST 2017).

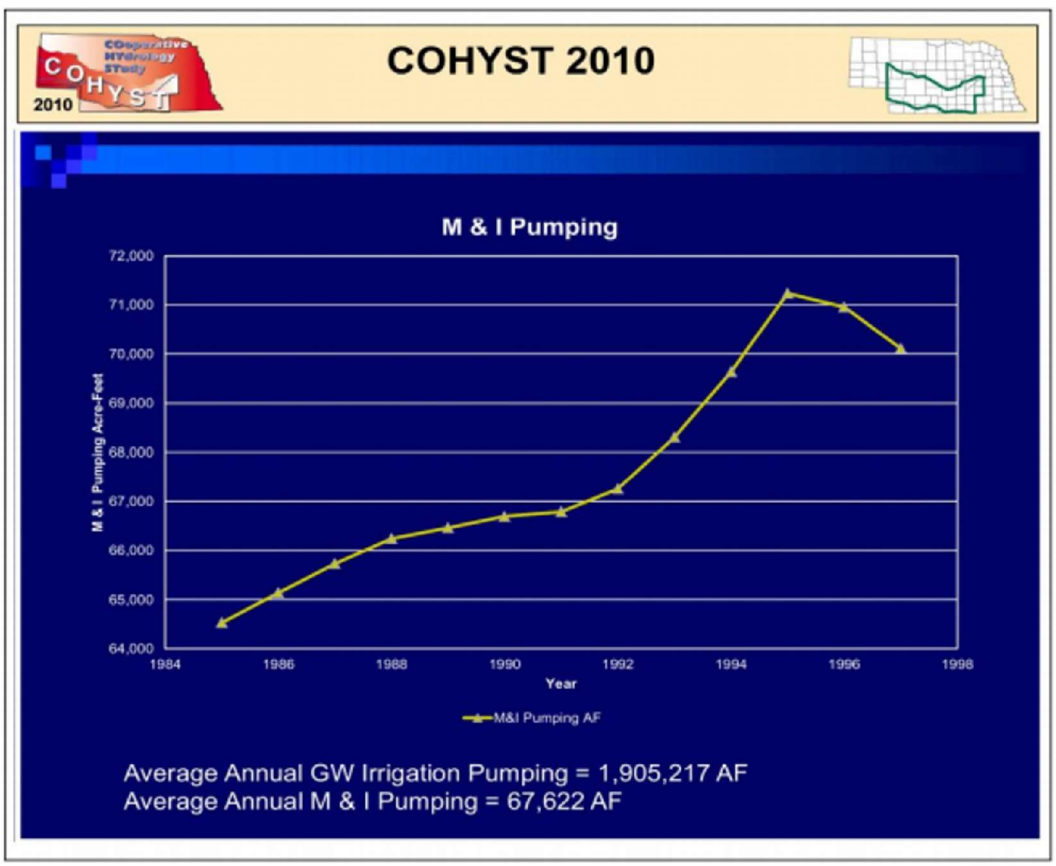


Figure 7. Annual M & I pumping in the COHYST Model (COHYST 2017).

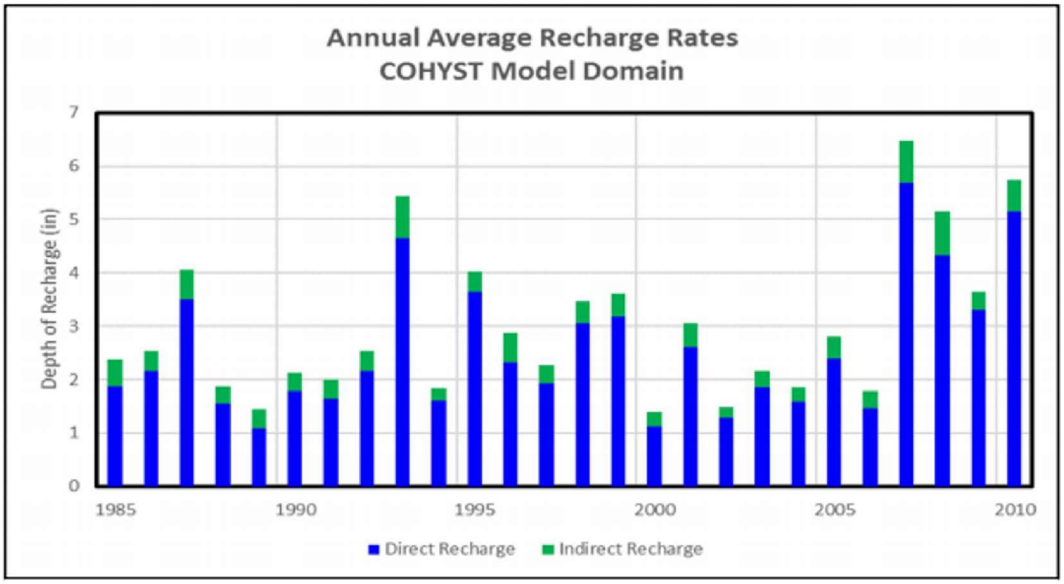


Figure 9. Average annual recharge in inches in the COHYST model (COHYST 2017).

2.3. Model Baseline Scenarios

2.3.1 Blue Basin Model

As stated above, each groundwater model was set up to include three baselines with separate climatic conditions: wet, dry, and normal. Wet and dry baselines were determined by reviewing the model water budget and identifying a particularly wet or dry stress period throughout the simulation. The normal baseline is defined by a stress period that represents average conditions. The modeling simulations were completed using Olsson's Groundwater Evaluation Toolbox (GET), which is a cloud-based platform used for completing groundwater model runs and viewing output in charts and graphs. GET used the model input files from the identified stress periods (wet, dry, normal) to create a flow field in which the TOT lines were calculated. The Blue Basin model was set up in GET using the wet month of June 1993, the dry month of July 2002, and the normal month of July 2009.

It was determined during the QA/QC analysis of GET that the difference in TOT lines produced by the wet, dry, and normal baselines were not significant (Olsson 2018). Small variations in TOT line length and orientation between the tested cases were attributed to differences in groundwater pumping and recharge during wet and dry periods. It is Olsson's recommendation that during development of WHP areas, the areas are drawn to incorporate this variability in TOT line length and orientation by including approximately ¼ to ½ mile beyond the normal year TOTs.

2.3.2. COHYST Model

Similarly, wet and dry baselines for COHYST were determined by reviewing the model water budget and identifying a particularly wet or dry stress period throughout the simulation. The normal baseline is defined by a stress period that represents average conditions. GET uses the model files from these identified stress periods to create a flow field in which the TOT lines are calculated. The COHYST model was set up in GET using the wet month of June 1993, the dry month of July 2002, and the normal month of July 2007.

It was determined during the QA/QC analysis of GET that the difference in TOT lines produced by the wet, dry, and normal baselines were not significant (Olsson 2018). Small variations in TOT line length and orientation between the tested cases were attributed to differences in groundwater pumping and recharge during wet and dry periods. It is Olsson's recommendation that during development of WHP areas, the areas are drawn to incorporate this variability in TOT line length and orientation by including approximately ¼ to ½ mile beyond the normal year TOTs.

2.4. Model Uncertainty

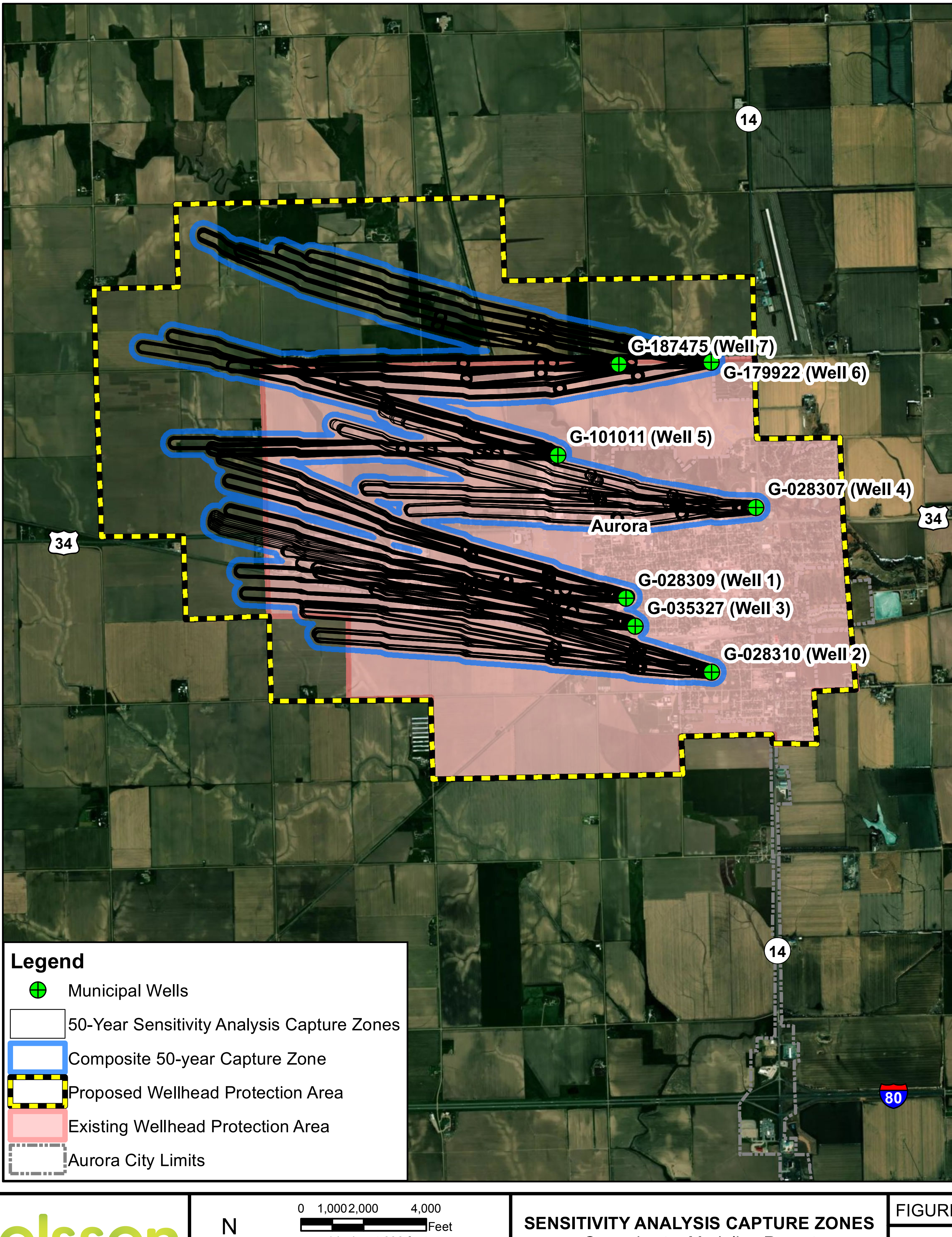
Several simplifying assumptions must be made about the hydrogeologic system in a groundwater model. Knowledge about the aquifer geometry and characteristics is limited by the quantity and quality of discrete data points. Interpolation and assumptions are necessary to supplement gaps in the data. As such, there will always be some degree of uncertainty associated with model results.

As proven by the sensitivity analysis, several model parameters can be adjusted within a reasonable range to produce similar groundwater flow paths to the baseline scenario. To account for this uncertainty, a composite 50-year capture zone was delineated around all of the resulting groundwater flow paths from the sensitivity analysis at each well (**Figure 10**).

3. RECOMMENDATIONS

The 50-year capture zone for Aurora is a composite area of the individual capture zones produced by the sensitivity analysis of the baseline capture zone of the Blue Basin and COHYST models (**Figure 10**). These composite capture zones were used in the creation of the proposed WHP area used throughout the DWPMP. The final WHP area will be determined by NDEE following their review of this report and the DWPMP, discussions with project stakeholders, and collaboration with Hamilton County Planning and Zoning.

The general direction of groundwater flow paths computed by the Blue Basin and COHYST models is not likely to change significantly with further evaluation. The total length of the flow paths, however, is susceptible to change when adjusting the model parameters. To address this, concatenating the capture zones resulting from changes made to model parameters produces a conservative estimate of the area to be protected.



1 inch = 4,000 feet
Original Published Resolution
NAD 1983 StatePlane Nebraska FIPS 2600 Feet
ESRI World Imagery

olsson

SENSITIVITY ANALYSIS CAPTURE ZONES
Groundwater Modeling Report
Aurora, Nebraska

FIGURE
10

F:\2021\05001-05500\021-05223\40-Design\GIS\Maps\Wellhead Map\23-04-19_WTRS_ModRep_Sensitivity.mxd PUBLISHED BY: jhinnant DATE: April 19, 2023

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APPENDIX B

ADDITIONAL INFORMATION ON COMPARISON OF MODELED NITRATE LOSSES

MODELED NITROGEN LOSSES AND NITRATE LEACHING LOAD ESTIMATES

Prepared for:

The City of Aurora, Nebraska

February 2023

Olsson Project No. 021-05223

ACRONYMS AND ABBREVIATIONS

ac .... acres
DWPMP .... Drinking Water Protection Management Plan
EPA .... Environmental Protection Agency
lbs .... pounds
MCL .... Maximum Contaminant Load
mg/L .... milligrams per liter
PLET .... Pollutant Load Estimation Tool
USDA .... United States Department of Agriculture
USGS .... United States Geological Survey

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SUMMARY

Olsson was contracted to develop a Drinking Water Protection Management Plan (DWPMP) as part of a broader effort to expand Aurora's wellhead protection (WHP) area to include two newly built municipal wells. The DWPMP meets the requirements for an alternative to an Environmental Protection Agency (EPA) 9-Element Watershed Management Plan Watershed Management Plan. One of the requirements of developing a watershed plan is to estimate pollutant loads. Olsson used the Natural Resource Conservation Service's (NRCS) Environmental Policy Integrated Climate (EPIC) model, EPA's Pollutant Load Estimation Tool (PLET), and the University of Nebraska's Economically Optimum Nitrogen Rate (EONR) Algorithm to model nitrogen losses and nitrate leaching load estimates within the planning area, the 50-year time of travel (TOT) boundary. This report includes tables detailing the source of the information used in the pollutant load estimations in the DWPMP, the calculations for amounts, and the results of the model calculations. This report is included as a technical supplement to Aurora's DWPMP.

1. INTRODUCTION

Pollution sources are often categorized as either point sources or nonpoint sources. The distinction is important to explain because the type of pollution can have significant impacts on the distribution and migration of the pollutants. Nonpoint source pollution results from many diffuse sources. This is in direct contrast to point source pollution, which results from a single source. According to the EPA, nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification (USEPA 2019). The primary issue of concern for Aurora's drinking water supply is the concentration of nitrate in groundwater which comes from nonpoint sources. The maximum contaminant load (MCL) for nitrate-nitrogen in drinking water is 10 mg/L and Aurora has had municipal wells sampled at levels higher than this MCL.

According to the EPA guidance document called the National Management Measures to Control Nonpoint Source Pollution from Agriculture, commercial fertilizers and manure are the primary sources of crop nutrients for agriculture (USEPA 2003). The crop nutrient nitrogen is naturally present in soils. But in most areas, it must be added to the soil to meet the crop production needs. Nitrogen is added to the soils by applying commercial fertilizers and manure. As reported in the guidance document, in parts of the country, it is assumed that only 50 percent of the applied nitrogen is assimilated by crops during the year of application (USEPA 2003).

As excess nitrate leaches into deep soil, it may accumulate at varying depths depending on soil conditions and density (Wortman, et. al. 2020). The rate of nitrate movement does not necessarily correlate to the rate of water movement to the aquifer. In fact, leaching of nitrate in silt loam soils over aquifers may take 25 to 30 years to travel to the aquifer about 100 ft below the soil surface (Shaver et al. 2014). It is possible that even with no excess nitrogen applied for crop production or from other sources, nitrate-nitrogen may continue leaching into the groundwater for several years. Even with this delay, immediate action to reduce nitrogen loading will begin to lower help to lower nitrate-nitrogen concentrations in groundwater sources in future years. To estimate nitrate and other pollutant loads in an area, three model approaches were evaluated.

1.1 NRCS Environmental Policy Integrated Climate (EPIC) Model

In a 2006 report modeling simulations of soil and nutrient losses and changes in soil organic matter content associated with crop production, the NRCS provided estimates of nitrogen losses to varying environmental pathways (Potter, et al, 2006). The NRCS used the physical process model EPIC (Environmental Policy Integrated Climate) to estimate surface water runoff, percolation, wind erosion, sediment loss, nutrient loss, and changes in soil organic carbon for several regions and cropland types throughout the U.S by conducting over 750,000 EPIC model runs.

EPIC simulates nitrogen exports from the field in two forms: crop removal and losses to the air and water. Nitrogen contained in the plant material is partitioned between that which is removed from the field with the harvested crop yield and that portion remaining in the residue which is added into the organic pools. Nitrogen losses include nitrates dissolved in surface runoff, percolation (leachate), and lateral subsurface flow; organic nitrogen attached to wind and waterborne sediment; and ammonia and nitrogen oxides lost to the atmosphere.

Selected results specific to corn and soybean production in the Upper Midwest and Northern Great Plains of the U.S. from the NRCS EPIC model runs are shown in **Table 1**. Eastern Nebraska is within the Northern Great Plains, adjacent to the Upper Midwest region. It is appropriate to consider both regions in estimating nitrate losses and leaching since the area of interest is close to the boundary between regions, the average percent losses were used for nitrate loss calculations (**Tables 1 and 2**) .

The data show that typical nitrogen losses in the Northern Great Plains and the Upper Midwest U.S. averages approximately 51 lbs per acre per year for corn crops, and approximately 28 lbs per acre per year for soybean crops. About 50 percent of the nitrogen loss is from volatilization to the atmosphere (average 25.6 lbs/acre/year from corn to about 14 lbs/acre/year from soybean crops). The NRCS modeling study indicates that an average of approximately 12.5 percent of nitrogen loss for corn crops is leached to groundwater, or approximately 6.45 lbs of nitrogen per acre per year. The modeling also shows that approximately 9 percent of nitrogen loss in soybean crops is leached to the subsurface, or about 2.75 lbs/acre/year.

Table 1 Nitrogen Loss Pathways and Estimated Amounts from EPIC Model Simulation Runs

Region	Crop		Volatilized	Dissolved in surface water runoff	Dissolved in leachate	Dissolved in lateral subsurface flow	Lost with waterborne sediment	Lost with windborne sediment	Sum of all loss pathways
	(1,000s of Acres)		(lb/a)	(lb/a)	(lb/a)	(lb/a)	(lb/a)	(lb/a)	(lb/a)
Northern Great Plains	Corn	15,466	28.2	2.7	3.6	0.8	8.0	7.7	50.9
	percent loss		*55.4*	*5.3*	*7.1*	*1.6*	*15.7*	*15.1*	
	Soybeans	9,562	13.3	0.5	0.7	0.2	5.7	3.7	24.2
	percent loss		*55.0*	*2.1*	*2.9*	*0.8*	*23.6*	*15.3*	
Upper Midwest	Corn	47,941	23.0	2.3	9.3	0.6	16.0	0.6	51.7
	percent loss		*44.5*	*4.4*	*18.0*	*1.2*	*30.9*	*1.2*	
	Soybeans	40,049	14.6	1.4	4.8	0.5	11.1	0.2	32.5
	percent loss		*44.9*	*4.3*	*14.8*	*1.5*	*34.2*	*0.6*	

Source: S. Potter, et. al. Model Simulation of Soil Loss, Nutrient Loss, and Change in Soil Organic Carbon Associated with Crop Production. NRCS 2006.

1.2 EPA Pollutant Load Estimation Tool (PLET)

Using PLET, the annual nutrient load is estimated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as land use distribution and management practices (USEPA 2023). The annual sediment load from sheet and rill erosion is calculated based on the Universal Soil Loss Equation and the sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using the known BMP efficiencies.

The following inputs were used to estimate the natural versus anthropogenic nitrate load:

- NLCD land cover data (USGS 2011) – from the PLET Input Data Server
- Nitrate concentration in groundwater from Aurora
- Agricultural census data of livestock counts (USDA 2017)
- Hydrologic soil group (NRCS 2019) – essentially the entire watershed is classified as hydrologic group C

The modeled nitrogen losses and leaching load estimates from PLET are described in **Tables 2 and 3**. PLET does not indicate nitrogen loss to leaching or volatilization, nitrogen losses from corn and soybean acreages calculated in the PLET are associated with runoff.

1.3 University of Nebraska Economically Optimum Nitrogen Rate Algorithm

The University of Nebraska developed an algorithm for determining the Economically Optimum Nitrogen Rate (EONR) for crop production in Nebraska (Wortman, et. al. 2020). The algorithm is supported by the following nitrogen management concepts: the timing of application, fertilizer use efficiency, and reduction of nitrogen fertilizer. The EONR Algorithm details that a mismatch in the timing of nitrogen fertilizer application, summer rainfall, and the nitrogen use of corn crops lead to increased leaching and runoff potential at certain times of the growing season (Wortman, et al. 2020). Using the EONR algorithm, researchers at the University of Nebraska have determined that the optimal nitrogen fertilizer rate for corn production is approximately 174 pounds per acre on fine-textured (silty loam or finer texture) soils, as is typically found in southeast Nebraska. Based off the EONR Algorithm, researchers found that growers in Nebraska may be applying 20-30 lbs/ac more than the economically optimum nitrogen rate needed for the crop. The excess fertilizer nitrogen has an average recovery efficiency of only 24 percent for corn after corn and 28 percent for corn after soybean, with much of the excess nitrogen lost to leaching of nitrate (Wortman, et. al. 2020). Nitrate modeling using the EONR Algorithm limits calculations to strictly acres producing corn (**Tables 2 and 3**).

2. METHODOLOGY

The following table describes the location of inputs for each of the cells in the table reporting the modeled nitrogen losses and nitrate leaching estimates from the three models.

Table 2 Modeled Nitrogen Losses and Nitrate Leaching Load Estimates Sources and Calculations

Model	Crop type & data source	Total N Loss per Year (lbs)	N lost to Leaching (lbs)	N loss to Leaching (lbs/acre/year)	N Loss to Runoff (lbs)	N Loss to Volatilization (lbs)
PLET	Corn & Soybeans. USGS National Land Cover Database, 2011.	Reported by model.	Not reported by model.	Not reported by model.	Reported by model. Same as Total N loss per year.	Not reported by model.
EONR Algorithm	Corn. Cropscape, 2017.	= Total ac of crop (corn) * 30 (lbs N in excess of 174 lbs/ac from EONR algorithm) * 0.76 (24% recovery rate of N in excess fertilizer to the EONR by corn).	= Total ac of crop (corn) * N loss to leaching/ year (6).	= Result from 'N loss to leaching (lbs)' / ac of crop (corn).	Not reported by model.	Not reported by model.
EONR algorithm with EPIC partitions	Corn. Cropscape, 2017.	= Total ac of crop (corn) * 30 (lbs N in excess of 174 lbs/ac from EONR algorithm) * 0.76 (24% recovery rate of N in excess fertilizer to the EONR by corn).	= N total loss * 0.1255 (Average of N. Great Plains and Up. Midwest 'Dissolved in leachate percentages': =[((7.1 + 18.0)/2)/100].	= Result from 'N loss to leaching (lbs)' / ac of crop (corn).	=Total N loss per year (corn) * .2455 [Summation of averages of N. Great Plains & Up. Midwest 'Dissolved in surface water runoff percentages,' Dissolved in lateral subsurface flow percentages,' and 'Lost with waterborne sediment percentages']: =[(((5.3 + 2.1)/2) + ((1.6 + 0.8)/2) +	= Results from Total N loss per Year (lbs) * .4995 (Average of N. Great Plains and Up. Midwest 'N Loss to Volatization' percentages: =[((55.4 + 44.5)/2)/100].

					((15.7 + 233.6)/2))/100].	
NRCS EPIC Model	Corn. Cropscape, 2017.	= Total ac of crop (corn) * 51.3 (Average of N. Great Plains and Up. Midwest 'Total N loss lbs/ac': =[((50.9 + 51.7)/2)/100].	= N total loss * 0.1255 (Average of N. Great Plains and Up. Midwest 'Dissolved in leachate percentages': =[((7.1 + 18.0)/2)/100].	= Result from 'N loss to leaching (lbs)' / ac of crop (corn).	=Total N loss per year (corn) * .2455 [Summation of averages of N. Great Plains & Up. Midwest 'Dissolved in surface water runoff percentages,' Dissolved in lateral subsurface flow percentages,' and 'Lost with waterborne sediment percentages']: =[(((5.3 + 2.1)/2) + ((1.6 + 0.8)/2) + ((15.7 + 233.6)/2))/100].	= Results from Total N loss per Year (lbs) * .4955 (Average of N. Great Plains and Up. Midwest 'N Loss to Volatization' percentages: =[((55.4 + 44.5)/2)/100].
NRCS EPIC Model	Soybean. Cropscape, 2017.	= Total ac of crop (corn) * 28.35 (Average of N. Great Plains and Up. Midwest 'Total N loss lbs/ac': =[((24.2 + 32.5)/2)/100].	= N total loss * 0.0885 (Average of N. Great Plains and Up. Midwest 'Dissolved in leachate percentages': =[((2.9 + 14.8)/2)/100].	= Result from 'N loss to leaching (lbs)' / ac of crop (soybean).	=Total N loss per year (soybean) * .3825 [Summation of averages of N. Great Plains & Up. Midwest 'Dissolved in surface water runoff percentages,' Dissolved in later subsurface flow percentages,' and 'Lost with waterborne sediment percentages']: =[(((4.4 + 4.3)/2) +	= Results from Total N loss per Year (lbs) * .4955 (Average of N. Great Plains and Up. Midwest 'N Loss to Volatization' percentages: =[((55.0 + 44.9)/2)/100].

					((1.2 + 1.5)/2) + ((30.9 + 34.2)/2))/100].	

Notes:

1. EONR algorithm Nitrogen loss based on use of 30 lbs of N fertilizer in excess of the EONR determined by UNL (174 lbs/acre/year). N loss determined on reported N recovery rate of 24% of excess fertilizer above the EONR by corn.
2. Using the EONR algorithm Nitrogen loss based on use of 30 lbs of N fertilizer in excess of the EONR, N losses are partitioned based on the estimated percentages of loss pathways determined by average of the NRCS EPIC model for the Upper Midwest and Northern Great Plains regions of the US.

3. RESULTS

Results of the three models or algorithms indicate that from 3 to 6 pounds of nitrate-nitrogen is lost to leaching per acre per year in the in the crop production areas of the planning area. With an average of 3.2 surface inches of water migrating to the groundwater per year, this represents nitrate concentrations of 4.2 to 8.3 mg/L in water migrating to the groundwater table. To achieve the goal of reducing anthropogenic additions of nitrate in groundwater by 38 percent (from 17 mg/L to 10 mg/L), a leaching reduction of 1.1 to 2.3 pounds of nitrate-nitrogen per acre per year – or a concentration of 1.6 to 3.2 mg/L is required.

Table 3 Comparison of Modeled Nitrogen Losses and Nitrate Leaching Load Estimates

Model	Crop	Total N Loss per Year (lbs)	N Lost to Leaching (lbs)	N Loss to Leaching (lbs/acre/year)	N Loss to Runoff (lbs)	N Loss to Volatilization (lbs)
PLET	Corn and Soybeans	131,512	N/A	N/A	131,512	N/A
EONR Algorithm[1]	Corn (3,591 acres)	81,875	21,546	6	?	N/A
EONR algorithm with EPIC partitions[2]	Corn (3,591acres)	81,875	10,275	2.86	20,100	40,896
NRCS EPIC Model	Corn (3,591 acres)	184,218	23,119	6.44	45,226	91,280
NRCS EPIC Model	Soybeans (1,216 acres)	34,474	3,051	2.51	13,186	17,082

Notes:

1. EONR algorithm Nitrogen loss based on use of 30 lbs of N fertilizer in excess of the EONR determined by UNL (174 lbs/acre/year). N loss determined on reported N recovery rate of 24% of excess fertilizer above the EONR by corn.
2. Using the EONR algorithm Nitrogen loss based on use of 30 lbs of N fertilizer in excess of the EONR, N losses are partitioned based on the estimated percentages of loss pathways determined by average of the NRCS EPIC model for the Upper Midwest and Northern Great Plains regions of the US.

Recommendations on how these nitrogen losses and leaching load estimates should be addressed are contained within the DWPMP. Each model provides varied estimations and modeling results of the nitrogen losses and leaching loads that are in part leading to water quality concerns over nitrate-nitrogen in Aurora.

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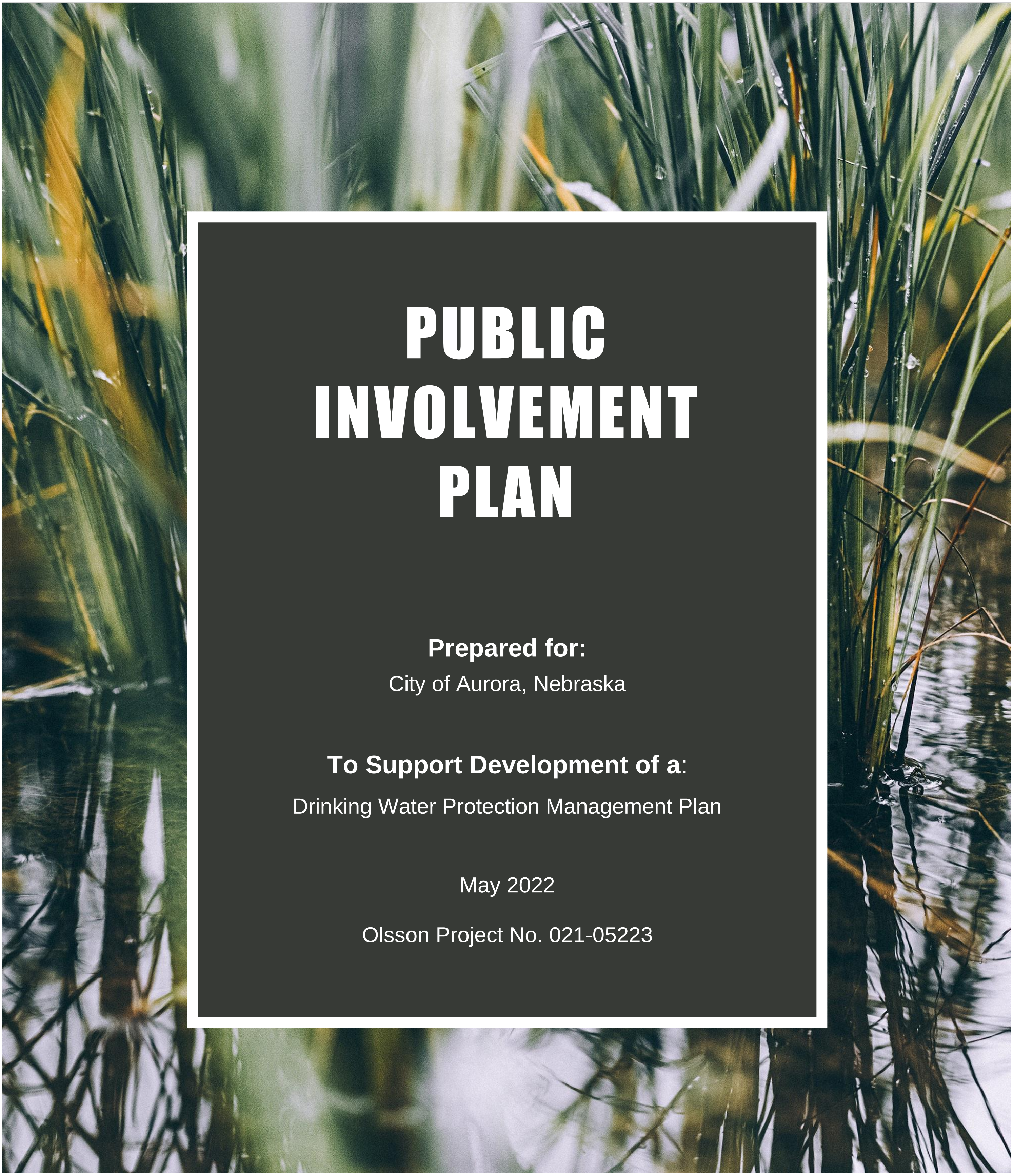
APPENDIX C

PUBLIC INVOLVEMENT MATERIALS



PUBLIC INVOLVEMENT PLAN

Prepared for:

City of Aurora, Nebraska

To Support Development of a:

Drinking Water Protection Management Plan

May 2022

Olsson Project No. 021-05223

olsson

ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
DWPMP	Drinking Water Protection Management Plan
EPA	U.S. Environmental Protection Agency
Gpd	gallons per day
MCL	maximum contaminant level
NDEE	Nebraska Department of Environment and Energy
NDHHS	Nebraska Department of Health and Human Services
NE	Nebraska
PIP	Public Involvement Plan
PPM	Parts Per Million
UBBNRD	Upper Big Blue Natural Resources Distirict
WHPP	Wellhead Protection Plan

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DISTRIBUTION LIST

Adam Darbro, City Utility Superintendent, City of Aurora
905 13th St., Aurora, NE 68818
utlysupt@hamilton.net
Phone 402-694-6992

Tatiana Davila, Wellhead Protection Program Coordinator, NDEE
1200 N St, Suite 400, Lincoln, NE 68509-8922
tatiana.davila@nebraska.gov
Phone 402-471-3376

Marie Krausnick, Water Department Manager, Upper Big Blue NRD
319 East 25th St., York, NE 68467
mebel@upperbigblue.org
Phone 402-362-6601

Mallory Morton, Project Manager, Olsson
601 P Street, Suite 200, Lincoln, NE 68508
mmorton@olsson.com
Phone 402-458-5071

Jim Schneider, Water Resources, Olsson
601 P Street, Suite 200, Lincoln, NE 68508
jschneider@olsson.com
Phone 402-458-5993

Nick Anderson, Compliance & Remediation, Olsson
601 P Street, Suite 200, Lincoln, NE 68508
nanderson@olsson.com
Phone 402-458-5925

1. OVERVIEW OF THE PUBLIC INVOLVEMENT PLAN

This Public Involvement Plan was developed to facilitate communication and involvement between residents, elected officials, administrators at the City of Aurora; staff members and the Board of Directors at the Upper Big Blue Natural Resources District (UBBNRD); and the Olsson project team during development of the Drinking Water Protection Management Plan (DWPMP).

The goal of this Public Involvement Plan is to describe the process to gain insight about the issues facing water users in and around Aurora so that a DWPMP can be developed that considers the various viewpoints and technical input of water users and community leaders in the area. Once the DWPMP is drafted, the City of Aurora will share the draft DWPMP with the Nebraska Department of Environment and Energy Quality (NDEE) and the UBBNRD.

NDEE will review the DWPMP to ensure that the best available studies, data, and information were utilized during the development of the plan. The NDEE will also ensure that the plan meets the requirements of the Wellhead Protection Area Act as described in Nebraska Revised Statute 46-1501 to 46-1509. The NDEE may consult with other state agencies they shall deem necessary when reviewing the plan, and report back to the City of Aurora with any comments. The DWPMP will then go through a review and approval process with the US Environmental Protection Agency (EPA). Once the plan is approved by the EPA, the City of Aurora will proceed to present the DWPMP to the public at a public hearing prior to adoption.

2. PROJECT DESCRIPTION

The City of Aurora has six specific objectives to accomplish as part of the source water protection grant received through the NDEE and EPA:

- Identify areas of elevated vulnerability to employ targeted best management practices (BMPs)
- Expand the Wellhead Protection (WHP) area to take into account two new municipal wells and incorporate the 50-year time of travel particle pathways
- Develop a robust DWPMP that identifies the water quality issues and opportunities for improving water quality in the Aurora area
- Adopt the DWPMP
- Engage and educate the community on the quality of their drinking water and how they can contribute to improvement
- Identify potential areas for additional future wells

The objectives will lead to their goal: provide a safe and secure drinking water supply to the citizens of Aurora, now and in the future. The project will be recognized as a success if each of these objectives is met. Specifically, if the DWPMP that is developed is protective of the city's drinking water source and leads to community engagement. This Public Involvement Plan is written to describe how the city will engage the public to protect the community's drinking water.

3. COMMUNITY BACKGROUND

3.1 Community Profile

The City of Aurora, located in Hamilton County in central Nebraska, had an estimated population of 4,500 in 2019. Aurora is located about 21 miles east of Grand Island, the third largest metropolitan area in Nebraska. Aurora is a thriving community that has experienced growth in the last decade, a trend that is not often observed in the rural communities of Nebraska. The City of Aurora owns and operates the municipal water supply system that serves the growing population. The water system has been modified and expanded several times to meet the increasing demand of the growing customer base. However today, it faces a dual threat of water quality degradation and increasing demand.

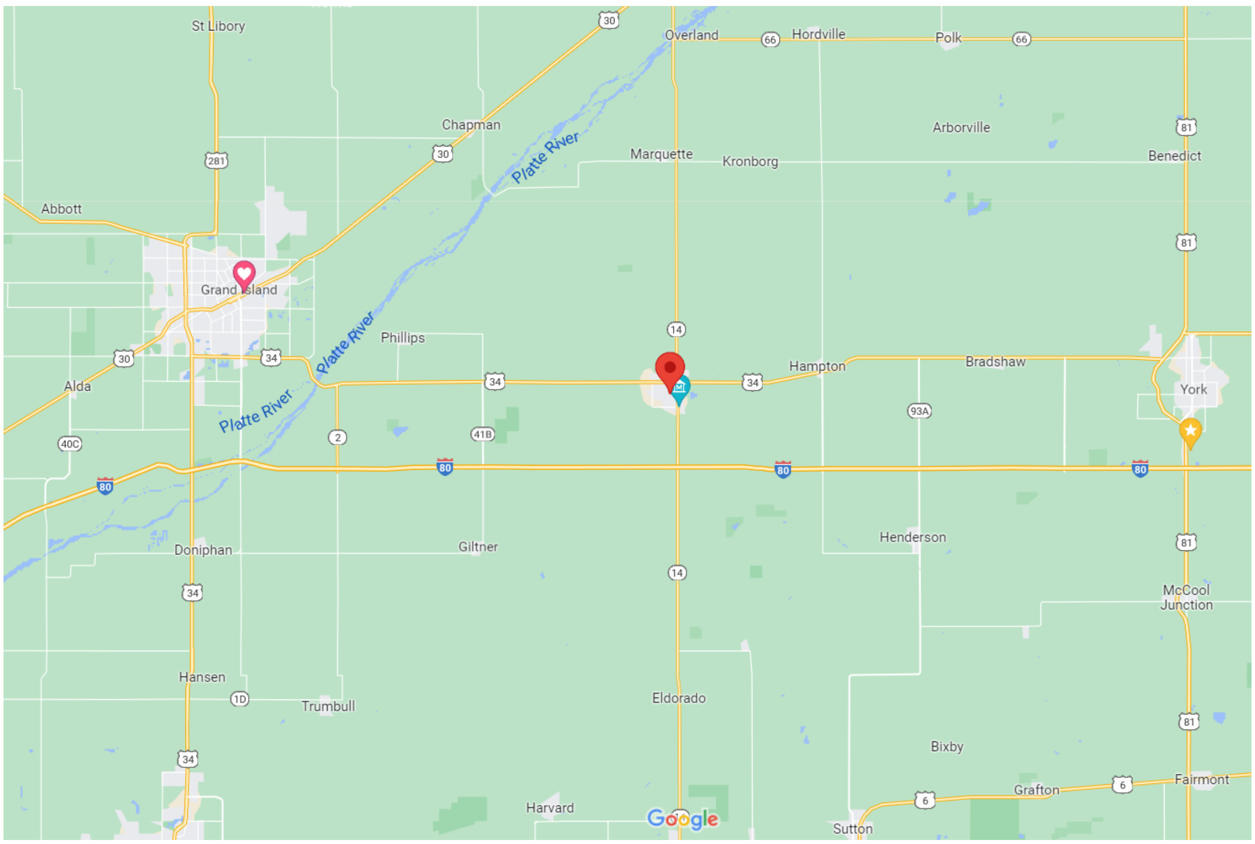


Figure 1. The City of Aurora is located between Grand Island and York, NE (Google Maps, 2022).

3.2 Community Water Supply

Aurora has seven active wells that supply the municipal water system. Well 1 was drilled in 1956, well 2 in 1965 and re-drilled in 2005, well 3 in 1973, well 4 in 1978, well 5 in 1999, well 6 in 2016 and well 7 was drilled in 2019. In general, the wells are in good condition and have a combined pumping capacity of around 9,000,000 gallons per day (gpd).

Aurora, like many communities across the country, is facing nitrate contamination in its drinking water wells. Nitrate levels in well 2 tested at 10.8 parts per million (ppm) in 2017 which exceeded the Maximum Contaminant Level (MCL) for nitrates of 10 ppm. The well was isolated from the system until the city performed the next quarterly sample that resulted in a nitrate level below the MCL and was safe to place back into service. Since 2013, average annual nitrate levels within the seven wells have ranged from 1.0 to 10.0 ppm (see Figure 2). The most recent testing results have shown average annual nitrate levels at or below 8.6 mg/L for all seven wells.as shown in Figure 2.

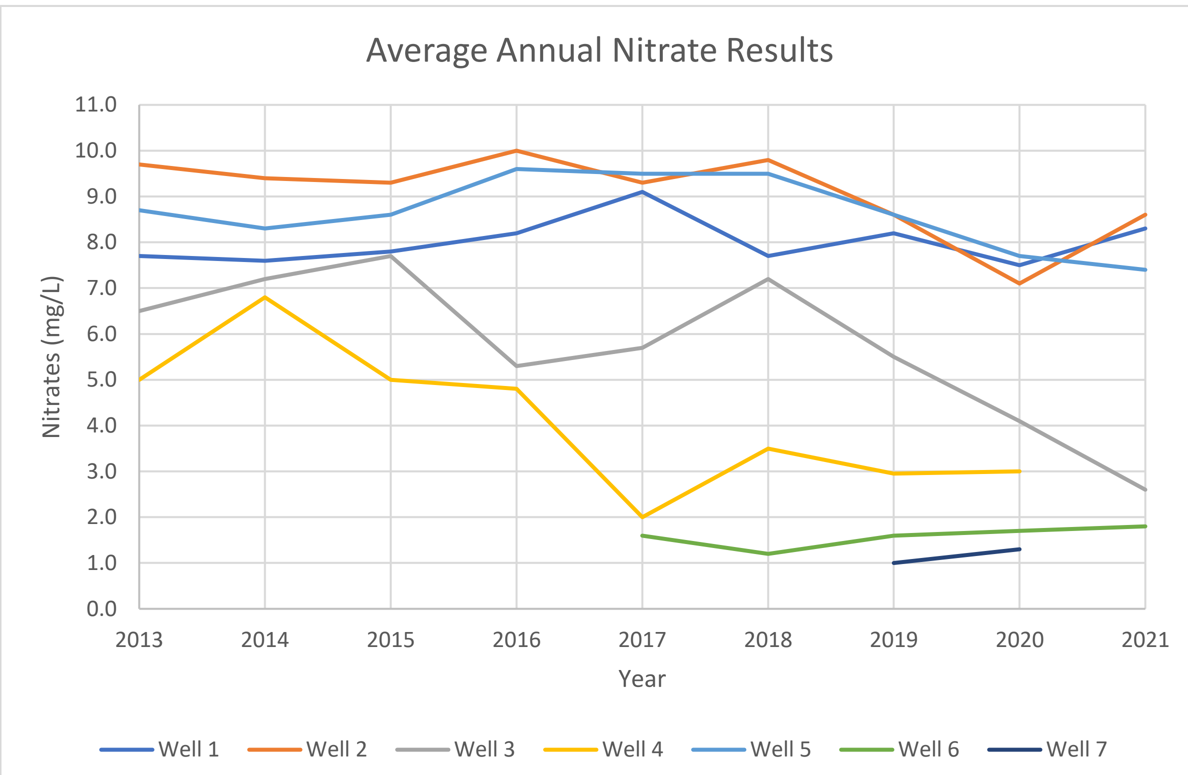


Figure 2. Aurora Municipal Well Nitrate Levels (2013 to 2021).

3.3 Drinking Water Protection Management Plan Requirements

The City of Aurora, with the support of the NDEE and the EPA, will prepare a DWPMP that meets the requirements for the EPA's alternate to a nine-element watershed management plan and NDEE's requirements for a Wellhead Protection Plan. The UBBNRD will participate in the development of the DWPMP by providing in-kind services such as attendance at public meetings and review of presentation materials. The plan development team will ensure that the DWPMP meets the requirements of both agencies and the Nebraska statutory requirements of the Wellhead Protection Area Act as identified in Nebraska Revised Statute 46-1501 to 46-1509. Plan development will include:

- Identification of causes or sources of water quality problem
- Wellhead protection goals for load reduction and proposed projects and an explanation of how the proposed project(s) will achieve or make advancements towards achieving water quality goals
- Strategically selected types and locations of "on-the-ground" Best Management Practices/projects, including a description of operation and maintenance requirements and explanation of how these measures will effectively address the nonpoint source impairment identified
- Monitoring plan to evaluate management practice effectiveness, including description of process and measures (e.g. water quality parameters, stream flow metrics, biological indicators to gauge project success)
- Proposed schedule and milestones to guide project implementation
- A community-based planning process including an information and education program
- Emergency and contingency plans
- Action plan for DWPMP implementation that incorporates specific projects, cost estimates along with future information, education and engagement strategies

4. PUBLIC INVOLVEMENT PLAN

The goal of this Public Involvement Plan is to define a process where the stakeholders and community leaders are encouraged to engage in their respective DWPMP development processes. By involving the public in developing the DWPMP, there will be a better level of understanding of why the DWPMP is important for the future. This Public Involvement Plan has several components including:

- Coordination meetings with the City of Aurora, UBBNRD, NDEE and Olsson
- A public open house meeting
- Stakeholder engagement meetings
- Status updates at City Council meetings
- Providing methods for informing and educating the public on the DWPMP
- A formal public hearing presenting the Draft DWPMP

Further information on each of these components, their timing, and implementation are described in more detail in Table 1.

A public open house meeting will be held prior to commencing the stakeholder engagement meetings. The purpose of the open house will be to inform the general public about the project and provide educational materials on the drinking water source for the City of Aurora. The meeting notice for the public open house will be published in the Aurora News-Register and the UBBNRD newsletter. Flyers will be posted around the city in high-traffic areas such as the post office and City Hall.

Other tables:

- Figure 3 presents the proposed overall DWPMP project schedule with public involvement meeting dates highlighted in orange.
- Table 2 describes the preparatory activities and assignments prior to each DWPMP meeting.
- Table 3 provides a list of the potential stakeholders for the DWPMP.

Table 1. Public Involvement Matrix of Activities.

Activity	Timing	Method
Stakeholder Committee Member Selection	Completed by 6/20/22	Committee Member suggestions from the City of Aurora, UBBNRD and NDEE
Stakeholder Committee Member Invitation	Completed by 6/27/22	Send letter of invitation to Stakeholder Committee members on City of Aurora letterhead or make personal phone calls
Coordination meetings	Monthly meetings or conference calls during DWPMP development	Discuss technical issues, progress, and action items identified throughout DWPMP development
Stakeholder Committee meetings*: *Generally, stakeholders shape the* DWPMP *in part by helping to identify priorities, and by helping to define other important components of the* DWPMP*.*	1. August 2022 2. December 2022	**Meeting 1:** Intro to the stakeholder committee including roles/responsibilities, DWPMP introduction and objectives. Discuss ongoing groundwater monitoring and wellhead protection areas. Information to educate the stakeholders on the water quality issues facing Aurora. Finally, the stakeholders will be asked to identify their main concerns regarding safe drinking water. **Meeting 2:** A draft of the DWPMP will be presented. This will include stakeholder committee input provided from previous meetings.
Public Open House Meeting	June 2022	Introduce DWPMP and objectives. Share ongoing groundwater monitoring and wellhead protection areas. Provide information to educate the community on the water quality issues facing Aurora. Provide opportunity to identify their main concerns regarding safe drinking water.
UBBNRD Board of Director and City Council Updates	Twice during DWPMP development	• Present status of DWPMP development to the City Council. • Request concurrence on the Draft DWPMP for submittal to NDEE and EPA for review.
Public Hearing *This hearing is held to take testimony from members of the public before the* DWPMP *is adopted.*	• January 2023 • Make draft DWPMP available 30 Days prior to hearing for public comment	• The meeting will be held at City Hall in Aurora, NE. • Notice of the hearing must be published in the local newspapers • All comments from the hearing are summarized and submitted to the City, NDEE and EPA.

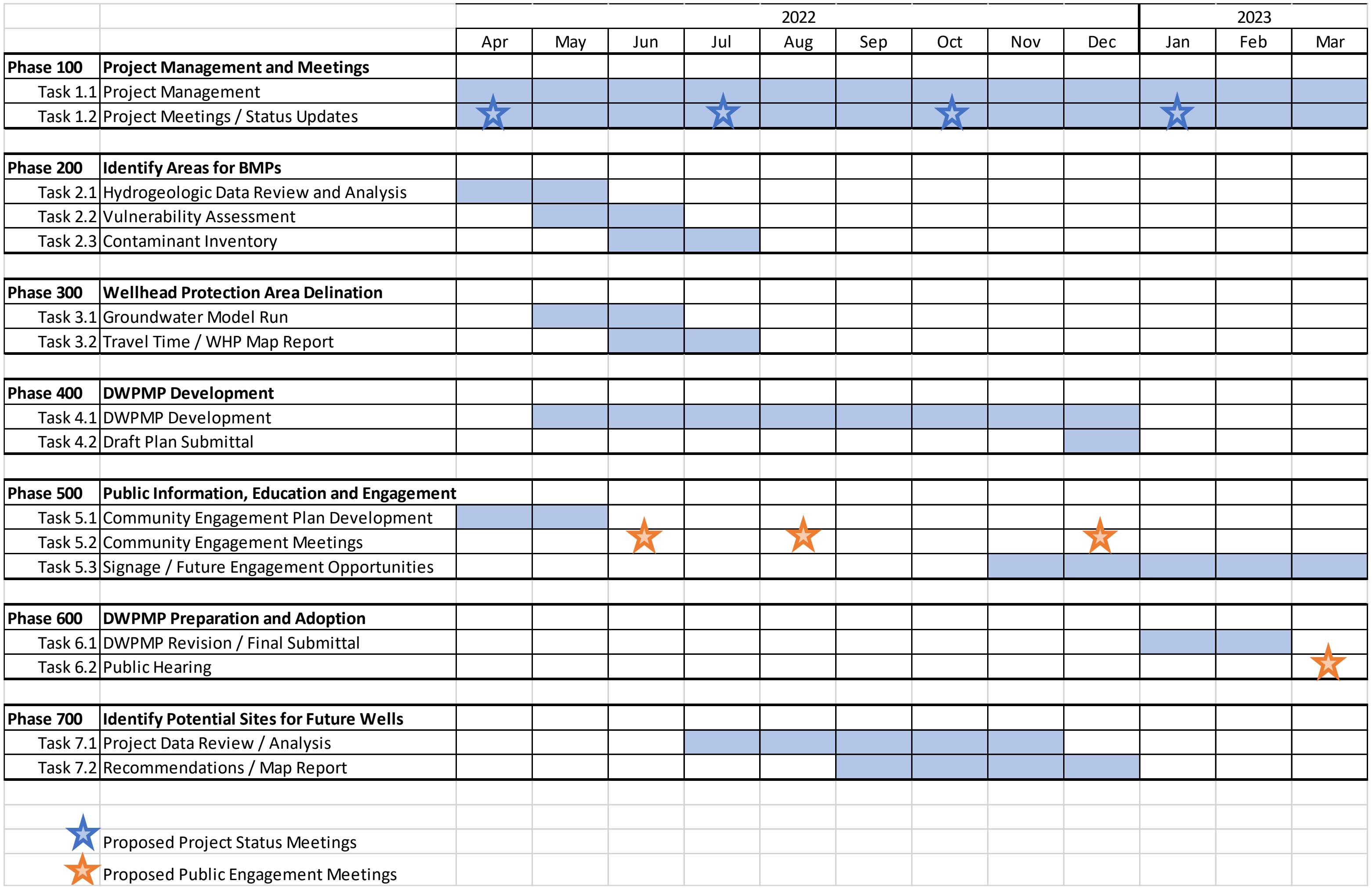


Figure 3. Proposed project schedule for DWPMP development.

Table 2. Preparation for each DWPMP meeting.

Date	Event	Staff Involved	Details
Month before each meeting	• Preparatory coordination meeting between City of Aurora, UBBNRD, NDEE, and Olsson • Ensure space for meeting is reserved	• Olsson • City staff	• Meeting to discuss content of the upcoming stakeholder meetings. • Select meeting dates and make sure the room will be set up appropriately for the meeting. • Olsson reserves meeting space.
Three weeks before meeting	• Send invite/meeting reminder to all stakeholder committee members • Send approved agenda	• Olsson	• Olsson will draft materials to be reviewed by UBBNRD, City, and NDEE. • Once approved, Olsson will send invite/reminder out to stakeholder committee members.
One week before meeting	• Prepare for Stakeholder committee meetings	• Olsson • Support from, UBBNRD, and NDEE	• Prepare questions to ask the group and create any visuals or materials needed for the meetings. • Support materials prepared by Olsson, UBBNRD, and NDEE
At meeting	• Facilitate and attend meeting	• Olsson • NDEE, City of Aurora, and UBBNRD Staff	• Olsson will facilitate the discussion around a variety of topics to help draft the DWPMP • NDEE, and UBBNRD staff will coordinate technical presentations/discussions.
Post meeting	• Compile a summary of stakeholder meetings	• Olsson	A summary of each meeting will be compiled and sent to City, NDEE, and UBBNRD team members.

Table 3. List of potential stakeholders.

First Name	Last Name	Affiliation	Representing
TBD			Agriculture
			Well driller
			Educator
			Well driller
			Local resident
			Corn Board
			CO-OP
Rick	Melcher	City of Aurora	City Administrator
Adam	Darbro	City of Aurora	Zoning/Utilities Dept
			Urban Resident

Public Open House

June 15, 2022

Bremer Community Center

1604 L St., Aurora, NE 68818

6:00 – 8:00 PM

NOTICE OF PUBLIC MEETING
CITY OF AURORA DRINKING WATER PROTECTION MANAGEMENT PLAN
PUBLIC OPEN HOUSE MEETING

Public Information Open House
Wednesday, June 15, 2022; 6:00 PM - 8:00 PM
Bremer Community Center (1604 L St, Aurora, NE 68818)

The City of Aurora will hold a public information open house regarding the development of a Drinking Water Protection Management Plan to improve the quality, safety, and accessibility of drinking water. This meeting will be held at the Bremer Community Center in Aurora, Nebraska on Wednesday, June 15, 2022, from 6:00-8:00 PM.

This public information open house meeting is being held to provide information about the drinking water plan development process, why the plan is needed, and best management practices associated with a wellhead protection area.

All interested persons are invited to attend and present relevant comments and questions. Project information will be displayed and personnel from the City of Aurora, the consultant team, and other agencies will be present to answer questions and receive comments. A formal presentation will not be included as part of this information open house. The information open house format allows the public to come at any time during the advertised hours, gather pertinent information about the project, speak one-on-one with project personnel, and leave as they wish.

The public is being encouraged to make suggestions or express concerns regarding this proposed project. Comments will be collected through June 28, 2022. Written comments or requests should be submitted to: Stacey Roach, Olsson, 601 P Street, Suite 200, Lincoln, NE 68508; sroach@olsson.com; telephone 402-458-5042.

For those without internet access, please contact the individual above.

AURORA
Nebraska

DRINKING WATER PROTECTION MANAGEMENT PLAN PUBLIC OPEN HOUSE

Wednesday, June 15, 2022 | 6:00 - 8:00 pm
Bremer Community Center
1604 L St, Aurora, NE 68818

The City of Aurora is hosting a public open house meeting to share information on the development of a Drinking Water Protection Management Plan to improve the quality, safety, and accessibility of drinking water in the community.

The public is invited to participate and to provide feedback. Members from the City, Olsson, UBBNRD, and NDEE will be in attendance to answer questions.

No formal presentation is planned, come and go as you please.

Drinking Water Protection Management Plan

Objectives:

- **Identify water quality concerns.**
- **Establish Wellhead Protection Area (including any necessary updates).**
- **Propose water quality restorative management measures.**
- **Create a monitoring schedule for preventative measures.**
- **Educate the community on water quality issues and best management practices.**
- **Develop a community-based prevention planning process.**

For more information, please contact:
Adam Darbro
utlysupt@cityofaurora.org
402.694.6992

AURORA DRINKING WATER PROTECTION MANAGEMENT PLAN

Drinking water protection management plans (DWPMP) are a tool for communities to help implement long-term strategies for ensuring a safe and reliable drinking water source for years to come.

There are six main objectives for DWPMPs:

- Identify water quality concerns.
- Establish Wellhead Protection Area (including any necessary updates).
- Propose water quality restorative management measures.
- Create a monitoring schedule for preventative measures.
- Educate the community on water quality issues and best management practices.
- Develop a community-based prevention planning process.

WHY YOUR FEEDBACK IS IMPORTANT TO US

1 **The City is completing a Drinking Water Protection Management Plan (DWPMP) to better protect the drinking water resource. The DWPMP is a long-term plan that addresses any water quality concerns with drinking water in order to implement strategies to ensure safe drinking water for the future.**

2 **The information presented at this meeting will outline the planning process, current Wellhead Protection Area, and describe funding sources for best management practice implementation.**

3 **We need your input to fully understand drinking water quality concerns in the area and develop solutions! Feedback on what else you would like to know about the DWPMP process is encouraged.**

AURORA DRINKING WATER PROTECTION MANAGEMENT PLAN

AURORA
Nebraska

DWPMP implementation is beneficial to the community.

Financial Benefits
Developing a DWPMP qualifies the community for funding from the Environmental Protection Agency (EPA) and the Natural Resources Conservation Service (NRCS).

Health Benefits
DWPMPs bring awareness to water quality concerns that may have long-term harmful health effects and creates a plan to reduce those concerns and health risks.

Educational Benefits
Continued community outreach and engagement will keep stakeholders and residents informed and involved.

YOUR FEEDBACK IS IMPORTANT TO US!

Fill out a comment form or email us with your feedback.

Comments are to be submitted by June 29, 2022 to:

Stacey Roach
601 P Street, Suite 200
Lincoln, NE 68508
sroach@olsson.com
402-474-6311

WELCOME!

Aurora Drinking Water Protection Management Plan Public Meeting

Aurora
Nebraska

WHY ARE YOU HERE?

AURORA
Nebraska

1

The City is completing a Drinking Water Protection Management Plan (DWPMP) to better protect the drinking water resource. The DWPMP is a long-term plan that addresses any water quality concerns with drinking water in order to implement strategies to ensure safe drinking water for the future.

2

The information presented at this meeting will outline **the planning process, current Wellhead Protection Area, and describe funding sources** for best management practice implementation.

3

We need your input to fully understand drinking water quality concerns in the area and develop solutions! Feedback on what else you would like to know about the DWPMP process is encouraged.

WHAT IS A DRINKING WATER PROTECTION MANAGEMENT PLAN?

AURORA Nebraska

Drinking water protection management plans (DWPMP) are a tool for communities to help implement long-term strategies for ensuring a safe and reliable drinking water source for years to come.

There are six main objectives for DWPMPs:

1. Identify water quality concerns.
2. Establish Wellhead Protection Area (including any necessary updates).
3. Propose water quality restorative management measures.
4. Create a monitoring schedule for preventative measures.
5. Educate the community on water quality issues and best management practices.
6. Develop a community-based prevention planning process.

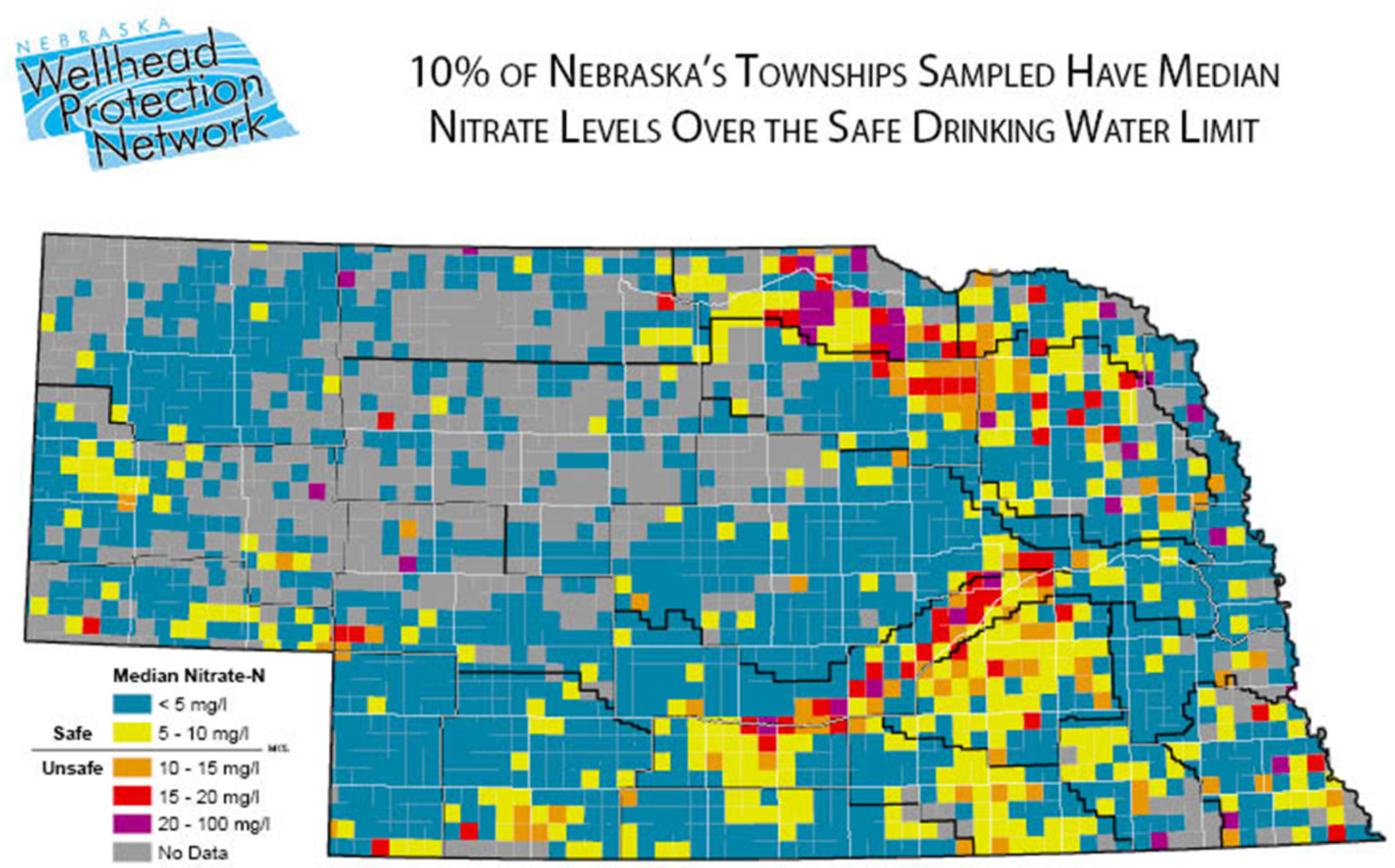
DWPMP implementation is beneficial to the community.

- **Financial benefits:** Developing a DWPMP qualifies the community for funding from the Environmental Protection Agency (EPA) and the Natural Resources Conservation Service (NRCS).
- **Health benefits:** DWPMPs bring awareness to water quality concerns that may have long-term harmful health effects and creates a plan to reduce those concerns and health risks.
- **Educational benefits:** Continued community outreach and engagement will keep stakeholders and residents informed and involved.

NITRATES IN DRINKING WATER

Aurora Nebraska

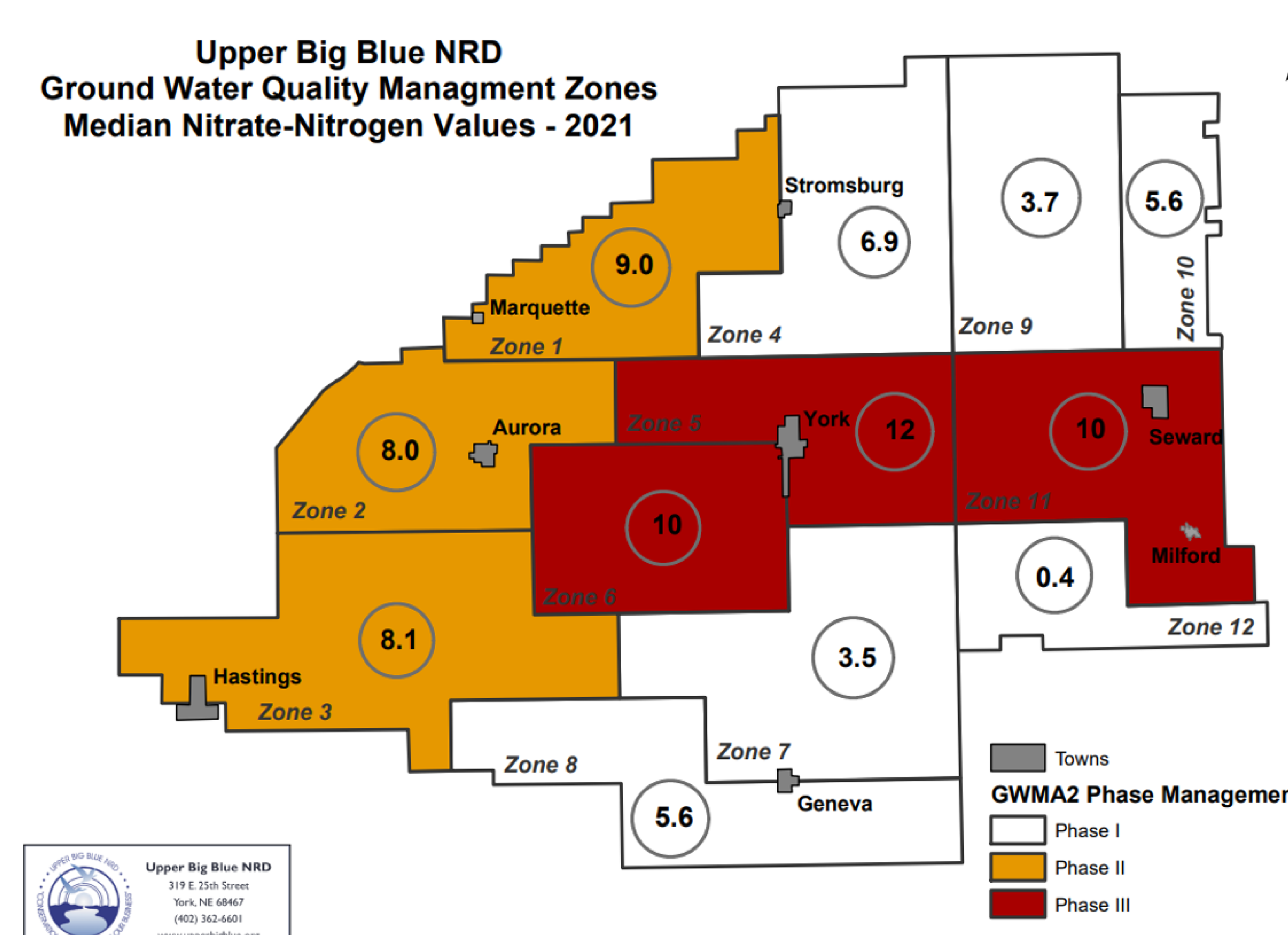
The City provides safe and clean drinking water. However, nitrates in drinking water can have negative health effects if concentrations rise above the Maximum Contaminant Level of 10 ppm.



Median of the most recent Nitrate-N concentration by township of 19,743 wells from 1995-2015.
Gray areas indicate no data reported, not the absence of nitrate in groundwater.
Source: Quality Assessed Agrichemical Database for Nebraska Groundwater, 2016

Nitrates are a common contaminant in drinking water in Nebraska. From a combination of point and non-point sources, excess nitrates build up in water supplies and creates the need for a community-based plan to address unsafe nitrate levels.

The Upper Big Blue NRD conducts a water quality sampling program to monitor nitrate levels in groundwater. The NRD publishes annual nitrate sampling results to their website.



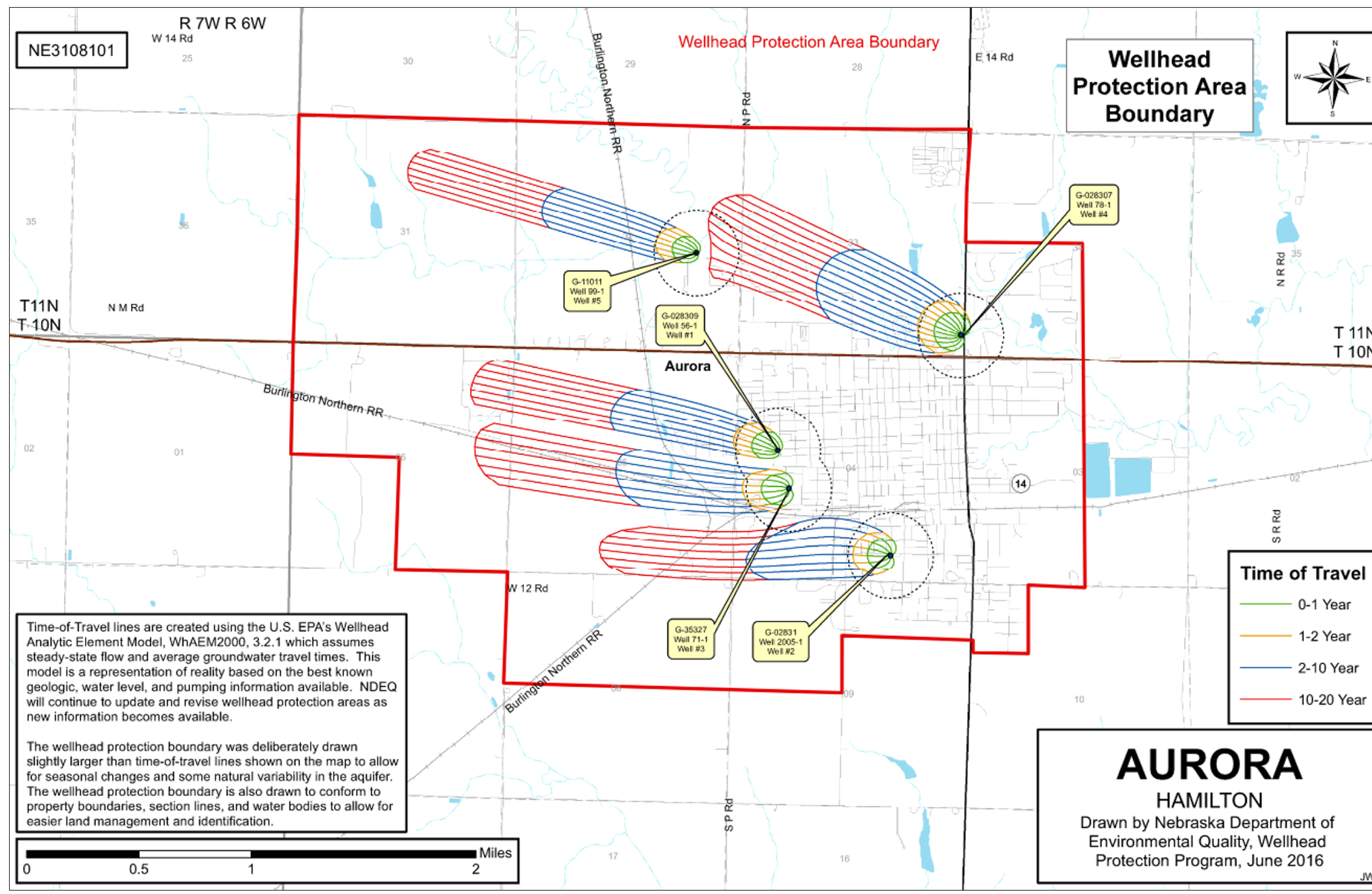
UPDATING THE WELLHEAD PROTECTION AREA

AURORA Nebraska

Communities completing a DWPMP are required to update their Wellhead Protection Area based on the 50-year Time of Travel lines.

The City's Wellhead Protection Area was last updated in 2016 by the Nebraska Department of Environment and Energy. The boundary was drawn around the 20-year Time of Travel lines. The requirement has since been updated to include the 50-year Time of Travel lines. Two new wells have been drilled since the last map was made.

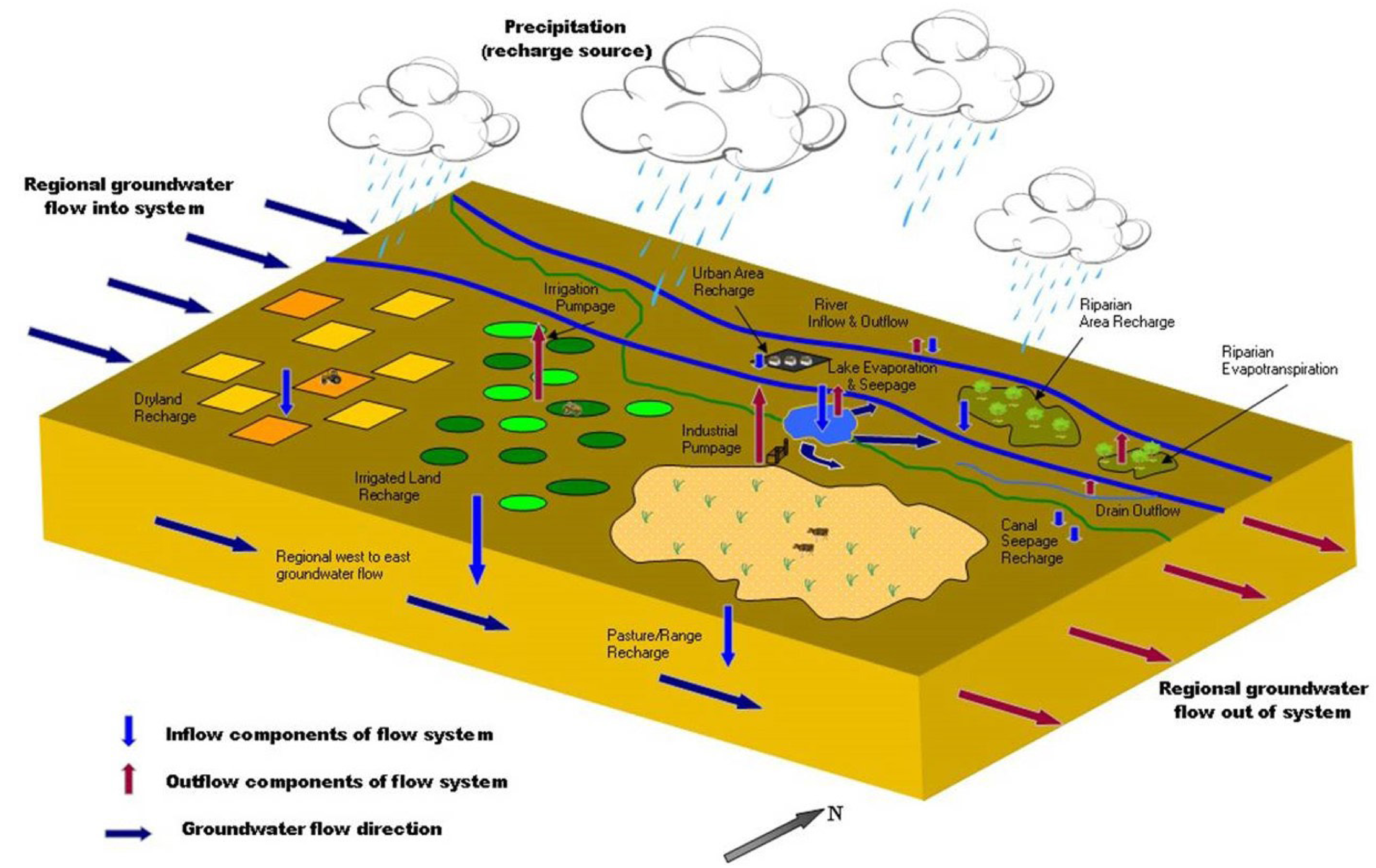
Existing Wellhead Protection Area (2016)

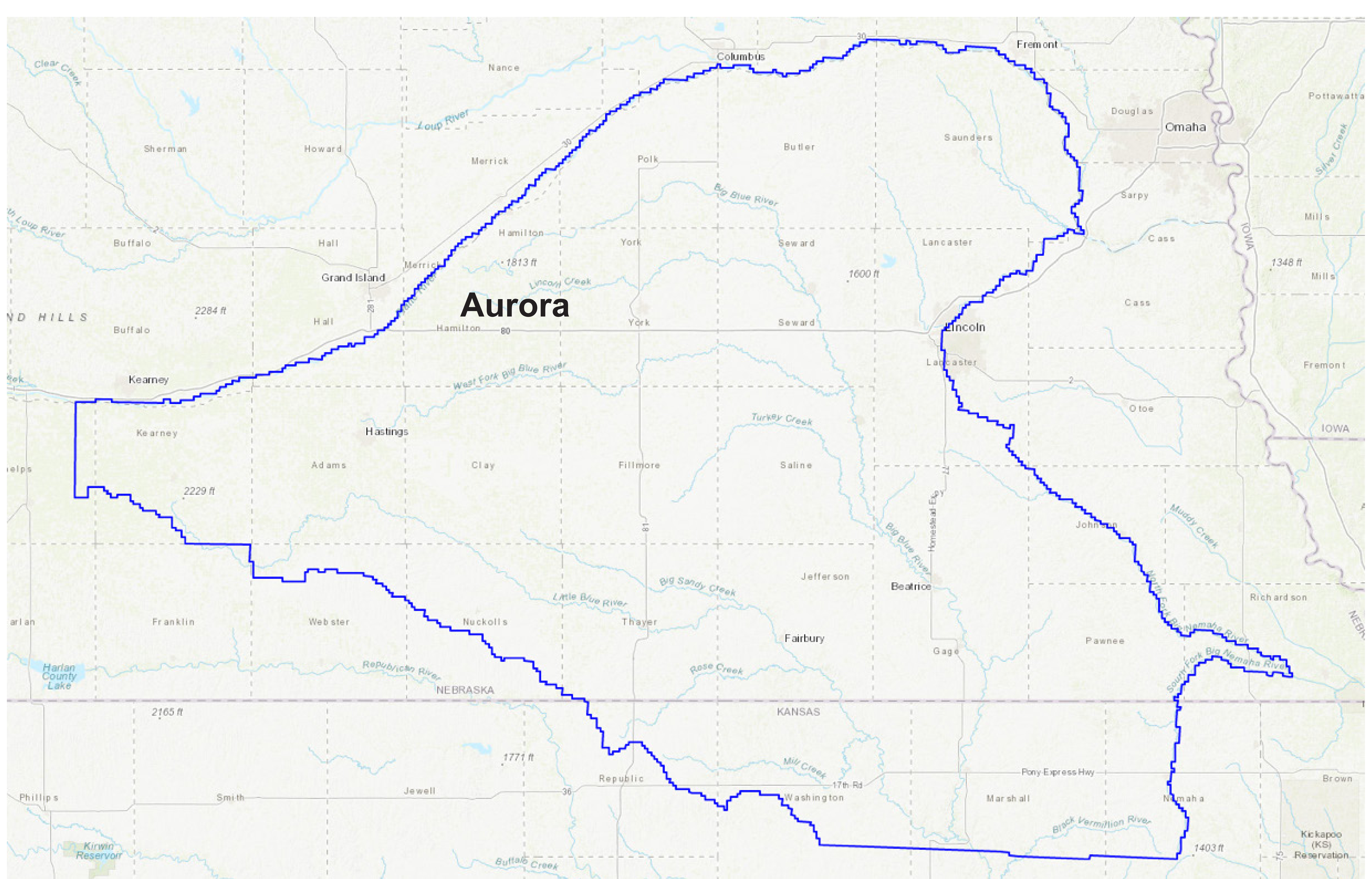


USING STATE-APPROVED GROUNDWATER MODELS TO UPDATE THE WELLHEAD PROTECTION AREA

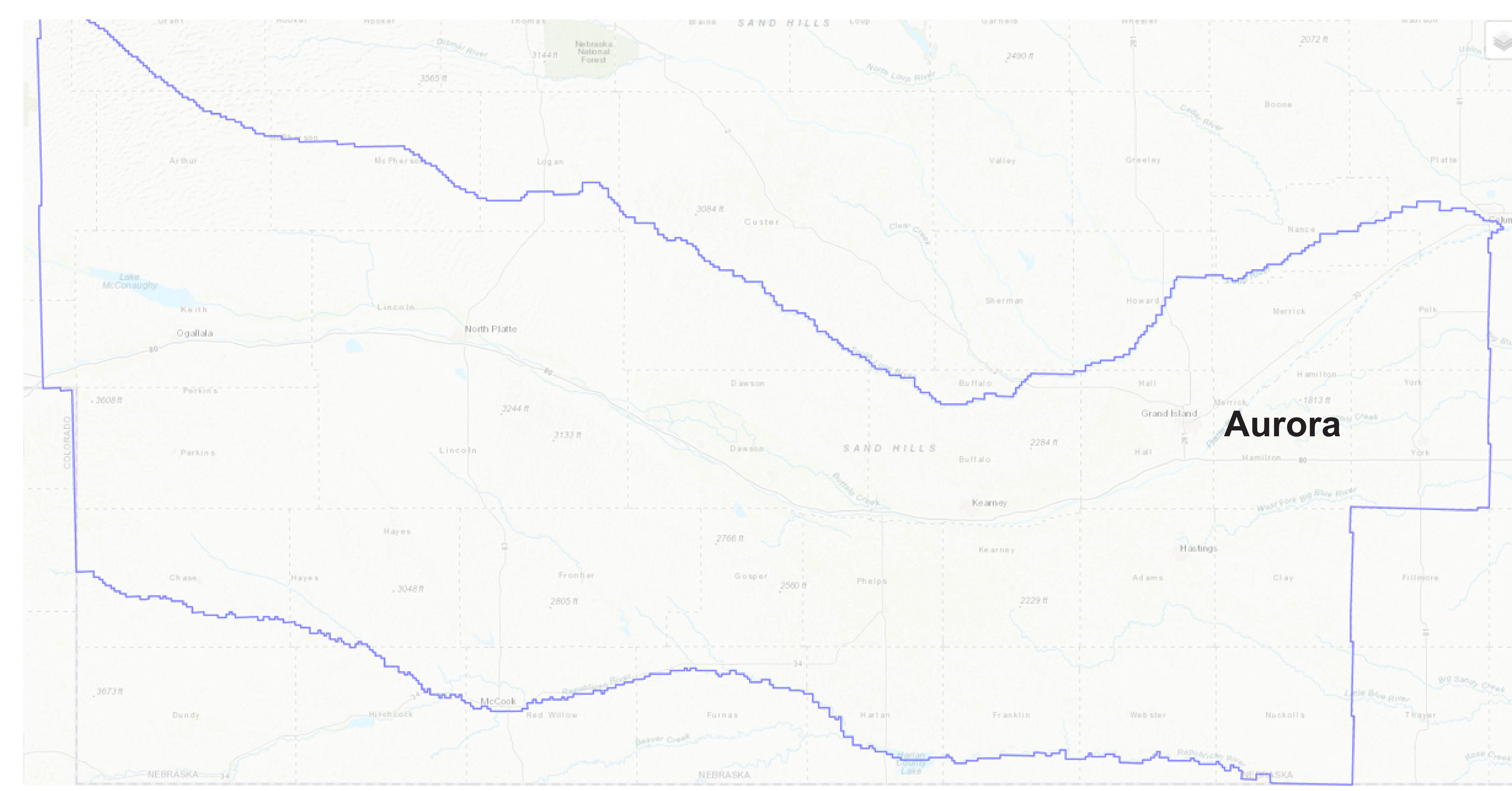
AURORA
Nebraska

Groundwater models approved by the Nebraska Department of Natural Resources will be used to delineate a proposed Wellhead Protection Area based on the 50-year Time of Travel lines and include the two new municipal wells.





Blue Basin Model



Cooperative Hydrology Study (COHYST) Model

POTENTIAL CONTAMINANT SOURCE INVENTORY

AURORA Nebraska

The Contaminant Source Inventory can:

- Clarify what constitutes a potential source of contamination
- Clarify what point and non-point source pollution is

Important Note #1: POTENTIAL is the key word

Important Note #2: This inventory only represents a SNAPSHOT IN TIME

The purpose is to identify existing contaminant sources and sources that have the potential to pollute groundwater within the Wellhead Protection Area.

Common Potential Sources of Contamination include:

Agricultural

- Fuel storage, grain storage, water wells, chemigation, livestock operations, and chemical storage

Commercial/Light Industry

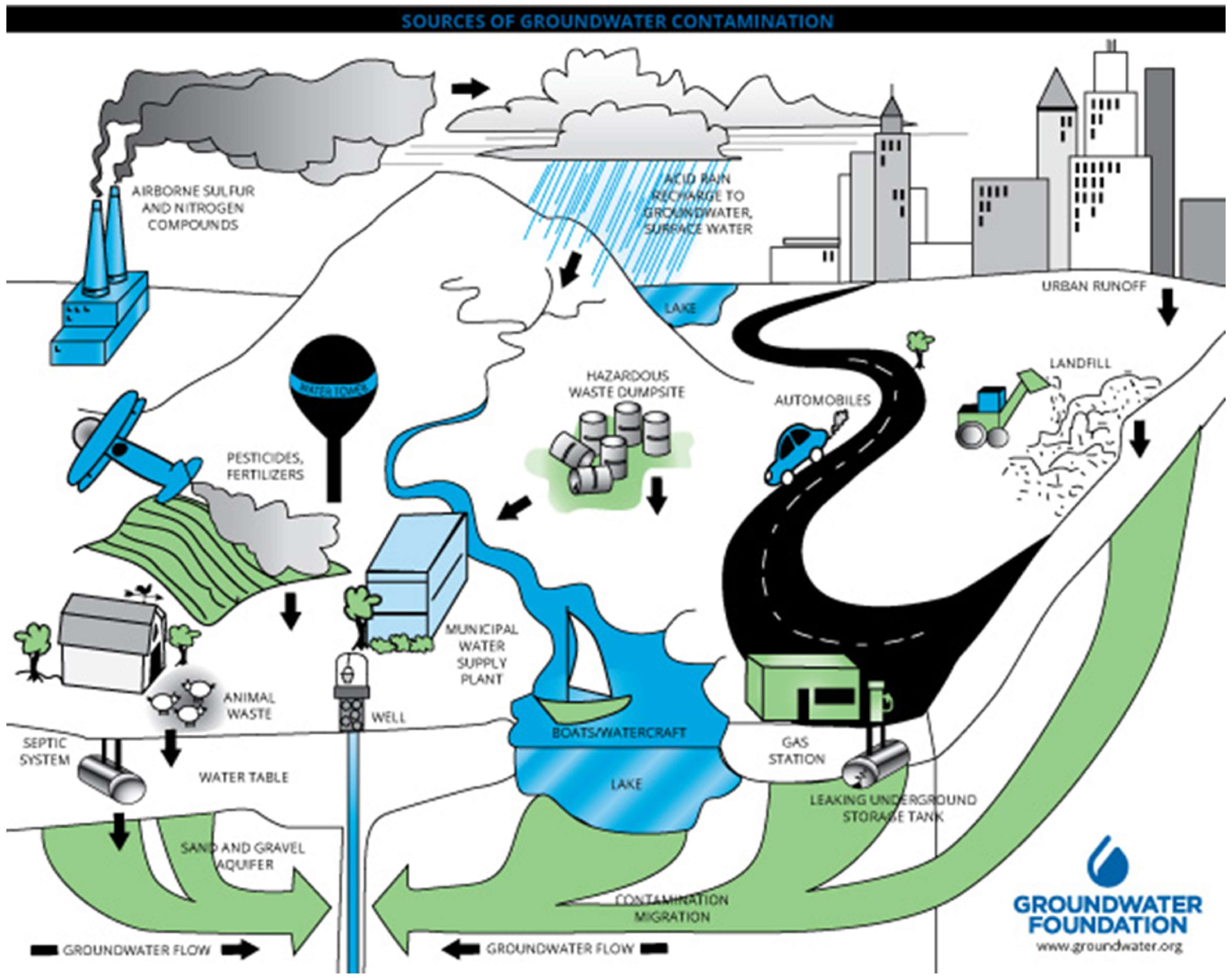
- Auto repair facilities, dry cleaners, fuel stations/storage, machine shops, rail yards

Industry

- Manufacturing facilities, oil and gas wells, junk yards, landfills, sewage treatment plants

Others

- Cemeteries, septic systems, golf courses, highway maintenance yards, transportation corridors



WHAT ACTIONS CAN BE TAKEN BY COMMUNITY MEMBERS TO IMPROVE DRINKING WATER QUALITY?

A variety of best management practices (BMPs) have been studied and proven to improve water quality.

BMPs for the rural setting:

- Annual Crop Reports
- Soil sampling
- Irrigation water well sampling
- Cover crops
- Crop rotations
- Crop tissue analysis
- Fertigation
- Split fertilizer application
- Seasonal fertilizer application restrictions
- Manure application restrictions
- Nitrification inhibitors
- Soil moisture sensors
- Variable rate application
- Water well flow meters
- Well abandonment
- No till/reduced tillage

WHAT ACTIONS CAN BE TAKEN BY COMMUNITY MEMBERS TO IMPROVE DRINKING WATER QUALITY?

AURORA
Nebraska

A variety of best management practices (BMPs) have been studied and proven to improve water quality.

BMPs for the urban setting:

- Bioswale
- Detention basins
- Fertilizer management
- Enhanced infiltration (soil amendment)
- Irrigation management
- Low impact landscaping
- Porous pavement
- Rain garden
- Rainwater harvesting

COST-SHARE RESOURCES

AURORA Nebraska

Upper Big Blue NRD Cost Share:

Action	Cost Share	Maximum
Nitrates/Bacteria Water Sample Testing	FREE!	
Well Decommissioning (AQWACAP)	60%	$750
Cover Crop Planting	$50/acre for seeding, gradually decreasing to $30/acre over five-year period	$7,500 per landowner per year
Buffer/Filter Strips	$20-$250 per acre depending on soil type + incentive payment of 50% of per acre payment	Contracts run from 5 to 10 years
Land Treatment Practices	Contact UBBNRD for more information	
Soil Moisture Sensor	50%	

COST-SHARE RESOURCES

AURORA Nebraska

Upon approval of the DWPMP, the Wellhead Protection Area becomes eligible for EPA Clean Water Act Section 319 grant funds.

The Nebraska Department of Environment and Energy is collaborating with the USDA and NRCS to prioritize wellhead protection areas for source water protection funding included in the 2018 Farm Bill. **About $2-3M is available annually for source water protection.**

Nebraska EQIP Source Water Protection Priority Areas
Drafted by Elbert Traylor & Sam Radford (NDEE) from work group input.

CRITERIA FOR PRIORITY LEVELS	PRIORITY		
	High	Medium	Low
Applications located within a Wellhead Protection Area as delineated by NDEE, OR	+		
Applications located within a delineated watershed that directly drains to a surface water intake of a public water system.	+		
Applications located within a Phase 2, 3, or 4 Groundwater Quality Management Area encompassing ≥ 1 Wellhead Protection Area, OR		+	
Applications located within a delineated Groundwater Quantity Management Area encompassing ≥ 1 Wellhead Protection Area.		+	
Applications located in a delineated Phase 1 Groundwater Quality Management Area encompassing ≥ 1 Wellhead Protection Area.			+
Ineligible: Applications located within an area that does not fit the definitions above.			

The 2018 Farm Bill requires 10% of EQIP funds to be targeted to source water protection. Funds go directly to producers through the general EQIP process. Priority practices include:

- Conservation Cover
- Conservation Crop Rotation
- Contour Buffer Strips
- Cover Crop
- Critical Area Planting
- Well Decommissioning
- Groundwater Testing
- Field Border
- Riparian Herbaceous Cover
- Riparian Forest Buffer
- Filter Strip
- Grassed Waterway

- Irrigation Pipeline
- Irrigation System, Microirrigation
- Sprinkler System
- Irrigation Water Management
- Pasture and Hay Planting
- Range Planting
- Nutrient Management
- Pest Management Conservation System
- Vegetated Treatment Area
- Constructed Wetland
- Wetland Restoration
- Wetland Enhancement

PUBLIC INPUT

We want to hear from you!
Is there anything else you would like to know about the DWPMP process?

HOW TO MAKE FORMAL COMMENTS

Fill out a comment form with your feedback

Written comments are to be submitted by June 29, 2022 to:

Stacey Roach
601 P Street, Suite 200
Lincoln, NE 68508
sroach@olsson.com
402-474-6311

AURORA
Nebraska

City of Aurora
Drinking Water Protection Management Plan
Public Open House

Return to: *Stacey Roach* *sroach@olsson.com*
601 P Street, Suite 200 *402.458.5042*
Lincoln, NE 68508

Please submit your written comments by June 29, 2022

PUBLIC COMMENT

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(Please Print)

Name ______________________________

Address ______________________________

City, State, Zip ______________________________

Phone ______________________________

Email ______________________________

Written comments submitted are considered public information and may be shared with appropriate local, state, or federal agencies, as well as the general public, as part of the project development process.

AURORA Nebraska

City of Aurora
Drinking Water Protection Management Plan
Public Open House

Return to: Stacey Roach
601 P Street, Suite 200
Lincoln, NE 68508

sroach@olsson.com
402.458.5042

Please submit your written comments by June 29, 2022

PUBLIC COMMENT

High levels of uranium & arsenic in testing minerals in humans. The past year many people have tested higher also. Personally I tested toxic for uranium & traces of arsenic, they've came up in the past 6 months. We have reverse osmosis water and many filters and still test high - my husband, friend & father are also toxic levels. This is a major concern

Also, our water smells like sewage many days. The water has gotten worse in the past 5 years. (tasted smell)

(Please Print)

Name Vicki Hill

Address 404 O Street

City, State, Zip Aurora NE 68818

Phone (402) 631-7244

Email Vickeruskis22@gmail.com

Written comments submitted are considered public information and may be shared with appropriate local, state, or federal agencies, as well as the general public, as part of the project development process.

City of Aurora Drinking Water Protection Management Plan

Public Information Meeting | June 15, 2022, 6:00 PM - 8:00 PM

Name	Contact Information	Phone	Email
Please Print ERIC MELCHER	Address 905 13th ST, AURORA	402-694-6992	ctyadm@cityofaurora.org
Please Print Adam Darbro	Address "	"	utlysupt@cityofaurora.org
Please Print Erinn Wilkins	Address 319 E 25 St York,	402-362-6601	erichert@upperbigblue.org
Please Print Vicki Hill	Address 404 'O' St. Aurora	(402)631-7244	vickeruskis22@gmail.com
Please Print DERRICK FAIRBANKS	Address	(310) 528.1016	DERRICK@HDC-WATER.COM
Please Print Marlin Seeman	Address City of Aurora	402-694-6992	MayorSeeman@cityofAurora.org
Please Print Pat Phillips	Address 619 1st St Aurora	402-694-3302	—
Please Print Dick Phillips	Address 619-1st AURORA	402-694-9036	—
Please Print Jacob Courtney	Address 1212 E Street #2	402-694-9036	courtneyjacob298@gmail.com
Please Print Andrew Murillo	Address 2045 Lewis St.	714-421-1415	agmurillo9@pm.me
Please Print Paul Lackore	Address 1830 Cedar St	402 631 7772	pmlod@hotmail.com

Stakeholder Committee Meeting 1

October 4, 2022

Bremer Community Center

1604 L St., Aurora, NE 68818

1:00 – 3:00 PM

Stakeholder Name	Contact	Occupation/Representation
Andrew Willis	awillis@diamondjcs.com	Agricultural Services (spraying, fertilizer)
Anthony Sigler	asigler@4rhuskies.org	Teacher/Aurora Public Schools
Jeremy Brandt	Hwy-supt@hamilton.net	Hamilton County Highway Superintendent
Brock Wyatt	Brock.wyatt@gmail.com	Hamilton Telecommunications/School Board
Chris Beins	cbeins@gmail.com	Aurora Co-op/Grower
Dustin Nissen	Sargentdrilling@hamilton.net	Sargent Drilling
Keith Wasem	kwasem@hamilton.net	Retired/Irrigation Expert
Matt Grosshans	Grosshans_12@hotmail.com	Grower
Steve Anderson	sanderson@myhbank.com	Heartland Bank
Amy Jones	amyppri@hamilton.net	Prairie Plains Resource Institute

Hello! Thank you for your interest to serve on the Aurora Drinking Water Protection Management Plan Stakeholder Committee. You have the unique opportunity to be part of the development of principle guidelines to implement the Drinking Water Protection Plan. **This is your chance to shape the process and the outcomes for this area!**

<u>Schedule</u>

As part of this committee, you are invited to participate in a series of two stakeholder meetings. Being mindful of your time, both sessions will be approximately two hours. Calendar invites for the meetings will be sent in the next couple of weeks. For now, **please hold 1:00-3:00 pm on the following dates on your calendar:**

- **Meeting #1:** Tuesday, October 4
    - Share project background, introduce objectives, define goals for plan implementation
- **Meeting #2:** To Be Determined

<u>Your Commitment</u>

As a member of the stakeholder committee, you are asked to commit to the following:

- Be honest in your comments and suggestions, keeping the larger community in mind.
- Keep an open mind and be respectful of others' thoughts and values when they differ from your own.
- Participate fully in discussions to help develop the implementation program.
- Respond to information requests and meeting invitations in a timely fashion.
- Advocate for the best community solution / plan.

MEETING AGENDA

Aurora Drinking Water Protection Management Plan

Date:	October 4, 2022

1. **Introductions**
2. **DWPMP Background Information**
3. **Role of City of Aurora in DWPMP**
4. **Role of Upper Big Blue NRD in DWPMP**
5. **Role of NDEE in DWPMP**
6. **Break**
7. **Breakout Group Activity/Interactive Activity**
8. **Next Steps**

WELCOME!

Aurora Drinking Water Protection Management Plan – Stakeholder Committee Meeting

October 4, 2022

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Introductions

- Project Team: City of Aurora, Olsson, NDEE
- Participating Agency: Upper Big Blue Natural Resources District (UBBNRD)
- Stakeholders

Agenda

- DWPMP Background Information
- Role of City of Aurora (Adam Darbro)
- Role of UBBNRD (Erinn Wilkins)
- Role of NDEE (Tatiana Davila)
- Break
- Interactive Session
- Next Steps

Why are you here?

The City is completing a Drinking Water Protection Management Plan (DWPMP) to better protect the drinking water resource. The DWPMP is a long-term plan that addresses water quality concerns with drinking water in order to implement strategies to ensure safe drinking water for the future.

The information presented at this meeting will outline the planning process, current Wellhead Protection Area, and actions currently being taken by Aurora, UBBNRD, and NDEE to monitor and protect water quality.

We need the **local perspective** on water quality concerns, ideas for improvement, and best management practice implementation.

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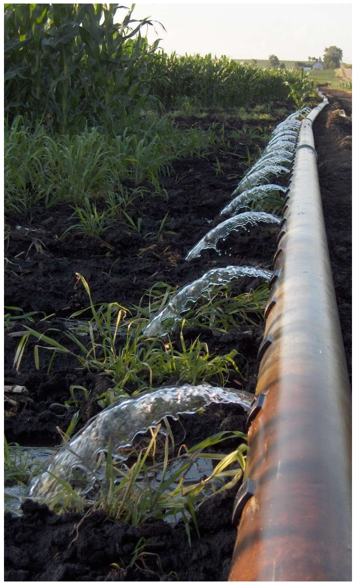
What Is A Drinking Water Protection Management Plan?

Drinking water protection management plans (DWPMP) are a tool for communities to help implement long-term strategies for ensuring a safe and reliable drinking water source for years to come.

There are six main objectives for DWPMPs:

1) Identify water quality concerns.
2) Establish Wellhead Protection Area (including any necessary updates).
3) Propose water quality restorative management measures.
4) Create a monitoring schedule for preventative measures.
5) Educate the community on water quality issues and best management practices.
6) Develop a community-based prevention planning process.



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What are the benefits of a DWPMP?

- Financial benefits:

  Developing a DWPMP qualifies the community for funding from the Environmental Protection Agency (EPA) and the Natural Resources Conservation Service (NRCS).

- Educational benefits:

  Continued community outreach and engagement will keep stakeholders and residents informed and involved.

- Health benefits:

  DWPMPs bring awareness to water quality concerns that may have long-term harmful health effects and creates a plan to reduce those concerns and health risks.

Key Messages

- DWPMP is a **collaborative** planning process that uses feedback from the public to craft the implementation plan to protect and improve drinking water quality for the community.

- Actions recommended by this plan are **voluntary**. This plan offers a mechanism for the community to access additional funding to advance water quality improvement projects. The purpose of this plan is <u>not</u> to introduce new regulations or restrictions on operations.

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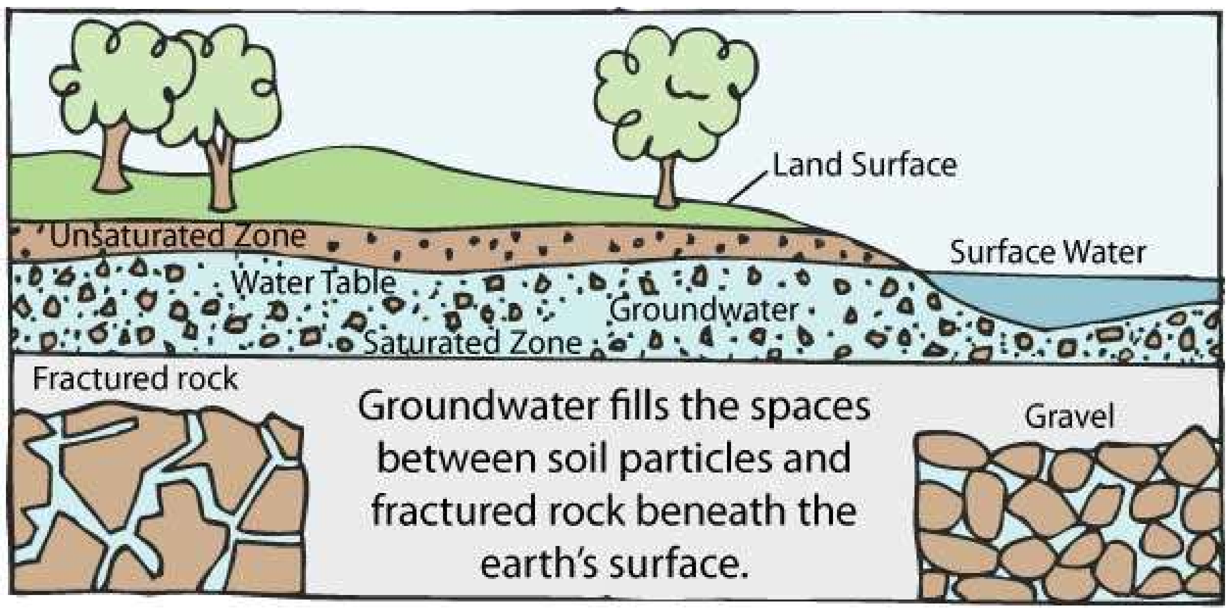
Groundwater 101



Source: www.groundwater.org

Nitrogen Cycle

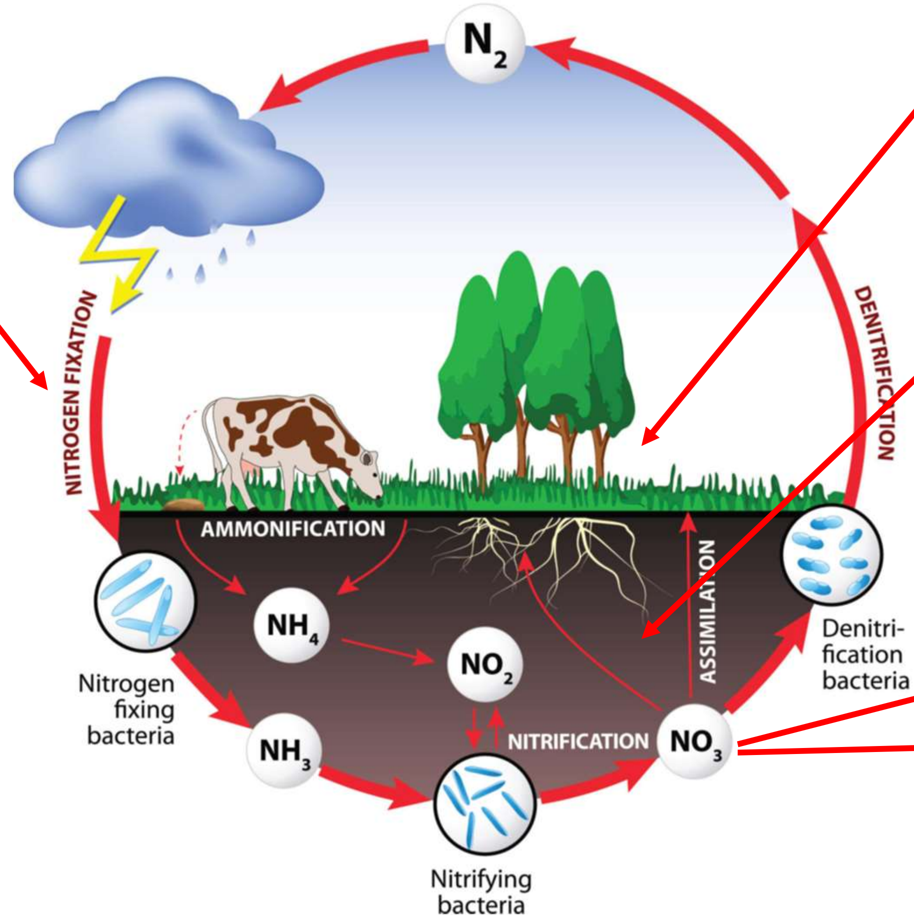
Nitrogen Fertilizer

Increased Plant Uptake

N stored in Vadose Zone

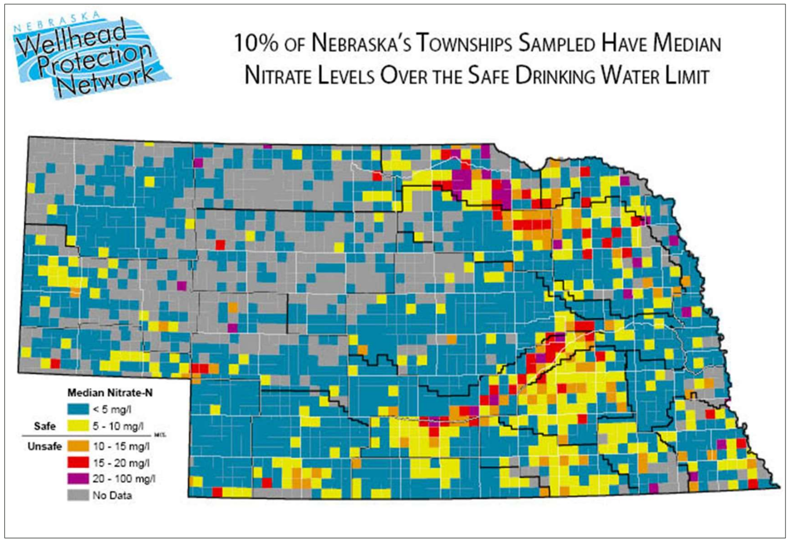
Discharge to surface water

Discharge to groundwater

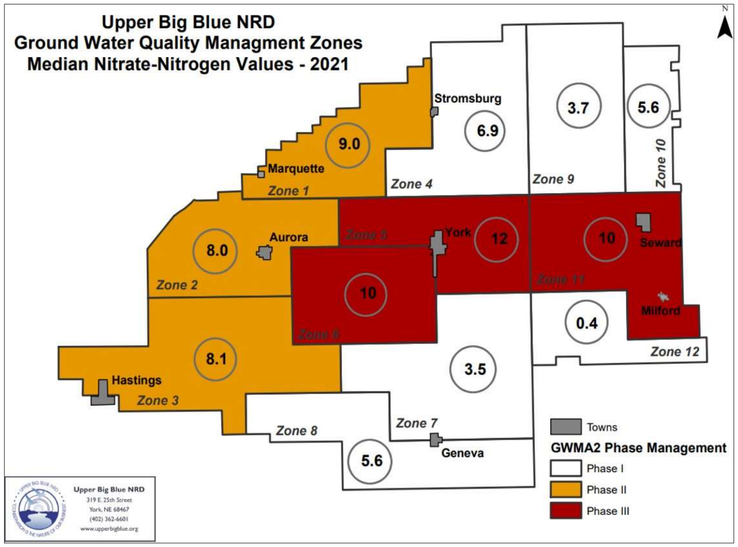


Nitrate in Drinking Water

The City provides safe and clean drinking water. However, nitrate in drinking water can have negative health effects. The EPA has set a Maximum Contaminant Level of 10 mg/L.



Nitrate-N is a common contaminant in drinking water in Nebraska. From a combination of point and non-point sources, excess nitrate builds up in water supplies and creates the need for a community-based plan to address unsafe nitrate levels.



The UBBNRD conducts a water quality sampling program to monitor nitrate levels in groundwater. The NRD publishes annual nitrate sampling results to their website.

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Nitrate in Drinking Water

Implications on public health:

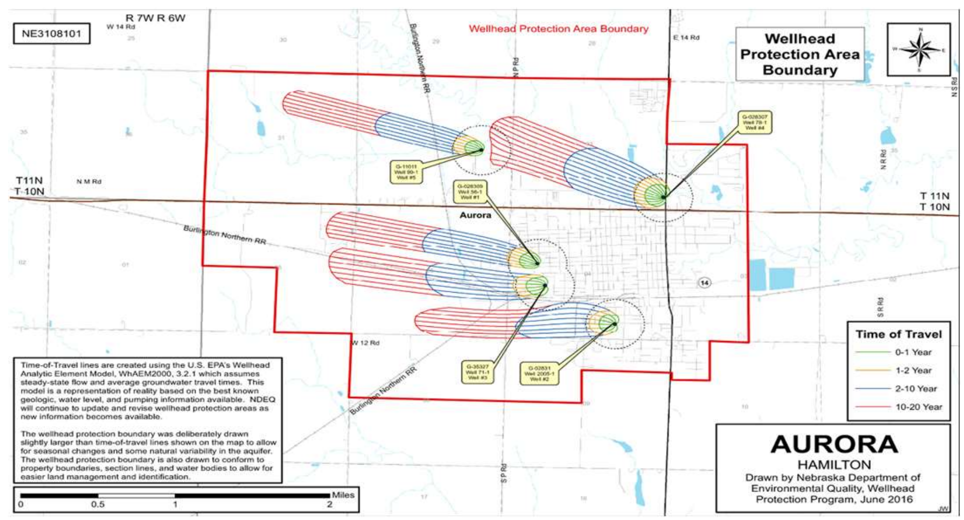
- Methemoglobinemia (blue baby syndrome)
- Studies have linked elevated nitrates in drinking water with:
  - Colorectal, bladder, and breast cancer
  - Thyroid disease
  - Birth defects

Updating the Wellhead Protection Area

Communities completing a DWPMP are required to update their Wellhead Protection Area based on the 50-year Time of Travel lines.

The City's Wellhead Protection Area was last updated in 2016 by the Nebraska Department of Environment and Energy. The boundary was drawn around the 20- year Time of Travel lines. The DWPMP requirement is to update the area to include the 50-year Time of Travel lines. Two new wells have been drilled since the last map was made.

Existing Wellhead Protection Area (2016)



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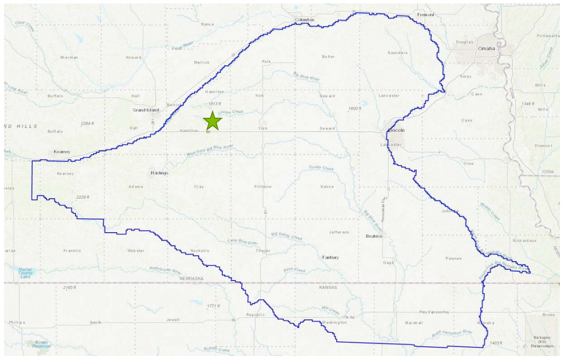
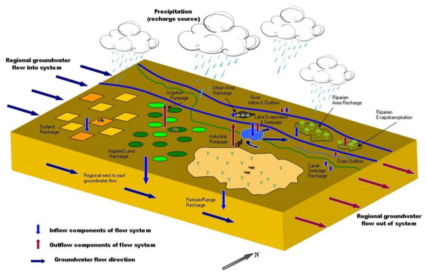
Using State-Approved Groundwater Models to Update the Wellhead Protection Area

Groundwater models approved by the Nebraska Department of Natural Resources will be used to delineate a proposed Wellhead Protection Area based on the 50-year Time of Travel lines and include the two new municipal wells.



Blue Basin Model

Cooperative Hydrology Study (COHYST) Model



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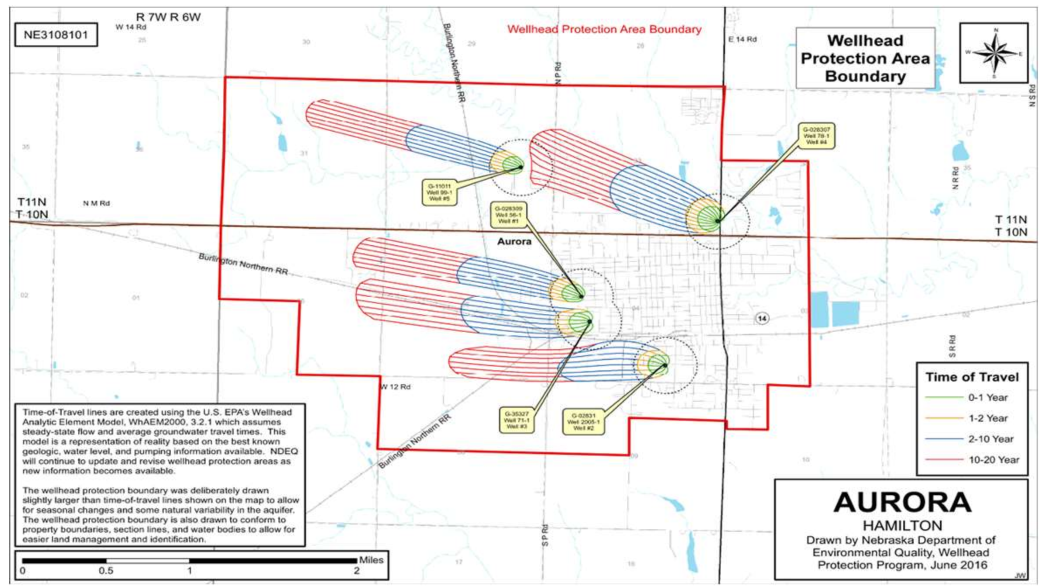
Updating the Wellhead Protection Area

- Run groundwater model including newest municipal wells
- Delineate proposed boundary around 50-year time of travel lines
- Share proposed area with Aurora/NDEE
- Share proposed area with stakeholder group
- Share proposed area with public at open house
- Submit proposed area with draft plan for approval by NDEE/EPA
- Update city zoning (wellhead protection overlay district)

Existing Wellhead Protection Area (2016)



Potential Contaminant Source Inventory

The Contaminant Source Inventory can:

- Clarify what constitutes a potential source of contamination
- Clarify what point and non-point source pollution is
- Important Note #1: Potential is the key
- Important Note #2: This inventory only represents a SNAPSHOT IN TIME

Common Potential Sources of Contamination include:

Agricultural

- Fuel storage, grain storage, water wells, chemigation, livestock operations, and chemical storage

Commercial/Light Industry

- Auto repair facilities, dry cleaners, fuel stations/storage, machine shops, rail yard

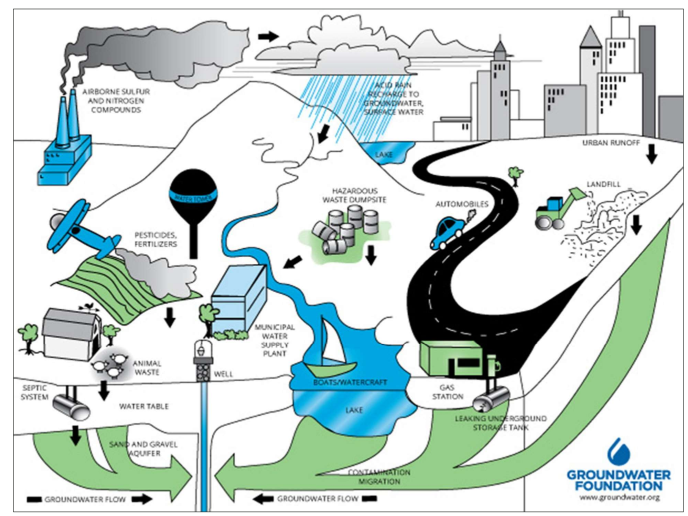
Industry

- Manufacturing facilities, oil and gas wells, junk yards, landfills, sewage treatment plants

Others

- Cemeteries, septic systems, golf courses, highway maintenance yards, transportation corridors

The purpose is to identify existing contaminant sources and sources that have the potential to pollute groundwater within the Wellhead Protection Area.



Potential Contaminant Source Inventory

- Online Data Sources:
  - Nebraska Department of Environment and Energy (NDEE)
  - Nebraska Department of Natural Resources (DNR)
  - Nebraska State Fire Marshall (SFM)
  - Nebraska Oil & Gas Conservation Commission (NOGCC)
- A field inventory will be completed to verify the online data

DRASTIC Modeling

- Purpose is to evaluate the vulnerability of groundwater resources to pollution based on hydrogeologic parameters
- EPA-developed method
- Will help us to identify high priority areas for BMP implementation

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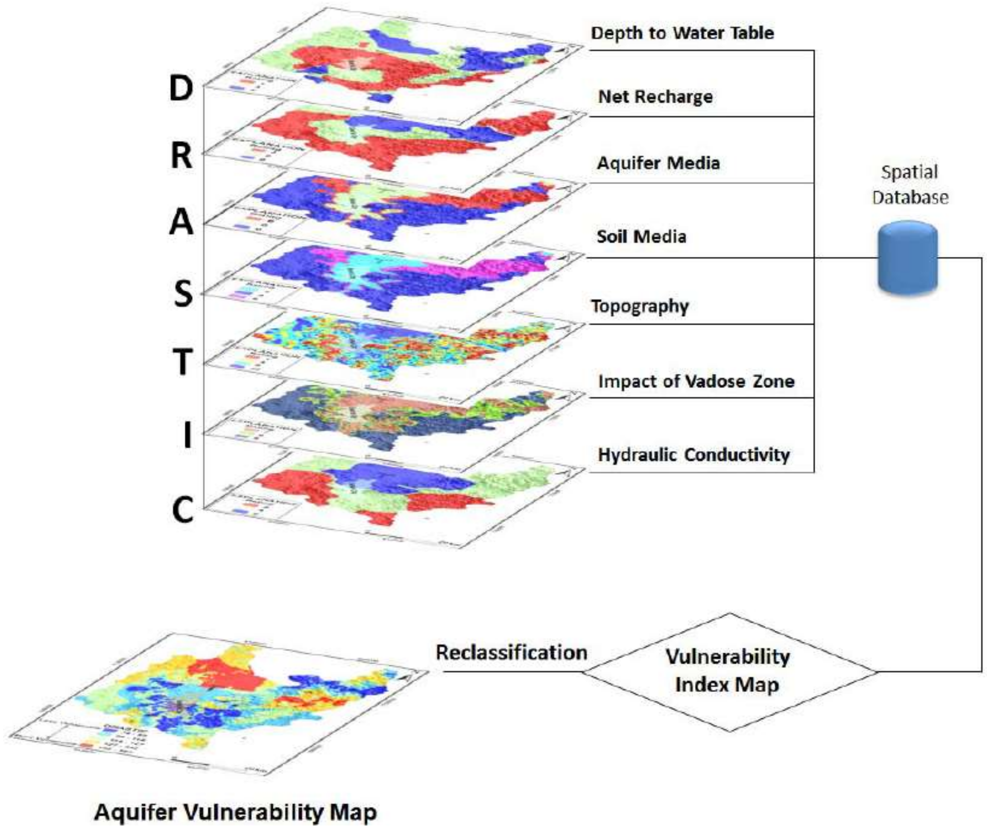
DRASTIC Modeling

- D – **D**epth to Water: the depth from the ground surface to the water table in an unconfined aquifer.
- R – Net **R**echarge: the quantity of water applied to the ground surface that infiltrates to reach the aquifer.
- A – **A**quifer media: the sediments which serve as the aquifer (e.g. sand, gravel, limestone).
- S – **S**oil media: the uppermost portion of the vadose zone characterized by biological activity.
- T – **T**opography: the slope and slope variability of the land surface.
- I – **I**mpact of vadose zone: the zone above the water table which is unsaturated or discontinuously saturated.
- C – Hydraulic **C**onductivity: the ability of the aquifer materials to transmit water.

DRASTIC Modeling

- D – **D**epth to Water
- R – Net **R**echarge
- A – **A**quifer media
- S – **S**oil media
- T – **T**opography
- I – **I**mpact of vadose zone (zone between root zone and water table)
- C – Hydraulic **C**onductivity



Source: Alwathaf, Y. *Assessment of aquifer vulnerability based on GIS and ARCGIS methods: A case study of the Sana'a Basin (Yemen).* January 2011.

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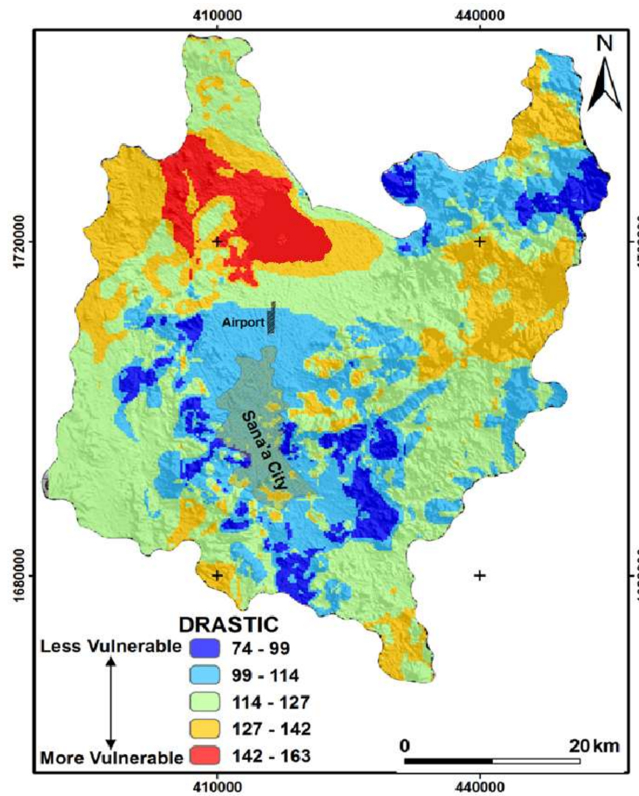
DRASTIC Modeling

- Example of resulting map from DRASTIC analysis
- Similar will be made for Aurora's wellhead protection area
- Red areas show highly vulnerable areas—if site conditions allow, good places for BMPs!



Source: Alwathaf, Y. *Assessment of aquifer vulnerability based on GIS and ARCGIS methods: A case study of the Sana'a Basin (Yemen).* January 2011.

Project Timeline

DWPMP Development

- Complete Contaminant Source Inventory (Oct 2022)
- Complete DRASTIC modeling (Nov 2022)
- Update WHP area (early Dec 2022)
- BMP Recommendations (Dec 2022/Jan 2023)
- Plan Revision/Adoption (March 2023)

Public Involvement

- Open House Meeting #1 (June 15)
- Stakeholder Meeting #1 (October 4)
- Stakeholder Meeting #2 (late Nov/early Dec)
- Open House Meeting #2 (Feb/March 2023)

Open House Meeting #1

- Held from 6-8 pm on June 15th @ Bremmer Center
- Information presented on what a DWPMP is, the current WHP area, best management practices to improve drinking water quality, and cost share resources.
- Representatives from Olsson, Aurora, NDEE, and UBBNRD were in attendance.
- Eight members of public in attendance. One comment received.

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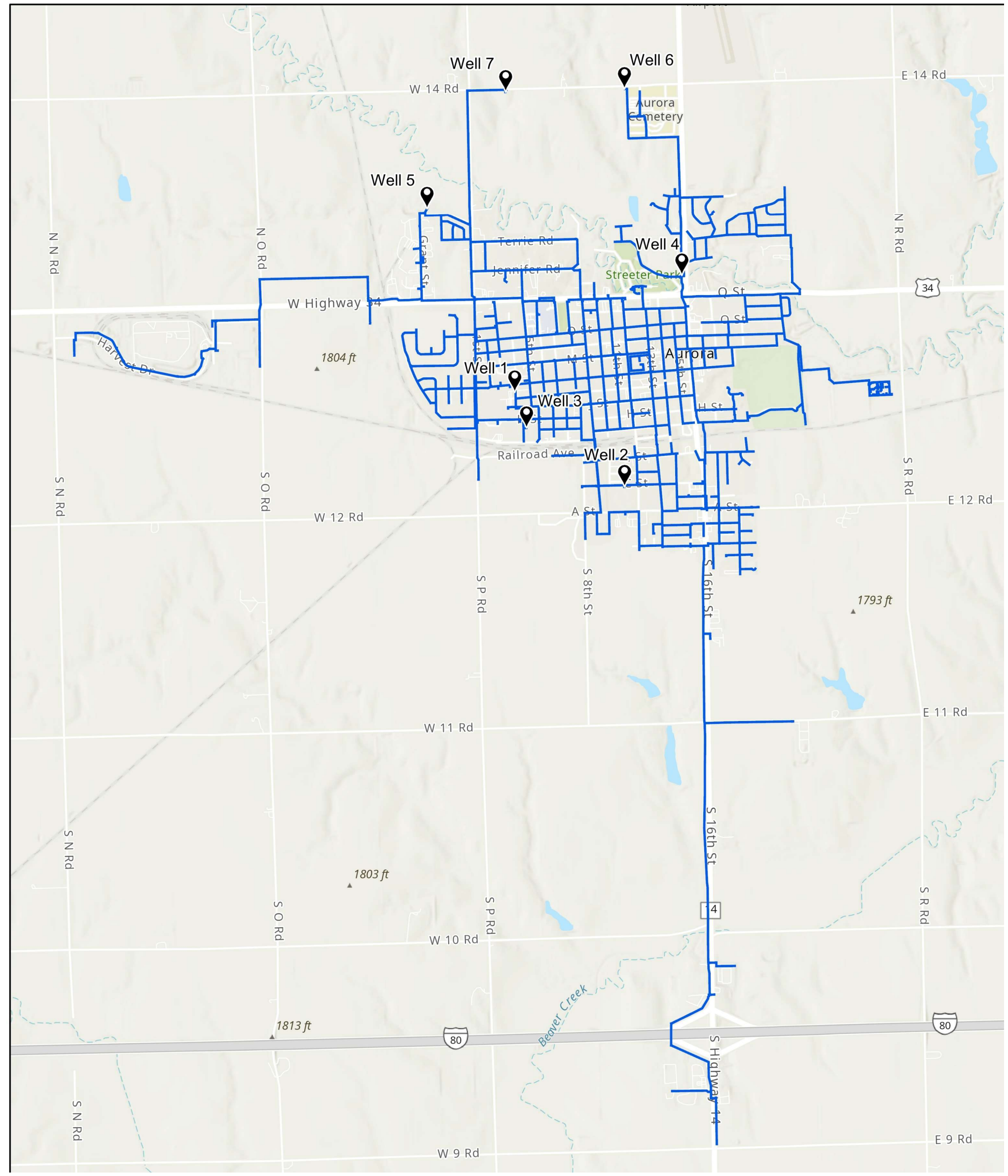
Role of City of Aurora

- Adam Darbro, Utility Superintendent/Zoning Administrator

City of Aurora Water System



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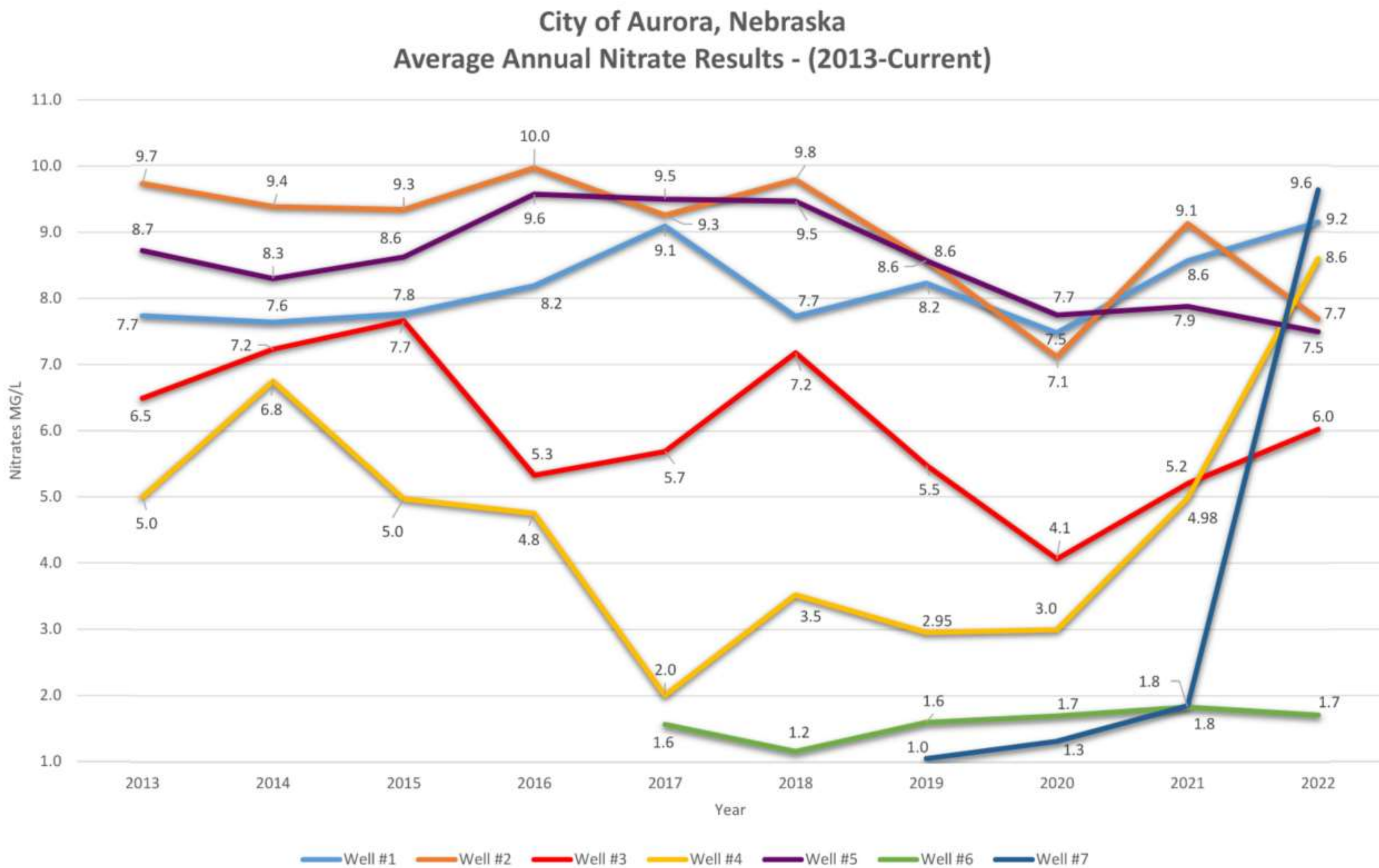

City of Aurora, Nebraska
Average Annual Nitrate Results - (2013-Current)
Nitrates MG/L
Year
Well #1
Well #2
Well #3
Well #4
Well #5
Well #6
Well #7

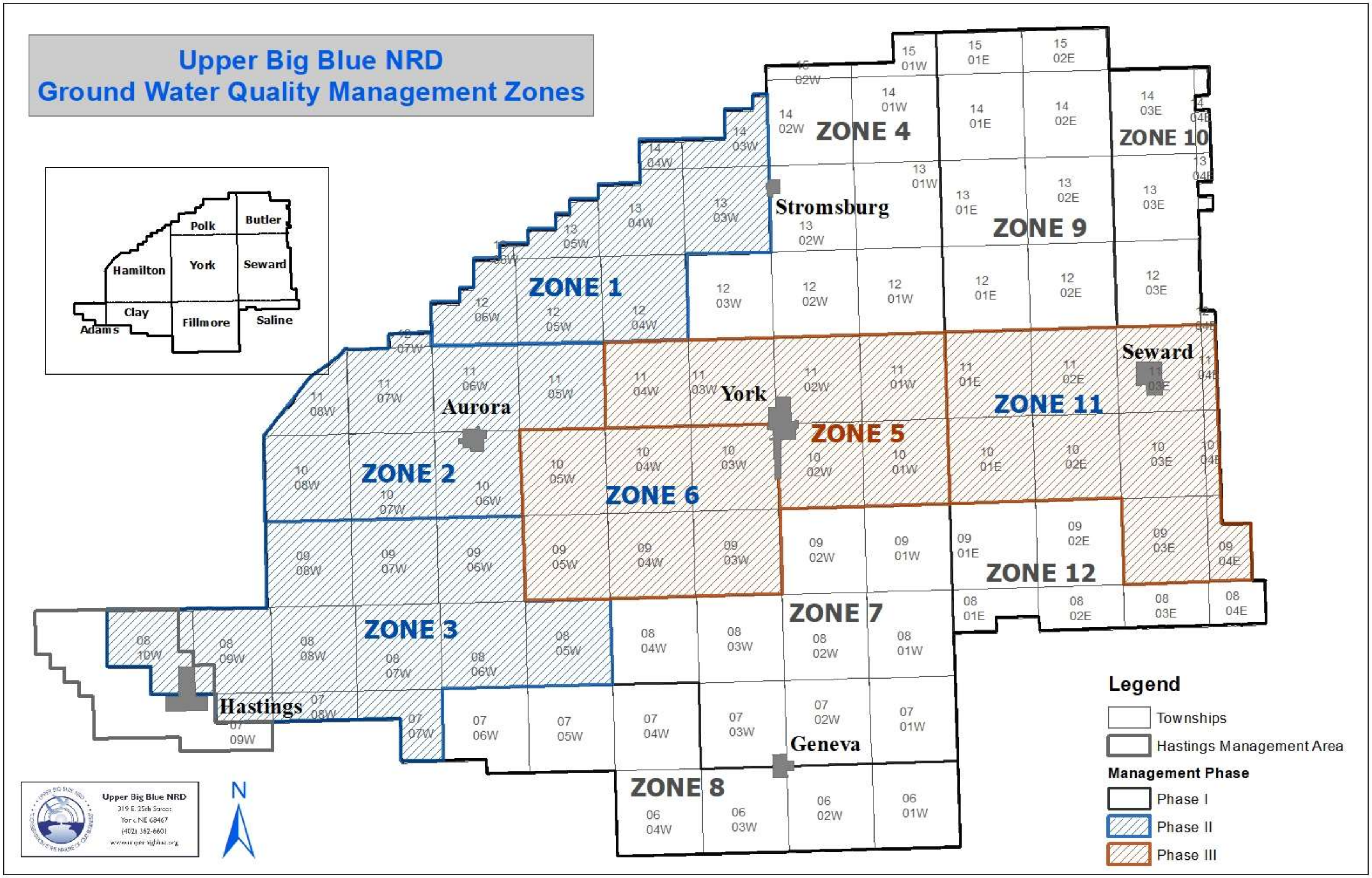
Role of Upper Big Blue NRD

- Erinn Wilkins, Water Resources Technician

UPPER BIG BLUE NRD AND AURORA DWPMP

ERINN WILKINS, *WATER RESOURCES TECHNICIAN*

WATER QUALITY AREAS AND REGULATIONS


Upper Big Blue NRD
Ground Water Quality Management Zones
Polk
Butler
Hamilton
York
Seward
Clay
Fillmore
Saline
Adams
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 6
ZONE 7
ZONE 8
ZONE 9
ZONE 10
ZONE 11
ZONE 12
Stromsburg
Aurora
York
Seward
Hastings
Geneva
Legend
Townships
Hastings Management Area
Management Phase
Phase I
Phase II
Phase III
Upper Big Blue NRD
319 E. 25th Street
York NE 68467
(402) 362-6601
N

PHASE TRIGGERS

Phase I

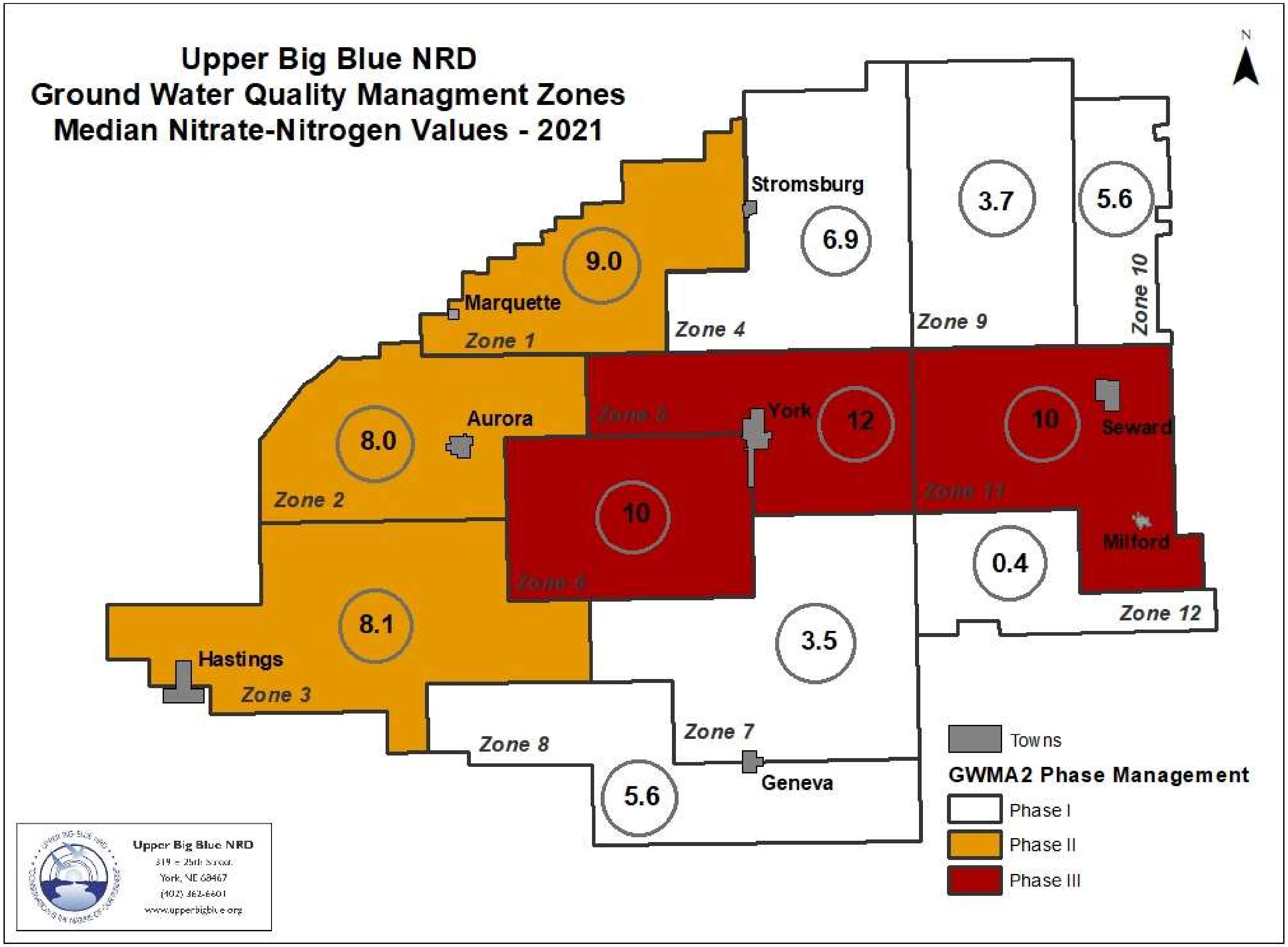
All operators of land withing the District are subject to Phase I requirements.

Phase II

Designated when the median nitrate level is 7 ppm or greater.

Phase III

Designated when the median nitrate level is 10 ppm or greater.


Upper Big Blue NRD
Ground Water Quality Managment Zones
Median Nitrate-Nitrogen Values - 2021
N
Stromsburg
Marquette
Aurora
York
Seward
Milford
Hastings
Geneva
9.0
6.9
3.7
5.6
8.0
12
10
10
0.4
8.1
3.5
5.6
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
Zone 7
Zone 8
Zone 9
Zone 10
Zone 11
Zone 12
Towns
GWMA2 Phase Management
Phase I
Phase II
Phase III
Upper Big Blue NRD

PHASE 1 REQUIREMENTS

- Pre-plant anhydrous ammonia may not be applied before November 1
- Liquid or dry pre-plant nitrogen fertilizer may not be applied before March 1

PHASE I REQUIREMENTS EXEMPTIONS

Application of nitrogen fertilizer for:

- Any purpose other than fertilization of spring planted crops
- Spring planted small grains – barley, oats, and rye
- Spreading of manure, sewage, and other by-products conducted in compliance with state laws and regulations

PHASE II REQUIREMENTS

All Phase I requirements continue to be enforced in Phase II

- Pre-plant anhydrous ammonia may not be applied before November 1
- Liquid or dry pre-plant nitrogen fertilizer may not be applied before March 1

PHASE II REQUIREMENTS

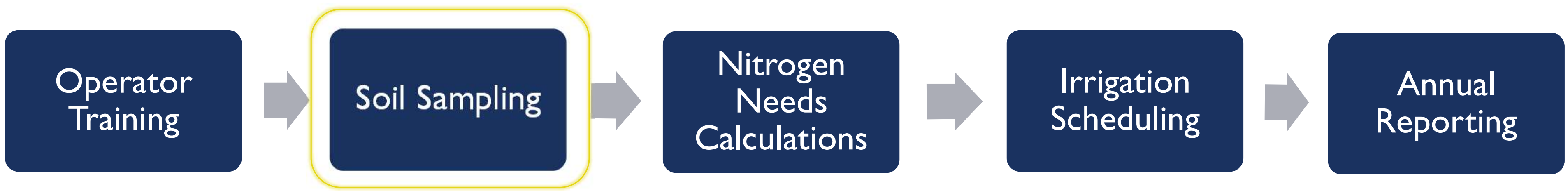
Operator Training → Soil Sampling → Nitrogen Needs Calculations → Irrigation Scheduling → Annual Reporting

PHASE II REQUIREMENTS

Operator Training → Soil Sampling → Nitrogen Needs Calculations → Irrigation Scheduling → Annual Reporting

- All operators must attend an NRD approved training and become certified.
- Training/certification must be renewed once every four years.

PHASE II REQUIREMENTS



- Before applying fertilizer, the operator must obtain
  - 0-8" sample for organic matter and residual nitrogen
  - 8-24" sample for residual nitrogen

- Fields with crop rotation are exempt.

PHASE II REQUIREMENTS

Operator Training → Soil Sampling → Nitrogen Needs Calculations → Irrigation Scheduling → Annual Reporting

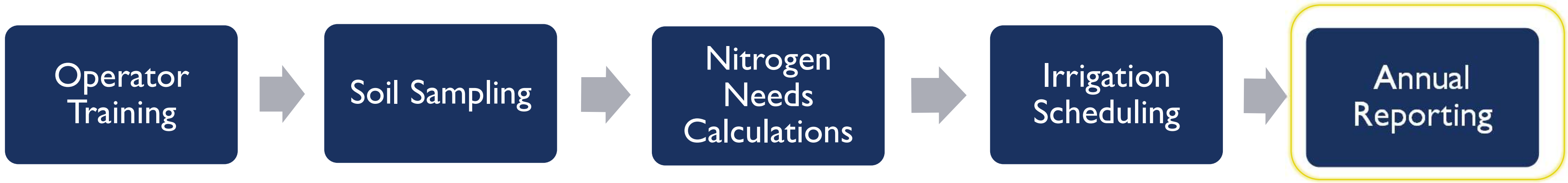
- Before applying nitrogen, the operator must calculate the nitrogen application rate needed for each field.
- Calculations are based on the University of Nebraska recommended procedures.

PHASE II REQUIREMENTS

Operator Training → Soil Sampling → Nitrogen Needs Calculations → Irrigation Scheduling → Annual Reporting

- Each operator must schedule irrigation in one field that is at least 65 acres using one of the following methods:
  - Capacitance probes
  - Resistance blocks

PHASE II REQUIREMENTS



- Each operator must report information regarding the use of best management practices.
- Report needs to include a copy of the soil analysis and irrigation scheduling information.

PHASE III REQUIREMENTS

All Phase I and Phase II requirements continue to be enforced in Phase III

- Nitrogen application date restrictions
- Nitrogen needs calculations
- Operator training
- Irrigation scheduling
- Soil sampling
- Annual report

PHASE III REQUIREMENTS

Soil Sampling → Irrigation Water Analysis → Fall and Winter Anhydrous Ammonia

PHASE III REQUIREMENTS

Soil Sampling → Irrigation Water Analysis → Fall and Winter Anhydrous Ammonia

- Before applying fertilizer, the operator must obtain
  - 0-8" sample for organic matter and residual nitrogen
  - 8-24" sample for residual nitrogen

- Phase III: per 40 acres

PHASE III REQUIREMENTS

Soil Sampling → Irrigation Water Analysis → Fall and Winter Anhydrous Ammonia

- The operator must have their irrigation water tested for nitrates at least once every three years

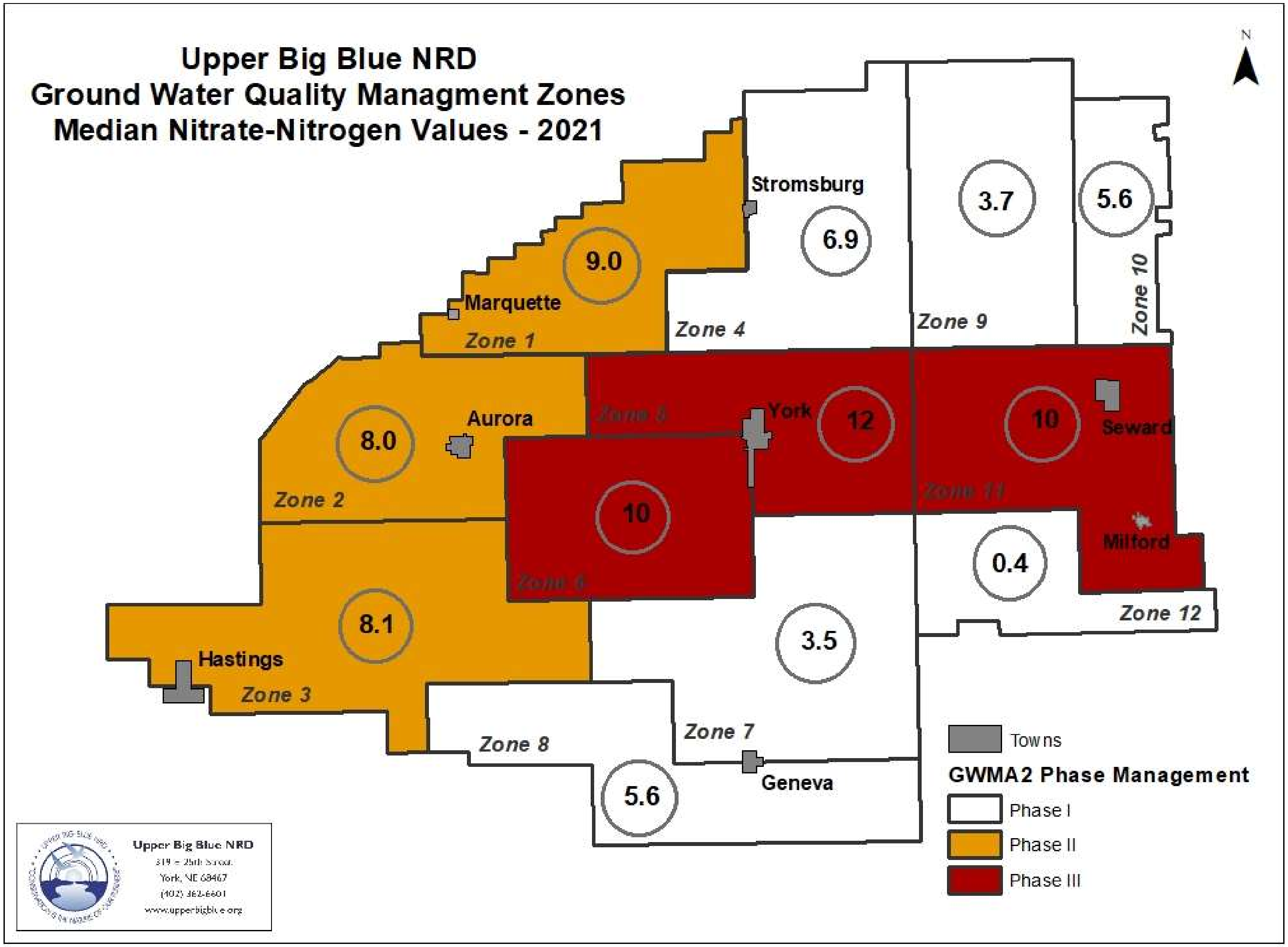
PHASE III REQUIREMENTS

Soil Sampling → Irrigation Water Analysis → Fall and Winter Anhydrous Ammonia

- If anhydrous ammonia is applied between November 1 and February 29, a District approved nitrification inhibitor must be used.

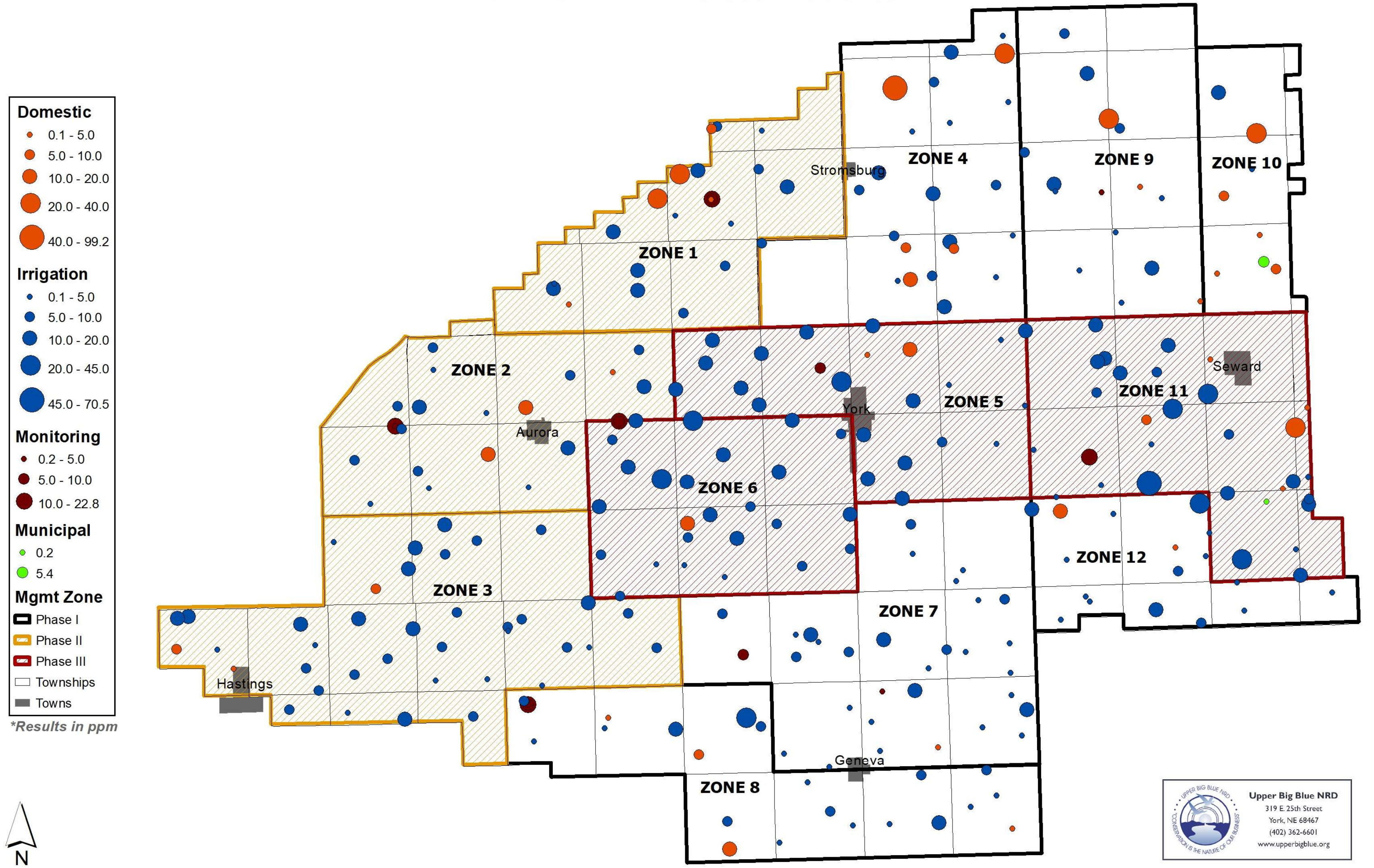
- A receipt as proof of purchase for the inhibitor must accompany the annual report.

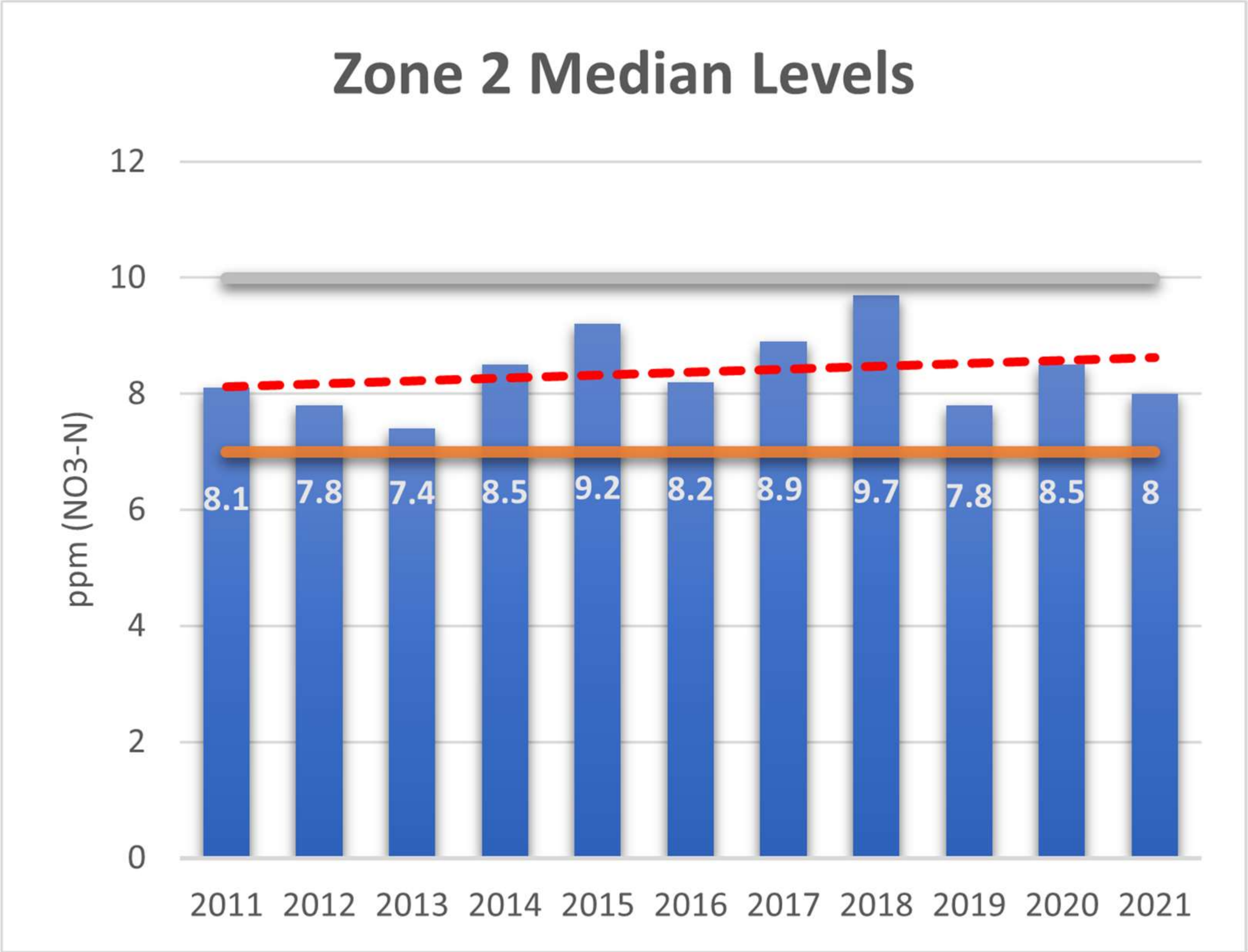
MONITORING



Upper Big Blue NRD
Ground Water Quality Managment Zones
Median Nitrate-Nitrogen Values - 2021
N
Stromsburg
6.9
3.7
5.6
9.0
Marquette
Zone 1
Zone 4
Zone 9
Zone 10
Aurora
8.0
Zone 5
York
12
10
Seward
Zone 2
10
Zone 11
Milford
0.4
Zone 6
Zone 12
8.1
3.5
Hastings
Zone 3
Zone 7
Zone 8
5.6
Geneva
Towns
GWMA2 Phase Management
Phase I
Phase II
Phase III
Upper Big Blue NRD
York, NE 68467

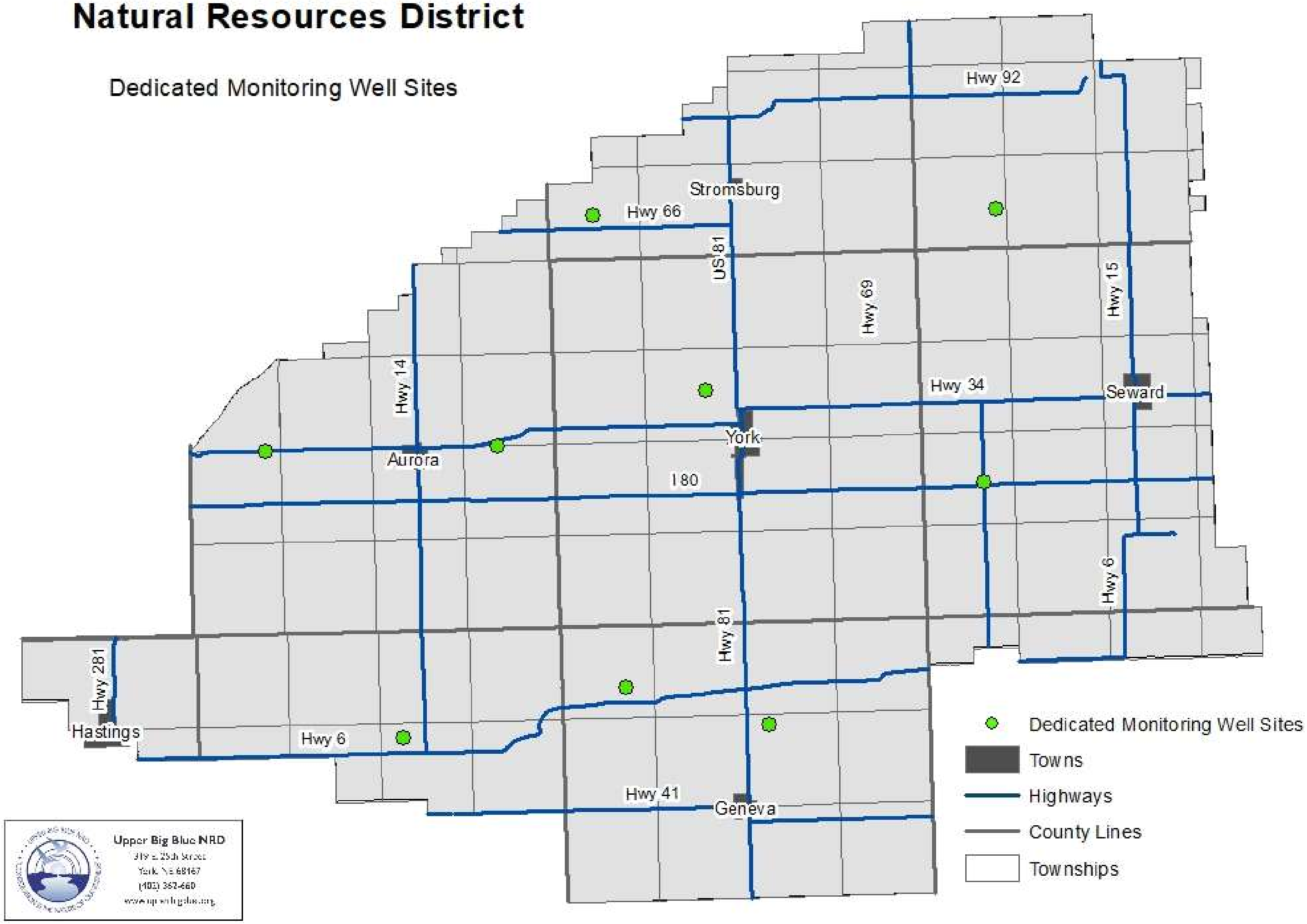
2021 GWMA Nitrate Results




Zone 2 Median Levels
ppm (NO3-N)
0
2
4
6
8
10
12
8.1
7.8
7.4
8.5
9.2
8.2
8.9
9.7
7.8
8.5
8
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021

Upper Big Blue Natural Resources District

Dedicated Monitoring Well Sites



COST-SHARE RESOURCES

AQWACAP

Aquifer Quality Well Abandonment Cost-Share Assistance Program

Wells that have not been properly decommissioned are a direct conduit for contaminants to enter our drinking water.

Cost-share rate is 60% of actual labor and materials.

Maximum cost-share rate is $750.

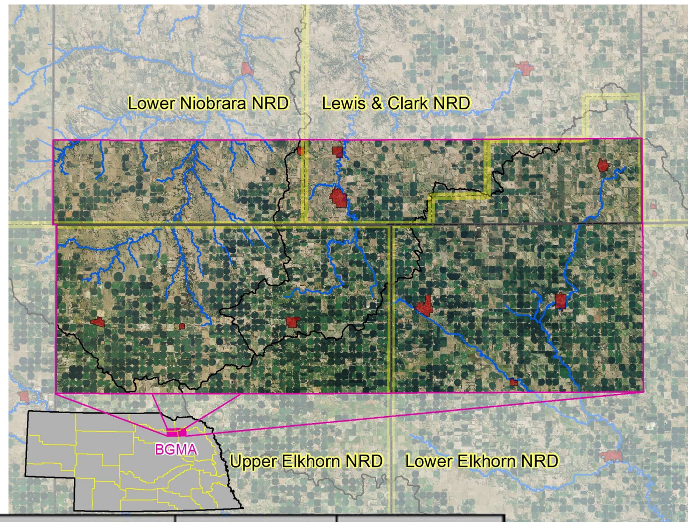
Application Process

- Well owner must submit a completed program application.
- Application must be approved by UBBNRD before work can begin.
- Itemized invoice must be provided to UBBNRD.
- Board of directors will approve final payment.

Role of NDEE

- Tatiana Davila, Hydrogeologist

Progression of DWPMPs: Bazile GMA



Prioriy Areas	Acres	Average NO3-N of most recent samples	Reduction % needed	Acres Needing BMPs
Tier 1	31,224	17.6	45%	14,051
Tier 2	53,112	14.2	30%	15,934
Tier 3	10,167	14.9	46%	4,677
Tier 4	389,337	12.6	21%	81,761
Total	483,840			116,422

Data courtesy of Laura Johnson, NDEE

- 2016 – Bazile Groundwater Management Area Plan is approved by EPA, reviewed as an alternative to a 9-element plan
  - 756 square miles
  - 4 NRDs
  - 3 basins
  - 8 public water systems providing drinking water to 10 communities (7,000 people)
- Plan Goals:
  - Short Term: Halt trend of NO3 in Tier 1-3 areas
  - Long Term: reduce concentrations below 10 mg/L in Tier 1 (WHP) areas
- Tasks:
  - Education & outreach
  - Nitrogen Mgmt (split application, cover crop, irrigation mgmt)
  - Monitoring: water, soil (vadose zone), crop tissue and residue, analyze crop reporting forms

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Why is BGMA so important?

- Less than 1% of water bodies in NE used for drinking water, so bacteria becomes focus of watershed based plans
- Over 88% of public water systems in NE rely on groundwater
- By 2013 Nebraska petitions EPA to allow use of CWA Section 319 funds for groundwater protection when “responding to a nonpoint source pollution emergency or *urgent nonpoint source pollution public health risk*”
- NE is able to address groundwater pollution through 319 for the first time, can utilize up to 50% of program funding for groundwater
- 4 NRDs agree to manage this area under the same rules
- Locally led effort

Courtesy of Laura Johnson, NDEE

Partnerships

2018 Farm Bill

United States Department of Agriculture

NRCS Source Water Protection

Apply by March 13, 2020, to be elibible for this year's funding.

2018 Farm Bill Source Water Protection Funding

The 2018 Farm Bill provides a new opportunity for farmers and landowners to receive financial assistance for applying conservation practices on agricultural land located in source water protection (SWP) priority areas.

If your farm is located in any of the priority areas on the map below, you may be eligible to receive increased financial assistance from the following Farm Bill conservation programs:

- Environmental Quality Incentives Program (EQIP)
- Conservation Stewardship Program (CSP)
- Regional Conservation Partnership Program (RCPP)
- Agricultural Conservation Easement Program (ACEP)

Nebraska NRCS is now accepting SWP applications. Approved applicants can receive funding to install conservation practices used to address water quality, that include:

- Nutrient management
- Irrigation water management
- Cover crops
- Conversion of flood to pivot or subsurface drip irrigation systems.

NRCS field office staff can determine if your application is eligible for SWP priority area financial assistance. Applications are accepted anytime, but to receive finding this year, applications must be received by March 13, 2020. Visit your local NRCS field office to learn more.

- 10% of all NRCS conservation funds (except CRP) to go toward source water protection (2.5M in NE)
- Subcommittee of NE State Technical Committee met to build framework for funding priority areas

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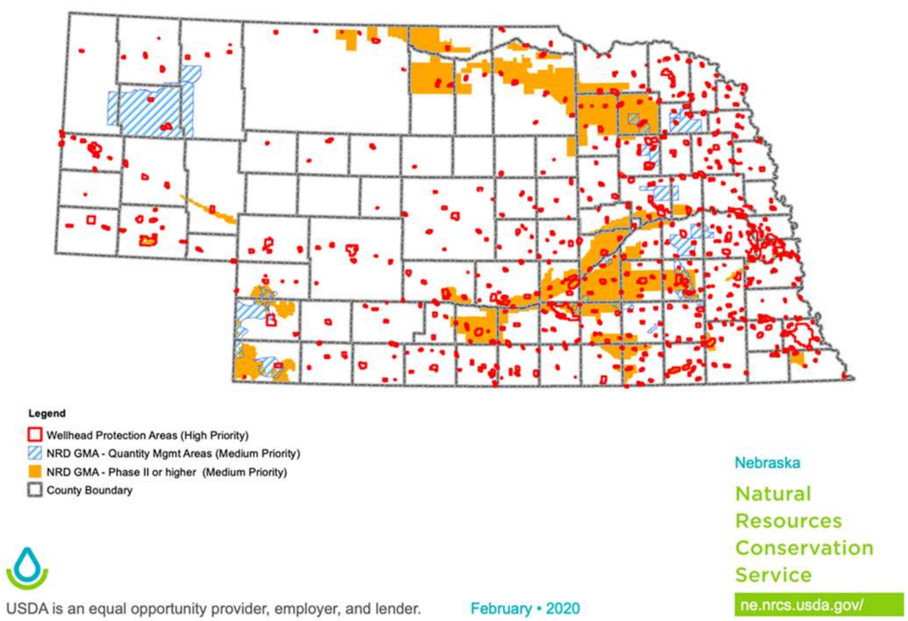
NDEE and NRCS Partnerships



- ▶Fall 2019 – Meeting to prioritize funding from 2018 Farm Bill SWPI (10% of conservation funds to SWP)
- ▶Priority best management practices are ID'd for water quality, are included in DWPMPs

Source Water Protection Initiative Priority Practices

Practice Number	Practice Name
314	Brush Management (only very low density scenario)
328	Conservation Crop Rotation
340	Cover Crop
351	Water Well Decommissioning
441	Irrigation System, Micro Irigation
442	Sprinkler System
449	Irrigation Water Management
590	Nutrient Management
595	Integrated Pest Management
657	Wetland Restoration
Not Available in 2020	
420	Wildlife Habitat Planting
604	Saturated Buffer

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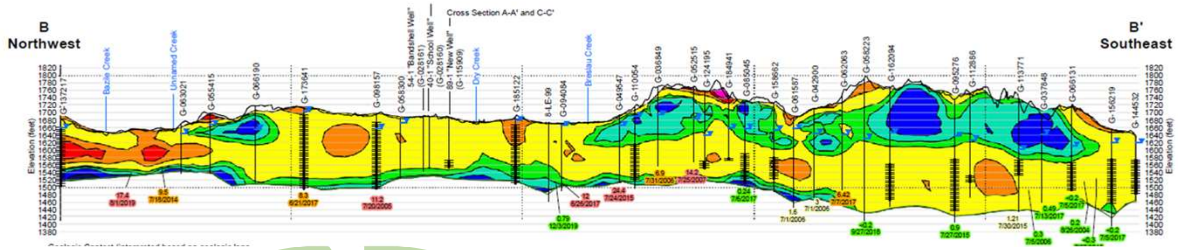
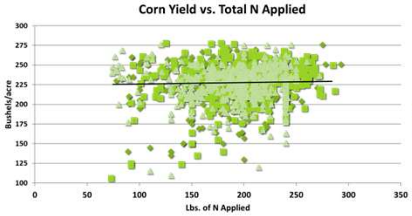
Bipartisan Infrastructure Bill Funding



Code	Practice
327	Conservation Cover
328	Conservation Crop Rotation
332	Contour Buffer Strips
340	Cover Crop
342	Critical Area Planting
351	Well Decommissioning
355	Groundwater Testing
386	Field Border
390	Riparian Herbaceous Cover
391	Riparian Forest Buffer
393	Filter Strip
412	Grassed Waterway
430	Irrigation Pipeline
441	Irrigation System, Microirrigation
442	Sprinkler System
449	Irrigation Water Management
512	Pasture and Hay Planting
550	Range Planting
590	Nutrient Management
595	Pest Management Conservation System
635	Vegetated Treatment Area
656	Constructed Wetland
657	Wetland Restoration
659	Wetland Enhancement



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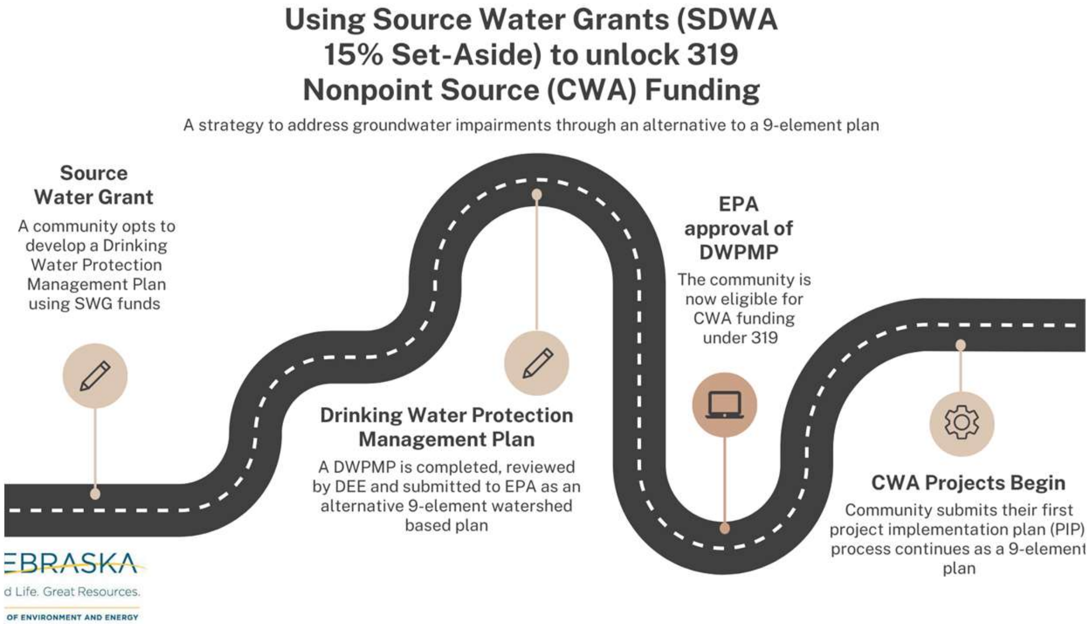
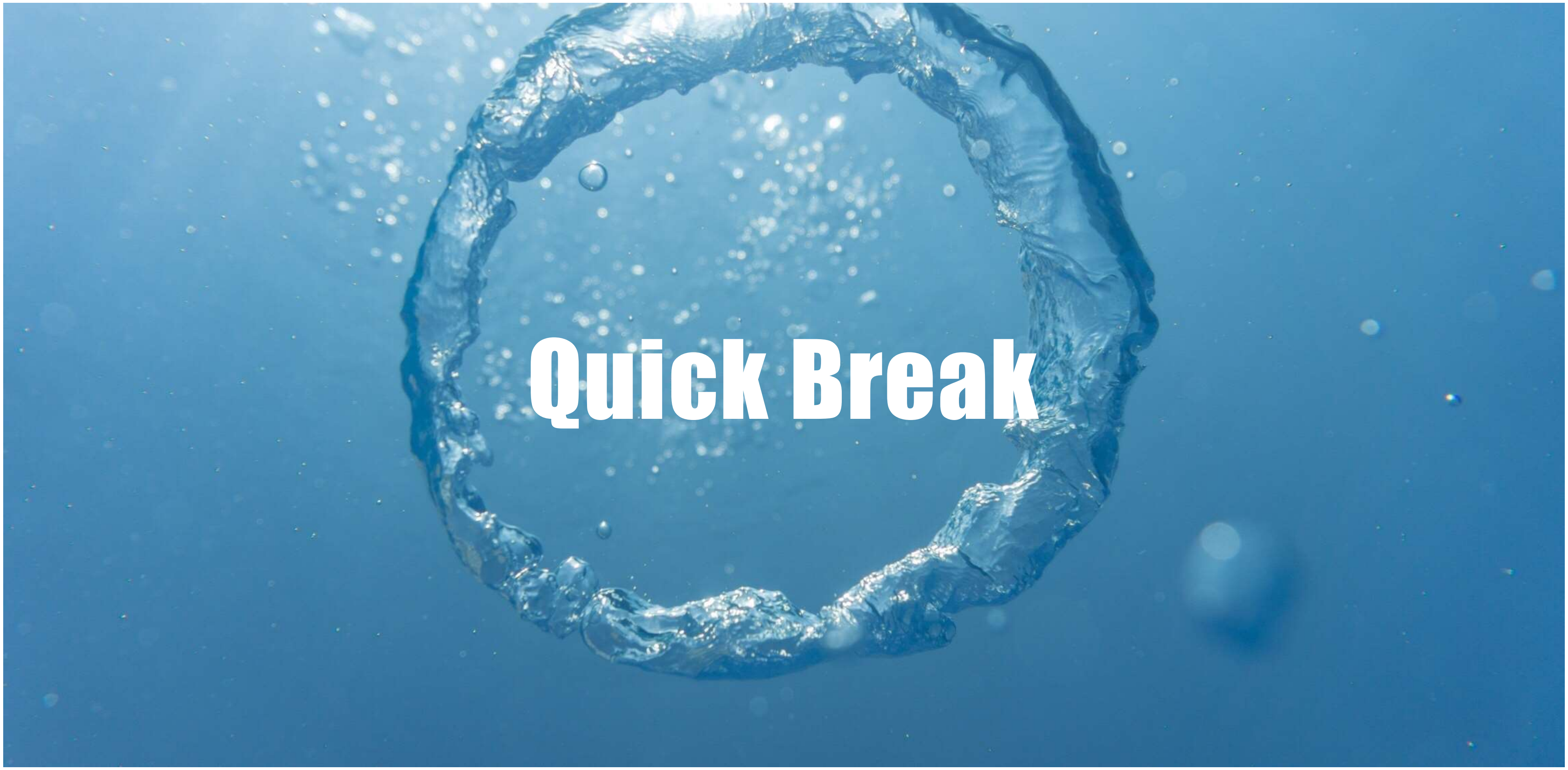
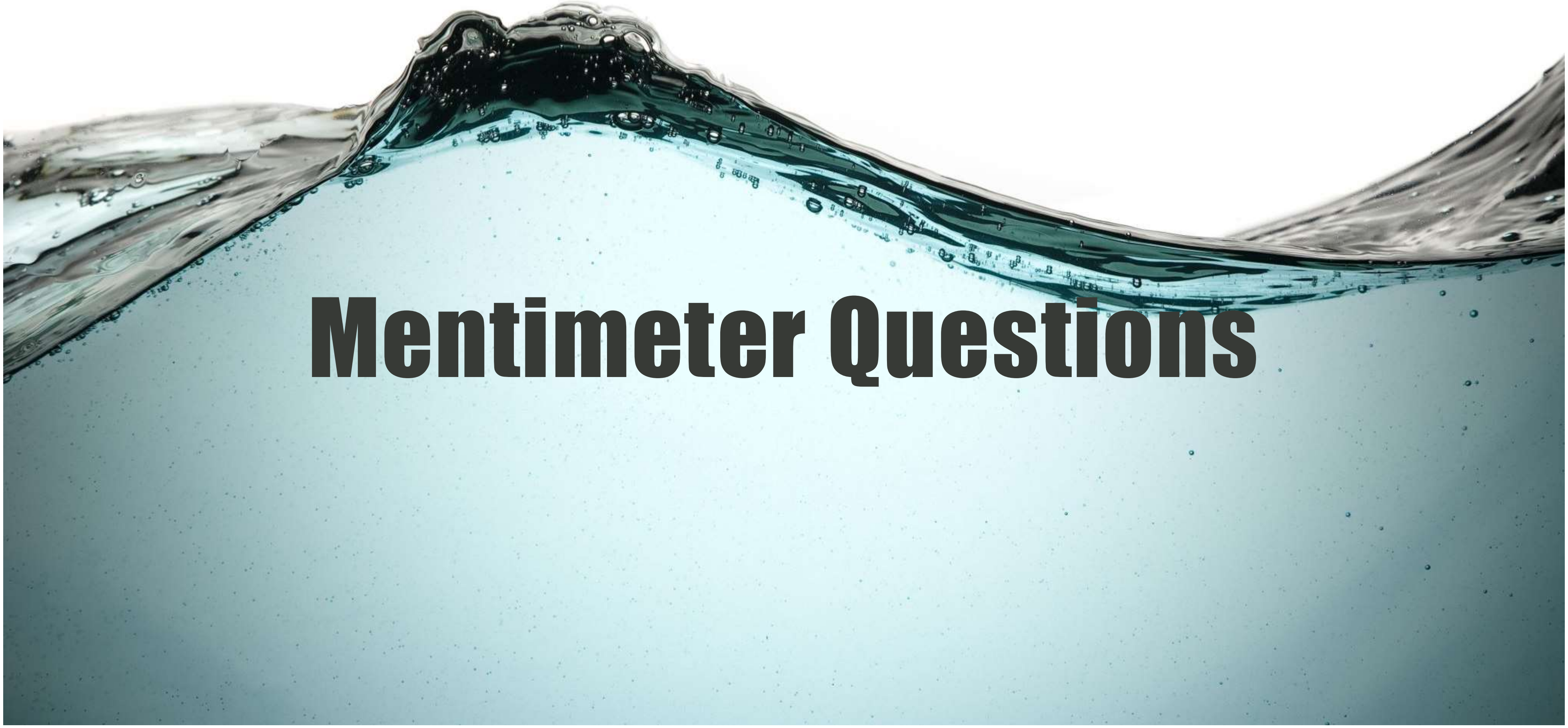


- Upcoming projects:
  - Springfield
    - Urban practices including rain gardens, bioswales
  - Waverly
    - Drinking Water Coordinator Position
  - Broken Bow
    - Interseeder demonstration / CO-OP for cover crop planting


Quick Break



Mentimeter Questions

What are some BMPs that you would like to see used in the area?

- Refer to BMP handout

How likely is the community to adopt BMPs encouraged by this plan?

- Rural community?
- Urban community?
- Why?

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How can we encourage adoption?

What are some myths/preconceived notions that need to be addressed?

What are ways to get the general public involved and attending the open house meeting?

Is there anything you'd like more information on at the next stakeholder meeting or topics you'd like to discuss?

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Next Steps

- Summarize your feedback and incorporate into draft plan
- Stakeholder Meeting #2 (late Nov/early Dec)
  - Share proposed WHP area, DRASTIC modeling, CSI results
  - Further discussion on BMP implementation/project ideas
- Open House Meeting #2 (Feb/Mar 2023)
- Complete draft plan and submit to NDEE/EPA (Spring 2023)

Contact Information

Olsson Project Manager:

Mallory Morton, PE

mmorton@olsson.com

(402) 458-5071

Aurora Project Manager:

Adam Darbro, Utility Superintendent/Zoning Administrator

utlysupt@cityofaurora.org

(402) 694-6992

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Rural Best Management Practices (BMPs)

Annual Crop Reports – This educational tool is a record of the amount of nitrogen fertilizer used and the corresponding yield to help make fertilizer decisions the following season. If less nitrogen could be used to obtain the same yield, this will reduce the risk of nitrogen leaching into the groundwater.

Soil sampling – Allows producers to identify the amount of nitrogen already existing in the soil, which can translate to less nitrogen fertilizer being applied which reduces nitrogen loading to the groundwater.

Irrigation water well sampling – By identifying the level of nitrogen in an irrigation water well, a producer can apply less nitrogen fertilizer, reducing the quantity of nitrogen percolating back into the groundwater with recharge occurring under the field.

Cover crops – Cover crop is growing a crop of grass, small grain, or legumes primarily for seasonal protection and soil improvement. Reduces water quality degradation by utilizing excessive soil nutrients. Usually planted in the off-season.

Crop rotations – Conservation crop rotation is growing a planned sequence of various crops on the same piece of land for a variety of conservation purposes. Crop rotations reduce water quality degradation due to excess nutrients.

Fertilizer application – By splitting, delaying, and/or restricting fertilizer applications at certain times of the year as well as using water-soluble fertilizers in irrigation equipment, less nitrogen can be applied during a growing season leading to less nitrogen leaching into the vadose zone and into the groundwater.

Soil moisture sensors – Using soil moisture sensors and irrigation scheduling gives the producer more resources to make educated irrigation management decisions. This will reduce the amount of irrigation water applied, reducing the risk of nitrogen leaching caused by overwatering.

Water well flow meters – Having a flow meter installed on an irrigation system takes the guesswork out of determining how much water is being applied per irrigation event. Flow meters give the producer more control over irrigation events, reducing the amount of water applied, which will reduce the risk of leaching caused by overwatering.

Well abandonment – Capping abandoned or inactive wells reduces aquifer vulnerability from potential pollutants and removes public health and safety concerns.

No till/reduced tillage – No till/reduced tillage is the limiting of soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year-round. Crops are planted and grown in narrow slots or tilled strips established in the untilled seedbed of the previous crop.

Urban Best Management Practices (BMPs)

Bioswale – Bioswales, often found along curbs and in parking lots, use vegetation or mulch to slow and filter pollutant loads from stormwater runoff.

Detention/retention basins – Detention/retention basins are constructed basins that store runoff after a storm event. Detention basins store water for a short period of time after the storm event, whereas retention basins hold a permanent pool of water. Both allow water to sit for a period of time and for pollutants/sediment to settle out. The primary pollutant removal mechanisms are sediment settling and pollutant uptake, particularly of nutrients, through biological activity in the pond.

Low impact landscaping – Low impact landscaping refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration or use of stormwater in order to protect water quality and associated aquatic habitat.

Porous pavement – Permeable pavements are a stormwater control that allows stormwater to infiltrate through the surface of the pavement to the ground below. They can be made of porous concrete, porous asphalt, or permeable interlocking pavers.

Rain garden – Rain gardens are landscaped depressions that treat on-site stormwater discharge from impervious surfaces such as roofs, driveways, sidewalks, parking lots and compacted lawns. They are used to collect stormwater and filter it through a mixture of soil, sand and/or gravel, which naturally removes pollutants and can recharge local groundwater supply.

What are some best management practices (BMPs) that you would like to see used in the area?

How likely is the community to adopt BMPs encouraged by this plan?

Rural community? Urban community? Why?

How can we encourage adoption?

What are some myths/preconceived notions that need to be addressed?

What are ways to get the general public involved and attending the open house meeting?

Is there anything you'd like more information on at the next stakeholder meeting or topics you'd like to discuss?

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10.4.2022 **Stakeholder Committee**

Dustin Nissen	
Anthony Sigler	
Marlin Seeman	
TATIANA DAVILA	NDEE
[illegible]	
[illegible]	
Keith Wasem	
Jeremy Brandt	
Erinn Wilkins	UBBNRD

601 P Street / Suite 200 / Lincoln, NE 68508
O 402.474.6311 / olsson.com

MEETING MINUTES

Stakeholder Meeting #1

Date:	10/4/2022
RE:	Aurora DWPMP Stakeholder Meeting 1
Attendees:	Mallory Morton, Haley Engstrom, and Joe Hinnant – Olsson Adam Darbro, Rick Melcher, and Marlin Seeman – City of Aurora Erinn Wilkins– Upper Big Blue NRD Tatiana Davila – Nebraska Department of Environment and Energy Dustin Nissen – Sargent Drilling Anthony Sigler – Teacher for Aurora Public Schools Andrew Willis – Diamond Agricultural Services Keith Wasem – Retired/Irrigation Expert Jeremy Brandt – Hamilton County Highway Superintendent Steve Anderson – Heartland Bank
Project #	021-05223

PROJECT SCOPE & REPORT

1. **Introduction**
   - **a.** Mallory introduced DWPMP
   - **b.** Groundwater 101
   - **c.** Nitrogen cycle
   - **d.** Time of Travel & Groundwater modeling
     - i. Keith asked about what the WHP area line was and how large it is, outside of Aurora, and general flow direction, asked if the GW moves towards Lincoln Creek.
   - **e.** Potential CSI inventory
   - **f.** DRASTIC evaluation

2. **City of Aurora Water System**
   - **a.** Adam Darbro
   - **b.** No treatment, straight from ground
   - **c.** Goal of city is to continue provide clean water without treatment, employing BMPs
   - **d.** 350-360 million gallons pumped
   - **e.** 6.2 mg/L nitrates last year
     - i. Quarterly sampling in all but one well, higher in 3rd quarter
   - **f.** Tony asked about size of aurora treatment plant cost
     - i. Wellfield, but only three are close. JEO had 5 million for a similarly sized treatment plant, just for the building.
     - ii. Mallory mentioned wellhead treatment options
   - **g.** 2013-present nitrate levels. Well 6 & 7 had lowest nitrates, why they chose the site. Well 7 was up to 9.6 mg/L in 2022, shallower well, have to lower rate in the summer.
     - i. Keith asked about what depths the wells are running at, and if its where pump or well is at

ii. Depth of pumps: Mitchell field 223’, 198’ park, Bonnevile 218’, cemetery 187’, Well 7 202’ but sits in the bottom of drainage.
iii. Steve asked if well 7 was retested after the spike in nitrates
iv. Well 3, 4 all spiked in the nitrates. Malory mentioned particularly dry year
v. MCL reached on Well 2 in 2016, turned it off, continued to sample, everytime after it was not.
vi. All wells have variable flow wells have VFDs, so the water can be blended throughout the year, run at lower rates

3. **UBBNRD**
   a. Erin
   b. Twelve management zones
      i. Districts are going through different things
   c. Phase triggers – median nitrate level, 7-10 ppm, Phase III at 10 ppm
      i. Phase 1 date restrictions on Ammonia or fertilizer
      ii. Phase 2 November and March restrictions on fertilizer application. Operator trainings offered by NRD w/in 2 years, Soil sampling (no corn/bean rotation) only corn-corn, Nitrogen needs calculation (includes soil sampling and water analysis credit), 65 acres or largest irrigation scheduling, reports of soil analysis and irrigation scheduling analysis for
      iii. Phase 3 soil sampling per 40 acres, irrigation water analysis (free nitrate testing), Fall and anhydrous ammonia needs to use inhibitor
   d. Monitoring
      i. Summer sampling, Phase II & 3 every year, Phase I is every 3 years for UBBNRD zones.
      ii. Mostly irrigation, monitoring, domestic, and municipal. Highest is 99 ppm. High nitrate wells can be in a phase I area. MEDIAN nitrate levels.
      iii. 10 year graph shows upward trend in Zone 2 UBBNRD Phase II area.
         - Tony asked about historical data. Erin replied wells used for sampling was from ’95 area. Tony asked how bad it has gotten over 30-40 years.
         - Clearing house – Tatiana
      iv. Monitoring wells, arsenic, selenium, uranium, nitrate, pre-during-post irrigation sampling . Aurora is b/w Hamilton and ___
      v. Aquacap, cost share for well abandonment. Prone for point source pollution to enter wells. Can go up to 750$ cost-share rate 60%.
      vi. UBBNRD does have cost-share for other BMPs on UBBNRD website.
      vii. Mallory mentioned irrigators in the Phase II fall under UBBNRD jurisdiction even outside of the WHPA
      viii. Rick asked if Operator training was free. Erin mentioned it was offered in Aurora

4. **DWPMPs**
   a. Tatiana
   b. Only in NE, begin with Bazile GWMA. Covers 4 NRDs.
   c. NRCS Source Water Protection funding from 2018 Farm Bill.
      i. 300,000 over 3 years for BMP implementation
   d. NDEE & NRCS partnership within WHP are given priority under source water protection initiative
      i. Priority practices: nutrient management & cover cropping
   e. Bipartisan Infrastructure Funding
      i. Public health, Agricultural economy, and Drinking water & hydrogeology

f. Aurora is at forefront of plan implementation in the nation
g. NDEE source water protection funding, developing plan with grant, send it to EPA for additional CWA funding
    i. Springfield, Waverly, Broken Bow are other communities using CWA funding
    ii. Bazile has several field demo sites, interseeding/cover cropping, water quality funding. Applied for second round of $300,000 funding.

Group broke for a 10 minute break.

ACTIVITY & DISCUSSION

5. Mentimeter activity questions

a. How informed is the general public about their supply of drinking water?
    i. 1, 6, 3, 10 (accidental), 5, 2, 1, 4, 4, 4
    ii. Marlin mentioned that everyone takes it for granted, as soon as you do treatment people get upset, when things are triggered then they want to know why
        - Very few people asked about the water tower, they don't want to deal with it
    iii. Curtis – people do not know the process of drilling for water, very spoiled from water quantity, but quality is an issue
    iv. Tony – most Americans, if they're healthy, they don't care. Some people think it matters
b. How concerned is the general public about their water? 1-least 10-very
    i. 5, 4, 3, 3, 6, 3, 5, 3
    ii. Steve 5 piggy backs off the first question, if you've never dealt with it then you don't think about it. People not concerned if Adam says that quality is good in the paper.
    iii. Rick said that people don't mention it unless it is brought up. If it is brough up then they have questions
    iv. Adam mentioned people don't like change. When cleaning happens people get upset
    v. Keith – lawncare days during drought in York, individual let her yard go dormant and mentioned that she wanted to save the water for her son who is a grower
    vi. Mallory – pediatric cancers, link b/w elevated nitrate in drinking water, raised question about the link b/w health and cancer
        - Tony mentioned the perception about school, kids are talking about it in school, heard it from parents. West of Grand Island there are more concerns, people are becoming concerned over what goes in their body
        - Marlin – Denver & Des Moines family – the people here aren't used to putting chemicals in the water to keep it clean, narrowminded. If people aren't worried about it, should we raise the alarm.
        - Adam mentioned that people are looking for a common theme. Tony mentioned radiation concerns. People want to have an answer. The City of Aurora provides safe clean drinking water as defined by EPA.
        - Steve mentioned people that some are looking for reason to point finger, at ag.
        - Mallory mentioned that WHPA in Aurora is both Urban and Rural, BMPs need to be made in both areas.
        - Rick mentioned that water quality improvements have to be made by both rural and urban
c. What are your main water quality concerns about Aurora's drinking water?

i. Contaminants, longevity, drinkability, sources, flavor, hard water, nitrate, safety
   - Tony mentioned kids at school don't like the flavor of water, Rick mentioned Aurora won the best water in Aurora
   - Marlin agreed with all of it. Hard water cannot be addressed by WHPA. Flavor isn't concern. Perception/fear of the contaminants. There all tied together. So much has changed, but the longevity is a concern from the problems of the past.
   - Jeremy – contaminants – Phillips area has had concerns over their water, worried about contaminants further away.
   - Tatiana – us as people who engage with the public need to recognize that the science has changed, we have new rules to protect our water, we know better now. To address rural/urban divide we need to have conversations about how things change

d. What are your main quantity concerns about Aurora's drinking water?

i. Sustainability, x 2, capacity for the future, stress, supply, growth, infrastructure

ii. Tony asked if Aurora has ever had to close a well
   - Adam said there was a well that had noticeable levels of tetrachloroethene, but still below the EPA MCL. Tried to pump it out, made it worse, it is voluntarily offline.=, worried about running it hard.
   - Rick said they don't know what the source of it is, which is why they are resting it because they don't know how big it is. Why there is 2 more new wells. Similar to other years in past (2008 & '12). Pumps were running dry, mostly hits in July and August. July 18, 4 million gallons per day, driest week
   - Marlin said Phillips and Marquette pumps were running dry, Aurora was sending water to Marquette
     - Keith asked about odd even days
     - Tony mentioned how people have it good, Oklahoma, Texas, California is running dry
     - Rick mentioned we can run so many wells with VFD and run at different rates. Marlin – we have scientific based method to supply and manage water because of diverse system. Economic development, brings in the question of where is the water going to go back in from?

6. Breakout group activity

a. What are some BMPs that you would like to see used in the area?

i. Soil and irrigation well sampling will help Aurora and the NRD target the areas with high nitrates.

ii. Cover crops – especially with the cost-share

iii. Detention basins & bioswales

b. How likely is the community to adopt BMPs encouraged by this plan?

i. More people will make use of BMPs if it is clear how to access the funding that comes with this plan.

ii. As more people make use of the cost-share and funding, more people will use it.

iii. It will be difficult to get older stakeholders to adopt some of these.

c. How can we encourage adoption?

i. Reiterating the cost-share opportunities

ii. Opportunities for funding
iii. By showing what other communities have done with the funding that comes from completing one of the DWPMPs.
iv. Field demos go a long way towards showing operators how effective and efficient some of these BMPs can be.
v. Education on what this plan is, what it means, and most of all how it helps the community.

d. What are some myths/preconceived notions that need to be addressed?
i. The idea that "Protection equals more regulations"
ii. That there will be increased regulations on growers outside of the wellhead protection area.
iii. The thought that this means people won't be able to redrill their irrigation well if they are within the WHPA, but the same rules and regulations apply to everywhere else.
iv. Highlight that if you are not planning for a CAFO or landfill this plan does not change much for you.

e. What are ways to get the general public involved and attending the open house meeting?
i. Have the meeting cover both the time at the end of the workday and afterwards so both people that can go during work, and those that can only go after work can both attend.

f. Is there anything you'd like more information on at the next stakeholder meeting or topics you'd like to discuss?
i. More information about how these plans have benefitted other communities (e.g. the Bazile GWMA)

Stakeholder Committee Meeting 2

January 17, 2023

Alice M. Farr Library

1603 L St., Aurora, NE 68818

1:00 – 3:00 PM

Joe Hinnant

From: Haley Engstrom
Sent: Tuesday, January 10, 2023 10:16 AM
To: awillis@diamondjcs.com; asigler@4rhuskies.org; Hwy-supt@hamilton.net; Brock.wyatt@gmail.com; cbeins@gmail.com; Sargentdrilling@hamilton.net; kwasem@hamilton.net; Grosshans_12@hotmail.com; sanderson@myhbank.com; Mallory Morton; Adam Darbro; Jim Schneider; Tatiana.Davila@nebraska.gov; amyppri@hamilton.net; Hannah Rivers; Joe Hinnant
Cc: Stacey Roach; erichert@upperbigblue.org; Aurora City Administrator
Subject: Aurora DWMPM - Stakeholder Committee

Follow Up Flag: Follow up
Flag Status: Completed

Good morning,

I hope your week is off to a great start! Just a reminder that next week we'll have our second stakeholder committee meeting for the Aurora Drinking Water Protection Management Plan (DWPMP). ***Our meeting will be held at the Library from 1-3PM.***

As a reminder, this DWPMP is a collaborative planning process that uses feedback from the public to craft the implementation plan to protect and improve drinking water quality for the community. The intent of this plan is to offer a mechanism for which additional funding can be unlocked to advance water quality improvement projects and/or to implement best management practices. It is not meant to introduce new regulations or restrictions on operations. **This is your chance to shape the process and the outcomes for this area!**

If you did not receive a calendar invitation for January 17th, please let me know. We're looking forward to our discussion next week!

Haley Engstrom
Public Engagement

D 531.365.4603
C 402.617.3276

601 P Street, Suite 200
Lincoln, NE 68508
O 402.474.6311

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WELCOME!

Aurora Drinking Water Protection Management Plan – Stakeholder Committee Meeting

January 17, 2023

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Introductions

- Project Team: City of Aurora, Olsson, NDEE
- Participating Agency: Upper Big Blue Natural Resources District (UBBNRD)
- Stakeholders

Agenda

- Recap from October stakeholder meeting
- Potential Contaminant Source Inventory results
- Updated Wellhead Protection Area
- DRASTIC modeling
- Best Management Practice (BMP) implementation discussion

Why are you here?

The City is completing a Drinking Water Protection Management Plan (DWPMP) to better protect the drinking water resource. The DWPMP is a long-term plan that addresses water quality concerns with drinking water in order to implement strategies to ensure safe drinking water for the future.

The information presented at this meeting will outline the planning process, current Wellhead Protection Area, and actions currently being taken by Aurora, UBBNRD, and NDEE to monitor and protect water quality.

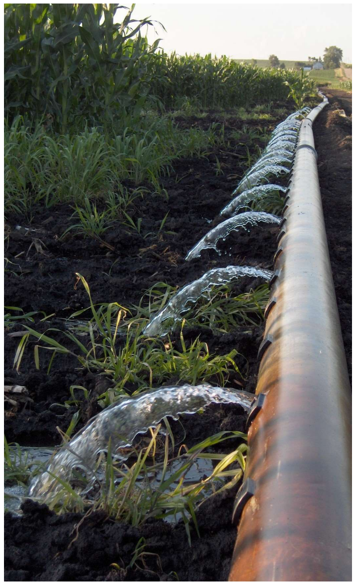
We need the **local perspective** on water quality concerns, ideas for improvement, and best management practice implementation.

What Is A Drinking Water Protection Management Plan?

Drinking water protection management plans (DWPMP) are a tool for communities to help implement long-term strategies for ensuring a safe and reliable drinking water source for years to come.

There are six main objectives for DWPMPs:

1) Identify water quality concerns.
2) Establish Wellhead Protection Area (including any necessary updates).
3) Propose water quality restorative management measures.
4) Create a monitoring schedule for preventative measures.
5) Educate the community on water quality issues and best management practices.
6) Develop a community-based prevention planning process.



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What are the benefits of a DWPMP?

- Financial benefits:

  Developing a DWPMP qualifies the community for funding from the Environmental Protection Agency (EPA) and the Natural Resources Conservation Service (NRCS).

- Educational benefits:

  Continued community outreach and engagement will keep stakeholders and residents informed and involved.

- Health benefits:

  DWPMPs bring awareness to water quality concerns that may have long-term harmful health effects and creates a plan to reduce those concerns and health risks.

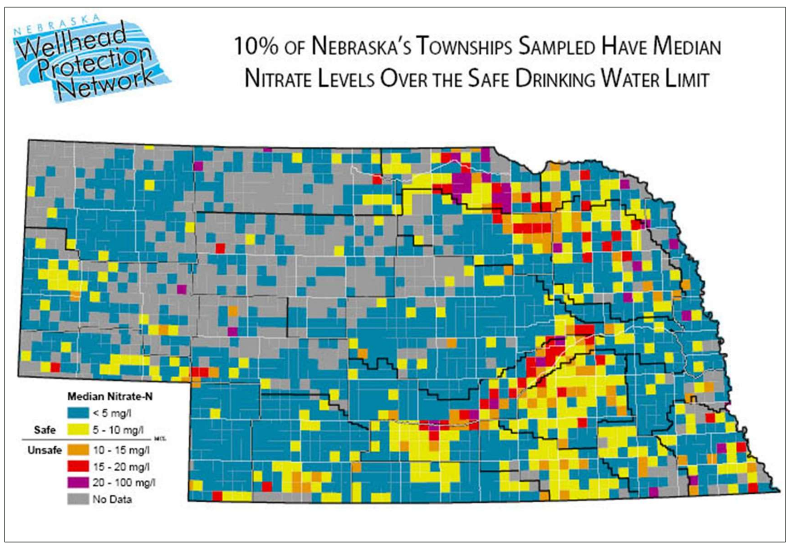
Key Messages

- DWPMP is a **collaborative** planning process that uses feedback from the public to craft the implementation plan to protect and improve drinking water quality for the community.

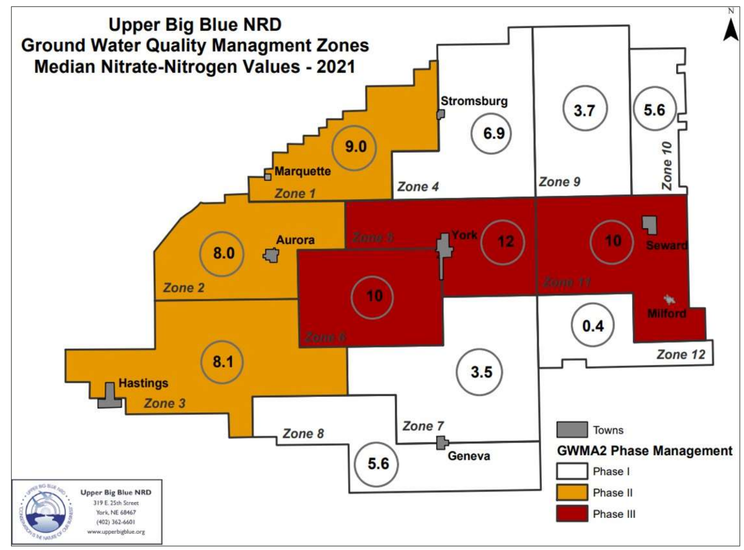
- Actions recommended by this plan are **voluntary**. This plan offers a mechanism for the community to access additional funding to advance water quality improvement projects. The purpose of this plan is <u>not</u> to introduce new regulations or restrictions on operations.

Nitrate in Drinking Water

The City provides safe and clean drinking water. However, nitrate in drinking water can have negative health effects. The EPA has set a Maximum Contaminant Level of 10 mg/L.



Nitrate-N is a common contaminant in drinking water in Nebraska. From a combination of point and non-point sources, excess nitrate builds up in water supplies and creates the need for a community-based plan to address unsafe nitrate levels.



The UBBNRD conducts a water quality sampling program to monitor nitrate levels in groundwater. The NRD publishes annual nitrate sampling results to their website.

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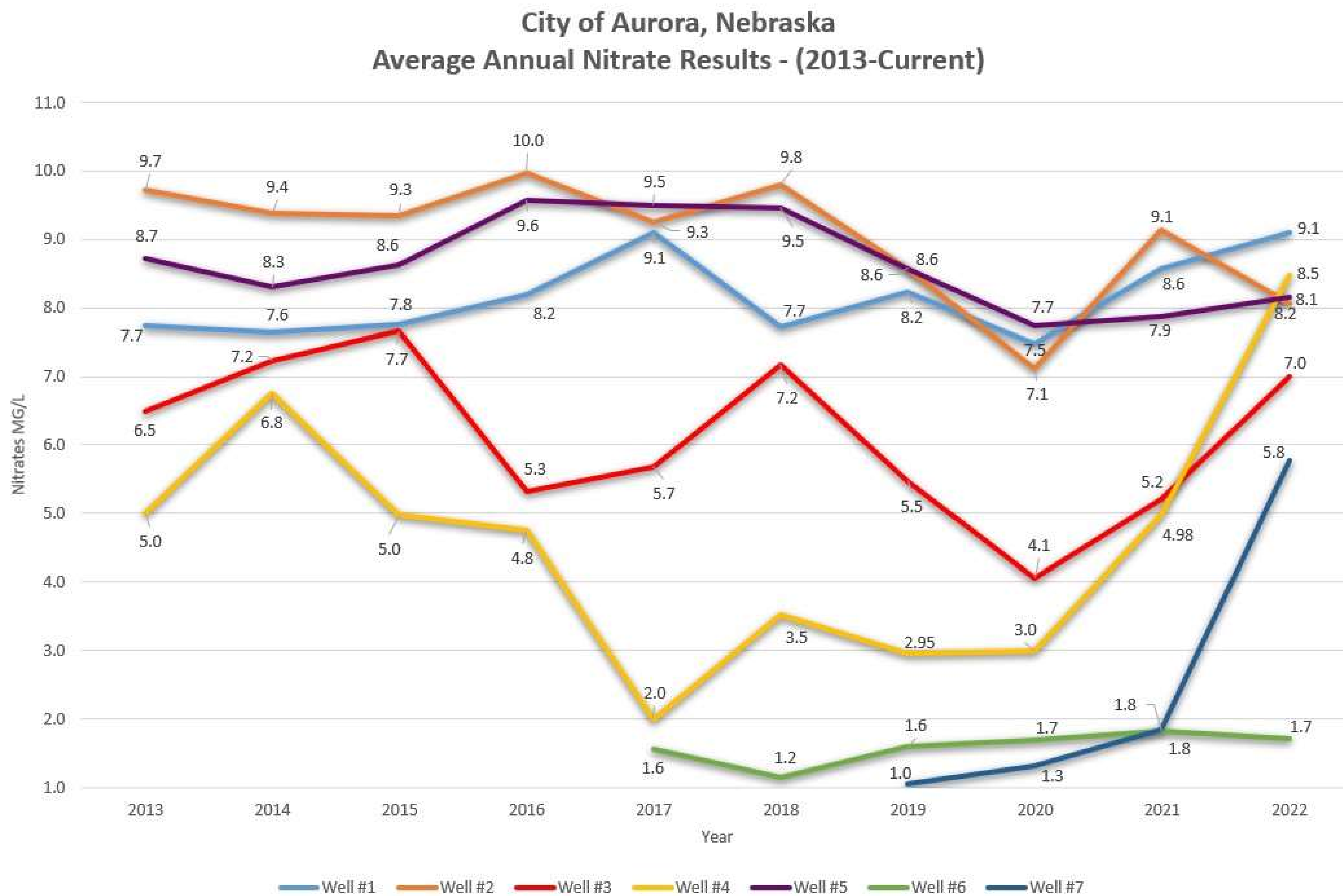


City of Aurora, Nebraska
Average Annual Nitrate Results - (2013-Current)
Nitrates MG/L
Year
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Well #1
Well #2
Well #3
Well #4
Well #5
Well #6
Well #7

Potential Contaminant Source Inventory

The Contaminant Source Inventory can:

- Clarify what constitutes a potential source of contamination
- Clarify what point and non-point source pollution is
- Important Note #1: Potential is the key
- Important Note #2: This inventory only represents a SNAPSHOT IN TIME

Common Potential Sources of Contamination include:

Agricultural

- Fuel storage, grain storage, water wells, chemigation, livestock operations, and chemical storage

Commercial/Light Industry

- Auto repair facilities, dry cleaners, fuel stations/storage, machine shops, rail yard

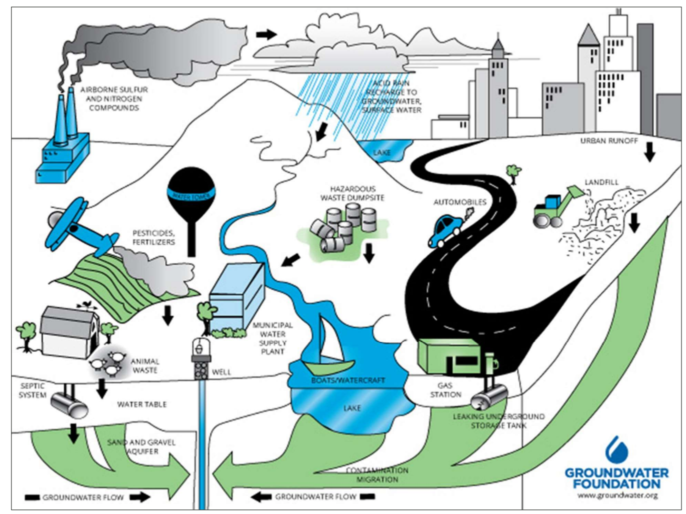
Industry

- Manufacturing facilities, oil and gas wells, junk yards, landfills, sewage treatment plants

Others

- Cemeteries, septic systems, golf courses, highway maintenance yards, transportation corridors

The purpose is to identify existing contaminant sources and sources that have the potential to pollute groundwater within the Wellhead Protection Area.



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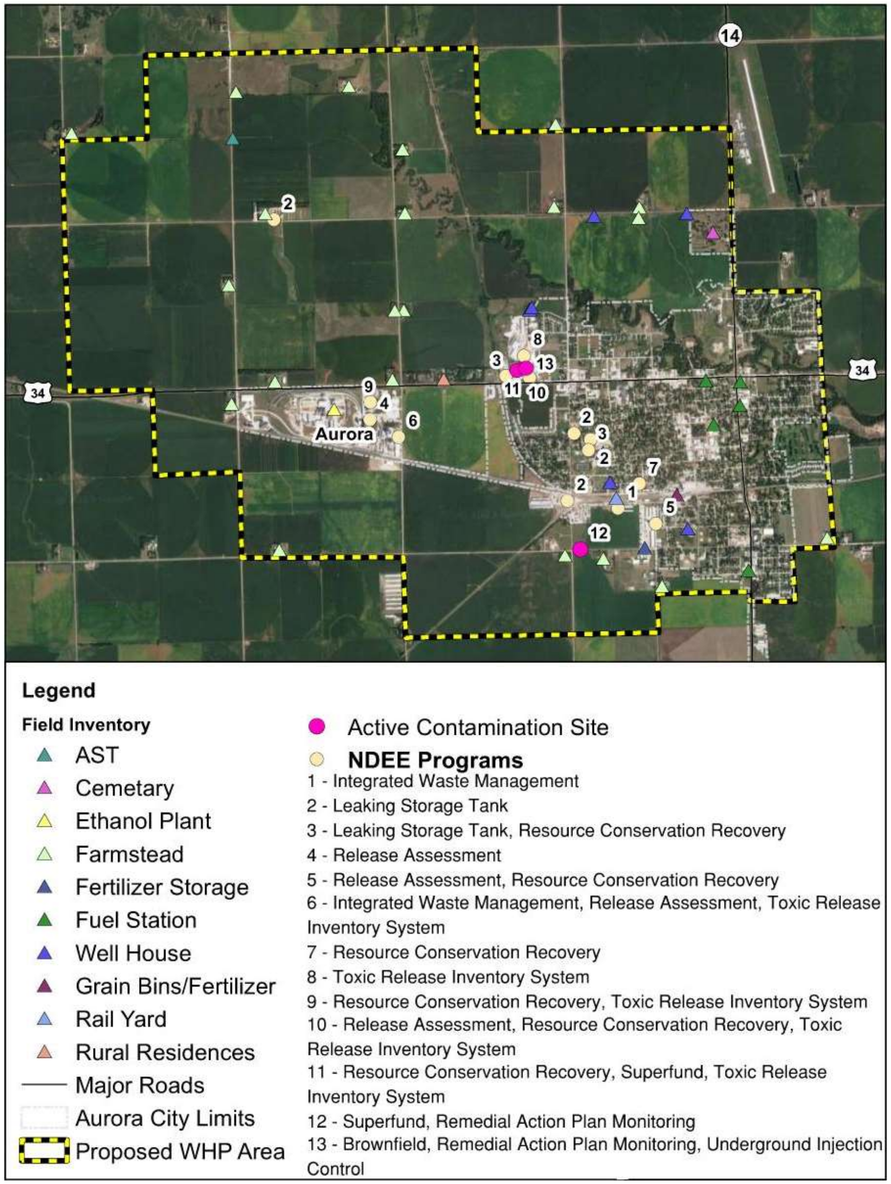
Potential Contaminant Source Inventory

- Online Data Sources:
  - Nebraska Department of Environment and Energy (NDEE)
  - Nebraska Department of Natural Resources (DNR)
  - Nebraska State Fire Marshall (SFM)
  - Nebraska Oil & Gas Conservation Commission (NOGCC)
- A field inventory to verify online data was completed on November 30, 2022.

CSI Results

- There were 81 total sites identified in the online database review
  - Most common listing was for Leaking Storage Tanks
    - Typically from Underground Storage Tanks storing or distributing petroleum
  - 17 of these sites were investigated further because of proximity to municipal wells and their histories with potential contamination
  - 2 of these sites have ongoing contaminant investigations



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Contamination Site 1

- Recent NDEE files indicate that groundwater, soil, and soil vapor at and downgradient of the site have been contaminated with tetrachloroethene as a result of previous operations.
- Interim remedial actions include excavation, soil vapor extraction, and in-situ air sparging through November 2024.
  - With groundwater and air monitoring, with on-site inspections and more sampling.
- Final remedial actions will address off-site contamination.

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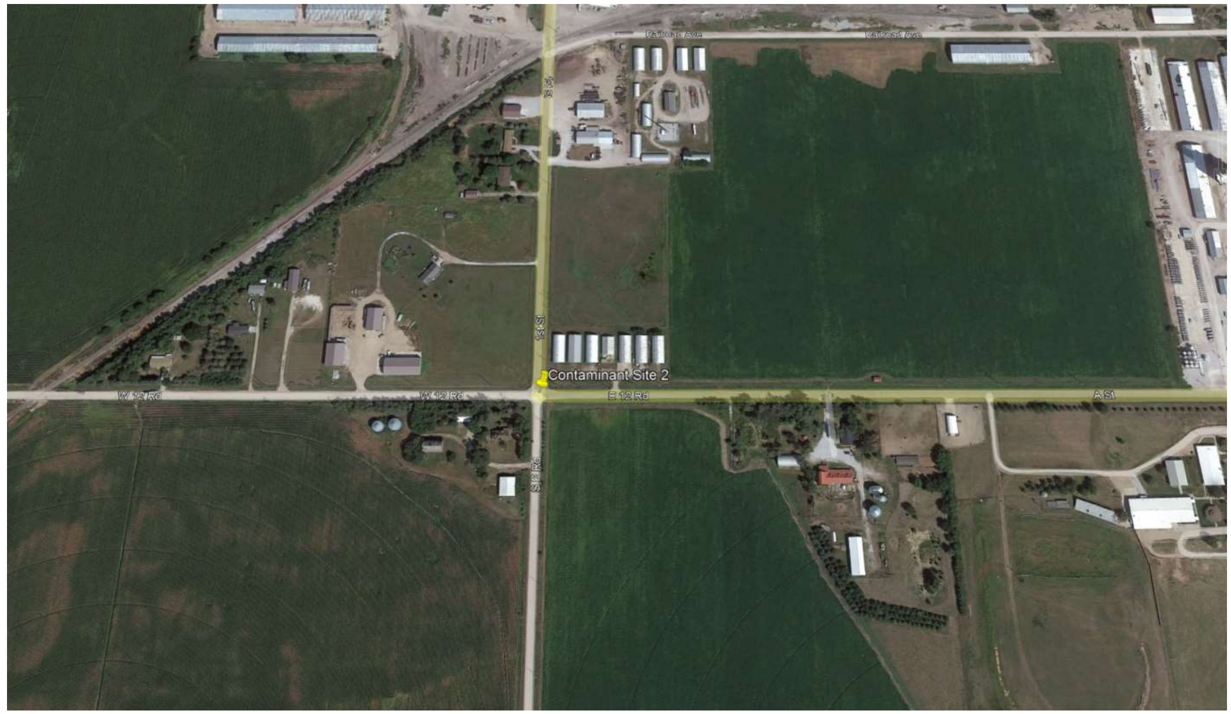
Contamination Site 2

- In 2012 sampling revealed contaminant plume concentrations that exceeded EPA Maximum Contaminant Levels (MCLs) in several private drinking water wells along E 12th Road between South R Road and South S Road and in soil vapor.
- Carbon tetrachloride has been detected in groundwater and indoor air samples at concentrations exceeding the EPA MCLs.
- Further sampling of both groundwater and soil gas is anticipated to assess conditions over time.

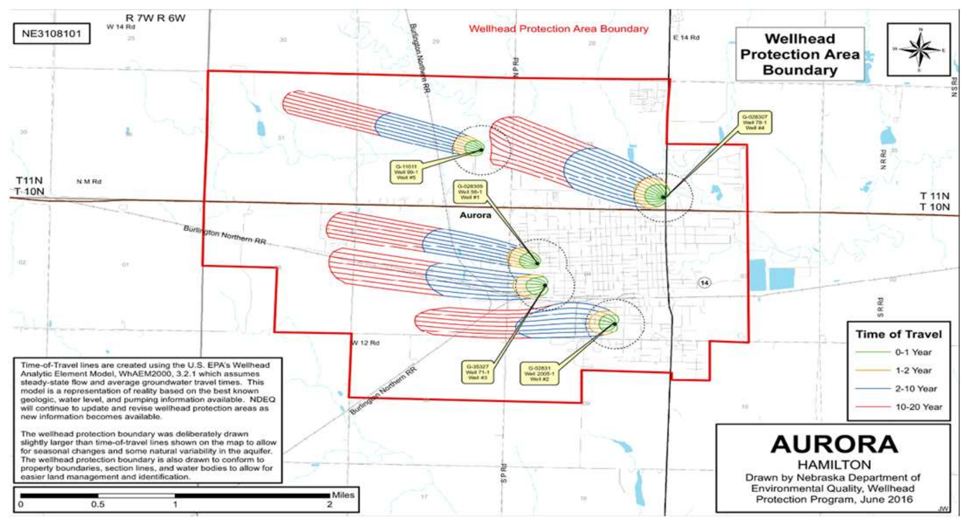


Updating the Wellhead Protection Area

Communities completing a DWPMP are encouraged to update their Wellhead Protection Area based on the 50-year Time of Travel lines.

The City's Wellhead Protection Area was last updated in 2016 by the Nebraska Department of Environment and Energy. The boundary was drawn around the 20- year Time of Travel lines. The DWPMP requirement is to update the area to include the 50-year Time of Travel lines. Two new wells have been drilled since the last map was made.

Existing Wellhead Protection Area (2016)



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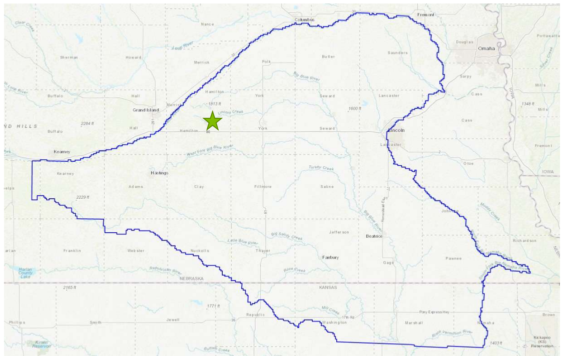
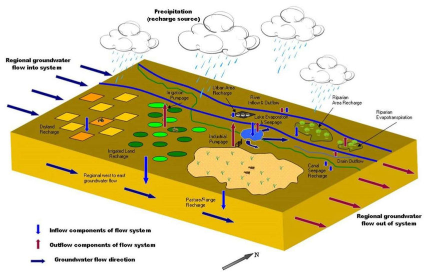
Using State-Approved Groundwater Models to Update the Wellhead Protection Area

Groundwater models approved by the Nebraska Department of Natural Resources will be used to delineate a proposed Wellhead Protection Area based on the 50-year Time of Travel lines and include the two new municipal wells.



Blue Basin Model

Cooperative Hydrology Study (COHYST) Model



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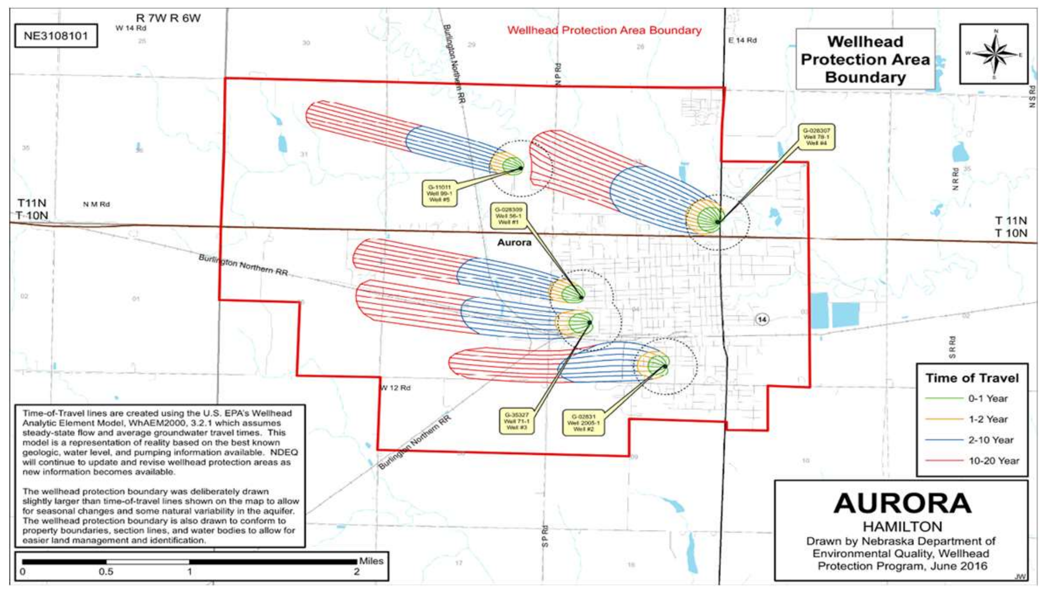
Updating the Wellhead Protection Area

- ✓ Run groundwater model including newest municipal wells
- ✓ Delineate proposed boundary around 50-year time of travel (TOT) lines
- ✓ Share proposed area with Aurora/NDEE
- ✓ Share proposed area with stakeholder group
- Share proposed area with public at open house
- Submit proposed area with draft plan for approval by NDEE/EPA
- Update city zoning (wellhead protection overlay district)

Existing Wellhead Protection Area (2016)



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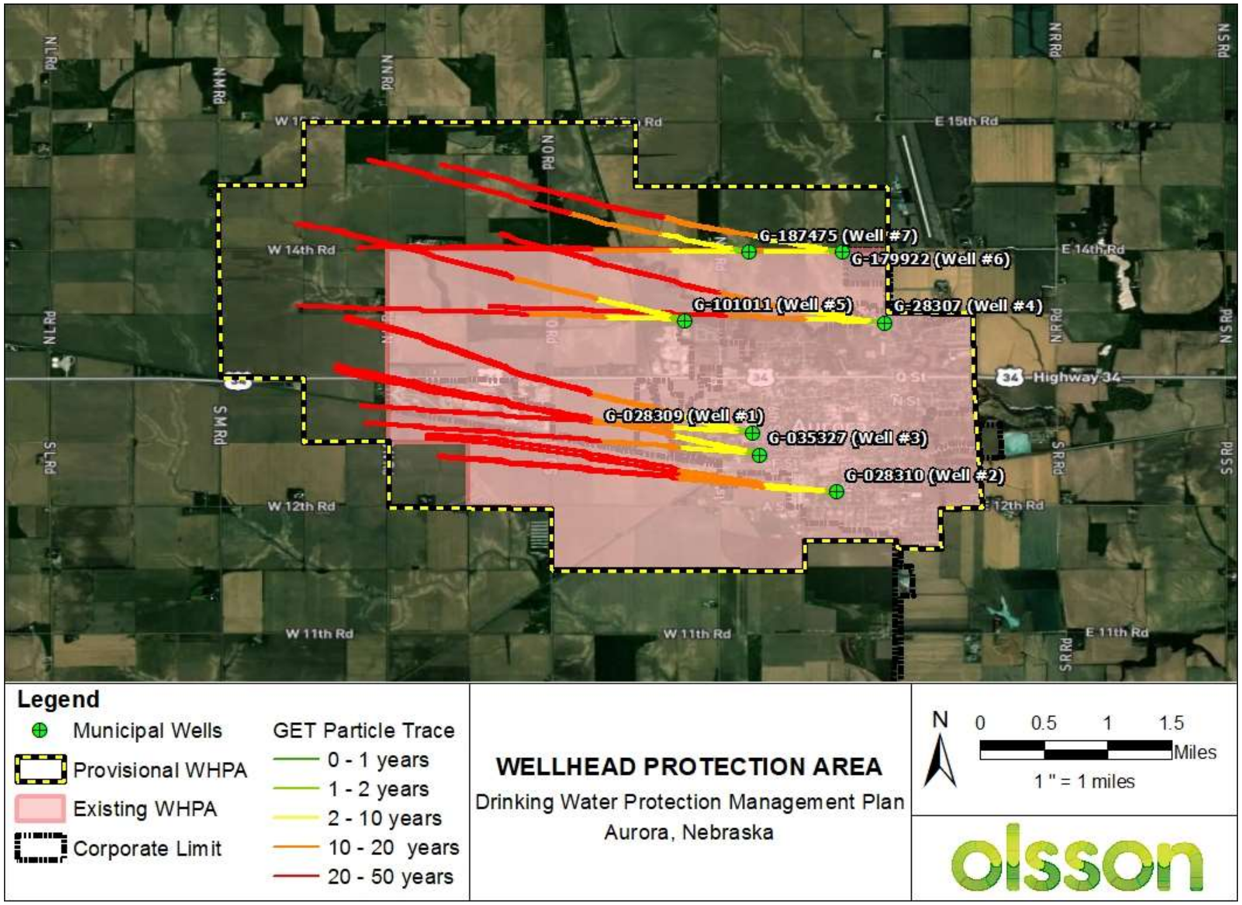
Updating the Wellhead Protection Area



DRASTIC Modeling

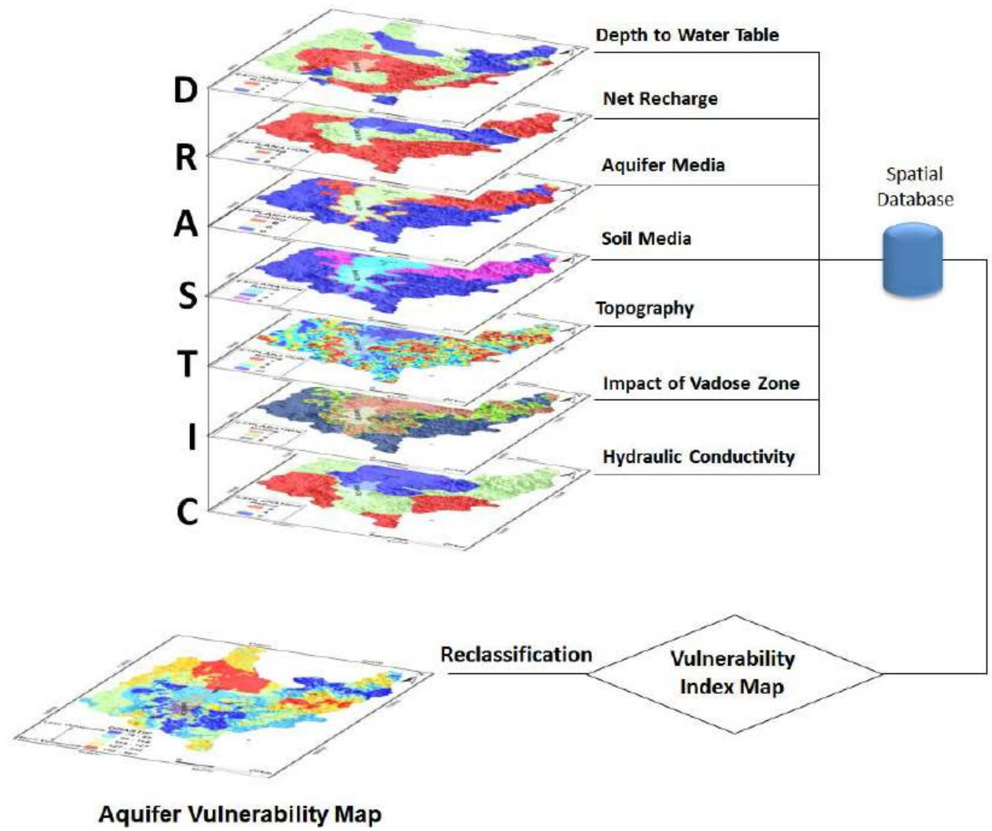
- Purpose is to evaluate the vulnerability of groundwater resources to pollution based on hydrogeologic parameters
- EPA-developed method
- Will help us to identify high priority areas for BMP implementation

DRASTIC Modeling

- D – **D**epth to Water: the depth from the ground surface to the water table in an unconfined aquifer.
- R – Net **R**echarge: the quantity of water applied to the ground surface that infiltrates to reach the aquifer.
- A – **A**quifer media: the sediments which serve as the aquifer (e.g. sand, gravel, limestone).
- S – **S**oil media: the uppermost portion of the vadose zone characterized by biological activity.
- T – **T**opography: the slope and slope variability of the land surface.
- I – **I**mpact of vadose zone: the zone above the water table which is unsaturated or discontinuously saturated.
- C – Hydraulic **C**onductivity: the ability of the aquifer materials to transmit water.

DRASTIC Modeling

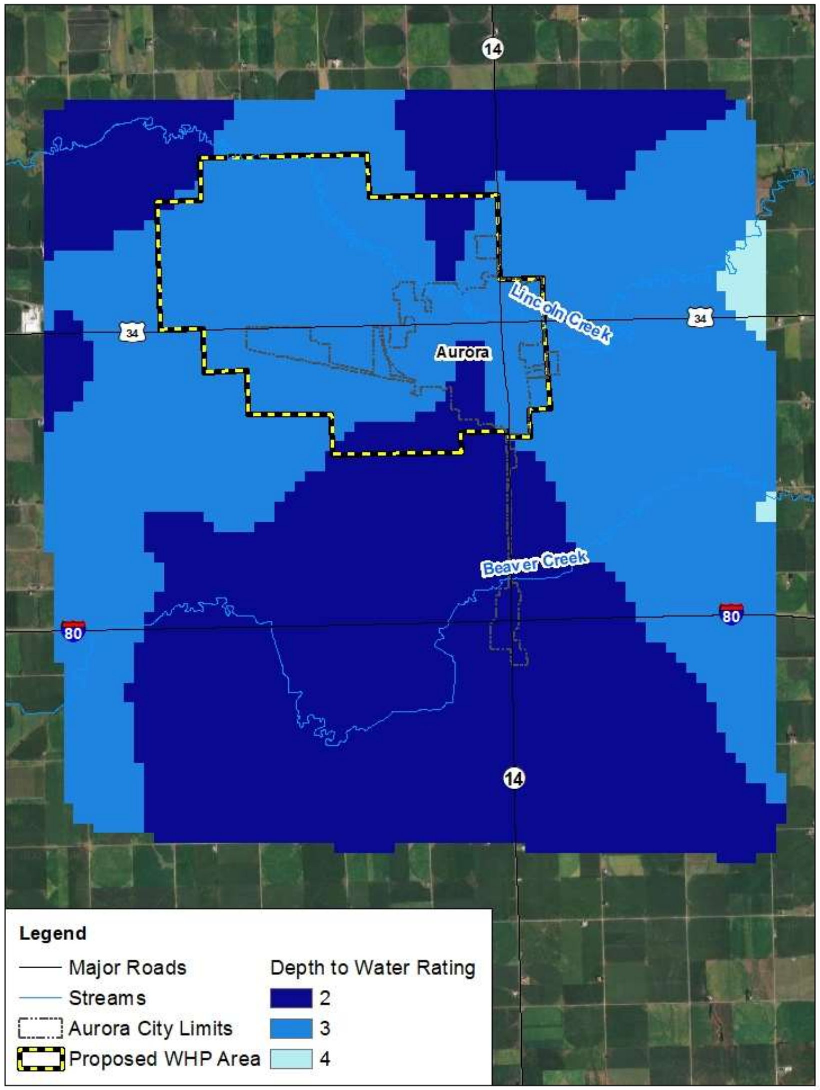
- D – **D**epth to Water
- R – Net **R**echarge
- A – **A**quifer media
- S – **S**oil media
- T – **T**opography
- I – **I**mpact of vadose zone (zone between root zone and water table)
- C – Hydraulic **C**onductivity



Source: Alwathaf, Y. *Assessment of aquifer vulnerability based on GIS and ARCGIS methods: A case study of the Sana'a Basin (Yemen).* January 2011.

D – Depth to Water

- The depth from the ground surface to the water table in an unconfined aquifer.
- Sources used:
    - Nebraska Department of Natural Resources Registered Well Database
    - University of Nebraska – Lincoln Conservation and Survey Division's monitoring well database
- Ratings increase with shallower depth to water.



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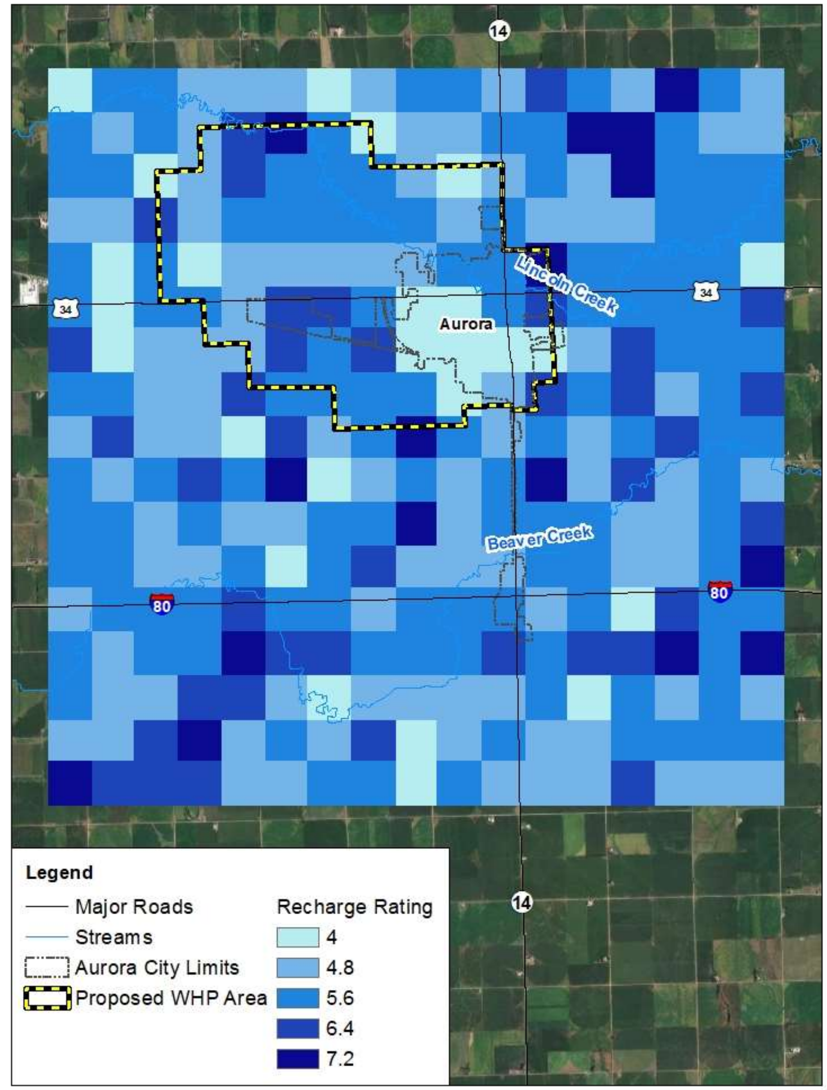
R – Net Recharge

- The quantity of water applied to the ground surface that infiltrates to reach the aquifer.
- Mean recharge from COHYST Groundwater Model.
- Ratings increase with greater recharge.



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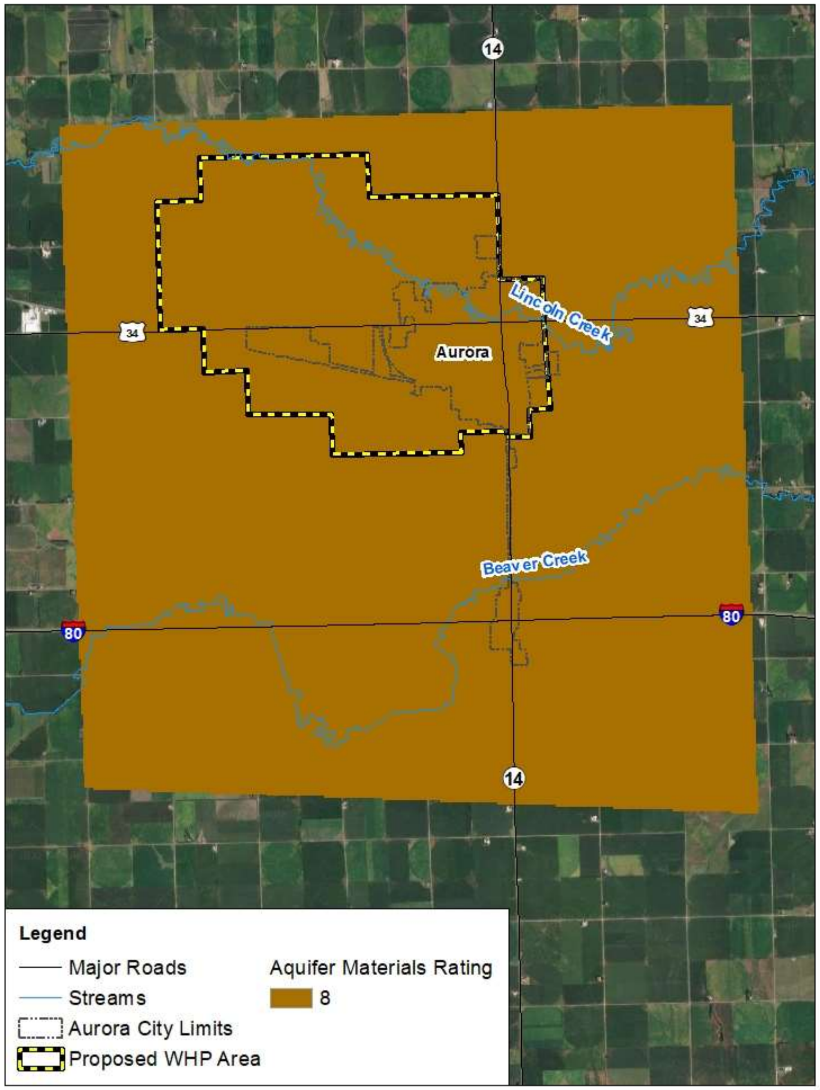
A – Aquifer Media

- The sediments which serve as the aquifer
  - (e.g. sand, gravel, limestone).
- Ratings are outlined by EPA.
- The entire area is unconsolidated sand & gravel.



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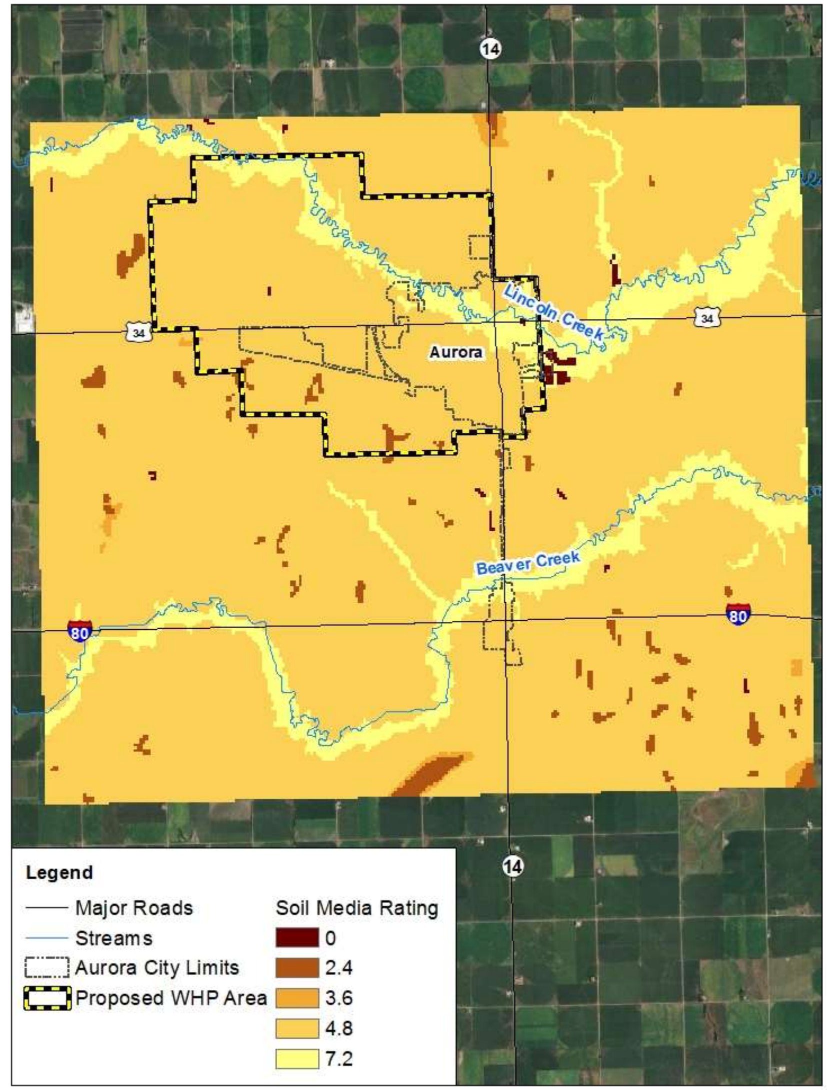
S – Soil Media

- The uppermost portion of the vadose zone characterized by biological activity.
- Soil data comes from Natural Resource Conservation Service Web Soil Survey.
- Ratings increase as soil particle size increases.



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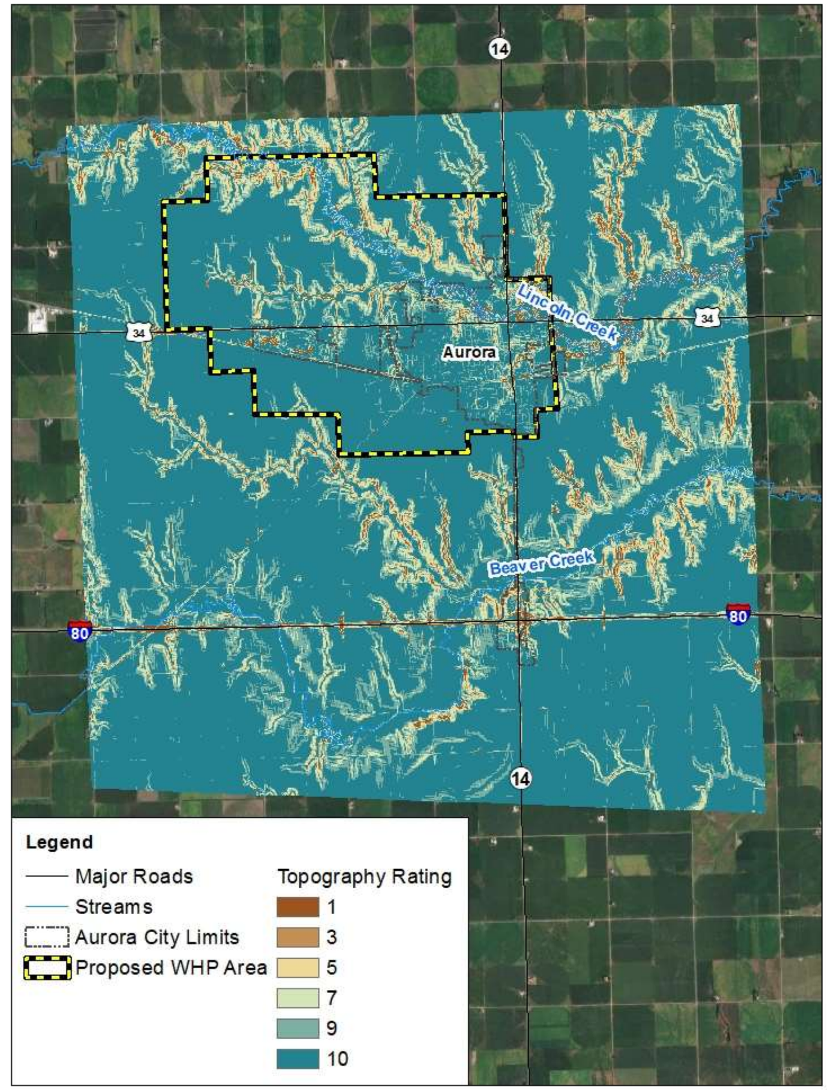
T – Topography

- The slope and slope variability of the land surface.
- Data comes from Light Detection and Ranging (LiDAR) remote sensing.
- Ratings increase as percent slope decreases.



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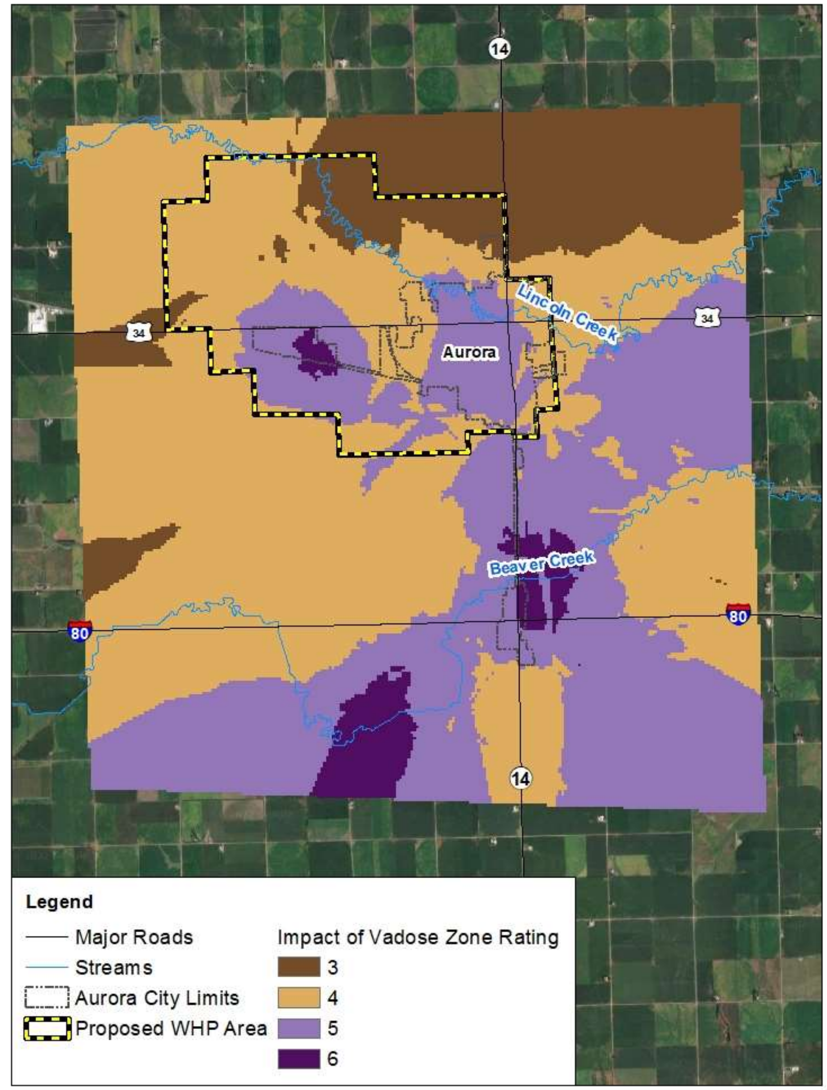
I – Impact of Vadose Zone

- The zone above the water table which is unsaturated or discontinuously saturated.
- Data comes from NeDNR's Registered Wells Database borehole logs.
- Ratings increase as vadose zone particle size increases.



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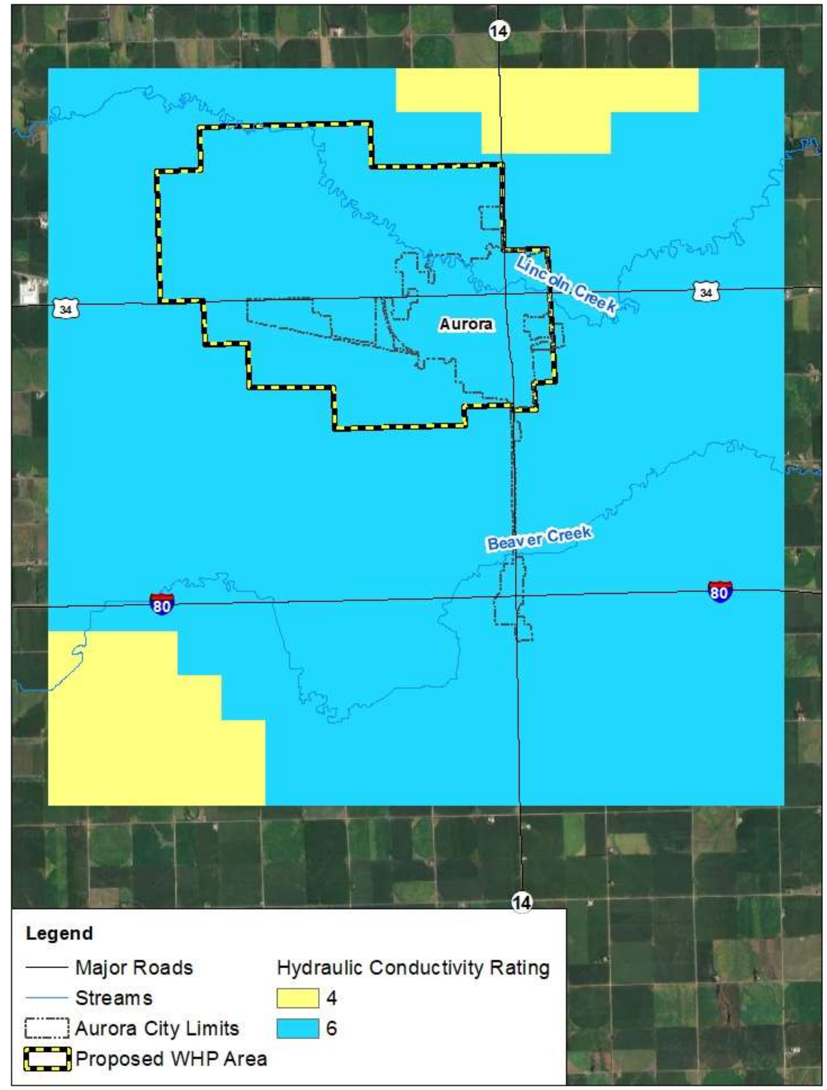
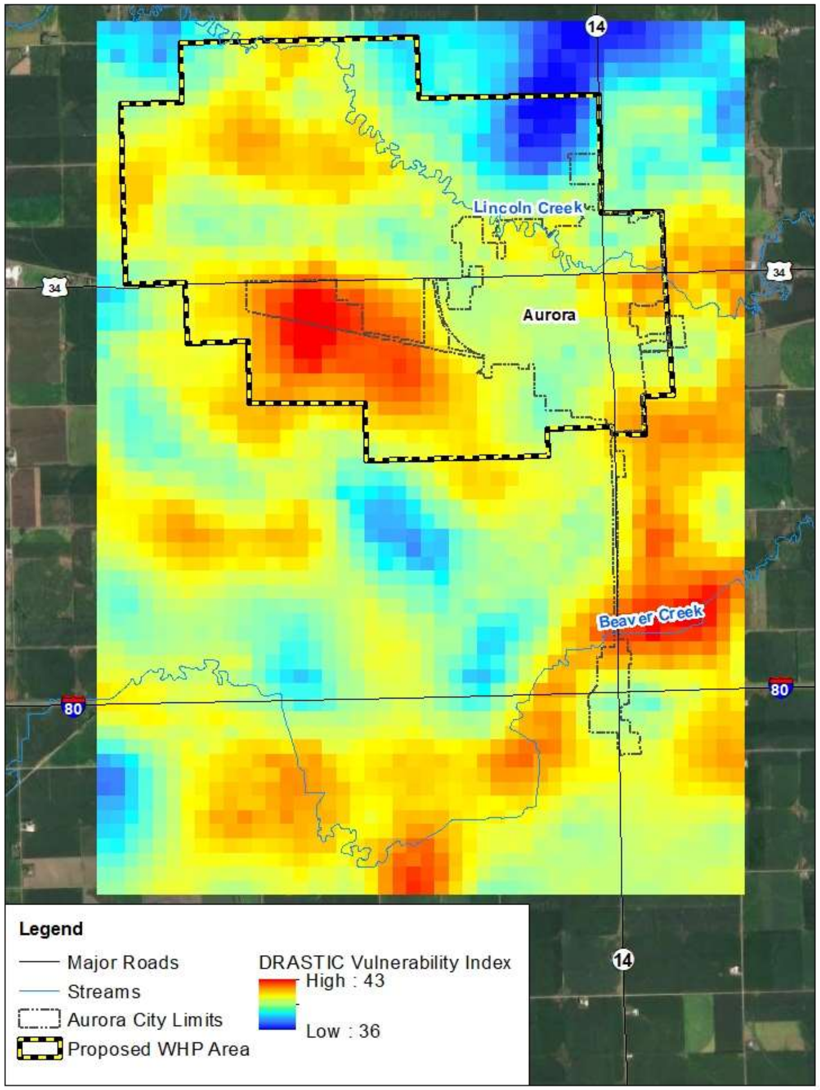
C – Hydraulic Conductivity

- The ability of the aquifer materials to transmit water.
- Hydraulic conductivity comes from COHYST Groundwater Model input.
- Ratings increase as hydraulic conductivity increases.



DRASTIC Modeling Results

- Vulnerability Index is the sum of all DRASTIC layers.
- Higher DRASTIC Vulnerability Index values indicates areas where the aquifer is at higher risk of contamination.



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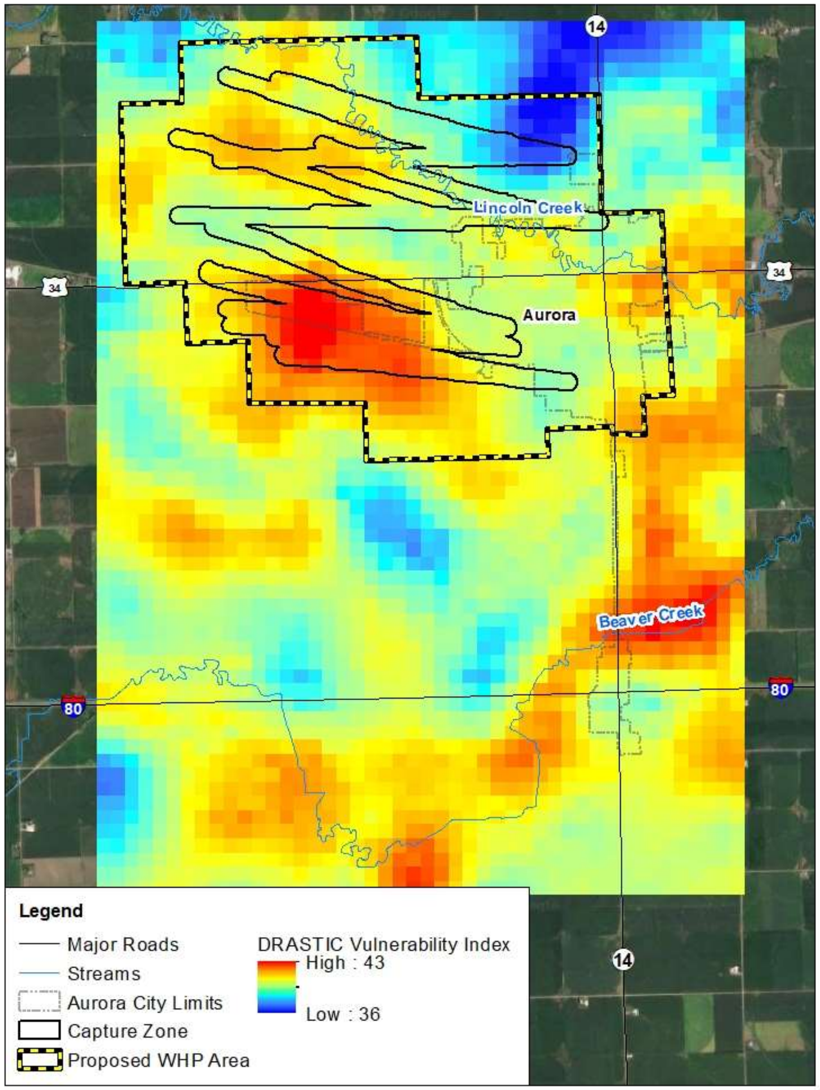
DRASTIC Modeling Results

- Capture Zone from the 50-year time of travel (TOT) lines in bolded black line
- 3 of Aurora's 7 municipal wells have capture zones that extend into a high vulnerability area



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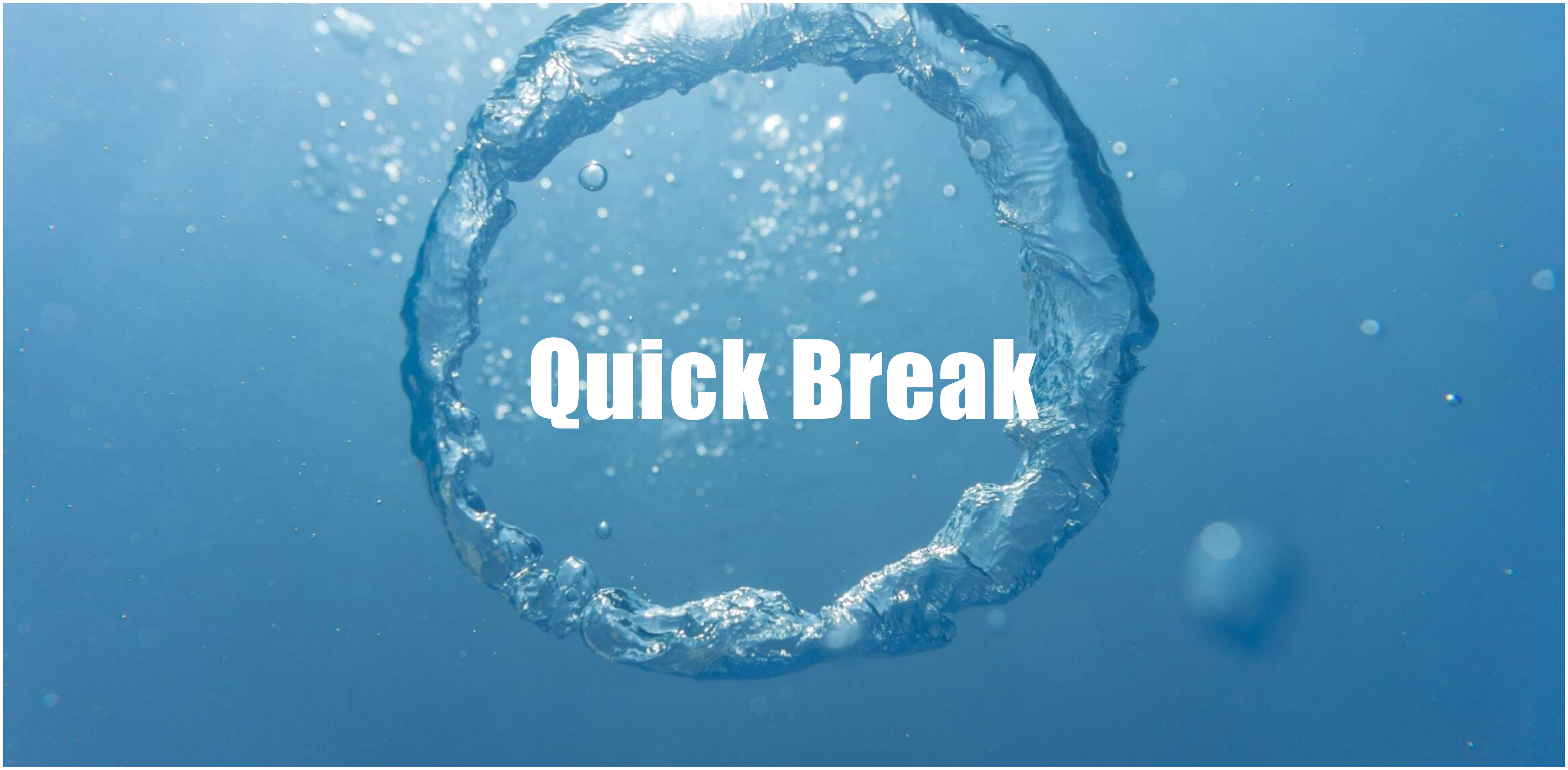
Quick Break

Open House Meeting #1

- Held from 6-8 pm on June 15th @ Bremmer Center
- Information presented on what a DWPMP is, the current WHP area, best management practices to improve drinking water quality, and cost share resources.
- Representatives from Olsson, Aurora, NDEE, and UBBNRD were in attendance.
- Eight members of public in attendance. One comment received.

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Stakeholder Meeting #1

What We Heard:

- In general, public is not very informed about drinking water supply.
- Public becomes concerned only when changes are proposed or when community issues are brought up.
- Moderate concern about sustainability of water supply (Marquette example mentioned)
- BMPs suggested by stakeholders:
  - Soil and water sampling, cover crops, detention basins and bioswales, field demos
- <u>Must emphasize cost share</u>
  - Need early adopters to encourage others and become familiar with process
- Need to address the myth that “protection equals more regulations”

Next Steps

- Summarize your feedback and incorporate into draft plan
- Open House Meeting #2 (March 2023)
- Complete draft plan and submit to NDEE/EPA (Spring 2023)

Discussion in Small Groups

- Refer to handout for discussion questions
- Re-convene at 2:40 to share results

Question 1: Feedback on the updated WHP area

- Notes:

Question 2: Feedback on the DRASTIC results

- Notes:

Question 3: Based on the DRASTIC results, any suggestions for BMPs in the highly vulnerable areas?

- Notes:

Question 4: Cost Share Ideas

- Notes:

Contact Information

Olsson Project Manager:

Mallory Morton, PE

mmorton@olsson.com

(402) 458-5071

Aurora Project Manager:

Adam Darbro, Utility Superintendent/Zoning Administrator

utlysupt@cityofaurora.org

(402) 694-6992

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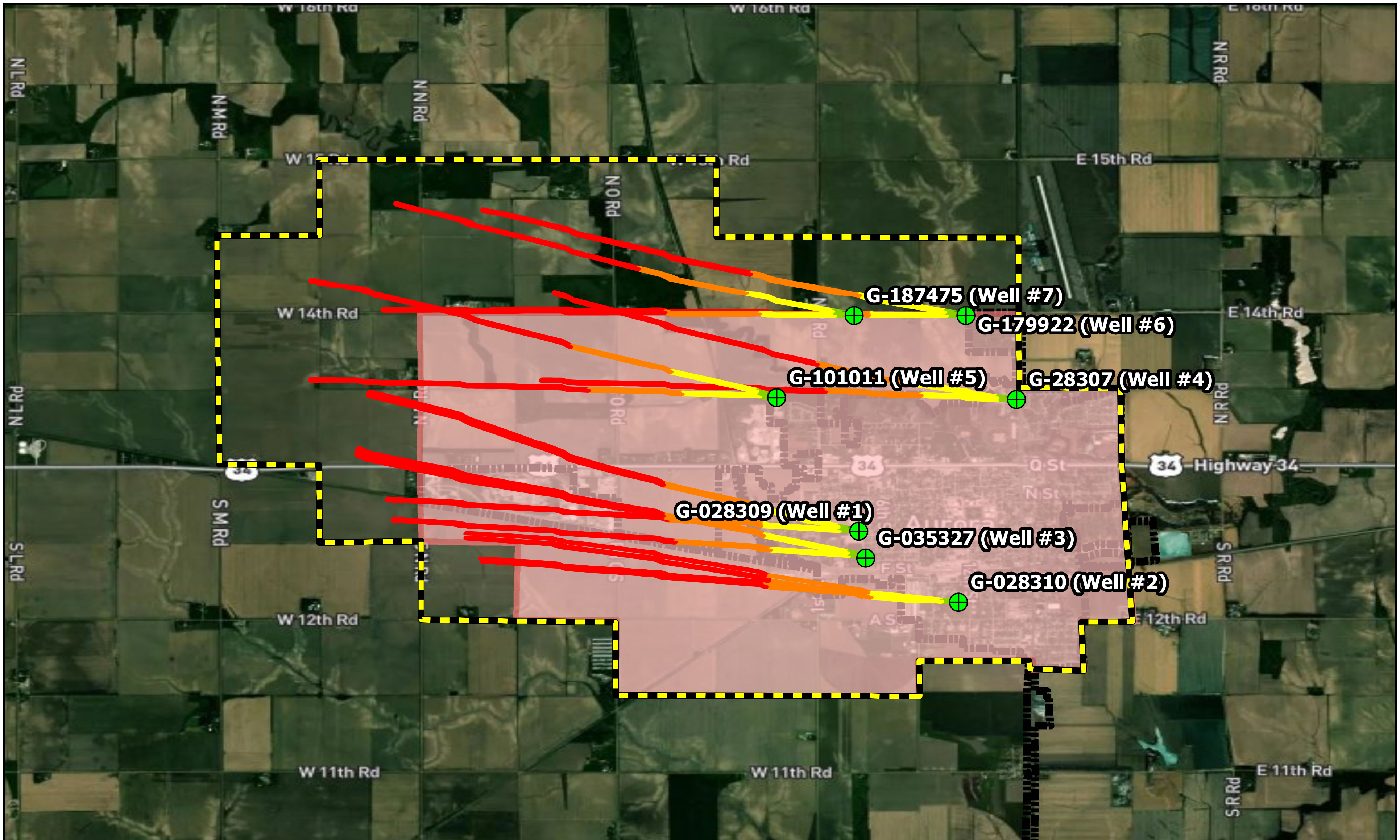
MEETING AGENDA

Aurora Drinking Water Protection Management Plan

Date:	January 17, 2023

1. **Introductions**
2. **DWPMP Background Information**
3. **Contaminant Source Inventory Results**
4. **Wellhead Protection Area Update**
5. **DRASTIC Results**
6. **Break**
7. **What We Heard**
8. **Small Group Discussion**
9. **Next Steps**



Legend

Municipal Wells

Provisional WHPA

Existing WHPA

Corporate Limit

GET Particle Trace

- 0 - 1 years
- 1 - 2 years
- 2 - 10 years
- 10 - 20 years
- 20 - 50 years

WELLHEAD PROTECTION AREA

Drinking Water Protection

Management Plan

Aurora, Nebraska

N

0 0.5 1 Miles

1 " = 1 miles

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Introduction to DRASTIC modeling

What is DRASTIC modeling?

The DRASTIC method, developed by the US Environmental Protection Agency (EPA), provides a methodology for evaluating the vulnerability of groundwater resources to pollution based on hydrogeologic parameters. This method provides a framework for evaluating an area based on available spatial datasets without the need for extensive, site-specific pollution data (Bataineh et al 2022). DRASTIC identifies vulnerable locations in the planning area that will aid Aurora in prioritizing areas for best management practice (BMP) implementation.

What does DRASTIC stand for?

DRASTIC stands for:

- D: Depth to Groundwater
  The depth from the ground surface to the water table in an unconfined aquifer. This data was gathered from the Nebraska Department of Natural Resources (NeDNR) Registered Well Database and University of Nebraska – Lincoln Conservation and Survey Division's monitoring well database for data gathered in 2015 or later.

- R: Net Recharge
  The quantity of water applied to the ground surface that infiltrates to reach the aquifer. Data from the Cooperative Hydrologic Study Groundwater Model (COHYST) was used to create the Net Recharge layer for the DRASTIC modeling.

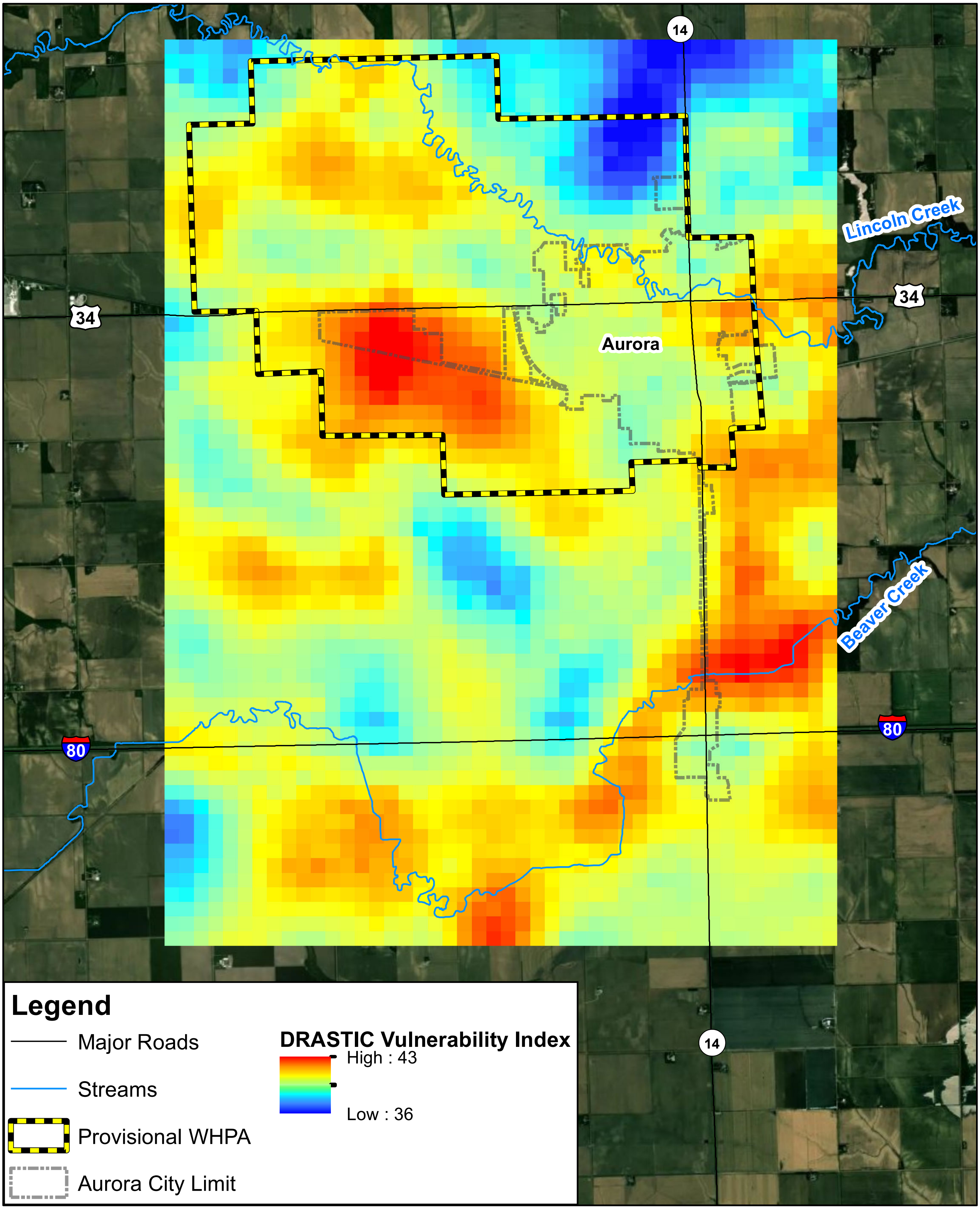
- A: Aquifer Media
  The consolidated or unconsolidated sediments which serve as the aquifer (e.g. sand, gravel, limestone). Data was gathered from COHYST and NeDNR's Registered Well Database.

- S: Soil Media
  The uppermost portion of the vadose zone characterized by significant biological activity. This data was gathered from the NRCS Web Soil Survey.

- T: General Topography or Slope
  The slope and slope variability of the land surface. This data was gathered using Light Detection and Ranging (LiDAR) technology.

- I: Vadose Zone
  The zone above the water table which is unsaturated or discontinuously saturated. This data was gathered from NeDNR's Registered Well Database.

- C: Hydraulic Conductivity
  The ability of the aquifer materials to transmit water. Data from COHYST was used to create this parameter.



N
0 0.5 1 2
Miles
1 " = 1 miles
Original Published Resolution
NAD 1983 StatePlane Nebraska FIPS 2600 Feet
ESRI World Imagery

DRASTIC Modeling Results
Drinking Water Protection Management Plan
Aurora, Nebraska

FIGURE
1

F:\2021\05001-05500\021-05223\40-Design\GIS\Maps\12-23-2022_WTRS_DWPMP_DRASTIC_Results.mxd PUBLISHED BY: jhinnant DATE: January 09, 2023

1. What are your thoughts on the updated WHP area?

Did you have any preconceived notion of what the source water area looked like? If so, are the time of travel paths generally what you expected? Refer to handout for the map.

2. What are your thoughts on the DRASTIC results?

Any major concerns after seeing these results? Refer to handout for the map.

3. **Based on your local knowledge of some of the high vulnerability areas, do you have any suggestions for BMPs?**

Note: Remember, BMPs can include educational opportunities (e.g. field demo day).

4. **Emphasis was placed on cost share during last stakeholder meeting. Please provide some feedback on the incentives you feel are necessary to encourage adoption of BMPs.**

What level of cost share would get people interested? How can we make it easier for people to use the program? Any suggestions on getting the word out?

City of Aurora Drinking Water Protection Management Plan

Stakeholder Meeting | January 17, 2023, 1:00 PM - 3:00 PM

Name	Agency/Organization
Erinn Wilkins	UBBNRD
Dustin Nissen	Sargent Drilling
Matthew Grosshans	Ag Producer
Chris Beins	Ag Producer
Andrew Willis	Diamond J
ERIC MELCHER	CITY OF AURORA
TATIANA DAVILA	NDEE
Marlin Seeman	Mayor-Aurora
Keith Wasem	Aurora Planning & Zoning

Public Open House

May 2023

To be determined.

APPENDIX D

ADDITIONAL INFORMATION ON CONTAMINANT SOURCE INVENTORY

Contaminant Source Inventory Summary

Purpose

The purpose of a potential contaminant source inventory (CSI) is to identify both existing contaminant sources and sources that have the potential to pollute groundwater within the WHP area. Additionally, the CSI can provide the community with a better understanding of what constitutes a potential source of contamination.

Common potential contaminant sources include:

- Agricultural - Fuel storage, grain storage, water wells, chemigation, livestock operations, and chemical storage
- Commercial/Light Industry - Auto repair facilities, dry cleaners, fuel stations/storage, machine shops, rail yards
- Industry - Manufacturing facilities, oil and gas wells, junk yards, landfills, sewage treatment plants
- Others - Cemeteries, golf courses, highway maintenance yards, transportation corridors

Note that although potential sources were identified in the following CSI, they may not presently be contributing to contamination.

Scope

The CSI was compiled from a combination of online databases and an on-the-ground field inventory. The following online sources were used to complete the CSI:

- NDEE interactive mapping system
- Nebraska State Fire Marshall database of registered underground storage tanks
- NDNR database of registered water wells
- USGS 2011 National Land Cover database

To verify the data that was collected through online resources, a field inventory was completed on November 30, 2022. In addition to validating the online data, the field inventory was completed to identify any potential contaminant sources that were not listed online.

Results

In total, 81 sites were identified during the online database review. Many of the sites were listed under more than one program, and the most common listing was for documented leaking storage tanks (LST). NDEE uses the LST listings to document releases from registered storage tanks. Typically, these listings document the discovery, investigation, and cleanup of release from underground storage tanks (UST) systems that store and distribute petroleum products.

Of the sites identified in the CSI (NDEE database review and field inventory) 17 were identified for further evaluation because of their locations in relation to the locations of the current municipal water supply wells and because of their histories as potential sources of contamination.

Of the 17 sites that were evaluated, three had ongoing contaminant investigations taking place. These three facilities are discussed below.

International Sensor Systems

The International Sensor Systems facility located at 103 Grant Street lies approximately 0.35 miles south of PWS Well #4, 0.68 miles northwest of PWS Well #1, 0.85 miles northwest of PWS Well #3, and 1.37 miles northwest of PWS Well #2.

The most recent information in the NDEE files indicate that groundwater, soil, and soil vapor at and downgradient of the site have been contaminated with primarily TCE (tetrachloroethylene), PCE (perchloroethylene), and acetone (also Cis-1,2,DCE; 1,1,1 TCA, and chloroform) as a result of previous operations. Interim remedial actions that will address on-site soil and groundwater contamination have been approved and will be completed by November 2024. The interim remedial actions include excavation, soil vapor extraction, and in-situ air sparging. They will also include groundwater and air monitoring and on-site inspections with additional sampling or mitigation as warranted.

Final remedial actions will address off-site contamination following the completion of the interim remedial actions.

J&B Industrial Services Inc

The J&B Industrial Services Inc facility located at 105 Hamilton Street is located 0.36 miles south-southwest of PWS Well #4, 0.71 miles northwest of PWS Well #1, 0.88 miles northwest of PWS Well #3, and 1.40 miles northwest of PWS Well #2.

This facility was included in investigations that took place in the surrounding area (International Sensor Systems and Fiberglass Products Inc). Soil, groundwater, and soil vapor in the area has been impacted by previous operations in the area. The contamination is being addressed as discussed with International Sensor Systems.

Information regarding International Sensor Systems and J&B Industrial Services Inc are included below the CSI photo log.

USDA Grain Bin NE-021

The USDA Grain Bin NE-021 facility located at 100 A Street is located approximately 0.65 miles west of PWS Well #2. Although NDEE places that facility at 100 A Street, it appears that most of the investigative work has taken place east of Aurora along E 12th Road between South R Road and South S Road. It is noted that that location is outside of the WHPA. However, several potential source areas along E 12th Road are located within the WHPA.

NDEE documents detail the discovery of a contaminant plume and follow up investigations at the facility. In 2012 sampling revealed contaminant concentrations that exceeded EPA Maximum Contaminant Levels (MCLs) in several private drinking water wells along E 12th Road between South R Road and South S Road. Additional assessment activities have been completed to confirm the presence of contaminants in the groundwater and soil vapor. Carbon tetrachloride has been detected in groundwater and indoor air samples at concentrations exceeding the EPA screening levels. Further sampling of both groundwater and soil gas is anticipated to assess conditions over time.

Information regarding USDA Grain Bin NE-021 is included below the CSI photolog, after information on International Sensor Systems and J&B Industrial Services Inc.

Other Potential Sources of Contamination

Improperly constructed wells can result in groundwater contamination when contaminants are introduced to the ground surface near the wellhead and are allowed to flow into the well. Additionally, wells that are improperly abandoned can serve as a conduit for contaminants to reach the aquifer.

Nitrate Contamination

Nitrate contamination is one of the most common groundwater contaminants in rural areas, and Nebraska is no different. Nonpoint sources of nitrates in groundwater often originate from the use of fertilizers. Excess nitrogen that is applied as fertilizer is not taken up by plants. The excess nitrogen is carried away by surface runoff and can leach into groundwater in the form of nitrate.

In the Upper Big Blue NRD conducts groundwater quality monitoring data across the NRD. This data was used to create a map depicting nitrate concentrations detected in groundwater samples in the vicinity of the WHP area.

NDEE Facilities and Programs outside the Aurora WHP Area

Facility ID	Facility Name	Programs	Status	Latitude	Longitude
9207	Island Towing & Recovery	LAST, NBD, SFM	Inactive	40.86437	-97.999795
16321	Brad & Tara Snyder Farm	NBD, UIC	Active	40.85796	-98.05038
25746	Aurora Co-op Elevator Company	AC, AIR, GW, IWM, LST, RA, RCR, SFM, TL3	Active, Inactive	40.86321	-98.00276
25747	Memorial Hospital	AIR, ASB, LST, PCS, SFM, UIC	Active, Inactive	40.870548	-98.011027
25752	Hamilton Manor	AIR, IWM, NBD	Inactive	40.87141	-98.012775
25763	Aurora Co-op Service Center	IWM, LST, PRR, RCR, SFM, TL3	Active, Inactive	40.863314	-98.002773
25769	Aurora Public Schools	ASB, LST, NBD, RCR, SFM	Active, Inactive	40.866526	-98.014839
25778	Hauf Repair	NBD, RCR	Inactive	40.863483	-98.0091
25780	T O Haas Tire & Auto Service	LST, PRR, SFM	Active, Inactive	40.855808	-97.996199
25787	Aurora Co-op Elevator Agronomy	LST, OWT, OCS, SFM	Active, Inactive	40.862151	-98.01738
25793	AKRS Equipment Solutions Inc	LST, RCR, SFM	Inactive	40.872724	-98.011585
25804	Interstate Battery System Nebr	LST, NBD, SFM	Inactive	40.868257	-98.004598
25824	Stan Allen Motors Inc	FS, LST, PRR, SFM	Active, Inactive	40.868599	-98.003961
25825	Stan Allen Motors Inc	LST, SFM	Inactive	40.872627	-98.013573
25871	International Sensor Systems	BF, PCS, RAP, RCR, UIC	Active	40.873663	-98.021722
25876	Del-Ray Manufacturing Inc	NBD, RCR	Active, Inactive	40.87275	-98.02531
25877	Pump & Pantry 07	AIR, LGL, LST, PRR, SFM, TL3	Active, Inactive	40.872165	-98.00137
25882	Aurora Co-op Elevator Company	AC, AIR, RA, RCR, TL3	Active, Inactive	40.860023	-98.007329
25886	Casey's General Store 2377	AIR, LST, NBD, PRR, SFM, TL3	Active, Inactive	40.859946	-97.996194
25917	Hamilton County Noxious Weed	UIC	Active	40.857652	-98.012033
25944	Grosshans International Inc	LST, RCR, SFM	Inactive	40.873023	-98.024056
25945	NDOT Old Aurora Yard	LST, SFM, TL3, UIC	Inactive	40.858802	-97.998386
25946	Norder Supply Inc	NBD, TL3	Active	40.865179	-98.036318
25961	Aurora Pallet Co	AIR	Active	40.860023	-98.007329
25963	Wortman Motor Co	IWM, LST, NBD	Inactive	40.87194	-98.00349
25966	Royal Highlanders Building	IWM, SF	Active, Inactive	40.864332	-97.999712
25975	Sutton Automotive	NBD, RCR	Inactive	40.871491	-98.007158
25988	Pinsetter Lanes	NBD, RA	Inactive	40.872765	-97.996567
26005	J&B Industrial Services Inc	AIR, LGL, NBD, OCP, PCS, RCR, SF, TRI, UIC	Active	40.873526	-98.02272
26012	Wheeler Transport Service	LST, RCR, SFM, TL3	Inactive	40.87172	-98.016772
26016	Hamilton County Sheriff	LST, SFM	Inactive	40.864135	-98.002836
45792	Coles Park	NBD, PCS	Inactive	40.87059	-98.00838
55058	Hamilton Telephone Co	LST, NBD, SFM, TL3	Active, Inactive	40.866401	-98.003076
58341	Fiberglass Products Inc	AIR, LGL, RA, RCR, TL3, TRI	Active, Inactive	40.872774	-98.021302
59052	Aurora East LLC	AIR, IWM, LGL, OCP, PCS, RA, RCR, TL3, TRI, WWF	Active, Inactive	40.86801	-98.03642
60117	Chief Custom Homes	AIR, PCS, TL3, TRI	Active	40.874808	-98.021948

Facility ID	Facility Name	Programs	Status	Latitude	Longitude
60826	Jim's Foodmart	LST, RCR, SFM, TL3	Active, Inactive	40.86994	-97.997305
60829	T&L's Convenience & Liquor	TL3	Inactive	40.85581	-97.99673
61411	Casey's General Store	LGL, PCS, PRR, SFM	Active, Inactive	40.87212	-97.99675
61413	Hamilton County Courthouse	ASB, LST, SFM	Inactive	40.867909	-98.001512
61423	McDonalds	LST, SFM	Inactive	40.872681	-97.997523
61424	Aurora Head Start	LST, SFM	Inactive	40.867428	-98.014575
63186	Aurora Landfill West	IWM	Inactive	40.86142	-98.01162
63218	Aurora Ready Mix Plant	AIR, PCS, TL3	Active, Inactive	40.870282	-98.036052
64077	Dick's Cafe	LST, PRR, UIC	Active, Inactive	40.872593	-97.992349
64207	Rodney Schroeder Residence	UIC	Inactive	40.878046	-97.992387
64873	Acord Transportation	TL3	Active	40.871935	-98.039993
65770	Aurora Co-op Elevator Company	TL3	Inactive	40.861531	-98.016642
65843	Aurora Public Schools Bus Barn	LST, SFM	Inactive	40.867964	-98.016443
65942	Del-Ray Manufacturing Inc	EA, RCR	Active	40.866098	-98.002576
66328	Barry Anderson Livestock	LWC	Active	40.872312	-98.033235
66338	Delmer Wadell Livestock	LWC	Active	40.886861	-98.035086
66356	Gerald Holtzen Livestock North	LWC	Active	40.85551	-98.007437
66368	John Springer Livestock	LWC	Active	40.886902	-98.018118
68371	Hamilton County Highway Dept	IWM, LST, SFM	Active, Inactive	40.857965	-97.997197
71008	Double G Auto	TL3	Inactive	40.862849	-98.008646
71176	Bar Lazy B Farm	LST, LWC, OWT, SFM, UIC	Active, Inactive	40.88703	-98.05005
71250	EPCO Carbon Dioxide Products	AIR, OCS, RA, TL3	Active, Inactive	40.869559	-98.039624
71545	International Sensor Systems	RCR	Inactive	40.87247	-98.015815
71783	USDA Grain Bin NE-021	RAP, SF	Active	40.85792	-98.01603
75098	Wert Farms Inc	LWC	Active	40.86142	-97.99197
75124	Houtz Steenburg Livestock	LWC	Active	40.87209	-98.03662
78212	Kremer Farms	LWC	Active	40.85769	-98.0135
81472	Aurora Industrial Park North	PCS	Active	40.87259	-98.02032
85312	A-1 Fiberglass Aurora Inc	AIR, LFL, RCR, TL3, TRI	Active, Inactive	40.87103	-98.03956
87052	Scott Homestead	PCS	Active	40.879621	-98.045728
87301	Mankin Farm	PCS	Inactive	40.879621	-98.045728
91217	North Ridge	PCS	Inactive	40.879651	-98.001301
91440	Mankin Farm	PCS	Inactive	40.886711	-98.017042
91676	Green Way	PCS	Inactive	40.86325	-97.99223
95530	Todd Vaught Body & Glass Inc	AIR	Active	40.8619	-98.00264
96573	John Thomas Acreage	OWT	Active	40.88689	-98.00807
97760	Aurora Body Shop	AIR, OWT	Active	40.86022	-98.01683
97960	Aurorans 4 Diamond Sports	PCS	Active	40.873888	-97.998611
101257	St Mary's Catholic Church	PCS	Active	40.87097	-98.00595

Facility ID	Facility Name	Programs	Status	Latitude	Longitude
102065	Streeter Park	PCS	Inactive	40.87259	-98.0034
102262	Gregg Kremer Farm	UIC	Active	40.85793	-98.01538
103216	Sargent Irrigation Co	PCS	Active	40.87252	-98.01677
103886	Kevin Elge Farm	UIC	Active	40.871692	-98.054867
103943	Cottage Park	PCS	Active	40.867769	-98.023348
104198	Winfield United	PCS	Active	40.867635	-98.022592

NDEE Programs and Facility Count

NDEE Program Name	Acronym	Program Description	Count
Leaking Storage Tanks (LST):	LST	Above or underground storage tanks of petroleum substances.	38
NPDES Permits and Compliance (PCS):	PCS	Discharge of monitored pollutants to waters of the state, including; Wastewater treatment facilities for industrial or domestic wastewater. Remediation wells. Discharge of cooling water Discharge of monitored pollutants (as above), specifically from storm water runoff. Construction sites which are 5 acres or larger.	36
State Fire Marshall (SFM):	SFM	Not an NDEQ program, provided for reference only State Fire Marshall facility information, usually associated with the storage of petroleum and flammable liquids	29
SARA Title III (TL3):	TL3	Voluntary reporting of hazardous chemical storage.	20
Resource Conservation Recovery (RCR):	RCR	Hazardous waste contamination of groundwater, soils, or other materials	18
Clean Air Act (AIR):	AIR	Ambient air monitoring not associated with point sources. Emissions from point sources.	16
Underground Injection Control (UIC):	UIC	Septic tanks that handle things other than domestic waste (shop drains that lead in to a septic tank) or that are large capacity. Injection or discharge of monitored fluids into a well, including non-domestic wastewater and open loop heat pumps.	12
Release Assessment (RA):	RA	Receives notification of spills, leaks, and other environmental emergencies, and provides technical assistance and regulatory oversight to those that pose an immediate hazard to either the environment or public health.	11

NDEE Program Name	Acronym	Program Description	Count
Livestock Waste Control (LWC):	LWC	Prevent the discharge of wastes from livestock operations to waters of the State.	9
Integrated Waste Management (IWM):	IWM	Facilities for the disposal of municipal solid waste (landfills). Construction and demolition debris, fossil fuel ash, and industrial waste	8
Superfund (SF):	SF	Identifies, assesses, and characterizes sites where hazardous substances are known or suspected to pose a threat to public health and/or the environment.	6
Asbestos Abatement Remediation (ASB):	ASB	Notification from facilities doing demolition and renovation involving asbestos	5
Toxic Release Inventory System (TRI):	TRI	Increase the public's access to information concerning the presence and release of hazardous chemicals in their communities Provide information for emergency planning and response. Provide information on toxic chemical releases into the environment.	5
Onsite Wastewater Treatment (OWT):	OWT	Any type of individual septic tank or domestic lagoons Any facility that is not connected to a community wastewater treatment plant.	4
Ground Water (GW):	GW	Sites undergoing clean-up of ground water under Title 118, Ground Water Quality Standards and Use Classification	2
Remedial Action Plan Monitoring (RAP):	RAP	Voluntary cleanup of any site.	2

NDEE Program Name	Acronym	Program Description	Count
Waste Water Facilities (WWF):	WWF	Review of plans for a change in sewer systems.	2
Environmental Assistance (EA):	EA	Assistance and coordination offered for environmental issues.	1
Brownfields (BF):	BF	Redevelopment of abandoned or underused industrial or commercial properties	1

PHOTO LOG

Project Name:	Site Location:	Project Number:

Description: Photo 1 – View north at the northwest corner of the Wellhead Protection Area (Intersection of County Roads 15 & M).

Description: Photo 2 – View east at the northwest corner of the Wellhead Protection Area (Intersection of County Roads 15 & M).

Description: Photo 3 – View south at the northwest corner of the Wellhead Protection Area (Intersection of County Roads 15 & M).

Description: Photo 4 – View west at the northwest corner of the Wellhead Protection Area (Intersection of County Roads 15 & M).

PHOTO LOG

Project Name:	Site Location:	Project Number:

Description: Photo 5 – Aboveground storage tank located along County Road N between County Roads 14 & 15.

Description: Photo 6 – View north at the intersection of County Roads O & 15.

Description: Photo 7 – View east at the intersection of County Roads O & 15.

Description: Photo 8 – View south at the intersection of County Roads O & 15.

PHOTO LOG

Project Name:	Site Location:	Project Number:

Description: Photo 9 – View west at the intersection of County Roads O & 15.

Description: Photo 10 – View of Cemetery near the intersection of County Road 14 and Highway 14.

Description: Photo 11 – View north from the northeast corner of the Wellhead Protection Area along Highway 14.

Description: Photo 12 – View east from the northeast corner of the Wellhead Protection Area along Highway 14.

PHOTO LOG

Project Name:	Site Location:	Project Number:

Description: Photo 13 – View south from the northeast corner of the Wellhead Protection Area along Highway 14.

Description: Photo 14 – View west from the northeast corner of the Wellhead Protection Area along Highway 14.

Description: Photo 15 – View north from the southern Wellhead Protection Area boundary along Highway 14.

Description: Photo 16 – View east from the southern Wellhead Protection Area boundary along Highway 14.

PHOTO LOG

Project Name:	Site Location:	Project Number:

Description: Photo 17 – View south from the southern Wellhead Protection Area boundary along Highway 14.

Description: Photo 18 – View west from the southern Wellhead Protection Area boundary along Highway 14.

Description: Photo 19 – View north from the southwest corner of the Wellhead Protection Area at the intersection of County Roads N and 12.

Description: Photo 20 – View east from the southwest corner of the Wellhead Protection Area at the intersection of County Roads N and 12.

olsson

PHOTO LOG

Project Name:	Site Location:	Project Number:

Description: Photo 21 – View south from the southwest corner of the Wellhead Protection Area at the intersection of County Roads N and 12.

Description: Photo 22 – View west from the southwest corner of the Wellhead Protection Area at the intersection of County Roads N and 12.

Description: Photo 23 – View of fertilizer plant located along Highway 34 taken from County Road O. View is looking to the northwest.

NEBRASKA

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Pete Ricketts, Governor

Public Notice
Proposed Interim Remedial Action
International Sensor Systems, Inc.

IIS Facility ID: 25871 Program ID: RAP 36-336-4961

Notice is hereby given pursuant to Neb. Rev. Stat. § 81-15, 185.01 and Nebraska Title 118 – Ground Water Quality Standards and Use Classification, Chapter 11 that the Nebraska Department of Environment and Energy (NDEE) is proposing approval of the Interim Remedial Action Plan (IRAP) for the International Sensor Systems, Inc. site located at 103 Grant Street, Aurora, Nebraska. The site is located in the southeast quarter of Section 32, Township 11 North, Range 06 West, Hamilton County, Nebraska.

Groundwater, soil, and soil vapor at and downgradient of the site have been contaminated as a result of previous operations. This interim remedial action will address on-site soil and groundwater contamination. A subsequent final remedial action will address off-site contamination. The NDEE has assigned the groundwater pollution event the highest remedial action class of RAC-1, which normally requires extensive and complete cleanup. The proposed final cleanup levels and interim remedial action described in the IRAP are based on the requirements to prevent the migration of chemicals of concern (COCs) to groundwater, remove COCs from the soil to control future migration, control the exposure of worker populations during utility and/or construction activities, and prevent exposure to soil vapors on-site. The NDEE is proposing the following interim remedial action measures: excavation, soil vapor extraction, and in-situ air sparging. The proposed interim remedial action will include groundwater monitoring, air monitoring, and on-site inspections with additional sampling or mitigation as warranted.

The IRAP and supporting documents are available online at http://dee.ne.gov/ by selecting "Public Notices" at the bottom of the page, then selecting "International Sensor Systems, Inc.". Individuals requiring special accommodations or alternate formats of materials should notify the Department by calling (402) 471-2186. TDD users should call (800) 833-7352 and ask the relay operator to call the Department at (402) 471-2186.

Any person may submit written comments regarding the proposed actions, or request a public hearing, in writing, on or before October 15, 2022. A request for hearing must state the nature of the issues to be raised and all arguments and factual grounds supporting such position. If the Director grants a public hearing, the hearing will be advertised by public notice at least 30 days prior to its occurrence. Comments and requests should be mailed to:

Department of Environment and Energy
P O Box 98922
Lincoln, Nebraska 68509-8922

Jim Macy, Director
OFFICE 402-471-2186 FAX 402-471-2909
ndee.moreinfo@nebraska.gov

Thomas Buell
Division Administrator
Monitoring and Remediation Division
Nebraska Department of Environment and Energy
245 Fallbrook Blvd., Suite 100
Lincoln, Nebraska 68521

Please contact Sarah Klescewski at sarah.klescewski@nebraska.gov or (402) 471-2186 with questions or for more information.

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NOV 17 2022

Gary Bales
International Sensor Systems Inc.
103 Grant Street
Aurora, NE 68818

RE: International Sensor Systems, Inc.
NDEE ID: 25871
Program ID: RAP 36-336-4961
Subject: Final Approval of Proposed Remedial Action

Dear Mr. Bales:

The Nebraska Department of Environment and Energy (NDEE) has completed the public notice of the proposed remedial actions and cleanup levels for the Interim Remedial Action Plan (IRAP) for International Sensor Systems, Inc. (ISSI) at 103 Grant Street, Aurora, Nebraska.

During the thirty (30) day public comment period, NDEE received an email from Wayne Roblee, a former employee of ISSI, requesting clarifying information about the Nebraska Voluntary Cleanup Program. This correspondence does not require a revision to the IRAP. NDEE did not receive any additional comments or requests for a hearing during the public comment period.

This letter serves as notification of the final approval of the proposed remedial actions and cleanup levels. Initiation of the IRAP must begin within six months of this approval and be completed within 24 months, excluding long-term operation, maintenance, and monitoring.

If you have any questions, please contact Billy Wesley, Sarah Klescewski, or me at (402) 471-2186.

Sincerely,

Tom Buell
Division Administrator
Monitoring and Remediation Division

cc: Rick Bean, P.G. – GSI Engineering

Department of Environment and Energy
P.O. Box 98922
Lincoln, Nebraska 68509-8922

Jim Macy, Director
OFFICE 402-471-2186 FAX 402-471-2909
ndee.moreinfo@nebraska.gov

20220175857

TETRA TECH

September 22, 2015

Mr. Joe Davis
On-Scene Coordinator
U.S. Environmental Protection Agency – TLC
8600 NE Underground Drive, Pillar 253
Kansas City, Missouri 64161

Subject: **Removal Action Report – Revision 2**
Aurora Groundwater Site, Aurora, Hamilton County, Nebraska
CERCLIS EPA ID: IAN000706068
U.S. EPA Region 7 START, Contract No. EP-S7-13-06, Task Order No. 0035
Task Monitor: Joe Davis, EPA On-Scene Coordinator/Task Monitor

Dear Mr. Davis:

Tetra Tech, Inc. is submitting the attached Removal Action Report, Revision 2, regarding the Aurora Groundwater site in Aurora, Hamilton County, Nebraska. This removal action report has been revised based on additional sampling at the site under the START 4 contract in 2014 and 2015. This report supersedes Revision 1, submitted April 9, 2013 (START 3, Task 284). If you have any questions or comments, please contact the Project Manager at (816) 412-1771.

Sincerely,

Jenna Mead, RG
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

cc: Debra Dorsey, START Project Officer (cover letter only)

X9025.14.0035.000

415 Oak Street, Kansas City, MO 64106
Tel 816.412.1741 Fax 816.410.1748 www.tetratech.com

REMOVAL ACTION REPORT – REVISION 2
AURORA GROUNDWATER SITE
AURORA, HAMILTON COUNTY, NEBRASKA

Superfund Technical Assessment and Response Team (START) 4 Contract

Contract No. EP-S7-13-06, Task Order No. 0035

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

September 22, 2015

Prepared By:

Tetra Tech, Inc.
415 Oak Street
Kansas City, Missouri 64106
(816) 412-1741

CONTENTS

APPENDICES

TABLES

1.0 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) was tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division, under Superfund Technical Assessment and Response Team (START) 3 Contract Number EP-S7-06-01, Task Order Number 0284, to support a removal action at the Aurora Groundwater site in the City of Aurora, Hamilton County, Nebraska (see Appendix A, Figure 1). A removal action report was submitted in February 2013, and revised in April 2013 (Tetra Tech 2013a). Additional work was performed at the site in 2014 and 2015 under the START 4 Contract Number EP-S7-13-06, Task Order Number 0035.

The Aurora Groundwater site was entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) on July 29, 2011, with Identification Number NEN000706271 (EPA 2012).

Investigations by EPA and the Nebraska Department of Environmental Quality (NDEQ) have focused on determining the extent of groundwater contamination, comprehensively characterizing potential receptors (domestic and municipal wells), and evaluating probable source areas. Volatile organic compounds (VOC) were found in seven domestic wells east of town, outside city limits, and in one municipal well in northern Aurora. Concentrations of carbon tetrachloride (CCl_4) were above federal maximum contaminant levels (MCL) in five domestic wells. A municipal well in northeast Aurora contained low levels of the chlorinated solvent tetrachloroethene (PCE). The PCE contamination was subsequently entered into CERCLIS as the Aurora Highway 34 North site (NEN000706524), and was determined to be unrelated to the Aurora Groundwater site (Tetra Tech 2013b).

Apparent Problem

In January 2012, CCl_4 was detected in three residential well samples; the samples were collected prior to any in-home water treatment systems. These wells are along East 12th Road between South R Road and South S Road, between 0.7 and 1.7 miles east of the Aurora city limits. All three of these wells contained CCL_4 at concentrations exceeding the EPA MCL of 5 micrograms per liter (µg/L).

In May 2012, samples were collected at two of the wells that had been sampled the previous January. This time the samples were collected following in-home water treatment systems installed by the homeowners, and CCl_4 was found below the MCL. The remaining previously sampled residential well (in January 2012) did not include a water treatment system, and the sample from this well again had levels of CCl_4 above the MCL. Four additional domestic wells were sampled within the same area for the first time during the May 2012 event, and one of these wells contained CCl_4 at a concentration above the MCL.

A sampling event at the Aurora site in October 2012 detected CCl_4 in groundwater above MCLs via mobile laboratory analysis, but these results were not confirmed via fixed laboratory analysis.

1.1 SITE LOCATION AND DESCRIPTION

The former Aurora high-capacity grain storage facility was at the northeast corner of the 1st Street and East 12th Road intersection in Aurora, Nebraska (see Figure 1 in Appendix A). Global positioning system (GPS) coordinates of the approximate center of the former facility are 40.858305 degrees north latitude and 98.016265 degrees west longitude.

Most communities across Nebraska at one time had access to a high-capacity grain storage facility owned and operated by the U.S. Department of Agriculture (USDA) in which CCl_4 was used as a grain fumigant (Nebraska Department of Health and Human Services [NDHHS] 2000). These fumigation processes often resulted in a CCl_4 release to groundwater. CCl_4 and the products of its degradation (chloroform and dichloromethane) have been found to exert detrimental effects on human health and have been classified as potential carcinogens (Agency for Toxic Substances and Disease Registry [ATSDR] 2005).

Aurora has an annual temperature of 50.8 degrees Fahrenheit (°F) and an average annual precipitation of 27 inches (Weatherbase 2012). According to USDA, soils in the Aurora area primarily consist of Hastings silt loam (1- to 3-percent slopes) followed by Hastings silty clay loam (3- to 7-percent slopes, eroded), Hastings silt loam (1- to 3-percent slopes), Hord silt loam (rarely flooded), and Crete silt loam (0- to 1-percent slopes) (USDA 2012).

The contaminated residential drinking water wells associated with the Aurora Groundwater site are southeast of Aurora, Nebraska, with the identified contamination along East 12th Road southeast of the City (geographic coordinates of approximate center of contamination are 40.857836 degrees north latitude and 97.978215 degrees west longitude). VOC contamination in groundwater associated with the Aurora Groundwater site is in Sections 2, 3, 10, 11, and 12 of Township 10 North, Range 6 West.

1.2 BACKGROUND

EPA's Pre-CERCLIS Screening Report regarding the Aurora site (dated October 2011) identified a formerly owned or operated USDA grain storage facility in southwest Aurora. Based on this report, EPA recommended sampling domestic and commercial use water supply wells in and around Aurora (EPA 2011).

Tetra Tech START conducted APA sampling in January 2012 and submitted an APA report on May 3, 2012—25 domestic wells had been sampled for VOCs (START Task Order 066). CCl_4, chloroform, 1,2-dichloroethane (DCA), 1,1-dichloroethene (DCE), and 1,1,1-trichloroethane (TCA) were detected in three wells. These wells are along East 12th Road between South R Road and South S Road, between 0.7 and 1.7 miles east of the Aurora city limits (Tetra Tech EM Inc. 2012a).

Tetra Tech START conducted removal site evaluation/site investigation (RSE/SI) field activities for EPA on May 8-9, 2012, and submitted an RSE/SI report on December 11, 2012 (START Task Order 0284). Tetra Tech START identified CCl_4, chloroform, DCE, PCE, 1,2,3-trichlorobenzene (TCB), or TCA in seven residential wells (including three previously sampled) and in one municipal well. During this investigation, property owners were asked whether they had installed any in-home water treatment systems, and if so, samples were collected before (pre-) and after (post-) the treatment system. Two of the three previously sampled domestic wells (in January 2012) contained CCl_4 in the post-treatment sample at concentrations below the EPA MCL of 5 µg/L, and further EPA action was not required at these two residences. The third domestic well previously sampled during January 2012 contained CCl_4 at a concentration above the MCL, and this residence did not have an owner-installed water treatment system. Four additional domestic wells were sampled for the first time during the RSE/SI, and one of these wells also contained CCl_4 at a concentration above the MCL.

EPA elected to install water treatment systems at two homes where CCl_4 had been reported above the MCL—one whose well had been initially sampled as part of the APA in January 2012 and that did not already have an owner-installed treatment system, and the second whose well had been sampled for the first time during the RSE/SI investigation. The remaining wells sampled either had not contained detectable levels of CCl_4 or had contained detected concentrations below the MCL (Tetra Tech EM Inc. 2012b).

2.0 SITE ACTIVITIES

On December 12, 2012, Fenster Plumbing, from Chapman, Nebraska, was contracted by Emergency and Rapid Response Services (ERRS) contractor Environmental Restoration (ER) to install whole house water treatment systems at two residences. START was not on site during these installations, which are described below.

2.1 WATER TREATMENT INSTALLATION JUSTIFICATION

During APA sampling by Tetra Tech START in January 2012, a drinking water sample collected from 1704 East 12th Road contained CCl_4 at 84 µg/L. The same well had been sampled during the RSE/SI May 2012 sampling event and had contained CCl_4 at 68 µg/L. Additionally, during the RSE/SI sampling event, a drinking water sample collected at 1605 East 12th Road had contained CCl_4 at 8.4 µg/L. After speaking with EPA, the homeowners of these two residences opted for installations of whole house water treatment systems (see Appendix A, Figure 1). At other properties with wells containing detectable levels of CCl_4, either those CCl_4 concentrations were not above the MCL or the residents already had privately-installed treatment systems, and post-treatment CCl_4 concentrations were below the MCL.

2.2 CARBON FILTRATION SYSTEMS

Each whole house water treatment system installed by EPA consists of an in-line housing containing one sediment filter and an additional in-line housing containing one carbon filter. The system is typically installed at a point close to where the main water service line enters the property structure. Shut-off valves are installed on either side of the system to allow shut-off of water while filters are changed. Changing the sediment filter every 3 months and the carbon filter every 6 months is recommended. The purpose of this system is to filter sediment and reduce dissolved organics in groundwater prior to consumption or other domestic use.

2.3 INSTALLATION ACTIVITIES

On December 12, 2012, Fenster Plumbing installed whole house water treatment systems at 1704 East 12th Road and 1605 East 12th Road. Installation of each system required 1 day. In early 2015, a second filtration unit was installed in-line with the first at 1605 East 12th Road.

2.4 GROUNDWATER SAMPLING

In March 2014, EPA On-scene Coordinator (OSC) Joe Davis and START member Danny O'Connor collected pre- and post-filtration samples at 1605 and 1704 East 12th Road. Table 1 summarizes the samples collected and the results obtained.

Because the post-filtration sample results from 1605 East 12th Street contained concentrations of CCl_4 exceeding the MCL (even after replacing the filter), a second filtration system was installed in-line with the previously installed system in early 2015. In May 2015, START member Jenna Mead collected additional pre- and post-filtration samples at 1605 East 12th Road. These results are also included in Table 1.

Under contract to NDEQ, Ms. Mead also collected samples from private wells at 1606, 1608, and 1908 East 12th Road. No VOCs were detected at 1606 or 1908 East 12th Road. CCl_4 was identified at 3.2 µg/L in the sample from 1608 E. 12 Road. This concentration is similar to the 3.8 µg/L detected in 2012 (Tetra Tech 2015).

A copy of the logbook for the March 2014 sampling event is included as Appendix B and photographs of the March 2014 sampling are in Appendix C. Field sheets for both the March 2014 and May 2015 sampling events are in Appendix D. Analytical results are in Appendix E.

TABLE 1

2014-2015 PRIVATE WELL SAMPLE RESULTS AT EAST 12TH ROAD
AURORA GROUNDWATER SITE, AURORA, NEBRASKA

Address	Sample Number	Sample Location	Sample Type	Sample Date	Sample Time	CCl_4	$CHCl_3$	1,1-DCE	1,1-TCA
						Concentration (µg/L)			
Federal Maximum Contaminant Level						**5**	**80**[a]	**7**	**200**
1704 E. 12th Rd.	6436-1	Kitchen Sink	Post-filtration	3/18/14	12:08	0.5 U	0.5 U	0.5 U	0.5 U
	6436-2	Hydrant	Pre-filtration	3/18/14	12:25	**98**	2.1	0.5 U	0.5 U
1605 E. 12th Rd.	6436-4	Kitchen Sink	Post-filtration (old filter)	3/18/14	12:49	**14**	0.91	1.6	1.3
	6436-5	Kitchen Sink	Post-filtration (new filter)	3/18/14	13:14	**14**	0.90	1.5	1.3
	6436-6	Hydrant	Pre-filtration	3/18/14	13:15	**14**	0.96	1.5	1.3
	6823-1	Kitchen Sink – 10-minute purge	Post-filtration (two filters in-line)	5/21/15	07:10	0.5 U	0.5 U	0.5 U	0.5 U
	6823-2	Kitchen Sink – 20-minute purge	Post-filtration (two filters in-line)	5/21/15	07:20	0.5 U	0.5 U	0.5 U	0.5 U
	6823-3	Hydrant – 10-minute purge	Pre-filtration	5/21/15	06:45	**8.3**	1.1	1.0	0.74
	6823-4	Hydrant – 20-minute purge	Pre-filtration	5/21/15	06:55	**7.2**	1.0	1.1	0.5 U
QA/QC Samples									
NA	6436-3FB	NA	Trip blank	3/18/14	08:15	0.5 U	0.5 U	0.5 U	0.5 U
NA	6823-5FB	NA	Trip blank	5/20/15	12:00	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Bold value indicates a concentration that exceeds the federal MCL.

[a] MCL is for total trihalomethanes.

CCl_4 Carbon tetrachloride
$CHCl_3$ Chloroform
DCE Dichloroethene
FB Field blank
NA Not applicable
QA/QC Quality Assurance/Quality Control
TCA Trichloroethane
U The analyte was not detected at or above the reporting limit.

3.0 SUMMARY

This following sections discuss removal considerations and pre-remedial considerations.

3.1 REMOVAL CONSIDERATIONS

CCl_4 and its degradation product, chloroform, have been detected in private domestic wells within an area immediately southeast of Aurora. Other VOCs such as DCE, PCE, TCB, DCA, and TCA have also been detected in private domestic wells in the same area. Source-area investigations have concentrated on the former USDA grain storage facility or the current Aurora Coop facility. Following sampling activities, EPA contacted homeowners with wells containing elevated levels of CCl_4 regarding installation of whole house water treatment systems. Owners of two residences on East 12th Road opted for installations of these systems, while owners of all other residences already had a reverse osmosis treatment system in place or their wells contained contaminant concentrations below benchmark values.

Periodic follow-up sampling should be conducted to ensure that that CCl_4 concentrations do not exceed MCLs in drinking water samples.

3.2 PRE-REMEDIAL CONSIDERATIONS

In 2012-2015, NDEQ investigated potential source areas and the extent of groundwater contamination at the Aurora Groundwater site. No VOCs were identified in soil samples collected near the former USDA grain storage facility or the Aurora Coop. In May 2015, CCl_4 and 1,1-DCE concentrations in groundwater samples exceeded their respective MCLs as far northwest as the intersection 6th and F Streets, about 1-3 miles upgradient of the contaminated private wells on East 12th Road. Further investigation upgradient of this intersection is recommended to investigate potential source areas.

4.0 REFERENCES

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Tetra Tech EM, Inc. 2012a. Abbreviated Preliminary Assessment, Aurora Groundwater Site. May 3.

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U.S. Department of Agriculture (USDA). 2012. Web Soil Survey. Accessed March 22, 2012. On-line address: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

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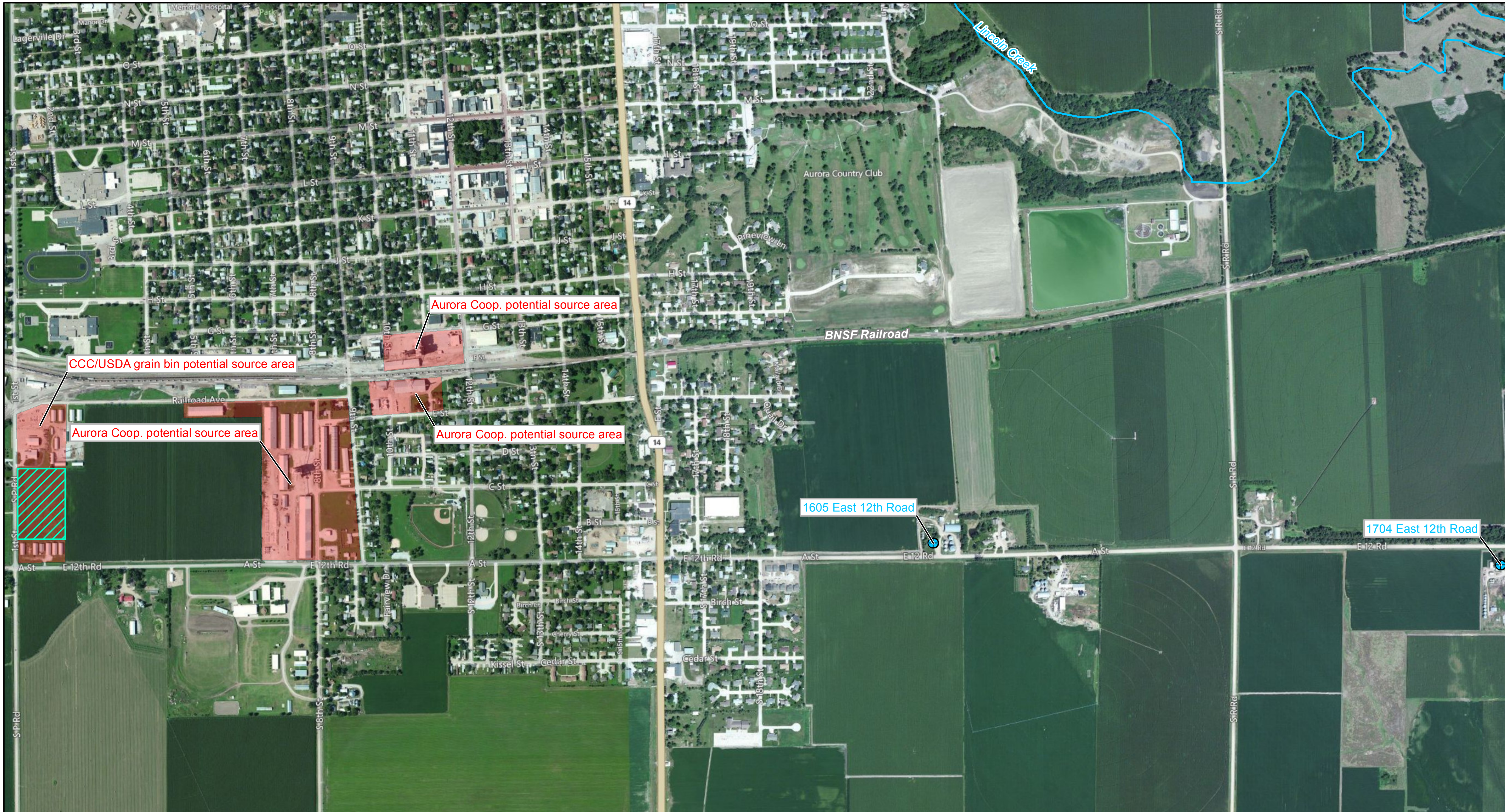
Weatherbase. 2012. Weather data summary. Accessed October 24, 2012. On-line address: http://www.weatherbase.com/weather/weather.php3?s=544052&refer=&cityname=Aurora-Nebraska-United-States-of-America

APPENDIX A

FIGURE



Legend

- Residence with EPA-installed water treatment system
- Stream/River
- Former Aurora landfill
- Potential source area

CCC	Commodity Credit Corporation
EPA	Environmental Protection Agency
USDA	United States Department of Agriculture

N

0 420 840

Feet

Aurora Groundwater Site
Aurora, Nebraska

Figure 1
EPA-Installed
Water Treatment System Location Map

TETRA TECH

Date: 1/24/2013 Drawn By: Nick Wiederholt Project No: X9004.L.12.0284.000

Source: ArcGIS Online, Bing Maps Hybrid, 2011; ESRI Data Maps, 2007

APPENDIX B

LOGBOOK

KS1392

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for Outdoor writing people

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Rite in the Rain®

ALL-WEATHER

LEVEL

№ 311

Aurora GW

3/18/14 Aurora Groundwater

0700 STM Danny O'Connor arrives @ EPA Caves. Meet with OSC Joe Davis

0730 Depart for site

1201 Arrive @ 1704 East 12th Road

1205 Begin purging water from kitchen sink

1208 Collect sample, KS-1. Three VOA vials from kitchen sink - through filtration

1225 Run 30 second purge of outside hydrant

Collect sample hydrant-1 (H-1)

Collect triple volume for MS/MSD

1244 Arrive @ 1605 East 12th Road

1245 Begin purging kitchen sink

1249 Collect sample from kitchen sink, KS-2

OSC Davis switches out expired filters

1307 Begin purging kitchen sink

1314 Collect sample from kitchen sink, KS-3

1315 Collect sample from outside hydrant (H-2)

Depart for Kansas City

1810 Arrive at EPA warehouse

1825 Drop off samples @ Tt office

1835 End day

Danny O.
3/18/14

Rite in the Rain

APPENDIX C

PHOTOGRAPHIC LOG

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9025.14.0035.000 DIRECTION: --	DESCRIPTION	This photograph shows filtration system at 1704 East 12th Road.	1
	CLIENT	Environmental Protection Agency - Region 7	DATE 3/18/14
	PHOTOGRAPHER	Danny O'Connor	

TETRA TECH PROJECT NO. X9025.14.0035.000 DIRECTION: --	DESCRIPTION	This photograph shows filtration system at 1704 East 12th Road.	2
	CLIENT	Environmental Protection Agency - Region 7	DATE 3/14/14
	PHOTOGRAPHER	Danny O'Connor	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9025.14.0035.000 DIRECTION: --	DESCRIPTION	This photograph shows carbon and sediment filters changed following change-out at 1605 East 12th Road.	3
	CLIENT	Environmental Protection Agency - Region 7	DATE 3/18/14
	PHOTOGRAPHER	Danny O'Connor	

TETRA TECH PROJECT NO. X9025.14.0035.000 DIRECTION: --	DESCRIPTION	This photograph shows filtration system at 1605 East 12th Road.	4
	CLIENT	Environmental Protection Agency - Region 7	DATE 3/14/14
	PHOTOGRAPHER	Danny O'Connor	

APPENDIX D

CHAIN-OF-CUSTODY FORMS AND FIELD SHEETS

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION	SHEET
Joe Davis	Aurora Groundwater	18 (DAY) 3 (MONTH) 14 (YEAR)	1 of 1

CONTENTS OF SHIPMENT

SAMPLE NUMBER	CUBITAINER	BOTTLE	BOTTLE	BOTTLE	VOA SET D.O. (2 VIALS EA) 3	water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
6436-1					1	X					
-2					3						MS/MSD
-3FB					1						TripBlank
-4					1						
-5					1						
-6					1						

TYPE OF CONTAINERS — NUMBERS OF CONTAINERS PER SAMPLE NUMBER; SAMPLED MEDIA

None to follow
Danny O. 3-19-14

DESCRIPTION OF SHIPMENT

____ PIECE(S) CONSISTING OF ____ BOX(ES)

1 ICE CHEST(S): OTHER ____

MODE OF SHIPMENT

____ COMMERCIAL CARRIER: ____

____ COURIER

X SAMPLER CONVEYED ____ (SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
[signature] ☒ SEALED ☐ UNSEALED	3/19/14	1000	RD Wiggam ☐ SEALED ☐ UNSEALED	Rec'd at lab
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY

 *U.S. GPO: 2002-756-917/40053

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6436 **Sample Number:** 1 **QC Code:** __ **Matrix:** Water **Tag ID:** 6436-1-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: KS-1

External Sample Number: ____________

Expected Conc: (or Circle One: Low Medium High)

			Date	Time(24 hr)
Latitude: 40.857504		**Sample Collection: Start:**	3/18/14	12:05
Longitude: -97.969983		**End:**	3/18/14	12:08

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)
Sample collected from kitchen sink @
1704 East 12th Road

3 minute purge

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6436 **Sample Number:** 2 **QC Code:** **Matrix:** Water **Tag ID:** 6436-2

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: H-1

External Sample Number: ____

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.857374 **Sample Collection: Start:** 3/18/14 12:25
Longitude: -97.969972 **End:** _/_/_ _:_

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A) Sample collected From outside hydrant @ 1704 East 12th Road

30 second purge

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6436 **Sample Number:** 3 **QC Code:** FB **Matrix:** Water **Tag ID:** 6436-3-FB

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: DW VOA Trip Blank sample

External Sample Number: ____________

Expected Conc: (or Circle One: Low Medium High)

	Date	Time(24 hr)
Latitude: ___ ___ ___ **Sample Collection: Start:**	3/~~10~~ 13/14	~~13:30~~ 0815
Longitude: ___ ___ ___ **End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A) Trip Bland

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6436 **Sample Number:** 4 **QC Code:** **Matrix:** Water **Tag ID:** 6436-4

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: KS - 2

External Sample Number: ______________

Expected Conc:	(or Circle One: Low Medium High)		**Date**	**Time(24 hr)**
Latitude: 40.858182		**Sample Collection: Start:**	3/18/14	12:45
Longitude: -97.987901		**End:**	3/18/14	12:49

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A) Sample collected from kitchen sink after 4 minute purged @ 1605 East 12th Road

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6436 **Sample Number:** 5 **QC Code:** **Matrix:** Water **Tag ID:** 6436- 5

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: KS - 3

External Sample Number: ____________

Expected Conc: (or Circle One: Low Medium High)

			Date	Time(24 hr)
Latitude: 40.858182		**Sample Collection: Start:**	3/18/14	13:07
Longitude: -97.987901		**End:**	3/18/14	13:14

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A) Sample collected from kitchen sink after Filter replacement @ 1605 East 12th Road

7 minute purge

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6436 **Sample Number:** 6 **QC Code:** **Matrix:** Water **Tag ID:** 6436- 6

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: H-2

External Sample Number: ______________

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.858579 **Sample Collection: Start:** 3/18/14 13:15
Longitude: -97.987583 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A) Sample collected From outside hydrant @
1605 East 12th Road

30 second purge

Sample Collected By: TT

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION	SHEET
Joe Davis	Aurora GW - Private Wells	DAY 21 MONTH 5 YEAR 15	1 of 1

CONTENTS OF SHIPMENT

SAMPLE NUMBER	CUBITAINER	BOTTLE	BOTTLE	VOA set 8260 BOTTLE	VOA SET (2 VIALS EA)	water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
6823-1					1	X					
-2					1						
-3				1							
-4					1						
-5FB					1	X					

NUMBERS OF CONTAINERS PER SAMPLE NUMBER

ASR completed

DESCRIPTION OF SHIPMENT	MODE OF SHIPMENT
1 PIECE(S) CONSISTING OF ____ BOX(ES)	____ COMMERCIAL CARRIER ____
X ICE CHEST(S): OTHER ____	____ COURIER
	✓ SAMPLER CONVEYED ____ (SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
Jenna Mead ✓ SEALED ☐ UNSEALED	5/21/15	1200	RD Wiggam ☐ SEALED ☐ UNSEALED	Rec'd at lab
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY

7-EPA-9262(Revised 5/85)

*U.S. GPO: 2002-756-917/40053

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6823 **Sample Number:** 1 **QC Code:** __ **Matrix:** Water **Tag ID:** 6823-1-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: Kitchen Sink - 10 min

External Sample Number: K-10

Expected Conc: (or Circle One: Low Medium High)

		Date	Time(24 hr)
Latitude: ___ ___ ___	**Sample Collection: Start:**	5/~~20~~ 21/15	07:10
Longitude: ___ ___ ___	**End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Gail West
1605 E 12 Rd
Aurora NE 68818
402-694-1219

Through Water Softener

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6823 **Sample Number:** 2 **QC Code:** __ **Matrix:** Water **Tag ID:** 6823-2-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: Kitchen sink 20 min

External Sample Number: K-20

Expected Conc: (or Circle One: Low Medium High)

		Date	Time(24 hr)
Latitude: ___ ___ ___	**Sample Collection: Start:**	5/~~20~~ 21/15	07:20
Longitude: ___ ___ ___	**End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Gail Wert
1605 E 12 RD

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6823 **Sample Number:** 3 **QC Code:** __ **Matrix:** Water **Tag ID:** 6823-3-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: Hydrant · 10 min

External Sample Number: H-10

Expected Conc: (or Circle One: Low Medium High)

	Date	Time(24 hr)
Latitude: ___ ___ ___ **Sample Collection: Start:**	5/~~20~~ 21/15	06:45
Longitude: ___ ___ ___ **End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
9 ~~8~~ - 40mL VOA vial MS MSD	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Start 0635

Gail West
1605 E 12 Rd

@ well by barn
NE of house

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6823 **Sample Number:** 4 **QC Code:** __ **Matrix:** Water **Tag ID:** 6823-4-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: Hydrant 20 min

External Sample Number: H-20

			Date	Time(24 hr)
Expected Conc:	(or Circle One: Low Medium High)			
Latitude: ___ ___ ___		**Sample Collection: Start:**	5/~~20~~ 21/15	06:55
Longitude: ___ ___ ___		**End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Gail Neff
1605 E 12 Rd

Sample Collected By: TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 6823 **Sample Number:** 5 **QC Code:** FB **Matrix:** Water **Tag ID:** 6823-5-FB

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: DW VOA Trip Blank sample

External Sample Number: ______________

			Date	Time(24 hr)
Expected Conc:	(or Circle One: Low Medium High)			
Latitude: ___ ___ ___	**Sample Collection: Start:**		5/20/15	1200
Longitude: ___ ___ ___	**End:**		__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A) Lab prepared trip blank

Sample Collected By: TT

APPENDIX E

TRANSMITTAL OF SAMPLE ANALYTICAL RESULTS FOR ASRs 6436 AND 6823

United States Environmental Protection Agency
Region 7
300 Minnesota Avenue
Kansas City, KS 66101

Date: 04/14/2014

Subject: Transmittal of Sample Analysis Results for ASR #: 6436

Project ID: JDB74200

Project Description: Aurora GW - Private well sampling

From: Michael F. Davis, Chief
Chemical Analysis and Response Branch, Environmental Services Division

To: Joe Davis
SUPR/ERNB

Enclosed are the analytical data for the above-referenced Analytical Services Request (ASR) and Project. The Regional Laboratory has reviewed and verified the results in accordance with procedures described in our Quality Manual (QM). In addition to all of the analytical results, this transmittal contains pertinent information that may have influenced the reported results and documents any deviations from the established requirements of the QM.

Please contact us within 14 days of receipt of this package if you determine there is a need for any changes. Please complete the enclosed Customer Satisfaction Survey and Data Disposition/Sample Release memo for this ASR as soon as possible. The process of disposing of the samples for this ASR will be initiated 30 days from the date of this transmittal unless an alternate release date is specified on the Data Disposition/Sample Release memo.

If you have any questions or concerns relating to this data package, contact our customer service line at 913-551-5295.

Enclosures

cc: Analytical Data File.

Project Manager:	Joe Davis	Org:	SUPR/ERNB	Phone:	913-551-7909
Project ID:	JDB74200				
Project Desc:	Aurora GW - Private well sampling				
Location:	Aurora	State:	Nebraska	Program:	Superfund
Site Name:	Aurora Groundwater - Site Evaluation/Disposition			Site ID:	B742 Site OU: 00
Purpose:	Site Characterization			GPRA PRC:	303DC6

Sampling private drinking water wells.

Explanation of Codes, Units and Qualifiers used on this report

Sample QC Codes: QC Codes identify the type of sample for quality control purpose.

__ = Field Sample
FB = Field Blank

Units: Specific units in which results are reported.

ug/L = Micrograms per Liter

Data Qualifiers: Specific codes used in conjunction with data values to provide additional information on the quality of reported results, or used to explain the absence of a specific value.

(Blank) = Values have been reviewed and found acceptable for use.
U = The analyte was not detected at or above the reporting limit.

ASR Number: 6436 Sample Information Summary 04/14/2014

Project ID: JDB74200 Project Desc: Aurora GW - Private well sampling

Sample No	QC Code	Matrix	Location Description	External Sample No	Start Date	Start Time	End Date	End Time	Receipt Date
1 -	__	Water	KS-1		03/18/2014	12:05	03/18/2014	12:08	03/19/2014
2 -	__	Water	H-1		03/18/2014	12:25			03/19/2014
3 -	FB	Water	DW VOA Trip Blank sample		03/13/2014	08:15			03/19/2014
4 -	__	Water	KS-2		03/18/2014	12:45	03/18/2014	12:49	03/19/2014
5 -	__	Water	KS-3		03/18/2014	13:07	03/18/2014	13:14	03/19/2014
6 -	__	Water	H-2		03/18/2014	13:15			03/19/2014

Analysis	Comments About Results For This Analysis

1 VOCs in Drinking Water by GC/MS

Lab: Region 7 ESAT Contract Lab (In-House)

Method: EPA Region 7 RLAB Method 3230.9E

Samples: 1-__ 2-__ 3-FB 4-__ 5-__ 6-__

Comments:

Analysis/ Analyte	Units	1-__	2-__	3-FB	4-__
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	98	0.50 U	14
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	2.1	0.50 U	0.91
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	1.6
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U

Analysis/ Analyte	Units	1-__	2-__	3-FB	4-__
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	1.3
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	5-__	6-__
1 VOCs in Drinking Water by GC/MS			
Acetone	ug/L	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	14	14
Chlorobenzene	ug/L	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U
Chloroform	ug/L	0.90	0.96
Chloromethane	ug/L	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	1.5	1.5
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U
Hexachlorobutadiene	ug/L	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 U	5.0 U

Analysis/ Analyte	Units	5-__	6-__
Naphthalene	ug/L	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U
Styrene	ug/L	0.50 U	0.50 U
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50
Toluene	ug/L	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	1.3	1.3
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U

United States Environmental Protection Agency
Region VII
300 Minnesota Avenue
Kansas City, KS 66101

Date: __/__/____

Subject: Data Disposition/Sample Release for ASR #: 6436

Project ID: JDB74200

Project Description: Aurora GW - Private well sampling

From: Joe Davis
SUPR/ERNB

To: Alisha Claycamp
ENSV/CARB

I have received and reviewed the Transmittal of Sample Analysis Results for the above-referenced Analytical Services Request(ASR) and have indicated my findings below by checking one of the boxes for Data Disposition.

I understand all samples will be disposed upon receipt of this form, unless samples are requested to be held. If I do not return this form all samples will be disposed of on ____________________.

☐ "RELEASED" - Read-only to all Region 7 employees and contractors that have R7LIMS "Customer" account. All Samples may be disposed of upon receipt of this form if not requested to be held.

☐ "Project Manager Accessible" - Available on the LAN in R7LIMS for my use only. All Samples may be disposed of upon receipt of this form if not requested to be held.

☐ "Archived" - THIS DATA IS OF A SENSITIVE NATURE. Any future reports must be requested through the laboratory. All samples may be disposed of upon receipt of the form if not requested to be held.

☐ Hold Samples - I have determined that the samples need to be held until _______________, after which time they will be disposed of in accordance with applicable regulations.
The reason for the hold is:

☐ Samples are associated with a legal proceeding.

☐ Question/Concern with data - possible reanalysis requested.

☐ Other:____

United States Environmental Protection Agency
Region 7
300 Minnesota Avenue
Kansas City, KS 66101

Date: 06/17/2015

Subject: Transmittal of Sample Analysis Results for ASR #: 6823

Project ID: JDB74200

Project Description: Aurora GW - Private well sampling

From: Margaret E.W. St. Germain, Chief
Laboratory Technology & Analysis Branch, Environmental Sciences & Technology Division

To: Joe Davis
SUPR/ERNB

Enclosed are the analytical data for the above-referenced Analytical Services Request (ASR) and Project. The Regional Laboratory has reviewed and verified the results in accordance with procedures described in our Quality Manual (QM). In addition to all of the analytical results, this transmittal contains pertinent information that may have influenced the reported results and documents any deviations from the established requirements of the QM.

Please contact us within 14 days of receipt of this package if you determine there is a need for any changes. Please complete the enclosed Customer Satisfaction Survey and Data Disposition/Sample Release memo for this ASR as soon as possible. The process of disposing of the samples for this ASR will be initiated 30 days from the date of this transmittal unless an alternate release date is specified on the Data Disposition/Sample Release memo.

If you have any questions or concerns relating to this data package, contact our customer service line at 913-551-5295.

Enclosures

cc: Analytical Data File.

Project Manager: Joe Davis Org: SUPR/ERNB Phone: 913-551-7909

Project ID: JDB74200

Project Desc: Aurora GW - Private well sampling

Location: Aurora State: Nebraska Program: Superfund

Site Name: Aurora Groundwater - Site Evaluation/Disposition Site ID: B742 Site OU: 00

Purpose: Site Characterization GPRA PRC: 303DC6

Sampling private drinking water wells.

Explanation of Codes, Units and Qualifiers used on this report

Sample QC Codes: QC Codes identify the type of sample for quality control purpose.

__ = Field Sample
FB = Field Blank

Units: Specific units in which results are reported.

ug/L = Micrograms per Liter

Data Qualifiers: Specific codes used in conjunction with data values to provide additional information on the quality of reported results, or used to explain the absence of a specific value.

(Blank) = Values have been reviewed and found acceptable for use.
U = The analyte was not detected at or above the reporting limit.

ASR Number: 6823 Sample Information Summary 06/17/2015

Project ID: JDB74200 Project Desc: Aurora GW - Private well sampling

Sample No	QC Code	Matrix	Location Description	External Sample No	Start Date	Start Time	End Date	End Time	Receipt Date
1 -	__	Water	K-10/Kitchen sink (10 minutes)	K-10	05/21/2015	07:10			05/21/2015
2 -	__	Water	K-20/Kitchen sink (20 minutes)	K-20	05/21/2015	07:20			05/21/2015
3 -	__	Water	H-10/Hydrant (10 minutes)	H-10	05/21/2015	06:45			05/21/2015
4 -	__	Water	H-20/Hydrant (20 minutes)	H-20	05/21/2015	06:55			05/21/2015
5 -	FB	Water	DW VOA Trip Blank sample		05/20/2015	12:00			05/21/2015

Analysis	Comments About Results For This Analysis

1 VOCs in Drinking Water by GC/MS

Lab: Contract Lab Program (Out-Source)

Method: CLP Statement of Work

Samples: 1-__ 2-__ 3-__ 4-__ 5-FB

Comments:

Analysis/ Analyte	Units	1-__	2-__	3-__	4-__
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	0.50 U	8.3	7.2
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.50 U	1.1	1.0
Chloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	1.0	1.1
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U

Analysis/ Analyte	Units	1-__	2-__	3-__	4-__
Naphthalene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.74	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	5-FB
1 VOCs in Drinking Water by GC/MS		
Acetone	ug/L	5.0 U
Benzene	ug/L	0.50 U
Bromobenzene	ug/L	0.50 U
Bromochloromethane	ug/L	0.50 U
Bromodichloromethane	ug/L	0.50 U
Bromoform	ug/L	0.50 U
Bromomethane	ug/L	0.50 U
2-Butanone	ug/L	5.0 U
n-Butylbenzene	ug/L	0.50 U
sec-Butylbenzene	ug/L	0.50 U
tert-Butylbenzene	ug/L	0.50 U
Carbon Disulfide	ug/L	0.50 U
Carbon Tetrachloride	ug/L	0.50 U
Chlorobenzene	ug/L	0.50 U
Chloroethane	ug/L	0.50 U
Chloroform	ug/L	0.50 U
Chloromethane	ug/L	0.50 U
2-Chlorotoluene	ug/L	0.50 U
4-Chlorotoluene	ug/L	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	0.50 U
Dibromochloromethane	ug/L	0.50 U
1,2-Dibromoethane	ug/L	0.50 U
Dibromomethane	ug/L	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U
1,1-Dichloroethane	ug/L	0.50 U
1,2-Dichloroethane	ug/L	0.50 U
1,1-Dichloroethene	ug/L	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U
1,2-Dichloropropane	ug/L	0.50 U
1,3-Dichloropropane	ug/L	0.50 U
2,2-Dichloropropane	ug/L	0.50 U
1,1-Dichloropropene	ug/L	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U
Ethyl Benzene	ug/L	0.50 U
Hexachlorobutadiene	ug/L	0.50 U
2-Hexanone	ug/L	5.0 U
Isopropylbenzene	ug/L	0.50 U
p-Isopropyltoluene	ug/L	0.50 U
Methylene Chloride	ug/L	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 U

Analysis/ Analyte	Units	5-FB
Naphthalene	ug/L	0.50 U
n-Propylbenzene	ug/L	0.50 U
Styrene	ug/L	0.50 U
1,1,1,2-Tetrachloroethane	ug/L	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	0.50 U
Tetrachloroethene	ug/L	0.50 U
Toluene	ug/L	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U
Trichloroethene	ug/L	0.50 U
Trichlorofluoromethane	ug/L	0.50 U
1,2,3-Trichloropropane	ug/L	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U
Vinyl Chloride	ug/L	0.50 U
m and/or p-Xylene	ug/L	0.50 U
o-Xylene	ug/L	0.50 U

United States Environmental Protection Agency
Region VII
300 Minnesota Avenue
Kansas City, KS 66101

Date: __/__/____

Subject: Data Disposition/Sample Release for ASR #: 6823

Project ID: JDB74200

Project Description: Aurora GW - Private well sampling

From: Joe Davis
SUPR/ERNB

To: Alisha Claycamp
ENSV/CARB

I have received and reviewed the Transmittal of Sample Analysis Results for the above-referenced Analytical Services Request(ASR) and have indicated my findings below by checking one of the boxes for Data Disposition.

I understand all samples will be disposed upon receipt of this form, unless samples are requested to be held. If I do not return this form all samples will be disposed of on ___________________.

☐ "RELEASED" - Read-only to all Region 7 employees and contractors that have R7LIMS "Customer" account. All Samples may be disposed of upon receipt of this form if not requested to be held.

☐ "Project Manager Accessible" - Available on the LAN in R7LIMS for my use only. All Samples may be disposed of upon receipt of this form if not requested to be held.

☐ "Archived" - THIS DATA IS OF A SENSITIVE NATURE. Any future reports must be requested through the laboratory. All samples may be disposed of upon receipt of the form if not requested to be held.

☐ Hold Samples - I have determined that the samples need to be held until _______________, after which time they will be disposed of in accordance with applicable regulations.
The reason for the hold is:

☐ Samples are associated with a legal proceeding.

☐ Question/Concern with data - possible reanalysis requested.

☐ Other:____

999032 SF NEN000706271
71783 RAP 36-336-4950

From: Davis, Joe
To: Jeffrey, Sarah
Subject: RE: Aurora Groundwater Site
Date: Wednesday, August 18, 2021 9:05:31 AM

Sarah,

I just added you as a contact on the EPA Response.gov website for Aurora Groundwater.
https://response.epa.gov/site/site_profile.aspx?site_id=8792

One of the docs was still too large to send over, so I just uploaded it in the documents section of the website.

I will call you to discuss.

Joe

Joe Davis | **Federal On-Scene Coordinator**
U.S. EPA Region 7 | Superfund Emergency Management Division
Office – 913.551.7909 | EPA Cell - 816.718.4279
8600 Underground Rd., Pillar 253, Kansas City, MO 64161
Email – davis.joe@epa.gov

From: Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Sent: Wednesday, August 18, 2021 8:14 AM
To: Davis, Joe <Davis.Joe@epa.gov>
Subject: Re: Aurora Groundwater Site

Thanks!

Sarah Jeffrey

Groundwater Geologist

Superfund/VCP Section | Monitoring and Remediation Division

Nebraska Department of Environment and Energy

P.O. Box 98922 | Lincoln, NE 68509-8922

Direct: (402) 471-3120 | http://dee.ne.gov

From: Davis, Joe <Davis.Joe@epa.gov>
Sent: Wednesday, August 18, 2021 8:13 AM
To: Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Subject: RE: Aurora Groundwater Site

Yes. I also sent 3). It did not kick back to me, but I think it was also too big. I will break it up into 2 or 3 emails and resend this morning..

Joe

From: Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Sent: Wednesday, August 18, 2021 7:02 AM
To: Davis, Joe <Davis.Joe@epa.gov>
Subject: Re: Aurora Groundwater Site

Joe,

Thanks for sending these documents. I received emails 1, 2A, and 2B. Did you send any others?

Thanks,
Sarah

Sarah Jeffrey

Groundwater Geologist

Superfund/VCP Section | Monitoring and Remediation Division

Nebraska Department of Environment and Energy

P.O. Box 98922 | Lincoln, NE 68509-8922

Direct: (402) 471-3120 | http://dee.ne.gov

From: Davis, Joe <Davis.Joe@epa.gov>
Sent: Friday, August 13, 2021 2:18 PM
To: Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Subject: RE: Aurora Groundwater Site

Sarah,

Sorry for the delay, We had to do some digging in the records data base (for various names). I think that I found all of the documents requested.

Some of these docs fairly large, so I will send them over to you in groups or separately in a few emails (following). I will follow up when done.

Thanks,

Joe

Joe Davis | **Federal On-Scene Coordinator**
U.S. EPA Region 7 | Superfund Emergency Management Division
Office – 913.551.7909 | EPA Cell - 816.718.4279
8600 Underground Rd., Pillar 253, Kansas City, MO 64161
Email – davis.joe@epa.gov

From: Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Sent: Tuesday, August 10, 2021 9:48 AM
To: Davis, Joe <Davis.Joe@epa.gov>
Subject: RE: Aurora Groundwater Site

Hi Joe,

Do you have an update on whether you were able to find these files?

Thanks,
Sarah

Sarah Jeffrey
Groundwater Geologist
Superfund/VCP Section | Monitoring and Remediation Division
Nebraska Department of Environment and Energy

From: Jeffrey, Sarah
Sent: Thursday, June 24, 2021 2:23 PM
To: Davis, Joe <Davis.Joe@epa.gov>
Subject: RE: Aurora Groundwater Site

Hi Joe,

I wanted to follow up on this email string regarding the Aurora Groundwater site. I am looking for the following files:

EPA, 2011, Pre-Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Screening Report, Aurora Groundwater, CERCLIS ID No. NEN00706271, October 12.

TetraTech, 2012, Abbreviated Preliminary Assessment, Aurora Groundwater Site, Aurora, Hamilton County, Nebraska, May 3.

TetraTech, 2012 Removal Site Evaluation/Site Investigation, Aurora Groundwater Site, Aurora, Hamilton County, Nebraska, December 11.

TetraTech, 2013, Removal Action Report, Revision 1, Aurora Groundwater Site, Aurora, Hamilton County, Nebraska, June 25.

TetraTech, 2018, Trip Report and Data Summary Regarding December 2017 Removal Assessment Sampling Event, Aurora Groundwater Site, Aurora, Nebraska, January 17.

TetraTech, 2019, Trip Report and Data Summary Regarding September and October 2019 Removal Assessment Sampling Events, Aurora Groundwater Site, Aurora, Nebraska, November 14.

Could you help me find these reports?

Thanks,
Sarah

Sarah Jeffrey
Groundwater Geologist
Superfund/VCP Section | Monitoring and Remediation Division
Nebraska Department of Environment and Energy
P.O. Box 98922 | Lincoln, NE 68509-8922
Direct: (402) 471-3120 | http://dee.ne.gov

From: Davis, Michael B. <Davis.MichaelB@epa.gov>
Sent: Friday, June 11, 2021 8:35 AM
To: Davis, Joe <Davis.Joe@epa.gov>; Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Subject: FW: Aurora Groundwater Site

Hi Joe,

Please see the message below from NDEE regarding your Aurora Groundwater site. Attached here is the report from the limited VI assessment we did, but I am not aware of other pertinent site-related documents that we may have on file. In short, we did not identify a significant vapor intrusion concern and no removal action measures were recommended or taken.

PLEASE NOTE: this report has **not been vetted for personally identifiable information** or other FOIA exempt non-releasable material.

Thanks,

Mike Davis
On-Scene Coordinator
U.S. EPA Region 7
Emergency Response & Removal
Office: (913) 551-7328
Cell: (816) 682-5906

US Environmental Protection Agency, Region 7
11201 Renner Blvd. | Lenexa KS 66219

From: Jeffrey, Sarah <sarah.jeffrey@nebraska.gov>
Sent: Friday, June 11, 2021 8:11 AM
To: Davis, Michael B. <Davis.MichaelB@epa.gov>
Subject: Aurora Groundwater Site

Good morning, Mike:

I am the new project manager for the Aurora Hwy 34 North and Aurora Former USDA/CCC Grain Storage Sites (replacing Ben Kittrell). We received a request from USDA for several facility files from EPA regarding the Removal work performed at the Aurora Groundwater Site. Would you be able to connect me with someone who can share these files with me so that I can make sure they're in our Records?

Thanks,
Sarah

Sarah Jeffrey
Groundwater Geologist
Superfund/VCP Section | Monitoring and Remediation Division
Nebraska Department of Environment and Energy
P.O. Box 98922 | Lincoln, NE 68509-8922
Direct: (402) 471-3120 | http://dee.ne.gov

TETRA TECH

December 11, 2012

Mr. Roy Crossland
START Project Officer
U.S. Environmental Protection Agency, Region 7
8600 NE Underground Dr., Pillar 253
Kansas City, Missouri 64161

Subject: **Removal Site Evaluation/Site Investigation**
Aurora Groundwater Site, Aurora, Hamilton County, Nebraska
CERCLIS ID: NEN000706271
U.S. EPA Region 7 START 3, Contract No. EP-S7-06-01, Task Order No. 0284
Task Monitor: Joe Davis, EPA On-scene Coordinator/Task Monitor

Dear Mr. Crossland:

Tetra Tech EM Inc. is submitting the enclosed Removal Site Evaluation/Site Investigation report regarding the above-referenced site. A Hazard Ranking System scoring memorandum will be submitted separately. If you have any questions or comments regarding this submittal, please contact the project manager at (816) 412-1781.

Sincerely,

for Cody McLarty, LEED AP, BD+C
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

Tetra Tech EM Inc.
415 Oak Street, Kansas City, MO 64106
816.412.1741 816.410.1748 www.tetratech.com

X9004.12.0284.000

REMOVAL SITE EVALUATION AND SITE INVESTIGATION
AURORA GROUNDWATER SITE
HAMILTON COUNTY, NEBRASKA
CERCLIS ID No. NEN000706271

Superfund Technical Assessment and Response Team (START) 3

Contract No. EP-S7-06-01, Task Order No. 0284

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

December 11, 2012

Prepared By:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106
(816) 412-1741

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APPENDICES

Appendix

TABLES

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) was tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division, under the Superfund Technical Assessment and Response Team (START) 3 Contract Number EP-S7-06-01, Task Order Number 0284, to conduct a removal site evaluation (RSE)/site investigation (SI) of the Aurora Groundwater site in the City of Aurora, Hamilton County, Nebraska (see Appendix A, Figure 1). The Aurora Groundwater site was entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) on July 29, 2011 with Identification (ID) Number NEN000706271 (EPA 2012a).

EPA completed a Pre-CERCLIS Screening Report for the Aurora site in October 2011 that identified a formerly owned or operated U.S. Department of Agriculture (USDA) grain storage facility in southwest Aurora. From this report, EPA recommended sampling domestic and commercial use water supply wells in and around Aurora (EPA 2011a). Tetra Tech conducted abbreviated preliminary assessment (APA) sampling in January 2012 and submitted an APA report on May 3, 2012—25 domestic wells were sampled for volatile organic compounds (VOC) (START Task Order 066). Carbon tetrachloride (CCl_4), chloroform, 1,2-dichloroethane (DCA), 1,1-dichloroethene (DCE), and 1,1,1-trichloroethane (TCA) were detected in three wells. These wells are along East 12th Road between South R Road and South S Road, between 0.7 and 1.7 miles east of the Aurora city limits (Tetra Tech 2012).

Apparent Problem

In May 2012, CCl_4, chloroform, 1,2-DCA, 1,1-DCE, and 1,1,1-TCA were identified in three domestic wells southeast of Aurora (associated with the Aurora Groundwater site). All three of these wells contained CCl_4 at concentrations exceeding the EPA maximum contaminant level (MCL) of 5 micrograms per liter (μg/L).

2.0 SITE BACKGROUND INFORMATION

This section discusses site location, history, description, and waste characteristics, and previous investigations at the Aurora site.

2.1 SITE LOCATION, HISTORY, AND DESCRIPTION

The former Aurora high-capacity grain storage facility was at the northeast corner of the 1st Street and E. 12th Road intersection in Aurora, Nebraska (see Figure 1 in Appendix A). Global positioning system

(GPS) coordinates of the approximate center of the former facility are 40.858305 degrees north latitude and 98.016265 degrees west longitude.

Most communities across Nebraska at one time had access to a high-capacity grain storage facility owned and operated by the U.S. Department of Agriculture (USDA) in which CCl_4 was used as a grain fumigant (Nebraska Department of Health and Human Services [NDHHS] 2000). These fumigation processes were often sources of carbon tetrachloride release to groundwater. CCl_4 and the products of its degradation (chloroform and dichloromethane) have been found to exert detrimental effects on human health and have been classified as potential carcinogens (Agency for Toxic Substances and Disease Registry [ATSDR] 2005).

Aurora has an annual temperature of 50.8 degrees Fahrenheit (°F) and an average annual precipitation of 27 inches (Weatherbase 2012). According to USDA, soils in the Aurora area primarily consist of Hastings silt loam (1- to 3-percent slopes) followed by Hastings silty clay loam (3- to 7-percent slopes, eroded), Hastings silt loam (1- to 3-percent slopes), Hord silt loam (rarely flooded), and Crete silt loam (0- to 1-percent slopes) (USDA 2012).

The contaminated drinking water wells associated with the Aurora Groundwater site are southeast of Aurora, Nebraska, with the identified contamination along East 12th Road southeast of the City (geographic coordinates of approximate center of contamination are 40.857836 degrees north latitude and 97.978215 degrees west longitude). VOC contamination in groundwater associated with the Aurora Groundwater site is in Sections 2, 3, 10, 11, and 12 of Township 10 North, Range 6 West.

2.2 WASTE CHARACTERISTICS AND POTENTIAL SOURCE AREAS

This section discusses waste characteristics and possible source areas investigated during the RSE/SI.

2.2.1 Waste Characteristics

Previous APA investigations of the Aurora Groundwater site indicated CCl_4 as the only contaminant present at concentrations exceeding MCLs.

Carbon tetrachloride

CCl_4 was used in dry cleaners and fire extinguishers until the 1960s. More commonly thereafter, CCl_4 was used as a grain fumigant until this use was banned in 1985. It was mixed with more effective fumigants such as carbon disulfide (CS_2) or 1,2-DCA, also known as ethylene dichloride, to reduce the fire hazard

(Meister Publishing Company 1980). Use of 1,2-DCA as a fumigant was banned in 1985, and use of CS_2 as a grain fumigant was voluntarily banned after 1985. 1,2-DCA was also used as a gasoline additive (a lead scavenger) in leaded gasoline.

CCl_4 is used as a chemical intermediate in production of the refrigerants Freon 11 and 12. It is also used in petroleum refining, pharmaceutical manufacturing, processing fats, oils, and rubber, laboratory applications, and as an industrial solvent. CCl_4 is reasonably anticipated to be a human carcinogen. High exposure from drinking or breathing CCl_4 can cause liver, kidney, and central nervous system damage. Exposure may result in feelings of intoxication, headaches, dizziness, sleepiness, nausea, and vomiting (ATSDR 2005). Chloroform ($CHCl_3$) is a common degradation product of CCl_4.

2.2.2 Potential Source Areas

The Pre-CERCLIS Screening Report by EPA identified a formerly owned or operated USDA grain storage facility in southwest Aurora. Additionally, other industrial activities such as agricultural chemical distribution, cement production, truck maintenance, fiberglass manufacturing, and hospital supply manufacturing have been identified in the Aurora area as sites of hazardous materials/hazardous waste/pesticides management, and are considered potential sources.

2.3 REGULATORY INVOLVEMENT

A summary of involvement and investigations by the Nebraska Department of Environmental Quality (NDEQ) and EPA follows.

2.3.1 Nebraska Department of Health and Human Services

In 1999, the Nebraska Department of Health and Human Services (NDHHS), in cooperation with the EPA, conducted a program of sampling privately owned wells near selected grain storage facilities owned or operated by the USDA (EPA 2011a, NDHHS 2000). Sampling procedures and results are discussed in Section 3.1.

2.3.2 U.S. Environmental Protection Agency

In October 2011, EPA completed a Pre-CERCLIS Screening Report for the Aurora site (EPA 2011a) that identified one grain storage facility formerly owned and operated by the USDA in Aurora. The Pre-CERCLIS Screening Report cited the former USDA grain storage facility as a potential source of CCl_4 (and possibly other VOCs) to groundwater.

In January 2012, Tetra Tech conducted an APA of the Aurora Groundwater site under the EPA Region 7 START contract, sampling groundwater at 25 domestic wells in and around Aurora, Nebraska. Tetra Tech submitted the APA report in May 2012. The sampling identified CCl_4 contamination in three domestic wells. Based on these results, EPA tasked START to conduct an RSE/SI of the Aurora Groundwater site.

3.0 PREVIOUS INVESTIGATIONS

NDHHS collected four samples from the Aurora area during the 1999 study; none of these contained VOCs at concentrations above MCLs (EPA 2011a, NDHHS 2000).

In October 2011, EPA completed a Pre-CERCLIS Screening Report regarding the Aurora site that identified a formerly owned or operated USDA grain storage facility in southwest Aurora. Other industrial activities such as agricultural chemical distribution, cement production, truck maintenance, fiberglass manufacturing and hospital supply manufacturing also were identified in the Aurora area as sites of hazardous materials/hazardous waste/pesticides management, and are considered potential sources. EPA concluded by recommending groundwater sampling at domestic use and commercial use water supply wells in and around Aurora (EPA 2011a).

In January 2012, START conducted APA sampling to assess the groundwater at the Aurora Groundwater site for presence of VOCs, and to identify potential sources of contamination. During this sampling, 25 private wells were sampled, one of which was upgradient of the former USDA grain storage facility in Aurora. Table 1 summarizes the VOCs identified in private wells sampled.

TABLE 1

ANALYTICAL DATA SUMMARY OF PRIVATE WELL SAMPLES JANUARY 2012 – AURORA GROUNDWATER SITE, AURORA, NEBRASKA

Analyte	Benchmark Values (µg/L)				Observed Release Criteria	EPA Sample Identification and Results (µg/L)			
	MCL	RSL for Tapwater	CR	RfD		5635-2 Background	5635-4	5635-5	5635-6
Carbon Tetrachloride	5.0	0.39	0.96	63	> 0.5	0.5 U	**27.0**	**84.0**	**33.0**
Chloroform	80[a]	0.19	2.2	160	> 0.5	0.5 U	**0.94**	**1.7**	**1.2**
1,2-Dichloroethane	5.0	0.15	0.74	94	> 0.5	0.5 U	0.5 U	0.5 U	**0.61**
1,1-Dichloroethene	7.0	260	NE	780	> 0.5	0.5 U	3.3	0.5 U	3.0
1,1,1-Trichloroethane	200	7,500	NE	31,000	> 0.5	0.5 U	2.3	0.5 U	2.2

Notes:

Samples not present in Table 1 were non-detect for volatile organic compounds.

Bold value indicates a concentration that exceeds a benchmark value.

Shaded cell indicates a concentration that exceeds the observed release criteria defined as three times the detected background concentration, or exceeding the detection limit if not detected in the background sample.

The detection limits for carbon tetrachloride, chloroform, and 1,2-dichloroethane exceeded their respective EPA RSLs for tapwater.

[a] Maximum contaminant level is for total trihalomethanes.

CR	Cancer Risk (SCDM)
EPA	United States Environmental Protection Agency
MCL	Maximum contaminant level (SCDM)
NE	Not established
RfD	Reference dose concentration (non-cancer risk) (SCDM)
RSL	Regional screening level (EPA 2012b)
SCDM	Superfund Chemical Data Matrix (EPA 2012c)
U	The analyte was not detected at or above the reporting limit.
µg/L	Micrograms per liter

Twenty-six samples (including one trip blank) were submitted to the EPA Region 7 laboratory for analysis for VOCs. Analytical results were compared to (1) the observed release criteria defined as three times the detected background concentration, or exceeding the detection limit if not detected in the background sample; (2) regional screening levels (RSL) in the EPA Regional Screening Level Summary Table (EPA 2012b); and (3) health-based benchmarks specified in the EPA Superfund Chemical Data Matrix (SCDM) (EPA 2012c).

CCl_4 was detected in samples 5635-4 (1710 E. 12th Road), 5635-5 (1704 E. 12th Road), and 5635-6 (1701 E. 12th Road) at concentrations of 27, 84, and 33 µg/L, respectively—all exceeding the MCL of 5 µg/L. $CHCl_3$, a degradation product of carbon tetrachloride, was detected in samples 5635-4, 5634-5, and 5635-6 at concentrations of 0.94, 1.7, and 1.2 µg/L, respectively—all below the MCL for total trihalomethanes, but above the RSL for tapwater. 1,2-DCA was detected in sample 5635-6 at a concentration of 0.61 µg/L—below the MCL but above the RSL. 1,1-DCE was detected in samples 5635-4 and 5635-6 at concentrations of 3.3 and 3.0 μg/L, respectively—both below all benchmark values. 1,1,1-Trichloroethane was detected in samples 5635-4 and 5635-6 at concentrations of 2.3 and 2.2 μg/L, respectively—both below all benchmark values.

4.0 REMOVAL SITE EVALUATION / SITE INVESTIGATION

Section 4.0 discusses the RSE/SI field sampling and associated quality assurance (QA)/quality control (QC) activities. The general objective of the RSE/SI was to evaluate potential source areas and further evaluate the extent of threats to human health or the environment posed by groundwater contamination.

START team members (STM) Bryant Merriman and Nick Wiederholt mobilized to the site and met with the EPA Task Monitor/On-Scene Coordinator (OSC) Joe Davis on May 7, 2012. STMs Merriman and Wiederholt sampled private wells and municipal wells in and around Aurora, Nebraska, during May 8-9, 2012. Photographs documenting site activities are included in Appendix B, and a copy of the site logbook is included in Appendix C.

Activities proceeded under the site-specific QAPP for the RSE/SI developed by START and approved by EPA in October 2011. The City of Aurora provided verbal permission to sample municipal wells 1, 2, 3, 4, and 5. Verbal permission was obtained from homeowners to sample taps/spigots nearest the wellhead at domestic wells.

Samples collected under analytical services request (ASR) 5769 were hand-delivered by START to the EPA Region 7 laboratory in Kansas City, Kansas, on May 10, 2012. Standard turnaround times were requested for all samples. Field sheets and chain-of-custody records are included as Appendix E.

4.1 GROUNDWATER SAMPLING

The groundwater migration pathway evaluation included sampling drinking water at five municipal wells and 17 private wells. Where the residence had a homeowner-installed water filtration system, samples were collected before and after the filtration system. Three homes had a reverse osmosis (RO) water filtration system at the sink, one home had a water softener at the sink, and one home had an RO water filtration system and a water softener at the sink. Municipal and private well samples were all submitted to the EPA Region 7 laboratory. Table 2 lists the samples collected during the RSE/SI.

TABLE 2

PRIVATE AND MUNICIPAL WELL SAMPLE SUMMARY
MAY 2012 – AURORA GROUNDWATER SITE, AURORA, NEBRASKA

Location ID	EPA Sample ID	Date Sampled	Time Sampled	GPS Coordinates Latitude (°N)	GPS Coordinates Longitude (°W)	Sampled Address	Remarks
Private Wells							
DW-1 (Pre)	5769-1	5/8/12	08:58	40.85822	97.97762	1701 E. 12th Rd.	WD=UK; WCD=UK; RO System and Softener
DW-1 (Post)	5769-2	5/8/12	09:05	40.85822	97.97762		
DW-2	5769-3	5/8/12	09:38	40.85729	97.97002	1704 E. 12th Rd.	WD=UK; WCD=UK
DW-3	5769-4	5/8/12	10:09	40.85714	98.01328	210 A St.	WD=100 ft; WCD=1977
DW-4 (Pre)	5769-10	5/8/12	12:13	40.85802	97.98587	1607 E. 12th Rd.	WD=120-125 ft; WCD=UK; RO System
DW-4 (Post)	5769-11	5/8/12	12:15	40.85802	97.98587		
DW-5 (Pre)	5769-12	5/8/12	12:32	40.85743	97.95973	1710 E. 12th Rd.	WD=140 ft; WCD=UK; RO System
DW-5 (Post)	5769-13	5/8/12	12:38	40.85743	97.95973		
DW-6	5769-14	5/8/12	13:48	40.85797	97.98776	1605 E. 12th Rd.	WD=150-160 ft; WCD=1960s
DW-7	5769-15	5/8/12	14:12	40.85792	97.99290	1825 A St.	WD=145 ft; WCD=1977
DW-8	5769-16	5/8/12	14:55	40.85705	97.98405	1608 E. 12th Rd.	WD=140; WCD=1960
DW-9	5769-17	5/8/12	15:07	40.85004	97.95829	1106 S. S Rd.	WD=200 ft; WCD=1990s
DW-10 (Pre)	5769-18	5/8/12	15:30	40.85026	97.95969	1105 S. S Rd.	WD=200 ft; WCD=1990s; Softener
DW-10 (Post)	5769-19	5/8/12	15:35	40.85026	97.95969		
DW-11 (Pre)	5769-20	5/8/12	16:00	40.85739	97.95643	1806 E. 12th Rd.	WD=120 ft; WCD=1990s; RO System
DW-11 (Post)	5769-21	5/8/12	16:05	40.85739	97.95643		
DW-12	5769-22	5/8/12	16:45	40.85428	98.00675	220 S. 8th St.	WD=UK; WCD=UK
DW-13	5769-23	5/8/12	17:05	40.85482	98.00678	210 S. 8th St.	WD=UK; WCD=1976
DW-14	5769-24	5/8/12	17:20	40.85554	98.00674	200 S. 8th St.	WD=UK; WCD=UK
DW-15	5769-25	5/8/12	17:42	40.85715	98.01756	1109 S. P Rd.	WD=130 ft; WCD=1990s
DW-16	5769-26	5/9/12	09:17	40.87330	97.97675	1701 E. Hwy. 34	WD=120 ft; WCD=2000
DW-17	5769-27	5/9/12	09:22	40.87330	97.97675	1701 E. Hwy. 34	WD=UK; WCD=UK
Municipal Wells							
CW-1	5769-5	5/8/12	10:42	40.85963	98.00347	Near C St. and 11th St.	Well 20051 / Well #2 (G-028310); WD=UK
CW-2	5769-6	5/8/12	11:03	40.86355	98.01246	Near H St. and 4th St.	Well 711 / Well #3 (G-035327); WD=248 ft.
CW-3	5769-7	5/8/12	11:20	40.86604	98.01324	Near K St. and 4th St.	Well 561 / Well #1 (G-028309); WD=170 ft.
CW-4	5769-8	5/8/12	11:40	40.87851	98.02101	Near Adams St. and Grant St.	Well 991 / Well #5 (G-101011); WD=218 ft.
CW-5	5769-9	5/8/12	12:05	40.87384	97.99829	Near Leadership Trail and Hwy. 14	Well 781 / Well #4 (G-028307); WD=198 ft.

Notes:

°N	Degrees north
°W	Degrees west
CW	Municipal well sample
DW	Private well sample
EPA	U.S. Environmental Protection Agency
ft	Feet
GPS	Geographic positioning system
ID	Identification number
Post	Sample collected after the treatment system
Pre	Sample collected prior to treatment system
RO	Reverse osmosis
UK	Unknown
WCD	Well completion date
WD	Well depth

Private well samples were collected from taps/spigots nearest the well heads, prior to any treatment systems. At private well locations DW-1, DW-4, DW-5, DW-10, and DW-11 samples were also collected after the treatment system. The system lines were purged for approximately 5 minutes before the samples were collected. Water quality parameters (pH, conductivity, temperature, and oxidation-reduction potential) were recorded on field sheets after the wells had been purged for the designated time. Water samples were collected into three 40-milliliter (mL) vials preserved with hydrochloric acid for analysis for VOCs at drinking water levels. All samples were stored in coolers maintained at temperatures at or below 4 degrees Celsius pending submittal to the EPA Region 7 laboratory.

Five municipal wells (561, 20051, 711, 781, and 991) across Aurora were also sampled during the May 2012 sampling event. At each location, the well pump was activated and water was pumped for about 5 minutes before collection of a sample from a spigot in the pump house.

Analytical Data Summary

Table 3 presents the results for the drinking water samples collected during the RSE/SI. As shown on this table, VOCs were detected in seven private wells and one municipal well. CCl_4 was identified in seven private wells at concentrations ranging from 0.52 to 68 μg/L, five of which exceeded the EPA MCL of 5.0 μg/L and two others exceeding the SCDM cancer risk screening level (CR) of 0.96 μg/L. At the three residences with an RO system and one residence with an RO system and water softener, CCl_4 was only detected in the pretreatment samples. $CHCl_3$ was detected in four private wells at concentrations ranging from 0.52 to 1.4 μg/L, none of which exceeded the EPA MCL. 1,1-DCE was detected in five private wells at levels ranging from 0.78 to 3.7 μg/L, none of which exceeded the EPA MCL. Tetrachloroethene (PCE) was detected in three private wells and one municipal well at concentrations ranging from 0.65 to 1.5 μg/L, none of which exceeded the EPA MCL. 1,2,3-Trichlorobenzene was detected in private well sample DW-1 (Pre) at 0.52 μg/L, less than the EPA MCL. 1,1,1-Trichloroethane was detected in five private wells at concentrations ranging from 0.73 to 2.4 μg/L, none of which exceeded the EPA MCL.

TABLE 3

VOC DETECTIONS IN DRINKING WATER SAMPLES
MAY 2012 - AURORA GROUNDWATER SITE, AURORA, NEBRASKA

Location ID	EPA Sample ID	Sample Location	CCl_4	$CHCl_3$	1,1-DCE	PCE	1,2,3-Trichlorobenzene	1,1,1-Trichloroethane
Private Wells								
DW-1 (Pre)	5769-1	1701 E. 12th Rd.	**29**	**1.1**	3.4	0.5 U	0.52	2.2
DW-1 (Post)	5769-2		**0.75**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DW-2	5769-3	1704 E. 12th Rd.	**68**	**1.4**	0.5 U	0.5 U	0.5 U	0.5 U
DW-4 (Pre)	5769-10	1607 E. 12th Rd.	**3.4**	**0.52**	0.84	0.79 J	0.5 U	0.84
DW-4 (Post)	5769-11	1607 E. 12th Rd.	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DW-5 (Pre)	5769-12	1710 E. 12th Rd.	**24**	**0.89**	3.7	0.5 U	0.5 U	2.4
DW-5 (Post)	5769-13	1710 E. 12th Rd.	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DW-6	5769-14	1605 E. 12th Rd.	**8.4**	0.5 U	1.1	0.65 J	0.5 U	1
DW-8	5769-16	1608 E. 12th Rd.	**3.8**	0.5 U	0.78	0.66 J	0.5 U	0.73
DW-11 (Pre)	5769-20	1806 E. 12th Rd.	**12**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DW-11 (Post)	5769-21		**0.52**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Municipal Wells								
CW-5	5769-9	Near Leadership Trail and Hwy. 14; Well 781	0.5 U	0.5 U	0.5 U	1.5 J	0.5 U	0.5 U
Maximum Contaminant Level			**5**	**80[a]**	**7**	**5**	**NE**	**200**
EPA RSL Tap Water			**0.39**	**0.19**	**260**	**9.7**	**5.2**	**7,500**
SCDM Reference Dose Screening Level			**63**	**160**	**780**	**94**	**NE**	**31,000**
SCDM Cancer Risk Screening Level			**0.96**	**2.2**	**NE**	**32**	**NE**	**NE**

Notes:

All values are in micrograms per liter (µg/L).

Bold font indicates that the concentration exceeds a health-based benchmark level.

Shading indicates that the concentration exceeds the EPA maximum contaminant level for drinking water or the SCDM cancer risk screening level.

Detection limits for CCl_4 and $CHCl_3$ exceeded their respective EPA RSLs for tapwater.

[a] Maximum contaminant level is for total trihalomethanes.

$CHCl_3$	Chloroform
CCl_4	Carbon tetrachloride
DCE	Dichloroethene
EPA	U.S. Environmental Protection Agency
ID	Identification number
J	Estimated concentration
NE	Not established
PCE	Tetrachloroethene
RSL	Regional screening level (EPA 2012b)
SCDM	Superfund Chemical Data Matrix (EPA 2012c)
U	Analyte was not detected at or above the reporting limit provided in table.

4.2 Quality Control Samples

No VOCs were detected in the trip blank (5769-36FB) submitted with the samples.

5.0 HAZARD RANKING SYSTEM FACTORS

This section discusses the sources of contamination and the various contaminant migration pathways evaluated under the Hazard Ranking System (HRS).

5.1 SOURCES OF CONTAMINATION

Groundwater samples were collected to assess VOC contamination (specifically CCl_4) identified during the 2012 APA investigation at the Aurora Groundwater site. During the APA, it was uncertain whether the contaminants in groundwater at this site had derived from a single source area or multiple source areas. Sources of hazardous substances, prior to the ban of CCl_4 use as a grain fumigant, could have included leaks or spills of CCl_4 from tanks and/or piping, or during application at the former USDA grain storage facility or other sites where long-term storage of grain occurred, resulting in contaminated soil and groundwater. The former USDA grain storage facility is within an industrial area of Aurora. Other facilities in the Aurora area that manage hazardous materials/hazardous waste/pesticides include International Sensor Systems, Aurora Mall Wood Place, Del Ray Manufacturing, A-1 Fiberglass, Aurora Coop, Del Ray Manufacturing, Green County Equipment, Arjo Manufacturing, Grosshans International, and Wheeler Transport (EPA 2011a). Impact on groundwater was the primary concern of the APA investigation.

Based on this RSE/SI, an unidentified area on the southeast side of the City of Aurora appears to be the source of the CCl_4-contaminated groundwater along East 12th Road to the east of the city limits. The only detections of CCl_4 during the January and May 2012 sampling events occurred in samples collected in this area of Aurora, with the highest detection at 1704 East 12th Road (68 µg/L, which exceeds the EPA MCL). Based on the contaminants identified in the groundwater, the 12 grain storage silos south of the residence at 1704 East 12th Road were considered the most likely source area of CCl_4 for the Aurora Groundwater site. Grain storage silos are also present at 1605 East 12th Road (nine silos), 1608 East 12th Road (10 silos), 1701 East 12th Road (three silos), and 1806 East 12th Road (one silo), and could contribute to the contaminant plume.

5.2 GROUNDWATER PATHWAY

Section 5.2 discusses the hydrogeologic setting, groundwater targets, and conclusions drawn from analytical results of groundwater samples. During the RSE/SI, START collected groundwater samples from five municipal wells and 17 private wells.

5.2.1 Hydrogeological Setting

Aurora is 1,798 feet above mean sea level (Appendix A, Figure 1). Hamilton County, Nebraska is part of the Central Plains Physiographic Province, defined as gently rolling except where major rivers and tributaries are deeply incised. The High Plains aquifer system is the main source of groundwater, consisting of unconsolidated to consolidated sand and gravel of Quaternary and Tertiary age that were deposited as a broad, thick sheet of alluvium on a wide, gentle plain by a network of branching streams whose channels migrated across the plain (U.S. Geological Survey [USGS] 2007).

5.2.2 Groundwater Targets

Aurora has established a wellhead protection area. Based on the wellhead protection maps, groundwater in the Aurora area primarily flows east-southeast. According to the NDHHS Safe Drinking Water Information System (SDWIS), Aurora has five active municipal water supply wells (20051, 561, 711, 781, and 991) and one inactive municipal water supply well (651). Aurora has been assigned Public Water System Identification Number NE3108101. The Aurora Municipal Water Supply system serves a population of approximately 4,479, and has 1,715 residential water supply connections, 270 commercial water supply connections, and 15 industrial water supply connections (NDHHS 2012). Assuming relatively equal production of the five active municipal wells, each well presumably serves approximately 896 residents on average. The average depth of the municipal wells is approximately 213 feet below ground surface (bgs) (Tetra Tech 2012). Static water levels within the Aurora area range from 58 to 95 feet bgs, depending on ground elevation (City of Aurora 2005).

Figure 3 in Appendix A shows all known registered wells within a 4-mile radius of the approximate presumed source area near 1704 East 12th Road. According to the Nebraska Department of Natural Resources (NDNR) Registered Groundwater Wells Database, 24 registered domestic wells and five municipal wells are within a 4-mile Target Distance Limit (TDL). Two domestic wells are within 0.5 and 1 mile, six domestic wells and two municipal wells are within 2 miles, nine domestic wells and two municipal wells are between 2 and 3 miles, and eight domestic wells and one municipal well are between 3 and 4 miles of the approximate presumed source area (NDNR 2012) (Appendix A, Figure 3). In addition, START identified 15 unregistered domestic wells within a 4-mile TDL. One unregistered domestic well is within zero and 0.25 mile, one unregistered domestic well is within 0.25 and 0.5 mile, seven unregistered domestic wells are within 0.5 and 1 mile, four unregistered domestic wells are within 1 and 2 miles, and two unregistered domestic wells are within 2 and 3 miles of the approximate presumed source area. The five domestic wells containing elevated levels of carbon tetrachloride are within 1 mile east and west of the approximate presumed source area (Figure 2, Appendix A).

Using the address at 1704 East 12th Road as an approximate presumed source area and according to the 2010 census, 20 people live within a 0.5-mile radius of the source area, 11 people live between 0.5 and 1 mile from the source area, 2,873 people live between 1 and 2 miles from the source area, 1,780 people live between 2 and 3 miles from the source area, and 112 people live between 3 and 4 miles from the source area (Mable/Geocorr Geographic Correspondence Engine Output 2012). The City of Aurora, Nebraska has a population of 4,479 based on the 2010 census (U.S. Census Bureau 2010a). Hamilton County has an average of 2.64 persons per household, and the City of Aurora has an average of 2.63 persons per household (U.S. Census Bureau 2010a, b).

5.2.3 Groundwater Pathway Conclusions

CCl_4 and its degradation product $CHCl_3$ were detected in private well samples collected between 1605 East 12th Road and 1806 East 12th Road. CCl_4 was detected at a maximum concentration of 68 μg/L in the private well sample collected at 1704 East 12th Road, with levels of CCl_4 decreasing in samples collected east and west of that location. Groundwater contamination associated with the Aurora Groundwater site appears to be attributable to the area around 1704 East 12th Road, at which multiple grain storage silos apparently are present south of the residence.

5.3 SURFACE WATER PATHWAY

The presumed main source area for CCl_4 appears to be a largely agricultural area on the southeast side of the City of Aurora, which is about 12.5 miles southeast of the Platte River, the closest perennial body of water. The normal annual rainfall in Aurora is 27 inches (Weatherbase 2012). Any surface water at the site would likely flow to rural roadside ditches and soak into the ground. Given the hydrologic setting of the site and non-use of surface water for drinking water in this area, the threat via the surface water pathway is minimal.

5.4 SOIL EXPOSURE AND AIR PATHWAYS

The presumed source area is southeast of the City of Aurora, which largely consists of agricultural fields. Day cares and schools are more than 1 mile west of the possible source area. The residence closest to the presumed source area is at 1704 East 12th Road, with two additional residences within 1 mile to the east and four residences within 1 mile to the west. Consequently, the soil exposure pathway is not likely to be significant.

Air samples were not collected during the RSE/SI; however, indoor air samples or sub-slab vapor samples could be collected in the future to evaluate potential for vapor intrusion into nearby buildings.

6.0 EMERGENCY RESPONSE CONSIDERATIONS

The National Contingency Plan [40 *Code of Federal Regulations* 300.415(b)(2)] authorizes the EPA to consider emergency response actions at those sites that pose an imminent threat to human health or the environment. An imminent threat is present at five houses with detected levels of CCl_4 exceeding the EPA MCL. EPA offered whole house carbon filtration systems to three of these homeowners after the APA; however, these three homeowners refused the offer. Appendix G includes a Removal Site Evaluation Form for the Aurora Groundwater site.

7.0 SUMMARY

The Aurora Groundwater site is in Sections 2, 3, 10, 11, and 12 of Township 10 North, Range 6 West on the southeast side of Aurora, Hamilton County, Nebraska. Five wells containing CCl_4 at concentrations above the MCL were identified in May 2012 at the Aurora Groundwater site.

<u>Possible Source Areas</u>

Based on the contaminants identified in the groundwater, the 12 grain storage silos south of the residence at 1704 East 12th Road were considered as a likely source area of CCl_4 for the Aurora Groundwater site. Grain storage silos are also present at 1605 East 12th Road (nine silos), 1608 East 12th Road (10 silos), 1701 East 12th Road (three silos), and 1806 East 12th Road (one silo), and could contribute to the contaminant plume identified along East 12th Road.

In addition, potential source areas are within the city limits of Aurora, including additional grain storage areas. NDEQ has initiated site investigations of these areas.

Private and Municipal Well Sampling

Private well sampling for the Aurora Groundwater site RSE/SI in May 2012 identified five private wells between 1605 East 12th Road and 1806 East 12th Road with CCl_4 concentrations exceeding the EPA MCL (5 µg/L). $CHCl_3$ was detected at 1607 East 12th Road, 1701 East 12th Road, 1704 East 12th Road, and 1710 East 12th Road at levels exceeding the EPA RSL for tapwater (0.19 µg/L). Other constituents detected at concentrations below regulatory screening levels in these private wells were 1,1-DCE, PCE, 1,2,3-trichlorobenzene, and 1,1,1-TCA.

Municipal well sampling for the Aurora Groundwater site RSE/SI in May 2012 detected PCE in municipal well 781 below the EPA MCL. No other VOCs were detected in samples from the municipal wells.

The pertinent HRS factors associated with the Aurora Groundwater site are as follows:

- One or more presumed source areas are identified between 1605 East 12th Road and 1806 East 12th Road in Aurora, Nebraska, with the center identified at 1704 East 12th Road. Five of the seven private wells within this 1.7-mile stretch contained CCl_4 at levels exceeding the EPA MCL (5 µg/L), and all seven private wells within this stretch contained CCl_4 at 3.4 µg/L or greater. Five of the seven residences in this area have grain silos associated with their properties, which could cause and/or contribute to the contaminant plume.

- $CHCl_3$ was detected in four of the seven private wells within the 1.7-mile stretch between 1605 East 12th Road and 1806 East 12th Road at levels exceeding the EPA RSL for tapwater (0.19 µg/L). $CHCl_3$ is a product of CCl_4 degradation.

- 1,1-DCE, PCE, 1,2,3-trichlorobenzene, and 1,1,1-TCA were detected in private well samples collected between 1605 East 12th Road and 1806 East 12th Road—all at concentrations less than regulatory screening levels.

- PCE was detected in municipal well 781, but at a concentration less than the regulatory screening levels. No other contaminants were detected in the five municipal wells.

- No groundwater contamination was identified in six private wells upgradient of 1605 East 12th Road. Additionally, no groundwater contamination was identified in private wells sampled at 1701 East Highway 34 (two wells) or at 1105 or 1106 South S. Road.

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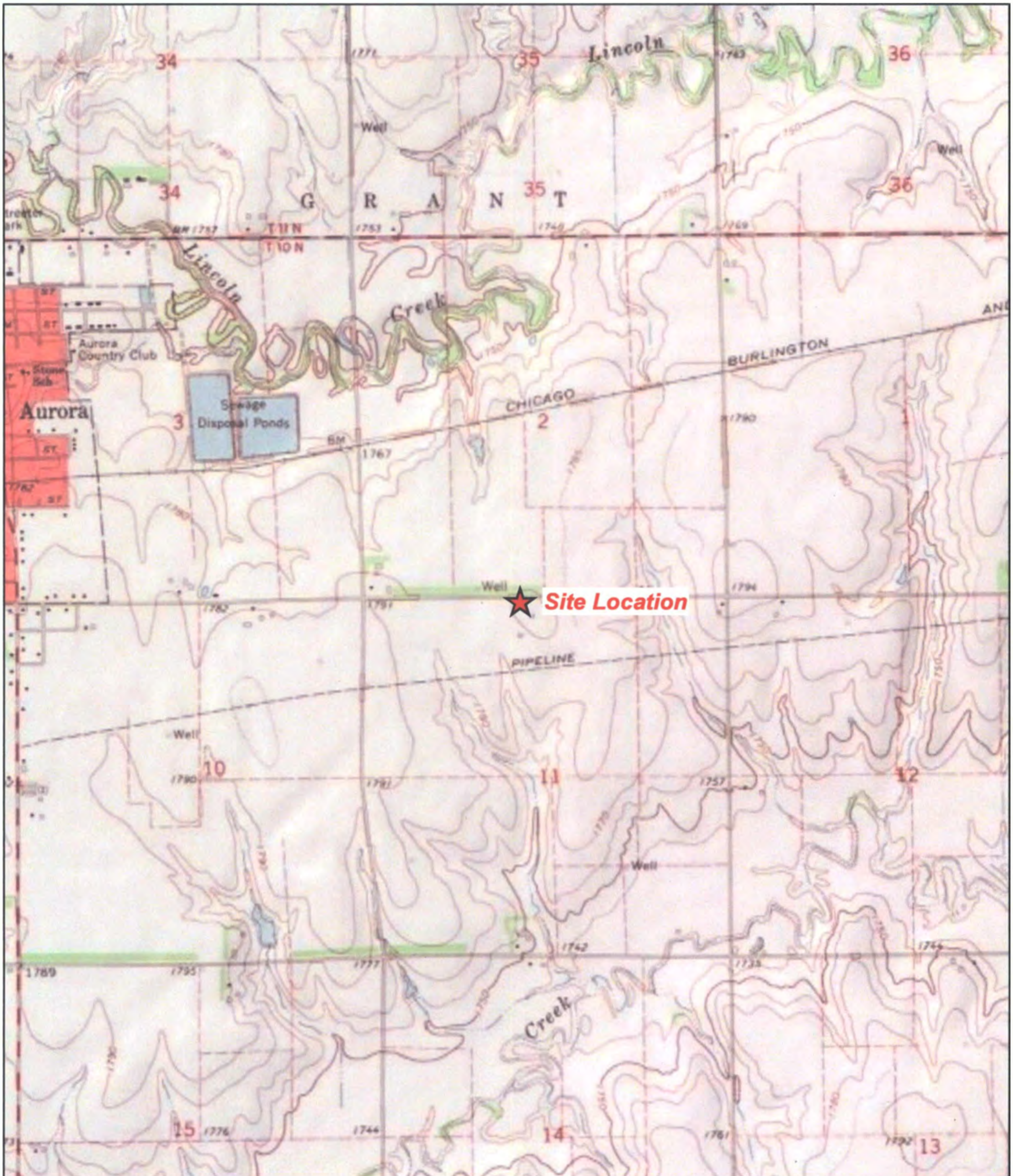
APPENDIX A

FIGURES



N

0 1,000 2,000

Feet

Source: USGS Aurora East, NE 7.5 Minute Topo Quad, 1978; USGS Hampton, NE 7.5 Minute Topo Quad, 1978

X:\G\9004\0284\000\Projects\mxd\Figure1.mxd

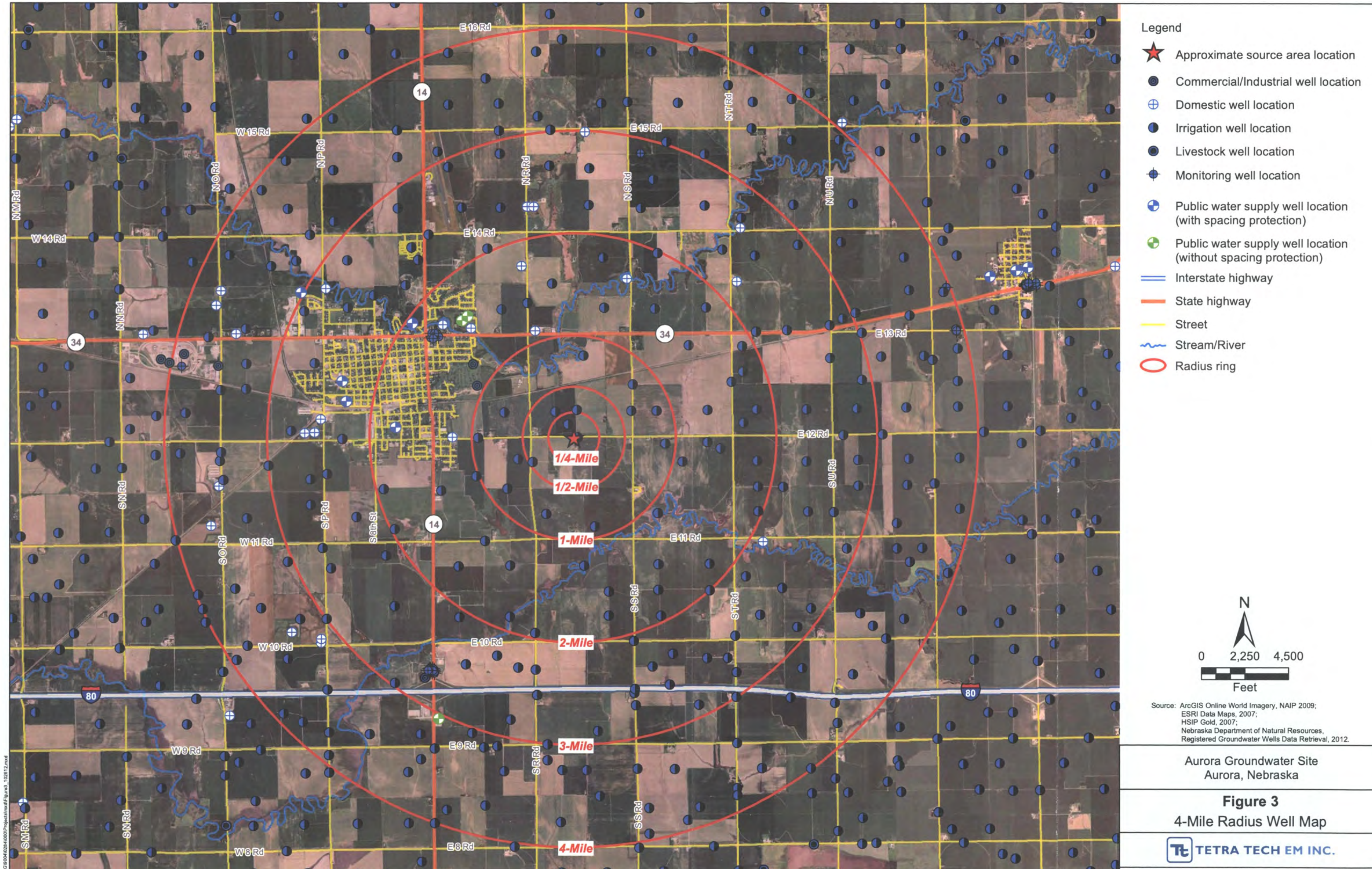
Aurora Groundwater Site
Aurora, Nebraska

Figure 1
Site Location Map

TETRA TECH EM INC.

Date: 10/26/12 Drawn By: Nick Wiederholt Project No: X9004.L.12.0284.000


Legend
Former USDA grain storage facility
Municipal well sample location
Private well sample location
Silo location
Stream/River
Aurora corporate limits
µg/L Micrograms per liter
USDA United States Department of Agriculture
Lincoln Creek
Beaver Creek
Groundwater Flow Direction
Aurora Cemetery
Aurora Country Club
5769-8
5769-9
5769-26
5769-27
5769-7
5769-6
5769-5
5769-15
5769-11
5769-13
5769-25
5769-4
5769-24
5769-23
5769-22
5769-18
5769-19
5769-17
5769-2 | Analyte | Result (µg/L) | Carbon Tetrachloride | 0.75
5769-10 | Analyte | Result (µg/L) | Carbon Tetrachloride | 3.4
5769-1 | Analyte | Result (µg/L) | Carbon Tetrachloride | 29
5769-12 | Analyte | Result (µg/L) | Carbon Tetrachloride | 24
5769-14 | Analyte | Result (µg/L) | Carbon Tetrachloride | 8.4
5769-3 | Analyte | Result (µg/L) | Carbon Tetrachloride | 68
5769-20 | Analyte | Result (µg/L) | Carbon Tetrachloride | 12
5769-21 | Analyte | Result (µg/L) | Carbon Tetrachloride | 0.52
5769-16 | Analyte | Result (µg/L) | Carbon Tetrachloride | 3.8
N
0 830 1,660
Feet
Source: ArcGIS Online, Bing Maps Hybrid, 2011; ESRI Data Maps, 2007
Aurora Groundwater Site
Aurora, Nebraska
Figure 2
Sample Location Map
TETRA TECH EM INC.


Legend
Approximate source area location
Commercial/Industrial well location
Domestic well location
Irrigation well location
Livestock well location
Monitoring well location
Public water supply well location (with spacing protection)
Public water supply well location (without spacing protection)
Interstate highway
State highway
Street
Stream/River
Radius ring
1/4-Mile
1/2-Mile
1-Mile
2-Mile
3-Mile
4-Mile
E 16 Rd
W 15 Rd
E 15 Rd
W 14 Rd
E 14 Rd
E 13 Rd
E 12 Rd
W 11 Rd
E 11 Rd
W 10 Rd
E 10 Rd
W 9 Rd
E 9 Rd
W 8 Rd
E 8 Rd
N M Rd
N N Rd
N O Rd
N P Rd
N R Rd
N S Rd
N T Rd
N U Rd
S M Rd
S N Rd
S O Rd
S P Rd
S 8th St
S R Rd
S S Rd
S T Rd
S U Rd
14
34
80
N
0 2,250 4,500
Feet
Source: ArcGIS Online World Imagery, NAIP 2009; ESRI Data Maps, 2007; HSIP Gold, 2007; Nebraska Department of Natural Resources, Registered Groundwater Wells Data Retrieval, 2012.
Aurora Groundwater Site
Aurora, Nebraska
Figure 3
4-Mile Radius Well Map
TETRA TECH EM INC.

APPENDIX B

PHOTOGRAPHIC LOG

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-3 (5769-4) at 210 A Street.	1
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: Northwest	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of city well sample CW-1 (5769-5), which was collected from city well # 2 (Well 20051).	2
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: Southwest	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of city well sample CW-2 (5769-6), which was collected from city well # 3 (Well 711).	3
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: Northeast	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of city well sample CW-3 (5769-7), which was collected from city well # 1 (Well 561).	4
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: Northwest	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of city well sample CW-5 (5769-9), which was collected from city well # 4 (Well 781).	5
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: Northeast	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-4 prior to reverse osmosis (RO) filtration (5769-10) at 1607 E. 12th Road.	6
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: West	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-5 prior to RO filtration (5769-12) at 1710 E. 12th Road.	7
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: East	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-6 (5769-14) at 1605 E. 12th Road.	8
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: North	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000 DIRECTION: Northeast	DESCRIPTION	This photograph shows the location of drinking water sample DW-8 (5769-16) at 1608 E. 12th Road.	9
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000 DIRECTION: Northwest	DESCRIPTION	This photograph shows the location of drinking water sample DW-9 (5769-17) at 1106 South S Road.	10
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-10 prior to a water softener (5769-18) at 1105 South S Road.	11
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: North	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-10 after a water softener (5769-19) at 1105 South S. Road.	12
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: North	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-11 prior to RO filtration (5769-20) at 1806 East 12th Road.	13
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: North	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of the wellhead and spigot for drinking water sample DW-13 (5769-23) at 210 South 8th Street.	14
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/8/12
DIRECTION: Northwest	PHOTOGRAPHER	Bryant Merriman	

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-14 (5769-24) at 200 South 8th Street.	15
	CLIENT	Environmental Protection Agency - Region 7	DATE
DIRECTION: Southwest	PHOTOGRAPHER	Bryant Merriman	5/8/12

TETRA TECH PROJECT NO. X9004.12.0284.000	DESCRIPTION	This photograph shows the location of drinking water sample DW-15 (5769-25) at 1109 South P Road.	16
	CLIENT	Environmental Protection Agency - Region 7	DATE
DIRECTION: North	PHOTOGRAPHER	Bryant Merriman	5/8/12

Aurora Groundwater Site
Aurora, Nebraska

TETRA TECH PROJECT NO. X9004.12.0284.000 DIRECTION: North	DESCRIPTION	This photograph shows a START team member collecting a drinking water sample from location DW-16 (5769-26) at 1701 East Highway 34.	17
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/9/12
	PHOTOGRAPHER	Bryant Merriman	

TETRA TECH PROJECT NO. X9004.12.0284.000 DIRECTION: East	DESCRIPTION	This photograph shows the location of drinking water sample DW-17 (5769-27) at 1701 East Highway 34.	18
	CLIENT	Environmental Protection Agency - Region 7	DATE 5/9/12
	PHOTOGRAPHER	Bryant Merriman	

APPENDIX C

FIELD LOGBOOK

Outdoor writing products for Outdoor writing people

All components of this product are recyclable

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KS1252

Rite in the Rain

ALL-WEATHER

LEVEL

№ 311

Aurora

Groundwater

1.16.12 9004.06.0002.066

700 STM Merriman arrives at Tetra Tech to prep for days activities.

750 STM Dillon and STM Merriman depart Tetra Tech office for Aurora, NE. Expect sunny, temp. 30-40's all week.

1200 Lunch.

1245 Left second message with Rick Melcher at Aurora City office about sampling city wells.

1322 Arrive in Aurora, NE.

1346 Spoke with Rick Melcher. He says city wells were sampled for VOCs in April 2010. Results were non-detect for carbon tetrachloride.

1350 Left message with DSE Brian Mitchell regarding city data.

1355 Informed City and County police we will be in the area.

1422 Collect $\boxed{5635-1}$

1452 Collect $\boxed{5635-2}$

1518 Collect $\boxed{5635-3}$

1555 Collect $\boxed{5635-4}$

1607 Collect $\boxed{5635-5}$

1638 Collect $\boxed{5635-6}$

1.16.12 Aurora GW

1700 Collect $\boxed{5635-7}$

1702 Depart Aurora for hotel in Grand Island.

1724 Arrive at hotel. Prep samples for delivery. Preserve VOA's.

1800 End of day.

1.16.12

1.17.12

825 Depart hotel for Aurora. Snowed last night. Expect high of 30°, sunny today.

850 Get gas and ice for samples.

925 Collect 5635-8

942 Collect 5635-9

1005 Collect 5635-10

1053 Collect 5635-11 Collect extra volume

1125 Collect 5635-12

1200 Lunch

1306 Collect 5635-13

1334 Collect 5635-14

1412 Collect 5635-15

1438 Collect 5635-16

1500 Depart Aurora. Will prep samples for shipment.

1636 Drop of samples at FedEx.

1651 Return to hotel. End of day.

1.17.12

1.18.12

830 STM Dillon + Merriman depart hotel. Expect high in 40's and sunny.

928 Attempting to gain access.

1051 Collect 5635-17

1107 ~~Collect~~ Sample canceled

1117 Collect 5635-18

1140 Collect 5635-19

1200 Lunch. Stopped by City Hall. Rick Melcher not available.

1303 Collect 5635-20

1318 Stop by City Hall.

1322 Rick Melcher not available, left message

1340 Collect 5635-21

1432 Collect 5635-22 * Extra Volume

1503 Collect 5635-23

1625 Spoke with Rick Melcher. Will meet at 900 tomorrow.

1645 Collect 5635-24

1700 Depart Aurora.

1720 Return to hotel. End of day.

1.18.12

1.19.12 Aurora GW

830 STM Merriman and Dillon depart hotel. Expect high in 30-40's. Will meet with city at 900.

845 Get gas and ice for samples.

857 Arrive at City Hall to meet with Rick Melcher.

915 Spoke with Rick Melcher, obtained VOC data for city wells.

1000 Collect $\boxed{5635-25}$

1030 Depart Aurora, NE for Kansas City.

1430 Return to Tetra Tech office. Begin to unload supplies.

1530 End of day.

1.19.12

5.7.12 Aurora GW

900 STMs Merriman and Widerholt begin to prep for weeks activities. Expect sunny and 70's this week. Will meet OSE Davis onsite.

1030 Enroute to Aurora, NE

1100 Arrive in Aurora. Meet with OSE Davis.

1630 Attempting to gain access.

1830 Buy sampling supplies

1900 Widerholt acidify VOA's. End of day

5.7.12

5.8.12 Aurora GW

825 STMs Wiederholt and Merriman depart hotel in Grand Island, NE.
830 Received phone call from Mr. Swanson to come sample pre- and post-.
840 Arrive in Aurora.
847 Arrive at 1701 E. 12th Rd. OSC Davis onsight.
850 Start purge
852 Checked YSI with 7 pH. 6.7 field check.
858 Collect 5769-1 DW-1
905 Collect 5769-2 DW-1
928 ~~Collect~~ ~~BM~~ Arrive at 1704 E. 12th Road
929 Begin purge of outside hydrant.
938 Collect 5769-3 DW-2
949 Arrive at 1710 E. 12th Rd.
955 No answer.
1002 Arrive at 210 A Street. Begin Purge
1009 Collect 5769-4 DW-3
1030 Arrive at City Well # 2 to collect sample.
1042 Collect 5769-5 CW-1
1055 Arrive at Well #3
1103 Collect 5769-6 CW-2
1112 Arrive at Well #1. Begin purge
1120 Collect 5769-7 CW-3

5.8.12

5.8.12 Aurora GW

1132 Arrive at Well #5. Begin purge.
1140 Collect 5769-8 CW-4
1158 Arrive at Well #4
1205 Collect 5769-9 CW-5
1208 Arrive at 1607 E 12th Rd. ~~Hydrant~~ ~~Fountains~~ BM Began purge.
1213 Collect 5769-10 DW-4 (Pre)
1215 Collect 5769-11 DW-4 (Post)
1225 Arrive at 1710 E. 12th Rd. Begin purge.
1232 Collect 5769-12 DW-5 (Pre)
1238 Collect 5769-13 ~~DW-6~~ DW-5 (Post)
1250 Lunch
1340 Arrive at 1605 E. 12th Rd.
1343 Begin purge
1348 Collect 5769-14 DW-6
1404 Arrive at 1825 A. St. Begin purge.
1412 Collect 5769-15 DW-7
1428 Arrive at 1608 E. 12th Rd. Begin purge
1455 Collect 5769-16 DW-8
1500 Arrive at 1106 S. S Rd. Begin purge.
1507 Collect 5769-17 DW-9 Collect MS/MSD
1522 Arrive at 1105 S. S Road Begin purge
1530 Collect 5769-18 DW-10 (Pre)
1535 Collect 5769-19 DW-10 (Post)

5.8.12

5.8.12 Aurora GW

1355 Arrive at 1806 E 12th Rd. Hydrant has been running over an hour.

1600 Collect $\boxed{5769\text{-}20}$ DW-11 (Pre)

1605 Collect $\boxed{5769\text{-}21}$ DW-11 (Post)

1615 OSE Davis is going to gain access to properties northeast of the grain storage. STMs Wiederholt and Merriman will attempt to get access southwest of grain bins.

1634 Arrive at 220 S. 8th St. Begin purge.

1645 Collect $\boxed{5769\text{-}22}$ DW-12

1700 Arrive at 210 S. 8th St. Begin purge

1705 Collect $\boxed{5769\text{-}23}$ DW-13

1710 Arrive at 200 S. 8th St. Begin purge.

1720 Collect $\boxed{5769\text{-}24}$ DW-14

1735 Arrive at 1109 S. P Rd. Begin purge

1742 Collect $\boxed{5769\text{-}25}$ DW-15

1800 Depart Aurora for hotel

1820 STM Wiederholt will preserve VOA's. End of day. Collect $\boxed{5769\text{-}36\text{-}FB}$

5.8.12

5.9.12 Aurora GW

808 STMs Wiederholt and Merriman depart hotel for Aurora, NE. Will attempt to collect samples then return to Kansas City. Expect sunny, 70's.

830 Arrive in Aurora, NE. Attempting to gain access.

912 Arrive at 1101 E. Hwy 34. Begin purge.

917 Collect $\boxed{5769\text{-}26}$ DW-16. Begin purging second well.

922 Collect $\boxed{5769\text{-}27}$ DW-17

1030 Met with OSE Davis. Determined we collected a good amount of samples. Departing Aurora for Kansas City.

1520 Return to Tetra Tech in Kansas City. Unload vehicle.

1600 End of day.

5.9.12

APPENDIX D

FIELD SHEETS AND CHAIN-OF-CUSTODY RECORDS

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION	SHEET
Joe Davis	Aurora GW	DAY 8-9 MONTH 5 YEAR 2012	1 of 2

CONTENTS OF SHIPMENT

SAMPLE NUMBER	CUBITAINER	BOTTLE	BOTTLE	BOTTLE	VOA SET ~~(2 VIALS EA)~~ 3 Vials EA	water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
5769-1					1	X					
-2					1	X					
-3					1	X					
-4					1	X					
-5					1	X					
-6					1	X					
-7					1	X					
-8					1	X					
-9					1	X					
-10					1	X					
-11					1	X					
-12					1	X					
-13					1	X					
-14					1	X					
-15					1	X					
-16					1	X					
-17					1	X					1 VOA Set of 9
-18					1	X					
-19					1	X					
-20					1	X					
-21					1	X					
-22					1	X					
-23					1	X					
-24					1	X					

DESCRIPTION OF SHIPMENT	MODE OF SHIPMENT
____ PIECE(S) CONSISTING OF ____ BOX(ES)	____ COMMERCIAL CARRIER ____
1 ICE CHEST(S) OTHER ____	____ COURIER
	X SAMPLER CONVEYED (SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED ☐ UNSEALED ☒	5-10-12		SEALED ☐ UNSEALED ☐	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED ☐ UNSEALED ☐			SEALED ☐ UNSEALED ☐	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED ☐ UNSEALED ☐			SEALED ☐ UNSEALED ☐	

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION	SHEET
Joe Davis	Aurora GW	DAY 8-9 MONTH 5 YEAR 2012	2 of 2

CONTENTS OF SHIPMENT

SAMPLE NUMBER	CUBITAINER	BOTTLE	BOTTLE	BOTTLE	VOA SET ~~(2 VIALS EA)~~ 3 Vials EA	water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
5769-25					1	X					
-26					1	X					1 VOA Set of 9
-27					1	X					
-36-FB					1	X					

NUMBERS OF CONTAINERS PER SAMPLE NUMBER

5-10-12

ASR Complete

DESCRIPTION OF SHIPMENT

____ PIECE(S) CONSISTING OF ____ BOX(ES)

____ ICE CHEST(S): OTHER ____

MODE OF SHIPMENT

____ COMMERCIAL CARRIER: ____

____ COURIER

____ SAMPLER CONVEYED

(SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED / UNSEALED			SEALED / UNSEALED	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED / UNSEALED			SEALED / UNSEALED	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED / UNSEALED			SEALED / UNSEALED	

7-EPA-9262(Revised 5/85)

*U.S. GPO: 2002-756-917/40053

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 1 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-1-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-1 (Pre)

Expected Conc: (or Circle One: Low Medium High)

		Date	Time(24 hr)
Latitude: 40.85822	**Sample Collection: Start:**	5/8/2012	8:58
Longitude: -97.97762	**End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Karen Swanson (Doug)
1701 E. 12th Rd.
Aurora, NE 68818
(402) 694-6149

Purge time / volume: 5 min / ~25 gallon
Depth: Unknown
Date completed: Unknown
Treatment: Softener + RO on Kitchen sin
Photo: —
Sample location: Spigot on house next to front door

Temp. 12.94 °C
pH 6.41
S/c 533
ORP 81.5

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 2 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-2-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-1 (Post)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85822 **Sample Collection: Start:** 5/8/2012 9:05
Longitude: -97.97762 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Purge time/Volume: 3 minutes
Sample location: collected from RO system

Karen Swanson (Doug)
1701 E. 12th Rd.
Aurora, NE 68818
(402) 694-6149

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 3 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-3-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: Dw-2

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85729 **Sample Collection: Start:** 5/8/2012 9:38
Longitude: -97.97002 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Virgene Jensen
1704 E. 12th Rd.
Aurora, NE 68818
(402) 694-3998

Purge time/volume: 5 min./~25 gallon
Depth: Unknown
Date completed: Unknown
Treatment: None
Photo: —
Hydrant in backyard

Temp 13.12°C
pH 7.39
S/c 441
ORP -32

* Does not have any water treatment systems. Drinking water is directly from well.

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 4 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-4-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-3

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85714 **Sample Collection: Start:** 5/8/2012 10:09
Longitude: -98.01328 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Sue Kremer
210 A St.
Aurora, NE
(402) 694-3969

Purge time/volume: 7 min. / ~ 25-30 gallon
Depth: ~ 100'
Date completed: ~ 1977
Treatment: Unknown
Photo: 1527
~~Hydrant~~
Sample location: Hydrant next to wellhead

Temp: 13.23°C
pH: 7.47
S/c: 340
ORP: -75.2

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 5 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-5-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: CW-1

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85963 **Sample Collection: Start:** 5/8/2012 10:42
Longitude: -98.00347 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

City well # 2
G-028310

Rick Melcher, City of Aurora
905 E. 13th St.
Aurora, NE 68818
(402) 694-6992

Purge time/volume: 5 min. Pump was turned on to purge the system. ~1100 gallons/minute

Depth:
Photo: 1528
Temp. 13.02 °C
pH 6.99
SC 498
ORP -35.8

Sample collected from spigot in wellhouse.

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 6 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-6-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: CW-2

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.86355 **Sample Collection: Start:** 5/8/2012 11:03
Longitude: -98.01246 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A) Well 711 Well #3
G-035327
Rick Melcher, City of Aurora
905 E. 13th St.
Aurora, NE 68818
(402) 694-6942

* Pump was turned on to allow system to purge. ~1100 gallons/minute

Purge time/volume: 5 min.
Depth: 247.6'
Photo: 1529
Sample location: collected from spigot inside wellhouse.

Temp. 13.04
pH 7.03
S/c 463
ORP -40

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 7 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-7-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: CW-3

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.86604 **Sample Collection: Start:** 5/8/2012 11:20
Longitude: -98.01324 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Purge time: 5 min.
Well 561 Well #1
G-028309
Depth: 170'
Top of Screen #1: 110'
Top of Screen #2: 142'
Photo: 1530

Rick Melcher, City of Aurora
905 E. 13th St.
Aurora, NE 68818
(402) 694-6992

Temp. 13.52°C
pH 6.80
Slc 484
ORP -15.9

* Pump was turned on to purge the system. ~ 1100 gallons/minute

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 8 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-8-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________

External Sample Number: CW-4

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.87851 **Sample Collection: Start:** 5/8/2012 11:40
Longitude: -98.02101 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Rick Melcher, City of Aurora
905 E. 13th St.
Aurora, NE 68818
(402) 694-6992

* pump turned on to purge system
* pumps at 100 gallons/minute

Purge time: ~~5-7 m~~ 5 min.
Well 991 Well # 5
G-101011
Depth 218'
Top of Screen # 1: 141'
Top of screen # 2: 205'

Sample collected from spigot in Wellhouse

Temp. 12.77
pH 7.60
S/c 411
ORP -71.3

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 9 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-9-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: CW-5

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.87384 **Sample Collection: Start:** 5/8/2012 12:05
Longitude: -97.99829 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Rick Melcher, City of Aurora
905 E. 13th st
~~Auroror~~ Aurora, NE 68818
(402) 694-6992

Purge time: 5 min.
Well 781 Well #4
G-028307
Depth: 198'
Top of Screen: 163'
Photo: 1531

Sample collected from spigot inside wellhouse

* Pump turned on to purge system
~ 1100 gallons/minute

Temp. 13.26 °C
pH 7.17
s/c 411
ORP -54.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 10 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-10-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______________________

External Sample Number: DW-4 (Pre)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85802 **Sample Collection: Start:** 5/8/2012 ~~12:10~~ ~~12:05~~ 12:13

Longitude: -97.98587 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Keith Wasem
1607 E. 12th Road
Aurora, NE 68818
(402) 694-9259

Purge time/volume: 5min/~25gal.
Depth: 120-125'
Date installed: unknown
Treatment: RO
Photo: 1532
Sample location: Hydrant in back yard

Temp 13.23°C
pH 6.14
s/c 758
ORP 31.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 11 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-11-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-4 (Post)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85802 **Sample Collection: Start:** 5/8/2012 12:15
Longitude: -97.98587 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Purge time: ~5 min
Sample location: collected from RO system

Keith Wasem
1607 E. 12th Rd.
Aurora, NE 68818
(402) 694-9259

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 12 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-12-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______________________

External Sample Number: DW-5 (Pre)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85743 **Sample Collection: Start:** 5/8/2012 12:32
Longitude: -97.95973 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Dan Hain
1710 E. 12th Rd.
Aurora, NE 68818
(402) 694-2352

Purge time / volume : 5 min / ~ 25 ga
Depth : ~ 140'
Date completed : Unknown
Treatment : RO
Photo : 1533
Sample collected from hydrant between house and garage

Temp 12.98°C
pH 6.69
S/c 783
ORP -24.3

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 13 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-13-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-5 (Post)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85743 **Sample Collection: Start:** 5/8/2012 12:38
Longitude: -97.95973 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Purge time: 5 min.
Sample collected from RO system.

Dan Hain
1710 E. 12th Rd.
Aurora, NE 68818
(402) 694 - 2352

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 14 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-14-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-6

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85797 **Sample Collection: Start:** 5/8/2012 13:48
Longitude: -97.98776 **End:** _/_/_ _:_

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Gail Wert
1605 E. 12th Rd
Aurora, NE 68818
(402) 694-1219

Purge time/volume: 5 min. / ~25 gallons
Depth: 150-160'
Date completed: ~1960's
Treatment: None
Photo: 1534
Sample location: Hydrant by back shed and wellhead

Temp. 13.75°C
pH 5.92
S/c 740
ORP 8.7

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 15 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-15-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-7

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85792 **Sample Collection: Start:** 5/8/2012 14:12
Longitude: -97.99290 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Rendell Friesen
1825 A st.
Aurora, NE 68818
(402) 694-6029 - Home
(402) 694-8495 - Cell

Purge time / volume : 5 min. / ~25 gal.
Depth: 145' Pump: 130-135'
Date completed: ~~Unknown~~ 1977
Treatment: Softener
Photo: —
Sample location: Spigot on back of house

Temp. 14.53°c
pH: 5.77
S/c: 547
ORP: 36.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 16 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-16-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________

External Sample Number: Dw. 8

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85705 **Sample Collection: Start:** 5/8/2012 14:55
Longitude: -97.98405 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Jay Schulze
1608 E. 12th Rd.
Aurora, NE 68818
(402) 631-9797

Purge time/volume: 5 min/~25 gallons
Depth: ~140
Date completed: ~1960
Treatment: Softener, RO
Photo: 1535
Sample location: Spigot on South side of house

* In January 2012 we sampled his neighbors house directly west, thinking it was his well

Temp: 14.18°c
pH: 6.23
Slc: 769
ORP: -15.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 17 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-17-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-9

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85004 **Sample Collection: Start:** 5/8/2012 15:07
Longitude: -97.95829 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
9 ~~2~~ - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Robert West
1106 S. S Road
Aurora, NE 68818
(402) 694-6600

* Extra Volume for MS/MSD

Purge time/volume: 5 min. / ~25 gallons
Depth: 200'
Date Completed: ~~2011~~ ~1990's
Treatment: None
Photo: 1536
Sample location: Hydrant in front yard

Temp: 12.76°C
pH: 6.50
S/c: 542
ORP: -34.5

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 18 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-18-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-10 (Pre)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.850226 **Sample Collection: Start:** 5/8/2012 15:30
Longitude: -97.95965 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Jeff Wert
1105 S. S Rd.
Aurora, NE 68818
(402) 694-5460

Purge time / Volume: 5 min / ~25 gallons
Depth: ~200'
Date completed: ~1990's
Treatment: Softener
Photo: 1537
Sample location: Hydrant in backyard

Temp: 12.92°C
pH: 6.54
S/c: 278
ORP -53.7

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 19 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-19-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-10 (Post)

Expected Conc: (or Circle One: Low Medium High)

	Date	Time(24 hr)
Latitude: 40.85026 **Sample Collection: Start:**	5/8/2012	15:35
Longitude: -97.95965 **End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Jeff Wert
1105 S. S Road
Aurora, NE 68818
(402)694-5460

Purge time/volume: 5 min./≈25 gallons
Sample collection: spigot on front of house, post softener.
Photo: 1538

Temp. 13.52
pH 6.22
S/C 285
ORP -7.5

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 20 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-20-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-11 (Pre)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85739 **Sample Collection: Start:** 5/8/2012 16:00
Longitude: -97.95643 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Tom Dibbern
1806 E. 12th Rd.
Aurora, NE 68818
(402) 631-3010 - Cell

Purge time / volume: > 1-hour
Depth: ~ 120'
Date completed: ~ 1990's
Treatment: RO
Photo: 1539
Sample location: Hydrant next to garage

Temp. 12.97°C
pH 6.37
S/C 405
ORP -14.7

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 21 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-21-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-11 (Post)

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85739 **Sample Collection: Start:** 5/8/2012 16:05
Longitude: -97.95643 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Sampled RO system

Tom Dibbern
1806 E. 12th Rd.
Aurora, NE 68818
(402) 631-3010 cell

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 22 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-22-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ____________________

External Sample Number: DW-12

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85428 **Sample Collection: Start:** 5/8/2012 16:45
Longitude: -98.00675 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Helen Miller
220 S. 8th St.
Aurora, NE 68818
(402) 694-2907

Purge time / volume: 5 min. / 2.25 gallons
Depth: Unknown
Date completed: Unknown
Treatment: None
Photo: —
Sample location: Hydrant next to flower shop

Temp 13.15°C
pH 6.77
S/c 634
ORP -59.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 23 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-23-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______________________

External Sample Number: DW-13

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85482 **Sample Collection: Start:** 5/8/2012 ~~16:45~~ 17:05
Longitude: -98.00678 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Deb Miller
210 S. 8th St
Aurora, NE 68818
(402) 694-3829

Purge time | Volume : 5 min | ~25 gallons
Depth : Unknown
Date Completed : 1976
Treatment : Softener
Photo : 1540
Sample location : spigot on south side of house

Temp 13.27
pH ~~4~~ 5.60
S/c 309
ORP 51.3

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 24 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-24-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-14

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85554 **Sample Collection: Start:** 5/8/2012 17:20
Longitude: -98.00674 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Gerald Holtzen
200 S, 8th St.
Aurora, NE 68818
(402) 694-2779

Purge time/Volume:
Depth: Unknown
Date installed: Unknown
Treatment: None
Photo: 1541
Sample location: Hydrant in backyard

Temp. 13.04
pH 5.94
SC 458
ORP 11.2

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 25 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-25-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______________________________

External Sample Number: DW-15

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.85715 **Sample Collection: Start:** 5/8/2012 17:42
Longitude: -98.01756 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Gary Johnson
1109 S. P Rd
Aurora, NE 68818
(402) 694 - 2729

Purge time/volume: 5 min/~25 gallons
Depth: 130'
Date installed: ~1990's
Treatment: None
Photo: 1542
Sample location: Hydrant in backyard

Temp. 13.07
pH 6.15
Sc 273
ORP 120

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 26 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-26-__

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______________________

External Sample Number: DW-16

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: 40.81330 **Sample Collection: Start:** 5/9/2012 9:17
Longitude: -97.97675 **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
9 ~~7~~ - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Ned Grosshans
1701 E. Hwy 34
Aurora, NE 68818
(402) 694-2000

* Collect extra volume for MS/MSD
* 1 of 2 wells on property

Purge time/Volume: 5 min / ~25 gallon
Depth: ~ 120'
Date installed: ~2000
Treatment: Softener, RO
Photo: 1543
Sample location: Hydrant in backyard of house

Temp: 12.55 °C
pH: 5.88
Slc: 488
ORP: 53.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** ~~35~~ 27 **QC Code:** __ **Matrix:** Water **Tag ID:** 5769-~~35~~ 27 __

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: ______

External Sample Number: DW-17

Expected Conc: (or Circle One: Low Medium High)

			Date	Time(24 hr)
Latitude: 40.87330		**Sample Collection: Start:**	5/9/2012	9:22
Longitude: -97.97675		**End:**	__/__/__	__:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:
(N/A)

Ned Grosshans
1701 E. Hwy 30
Aurora, NE 68818
(402) 694-2000

* 1 of 2 wells on property

Purge time / Volume: 5 min / ~ 25 gallons
Depth - Unknown
Date installed: unknown
Treatment: None
Photo: 1544
Sample location: Hydrant next to Wellhead infront of large white shop.

Temp: 12.64 °C
pH: 5.86
S/c: 488
ORP: 42.0

Sample Collected By: BM/TT

Sample Collection Field Sheet
US EPA Region 7
Kansas City, KS

ASR Number: 5769 **Sample Number:** 36 **QC Code:** FB **Matrix:** Water **Tag ID:** 5769-36-FB

Project ID: JDB74200 **Project Manager:** Joe Davis
Project Desc: Aurora GW - Private well sampling
City: Aurora **State:** Nebraska
Program: Superfund
Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Location Desc: DW VOA Trip Blank sample

External Sample Number: ______

Expected Conc: (or Circle One: Low Medium High) **Date** **Time(24 hr)**

Latitude: __ __ __ **Sample Collection: Start:** 5/8/2012 18:20
Longitude: __ __ __ **End:** __/__/__ __:__

Laboratory Analyses:

Container	Preservative	Holding Time	Analysis
3 - 40mL VOA vial	4 Deg C, HCL to pH<2	14 Days	1 VOCs in Drinking Water by GC/MS

Sample Comments:

(N/A)

Sample Collected By: BM/TT

APPENDIX E

EPA REGION 7 LABORATORY ANALYTICAL RESULTS

United States Environmental Protection Agency
Region 7
901 N. 5th Street
Kansas City, KS 66101

Date: 06/11/2012

Subject: Transmittal of Sample Analysis Results for ASR #: 5769

Project ID: JDB74200

Project Description: Aurora GW - Private well sampling

From: Michael F. Davis, Chief
Chemical Analysis and Response Branch, Environmental Services Division

To: Joe Davis
SUPR/ERNB

Enclosed are the analytical data for the above-referenced Analytical Services Request (ASR) and Project. The Regional Laboratory has reviewed and verified the results in accordance with procedures described in our Quality Manual (QM). In addition to all of the analytical results, this transmittal contains pertinent information that may have influenced the reported results and documents any deviations from the established requirements of the QM.

Please contact us within 14 days of receipt of this package if you determine there is a need for any changes. Please complete the enclosed Customer Satisfaction Survey and Data Disposition/Sample Release memo for this ASR as soon as possible. The process of disposing of the samples for this ASR will be initiated 30 days from the date of this transmittal unless an alternate release date is specified on the Data Disposition/Sample Release memo.

If you have any questions or concerns relating to this data package, contact our customer service line at 913-551-5295.

Enclosures

cc: Analytical Data File.

Project Manager: Joe Davis **Org:** SUPR/ERNB **Phone:** 913-551-7909

Project ID: JDB74200

Project Desc: Aurora GW - Private well sampling

Location: Aurora **State:** Nebraska **Program:** Superfund

Site Name: Aurora Groundwater - Site Evaluation/Disposition **Site ID:** B742 **Site OU:** 00

Purpose: Site Characterization **GPRA PRC:** 303DC6

Private well sampling.

Explanation of Codes, Units and Qualifiers used on this report

Sample QC Codes: QC Codes identify the type of sample for quality control purpose.

__ = Field Sample
FB = Field Blank

Units: Specific units in which results are reported.

ug/L = Micrograms per Liter
Deg C = Degrees Celsius
umhos/cm = Micromhos per Centimeter
SU = Standard Units (pH)

Data Qualifiers: Specific codes used in conjunction with data values to provide additional information on the quality of reported results, or used to explain the absence of a specific value.

(Blank)= Values have been reviewed and found acceptable for use.
UJ = The analyte was not detected at or above the reporting limit. The reporting limit is an estimate.
J = The identification of the analyte is acceptable; the reported value is an estimate.
U = The analyte was not detected at or above the reporting limit.

ASR Number: 5769 **Sample Information Summary** **06/11/2012**

Project ID: JDB74200 **Project Desc:** Aurora GW - Private well sampling

Sample No	QC Code	Matrix	Location Description	External Sample No	Start Date	Start Time	End Date	End Time	Receipt Date
1 -	__	Water	DW-1 (Pre)		05/08/2012	08:58			05/10/2012
2 -	__	Water	DW-1 (Post)		05/08/2012	09:05			05/10/2012
3 -	__	Water	DW-2		05/08/2012	09:38			05/10/2012
4 -	__	Water	DW-3		05/08/2012	10:09			05/10/2012
5 -	__	Water	CW-1		05/08/2012	10:42			05/10/2012
6 -	__	Water	CW-2		05/08/2012	11:03			05/10/2012
7 -	__	Water	CW-3		05/08/2012	11:20			05/10/2012
8 -	__	Water	CW-4		05/08/2012	11:40			05/10/2012
9 -	__	Water	CW-5		05/08/2012	12:05			05/10/2012
10 -	__	Water	DW-4 (Pre)		05/08/2012	12:13			05/10/2012
11 -	__	Water	DW-4 (Post)		05/08/2012	12:15			05/10/2012
12 -	__	Water	DW-5 (Pre)		05/08/2012	12:32			05/10/2012
13 -	__	Water	DW-5 (Post)		05/08/2012	12:38			05/10/2012
14 -	__	Water	DW-6		05/08/2012	13:48			05/10/2012
15 -	__	Water	DW-7		05/08/2012	14:12			05/10/2012
16 -	__	Water	DW-8		05/08/2012	14:55			05/10/2012
17 -	__	Water	DW-9		05/08/2012	15:07			05/10/2012
18 -	__	Water	DW-10 (Pre)		05/08/2012	15:30			05/10/2012
19 -	__	Water	DW-10 (Post)		05/08/2012	15:35			05/10/2012
20 -	__	Water	DW-11 (Pre)		05/08/2012	16:00			05/10/2012
21 -	__	Water	DW-11 (Post)		05/08/2012	16:05			05/10/2012
22 -	__	Water	DW-12		05/08/2012	16:45			05/10/2012
23 -	__	Water	DW-13		05/08/2012	17:05			05/10/2012
24 -	__	Water	DW-14		05/08/2012	17:20			05/10/2012
25 -	__	Water	DW-15		05/08/2012	17:42			05/10/2012
26 -	__	Water	DW-16		05/09/2012	09:17			05/10/2012
27 -	__	Water	DW-17		05/09/2012	09:22			05/10/2012
36 -	FB	Water	DW VOA Trip Blank sample		05/08/2012	18:20			05/10/2012

Analysis **Comments About Results For This Analysis**

1 Conductivity by Field Measurement

Lab: (Field Measurement)

Method: Measurement of field parameter

Samples:							
	1-__	3-__	4-__	5-__	6-__	7-__	8-__
	9-__	10-__	12-__	14-__	15-__	16-__	17-__
	18-__	19-__	20-__	22-__	23-__	24-__	25-__
	26-__	27-__					

Comments:
(N/A)

1 pH of Water by Field Measurement

Lab: (Field Measurement)

Method: Measurement of field parameter

Samples:							
	1-__	3-__	4-__	5-__	6-__	7-__	8-__
	9-__	10-__	12-__	14-__	15-__	16-__	17-__
	18-__	19-__	20-__	22-__	23-__	24-__	25-__
	26-__	27-__					

Comments:
(N/A)

1 Temperature of Water by Field Measurement

Lab: (Field Measurement)

Method: Measurement of field parameter

Samples:							
	1-__	3-__	4-__	5-__	6-__	7-__	8-__
	9-__	10-__	12-__	14-__	15-__	16-__	17-__
	18-__	19-__	20-__	22-__	23-__	24-__	25-__
	26-__	27-__					

Comments:
(N/A)

1 VOCs in Drinking Water by GC/MS

Lab: Region 7 ESAT Contract Lab (In-House)

Method: EPA Region 7 RLAB Method 3230.9E

Samples:							
	1-__	2-__	3-__	4-__	5-__	6-__	7-__
	8-__	9-__	10-__	11-__	12-__	13-__	14-__
	15-__	16-__	17-__	18-__	19-__	20-__	21-__
	22-__	23-__	24-__	25-__	26-__	27-__	36-FB

Comments:
Styrene (22.4%) was low in the initial calibration and was UJ-coded in samples 5769-1,

5769-2, 5769-3, 5769-4, 5769-5, 5769-6, 5769-7, 5769-8, 5769-9, 5769-10, 5769-11, 5769-12, 5769-13, 5769-14, 5769-15, 5769-16, 5769-17, 5769-18, 5769-19, 5769-20, 5769-21, 5769-22, 5769-23, 5769-24, 5769-25, 5769-26, 5769-27, and 5769-36-FB. This analyte was not found in the samples at or above the reporting limit however, the reporting limit is an estimate (UJ-coded) due to the initial instrument calibration not meeting specifications. The actual reporting limit may be higher than the reported value.

The %D exceeded the ±30% limits for Dichlorodifluoromethane (38.3%) and were UJ-coded in samples 5769-21, 5769-22, 5769-23, 5769-24, 5769-25, 5769-26, 5769-27, and 5769-36-FB. The analyte was not found in the samples at or above the reporting limit however, the reporting limit is an estimate (UJ-coded) due to the continuing calibration check not meeting accuracy specifications. The actual reporting limit for these analytes may be higher than the reported value.

4-Methyl-2-Pentanone (84%, 86 - 132%) was outside QC limits and was UJ-coded in samples 5769-1, 5769-2, 5769-3, 5769-4, 5769-5, 5769-6, 5769-7, 5769-8, 5769-9, 5769-10, 5769-11, 5769-12, 5769-13, 5769-14, 5769-15, 5769-16, 5769-17, 5769-18, 5769-19, and 5769-20. The analyte was not found in the samples at or above the reporting limit however, the reporting limit is an estimate (UJ-coded) due to the low recovery of the analyte in the laboratory control sample. The actual reporting limit for these analytes may be higher than the reported value.

Tetrachloroethene (121%, 82 - 116%) was outside QC limits and was J-coded in samples 5769-9, 5769-10, 5769-14, and 5769-16. The analyte was positively identified in the samples however the quantitation is an estimate (J-coded) due to the high recovery of the analyte in the laboratory control sample. The concentrations for this analyte may be lower than the reported value.

1,2-Dichloroethane (83%, 86 - 117%) and 4-Methyl-2-Pentanone (84%, 87 - 127%) were biased low in the laboratory matrix spike duplicate and were UJ-coded in sample 5769-17. The analytes were not found in the sample at or above the reporting limit however, the reporting limit is an estimate (UJ-coded) due to low recovery of the analytes in the laboratory matrix spike duplicate. The actual reporting limit for these analytes may be higher than the reported value.

Bromomethane (RPD 14%, PCL 11%) was high and was UJ-coded in sample 5769-17. The analyte was not found in the sample at or above the reporting limit however, the reporting limit is an estimate (UJ-coded) due to the poor precision of the analyte in the Matrix Spike/Matrix Spike Duplicate. The actual reporting limit for this analyte may be higher than the reported value.

Analysis/ Analyte	Units	1-__	2-__	3-__	4-__
1 Conductivity by Field Measurement					
Conductivity	umhos/cm	533		441	340
1 pH of Water by Field Measurement					
pH	SU	6.41		7.39	7.47
1 Temperature of Water by Field Measurement					
Temperature	Deg C	12.94		13.12	13.23
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	29	0.75	68	0.50 U
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	1.1	0.50 U	1.4	0.50 U
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	3.4	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**1-__**	**2-__**	**3-__**	**4-__**
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.52	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	2.2	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	5-___	6-___	7-___	8-___
1 Conductivity by Field Measurement					
Conductivity	umhos/cm	498	463	484	411
1 pH of Water by Field Measurement					
pH	SU	6.99	7.03	6.80	7.60
1 Temperature of Water by Field Measurement					
Temperature	Deg C	13.02	13.04	13.32	12.77
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**5-__**	**6-__**	**7-__**	**8-__**
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**9-__**	**10-__**	**11-__**	**12-__**
1 Conductivity by Field Measurement					
Conductivity	umhos/cm	411	758		783
1 pH of Water by Field Measurement					
pH	SU	7.17	6.14		6.69
1 Temperature of Water by Field Measurement					
Temperature	Deg C	13.26	13.23		12.98
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	3.4	0.50 U	24
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.52	0.50 U	0.89
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.84	0.50 U	3.7
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**9-__**	**10-__**	**11-__**	**12-__**
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	1.5 J	0.79 J	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.84	0.50 U	2.4
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

ASR Number: 5769 **RLAB Approved Sample Analysis Results** **06/11/2012**

Project ID: JDB74200 **Project Desc:** Aurora GW - Private well sampling

Analysis/ Analyte	Units	13-__	14-__	15-__	16-__
1 Conductivity by Field Measurement					
Conductivity	umhos/cm		740	547	769
1 pH of Water by Field Measurement					
pH	SU		5.92	6.77	6.23
1 Temperature of Water by Field Measurement					
Temperature	Deg C		13.75	14.53	14.18
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	8.4	0.50 U	3.8
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	1.1	0.50 U	0.78
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**13-__**	**14-__**	**15-__**	**16-__**
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.65 J	0.50 U	0.66 J
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	1.0	0.50 U	0.73
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**17-__**	**18-__**	**19-__**	**20-__**
1 Conductivity by Field Measurement					
Conductivity	umhos/cm	542	278	285	405
1 pH of Water by Field Measurement					
pH	SU	6.50	6.54	6.22	6.37
1 Temperature of Water by Field Measurement					
Temperature	Deg C	12.76	12.92	13.52	12.97
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 UJ	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	0.50 U	0.50 U	12
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 UJ	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	17-__	18-__	19-__	20-__
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	21-__	22-__	23-__	24-__
1 Conductivity by Field Measurement					
Conductivity	umhos/cm		634	309	458
1 pH of Water by Field Measurement					
pH	SU		6.77	5.60	5.94
1 Temperature of Water by Field Measurement					
Temperature	Deg C		13.15	13.27	13.04
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.52	0.50 U	0.50 U	0.50 U
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	21-__	22-__	23-__	24-__
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	**Units**	**25-__**	**26-__**	**27-__**	**36-FB**
1 Conductivity by Field Measurement					
Conductivity	umhos/cm	273	488	488	
1 pH of Water by Field Measurement					
pH	SU	6.15	5.88	5.86	
1 Temperature of Water by Field Measurement					
Temperature	Deg C	13.07	12.55	12.64	
1 VOCs in Drinking Water by GC/MS					
Acetone	ug/L	10 U	10 U	10 U	10 U
Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
sec-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
tert-Butylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Chloromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Chlorotoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromo-3-Chloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dibromoethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Dichlorodifluoromethane	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,2-Dichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3-Dichloropropane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
trans-1,3-Dichloropropene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Ethyl Benzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

Analysis/ Analyte	Units	25-__	26-__	27-__	36-FB
Hexachlorobutadiene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
2-Hexanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
p-Isopropyltoluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Methylene Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
4-Methyl-2-Pentanone	ug/L	5.0 U	5.0 U	5.0 U	5.0 U
Naphthalene	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Styrene	ug/L	0.50 UJ	0.50 UJ	0.50 UJ	0.50 UJ
1,1,1,2-Tetrachloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2,2-Tetrachloroethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,3-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trichlorobenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Trichlorofluoromethane	ug/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2,4-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
1,3,5-Trimethylbenzene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
Vinyl Chloride	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
m and/or p-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	ug/L	0.50 U	0.50 U	0.50 U	0.50 U

United States Environmental Protection Agency
Region VII
901 N. 5th Street
Kansas City, KS 66101

Date: __/__/____

Subject: Data Disposition/Sample Release for ASR #: 5769

Project ID: JDB74200

Project Description: Aurora GW - Private well sampling

From: Joe Davis
SUPR/ERNB

To: Kaye Dollmann
ENSV/CARB

I have received and reviewed the Transmittal of Sample Analysis Results for the above-referenced Analytical Services Request(ASR) and have indicated my findings below by checking one of the boxes for Data Disposition.

I understand all samples will be disposed upon receipt of this form, unless samples are requested to be held. If I do not return this form all samples will be disposed of on ____________________.

☐ "RELEASED" - Read-only to all Region 7 employees and contractors that have R7LIMS "Customer" account. All Samples may be disposed of upon receipt of this form if not requested to be held.

☐ "Project Manager Accessible" - Available on the LAN in R7LIMS for my use only. All Samples may be disposed of upon receipt of this form if not requested to be held.

☐ "Archived" - THIS DATA IS OF A SENSITIVE NATURE. Any future reports must be requested through the laboratory. All samples may be disposed of upon receipt of the form if not requested to be held.

☐ Hold Samples - I have determined that the samples need to be held until ________________, after which time they will be disposed of in accordance with applicable regulations.
The reason for the hold is:

☐ Samples are associated with a legal proceeding.

☐ Question/Concern with data - possible reanalysis requested.

☐ Other: ____

APPENDIX F

NEBRASKA REGISTERED WELLS WITHIN 4 MILES OF SITE

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
0-0.25 Mile																
G-006373	A	I	2	10	6	W	4/15/1954	167	66	40.85967	-97.97123	Rolling Meadows Inc	PO Box 69	York	NE	68467
G-017104	A	I	11	10	6	W	10/8/1949	150	70	40.85781	-97.96945	Fred C Strotman	807 13th Street	Aurora	NE	68818
0.25-0.5 Mile																
G-040312	A	I	2	10	6	W	6/12/1973	234	90	40.86170	-97.96956	Rolling Meadows Inc	PO Box 69	York	NE	68467
G-073628	A	I	2	10	6	W	2/13/1991	240	80	40.86152	-97.97360	Rolling Meadows Inc	PO Box 69	York	NE	68467
G-017103	A	I	11	10	6	W	6/6/1955	150	0	40.85441	-97.97795	Fred C Strotman	807 13th Street	Aurora	NE	68818
0.5-1 Mile																
G-017107	A	I	2	10	6	W	7/11/1958	150	85	40.86151	-97.95941	Fred Strotman		Aurora	NE	68818
G-056061	A	I	3	10	6	W	2/5/1977	230	89	40.86147	-97.98315	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-035276	A	I	2	10	6	W	6/6/1971	156	57	40.86940	-97.96823	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-050244	A	I	1	10	6	W	5/20/1976	0	85	40.86145	-97.95462	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-012114	A	I	11	10	6	W	10/22/1955	151	78	40.84702	-97.97550	Clarence Luthey etux	1411 North Street	Aurora	NE	68818
G-017121	A	I	10	10	6	W	1/1/1927	190	83	40.85066	-97.98271	Lynn Tredway	1308 19th Street	Aurora	NE	68818
G-006670	A	I	12	10	6	W	5/30/1956	172	70	40.85677	-97.95304	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
G-012103	A	I	1	10	6	W	5/6/1956	168	86	40.86523	-97.95905	Robert E & Tamera I Wert	1401 20th St	Aurora	NE	68818
G-014576	A	I	10	10	6	W	6/20/1958	150	83	40.85485	-97.98064	Willis George	RR 3	Aurora	NE	68818
G-004736	A	I	11	10	6	W	2/25/1957	142	42	40.84517	-97.96642	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
G-015799	A	I	3	10	6	W	7/4/1947	176	76	40.85789	-97.98810	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
1-2 Mile																
G-028307	A	P	33	11	6	W	11/17/1978	192	58	40.87423	-98.00023	City of Aurora	905 13th Street	Aurora	NE	68818
G-115026	A	U	34	11	6	W	1/1/1978	175	52	40.87456	-97.99090	Leadership Center	1609 East Highway 34	Aurora	NE	68818
G-115027	A	U	34	11	6	W	1/1/1968	126	42	40.87514	-97.98985	Leadership Center	1609 East Highway 34	Aurora	NE	68818
G-028310	A	P	4	10	6	W	2/28/2006	223	83	40.85950	-98.00350	City of Aurora	905 13th Street	Aurora	NE	68818
G-085068	A	I	14	10	6	W	4/4/1995	180	45	40.83961	-97.96848	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-045432	A	I	1	10	6	W	5/19/1975	208	92	40.86149	-97.94506	Robert E & Tamera I Wert	1401 20th St	Aurora	NE	68818
G-048548	A	C	3	10	6	W	10/23/1975	208	44	40.86835	-97.98891	Aurora Country Club	1807 East 17th Road	Aurora	NE	68818
G-083945E	A	Q	3	10	6	W	6/17/1990	65	50	40.87287	-97.99570	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-057622	A	I	15	10	6	W	6/30/1977	221	86	40.83974	-97.98232	Lucille E Smith NE Land Trt	455 East Puckett Lake Road	West Monroe	LA	71292
G-031910	A	I	15	10	6	W	6/27/1969	225	84	40.83970	-97.99201	Aurora Development Corporation	PO Box 510	Aurora	NE	68818
G-017948	A	I	7	10	5	W	12/1/1954	150	45	40.85056	-97.93551	Jay F Splinter	2101 East 8 Road	Hampton	NE	68843
G-045362	A	I	35	11	6	W	3/12/1975	225	60	40.87969	-97.97394	Ned & Rhonda Grosshans	1701 East Highway 34	Aurora	NE	68818
G-125863	A	C	3	10	6	W	12/1/2003	215	52	40.86531	-97.98819	Aurora Country Club	1807 East 17th Road	Aurora	NE	68818
G-094057	A	D	34	11	6	W	9/28/1995	165	50	40.87402	-97.99443	Craig Dick	1913 Q	Aurora	NE	68818
G-021971	A	I	15	10	6	W	6/20/1962	131	58	40.83015	-97.97782	Mrs Raymond E Anderson	1004 South 14	Aurora	NE	68818
G-017125	A	I	15	10	6	W	4/1/1954	170	76	40.84329	-97.98698	Lynn Tredway	1308 19th Street	Aurora	NE	68818
G-040644	A	I	9	10	6	W	10/31/1973	253	90	40.85080	-98.00580	Mrs Esther Edgerton	Box 1186	Kearney	NE	68848
G-083945B	A	Q	3	10	6	W	10/18/1991	74	50	40.87236	-97.99647	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-094978	A	D	35	11	6	W	10/10/1997	185	68	40.87300	-97.97724	Ned & Rhonda Grosshans	1701 East Highway 34	Aurora	NE	68818
G-083945C	A	Q	3	10	6	W	8/24/1992	64	50	40.87229	-97.99529	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-060070	A	I	34	11	6	W	2/22/1977	150	89	40.87607	-97.98347	Joseph Peter & John Thomas Aalborg	901 West 8th Road	Giltner	NE	68841
G-083945J	A	Q	3	10	6	W	8/29/1989	58	49	40.87223	-97.99638	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-042552	A	I	12	10	6	W	3/22/1974	196	50	40.84695	-97.95456	Robert E & Tamera I Wert	1401 20th St	Aurora	NE	68818
G-083945G	A	Q	3	10	6	W	10/16/1990	65	50	40.87212	-97.99678	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-142970	A	I	1	10	6	W	4/1/1963	210	75	40.86545	-97.94040	Robert E & Tamera I Wert	1401 20th St	Aurora	NE	68818
G-024720	A	I	35	11	6	W	9/22/1965	192	68	40.87695	-97.97859	Ned & Rhonda Grosshans	1701 East Highway 34	Aurora	NE	68818
G-083945D	A	Q	3	10	6	W	10/18/1990	64	50	40.87279	-97.99659	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-057487	A	I	13	10	6	W	2/2/1977	234	82	40.83970	-97.95456	Clarence Luthy	1411 North Street	Aurora	NE	68818
G-089481	A	I	36	11	6	W	3/15/1996	225	73	40.87594	-97.95476	William F Bavinger Trust	1735 East Military	Fremont	NE	68025

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
G-020444	A	I	12	10	6	W	6/2/1959	181	80	40.85693	-97.94511	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
G-083945I	A	Q	3	10	6	W	7/26/2005	75	48	40.87278	-97.99605	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-035378	A	I	1	10	6	W	5/29/1971	208	92	40.87070	-97.94847	Robert E & Tamera I Wert	1401 20th St	Aurora	NE	68818
G-106651	A	I	14	10	6	W	6/28/2000	240	90	40.83594	-97.96396	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-049537	A	I	13	10	6	W	12/31/1975	215	82	40.83969	-97.94497	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
G-026424	A	I	15	10	6	W	2/3/1977	208	60	40.83249	-97.98248	Mrs Raymond E Anderson	1004 South 14	Aurora	NE	68818
G-071273	A	I	7	10	5	W	1/20/1989	210	90	40.85424	-97.93563	Zimmers & Shaw & Grell	8338 West 120th St	Overland Park	KS	66213
G-017123	A	I	10	10	6	W	3/1/1955	150	80	40.85248	-97.98850	Lynn Tredway	1308 19th Street	Aurora	NE	68818
G-104191	A	D	34	11	6	W	9/15/1998	195	78	40.88217	-97.97962	Derek D Nissen	1307 North R Road	Aurora	NE	68818
G-091143	A	D	35	11	6	W	1/2/1997	125	40	40.88026	-97.95997	Gary L Andrews	1305 North S R 6	Aurora	NE	68818
G-016814	A	I	36	11	6	W	12/17/1998	160	30	40.88380	-97.95414	Jeannie Siebert	820 Road F	Henderson	NE	68371
G-041006	A	I	14	10	6	W	3/24/1974	234	88	40.83250	-97.96403	Arch Lile	317 North Shore Drive	Parkville	MO	64150
G-004725	A	I	12	10	6	W	8/3/1956	164	73	40.85602	-97.94265	Blessing & Lewis Family Farm Holdings Trust	PO Box 658	Gainesville	TX	76241
G-008126	A	D	3	10	6	W	5/20/1954	150	72	40.85799	-97.99291	Rendell R & Verda C Friesen	1825 A Street	Aurora	NE	68818
G-029950	A	I	13	10	6	W	5/1/1968	210	93	40.83241	-97.95420	Mrs John Merle Bamesberger		Hampton	NE	68843
G-003884	A	I	9	10	6	W	4/1/1955	180	72	40.84507	-98.00382	Mrs Esther Edgerton	Box 1186	Kearney	NE	68848
G-055482	A	I	13	10	6	W	2/1/1977	221	90	40.83608	-97.95463	Rolland J Bamesberger	96 Lakeview Acres Dr #14C	Johnson Lake	NE	689372229
G-004358	A	I	6	10	5	W	9/17/1956	171	82	40.85963	-97.93816	Norma R Rohde Life Estate	1423 7th Street	Aurora	NE	68818
G-039881	A	I	35	11	6	W	3/15/1973	221	79	40.88323	-97.96433	Philip C Troester	908 South U Road	Hampton	NE	68843
G-022141	A	I	36	11	6	W	6/1/1979	212	63	40.87602	-97.94513	William F Bavinger Trust	1735 East Military	Fremont	NE	68025
G-064488	A	I	6	10	5	W	5/23/1980	234	80	40.87050	-97.93822	Wenell & Tucker & Campbell LE	908 11th Street	Aurora	NE	68818
G-144554	A	I	7	10	5	W	4/9/2007	220	88	40.84706	-97.93553	Ronald L & Leslie G Florea Liv Rev Tr	413 East 9th	Stromsburg	NE	68666
G-083945H	A	Q	3	10	6	W	10/17/1990	65	50	40.87205	-97.99632	J & F Investment Inc	PO Box 87	Aurora	NE	68818
G-006127	A	I	35	11	6	W	2/28/1997	190	68	40.87617	-97.96424	John E Miller	1901 East 14 Road	Aurora	NE	68818
G-115025	A	D	34	11	6	W	6/26/1996	180	46	40.87344	-97.98918	Leadership Center	1609 East Highway 34	Aurora	NE	68818
G-017122	A	I	10	10	6	W	1/1/1934	190	80	40.85048	-97.99510	Lynn Tredway	1308 19th Street	Aurora	NE	68818
G-039713	A	I	12	10	6	W	6/9/1973	211	84	40.85426	-97.94987	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
G-003148	A	I	6	10	5	W	7/24/1956	169	86	40.86688	-97.93820	Wenell & Tucker & Campbell LE	908 11th Street	Aurora	NE	68818
G-091571	A	I	6	10	5	W	2/18/1997	228	90	40.86148	-97.93559	Martin D & Lois E Sagehorn Schroeder	1570 Tower Blvd 121	North Mankato	MN	56003
2-3 Miles																
G-028309	A	P	4	10	6	W	7/24/1956	170	75	40.86612	-98.01340	City of Aurora	905 13th Street	Aurora	NE	68818
G-035327	A	P	4	10	6	W	7/2/1971	248	86	40.86322	-98.01270	City of Aurora	905 13th Street	Aurora	NE	68818
G-045336	A	I	5	10	6	W	3/10/1975	208	68	40.85917	-98.02301	Gilbert M & Meredith G Reel Rev Trusts	3301 Admiralty Drive	Huntington Beach	CA	92649
G-007383	A	I	24	10	6	W	7/1/1947	183	93	40.81980	-97.94723	Rolland J Bamesberger	96 Lakeview Acres Dr #14C	Johnson Lake	NE	68937
G-090443	A	D	5	10	6	W		162	71	40.85883	-98.02044	Tim Granfield	919 15th Street	Aurora	NE	68818
G-055212	A	I	7	10	5	W	2/8/1977	221	85	40.84693	-97.92614	Marcellus Wall	1305 West 10 Road	Aurora	NE	68818
G-159356B	A	Q	21	10	6	W	1/26/2011	83	73	40.82521	-97.99745	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-009042	A	I	36	11	6	W	8/1/1948	110	33	40.88422	-97.94185	E Keller Farms LLP	1308 North T Road	Aurora	NE	68818
G-017809	A	I	4	10	6	W	7/10/1945	160	78	40.85793	-98.01347	Brian K Kremer	2315 Ventura Blvd	Carmarillo	CA	93010
G-017810	A	I	9	10	6	W	8/25/1940	170	78	40.85302	-98.01635	Kenneth D Kremer	210 A Street	Aurora	NE	68818
G-043866	A	I	16	10	6	W	7/3/2000	230	75	40.83418	-98.00399	Robert & Beverly Kremer	186 Donegal Road	Aurora	NE	68818
A-006022	A	I	19	10	5	W	2/13/1954	0	0	40.82084	-97.94004	Robert Wayne Friesen etal	703 South Y Rd	Henderson	NE	68371
G-008417	A	I	31	11	5	W	2/11/1954	184	75	40.87255	-97.93560	Dennis W Goertzen	2209 East 9th Road	Henderson	NE	68371
G-000451A	A	I	8	10	6	W	1/1/1956	0	0	40.84868	-98.01945	Loren E & Doris L Hunnicutt Trustees	1103 South P Road	Aurora	NE	68818
G-035525	A	I	8	10	6	W	6/15/1971	220	82	40.85230	-98.01946	Dave Reardon		Aurora	NE	68818
G-160473F	A	Q	21	10	6	W	8/19/2011	83	73	40.82528	-97.99767	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-059639	A	I	22	10	6	W	3/7/1978	240	100	40.82699	-97.98495	Dennis Martensen	39870 250th Avenue	Humphrey	NE	68642
G-017110	A	I	8	10	5	W	3/3/1974	208	0	40.85770	-97.91928	Richard Regier	125 East Liberty Drive	Henderson	NE	68371
G-025084	A	I	22	10	6	W	2/18/1966	231	100	40.82530	-97.98103	Jessie Ann Anderson	1006 South Highway 14	Aurora	NE	68818
G-029036	A	I	26	11	6	W	7/9/1967	142	47	40.89637	-97.97426	David T George	4138 Parkview Drive	Blair	NE	68008
G-000570	A	I	32	11	5	W	9/1/1955	0	0	40.87421	-97.91920	Wall Farms Inc	557 5th Street	Hampton	NE	68843
G-144104	A	D	26	11	6	W	10/13/2006	179	90	40.90106	-97.96756	Chris Vincent	PO Box 265 1706 E 15 Road	Aurora	NE	68818
G-014552	A	I	26	11	6	W	4/16/1958	190	83	40.89072	-97.96695	J E Shafer Dr		Aurora	NE	68818
G-159356A	A	Q	21	10	6	W	1/25/2011	83	73	40.82506	-97.99752	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
G-008718	A	I	8	10	6	W	6/18/1992	240	92	40.85431	-98.02723	Gloria A Lindberg	5929 Forrestview Lane North	Plymouth	MN	55442
G-060029	A	I	16	10	6	W	5/17/1978	199	75	40.83247	-98.01671	Gale L Christenson	619 M Street	Aurora	NE	68818
G-162740B	A	Q	22	10	6	W	4/5/2012	83	72	40.82462	-97.99678	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-007918	A	I	19	10	5	W	12/11/1956	212	97	40.82432	-97.93995	Arthur E George	3712 Kentford Road	Fort Collins	CO	80525
G-017156	A	I	7	10	5	W	6/17/1981	225	88	40.85408	-97.92637	Ron L & Penny M Buller	1802 East 8 Road	Aurora	NE	68818
G-132169	A	D	30	11	5	W	11/11/2004	162	44	40.88722	-97.93833	John E Miller	1901 East 14 Road	Aurora	NE	68818
G-155786	A	I	24	10	6	W	4/13/2010	270	83	40.82267	-97.95272	Lucille E Smith NE Land Trt	455 East Puckett Lake Road	West Monroe	LA	71292
G-000284	A	I	30	11	5	W	12/1/1970	166	43	40.88864	-97.93815	Fred Enderle	1406 P Street	Aurora	NE	68818
G-083727	A	D	5	10	6	W	7/15/1994	160	82	40.86079	-98.01744	Peggy A Richter	317 1st Street	Aurora	NE	68818
G-008736	A	I	14	10	6	W	3/16/1956	184	81	40.82888	-97.95933	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-027436	A	I	8	10	5	W	5/16/1967	200	75	40.85051	-97.91655	Arthur Anderson		Aurora	NE	68818
G-162740C	A	Q	22	10	6	W	4/6/2012	82	70	40.82504	-97.99677	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-037694	A	I	33	11	6	W	7/12/1972	208	86	40.88326	-98.01221	Joe Strotman Jr etal	RR 2	Aurora	NE	68818
G-017119	A	I	16	10	6	W	1/1/1949	180	80	40.84137	-98.00552	Gary D & Shauna L Moody	1602 East 11th Road	Aurora	NE	68818
G-060882	A	I	28	11	6	W	12/1/1978	208	90	40.89053	-98.00268	Strotman Trusts	PO Box 180	Beatrice	NE	68310
G-039880	A	I	27	11	6	W	8/26/1981	221	85	40.89055	-97.99074	Joleen M Traudt	1605 East 14th Road	Aurora	NE	68818
G-160473D	A	Q	21	10	6	W	8/18/2011	77	67	40.82531	-97.99705	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-084856	A	I	33	11	6	W	4/29/1995	190	80	40.88503	-98.00020	City of Aurora	905 13th Street	Aurora	NE	68818
A-005739	A	I	24	10	6	W	7/1/1945	0	0	40.82638	-97.94166	Arthur E George	3712 Kentford Road	Fort Collins	CO	80525
G-056432	A	I	25	11	6	W	2/1/1977	221	78	40.89422	-97.95477	William F Bavinger Trust	1735 East Military	Fremont	NE	68025
G-130197	A	D	13	11	5	W	8/19/2004	150	60	40.87964	-97.93911	Duane L Keller	1308 North T Road	Aurora	NE	68818
G-017132	A	I	23	10	6	W	1/18/1966	211	96	40.82496	-97.97778	Phoebe McCarthy	American Embassy APO 231	New York	NY	10044
G-003453	A	I	6	10	5	W	1/21/1971	236	92	40.86866	-97.92167	Gail R & Norma Wert	1605 East 12 Road	Aurora	NE	68818
G-006534	A	I	18	10	5	W	5/20/1957	211	92	40.82950	-97.94015	Cory L & Tracy Ohlson	1208 South S Road	Aurora	NE	68818
G-027021	A	I	8	10	5	W	3/3/1967	209	80	40.85418	-97.91654	Marvin L & Lorene A Kroeker & Friesen	Box 367	Henderson	NE	68371
G-162740A	A	Q	21	10	6	W	4/5/2012	83	73	40.82473	-97.99713	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-049471	A	I	15	10	6	W	2/26/1976	182	60	40.83249	-97.99196	Rae Ann Anderson Weymouth Trust	548 3rd Street	Ann Arbor	MI	48103
G-007415	A	I	18	10	5	W	2/15/1945	175	86	40.83060	-97.92840	Gustav Troester		Hampton	NE	68843
G-010223	A	I	23	10	6	W	6/1/1940	185	70	40.82151	-97.95933	John M Pogue	PO Box 1186	Kearney	NE	68848
G-010864	A	I	5	10	5	W	4/25/1956	220	85	40.86549	-97.91562	Richard Regier	125 East Liberty Drive	Henderson	NE	68371
G-040100	A	I	18	10	5	W	10/20/1973	195	65	40.83242	-97.93538	Melvin Troester		Hampton	NE	68843
G-042182	A	I	17	10	5	W	9/3/1974	195	70	40.84165	-97.91887	Allen D Troester et al	419 Park Cirlce Dr	Sterling	CO	80751
G-017807	A	I	27	11	6	W	2/8/1957	191	86	40.89813	-97.98350	Clarence Heiser etux etal	400 North 75th St	Lincoln	NE	68505
G-047786	A	I	6	10	5	W	3/22/1975	228	90	40.86141	-97.92624	Edmond & Ruth George Test Trust	901 South U Road	Hampton	NE	68843
G-014589	A	I	5	10	6	W	5/18/1956	165	75	40.86875	-98.01844	Alice Matson	PO Box 144	Marquette	NE	68854
G-140173	A	I	17	10	6	W	4/12/2006	245	85	40.84253	-98.01733	Aleeta C Wilson 1999 Trust	200 South Harding Road	Columbus	OH	43209
G-062940	A	I	24	10	6	W	6/14/1979	299	90	40.82636	-97.94562	Arthur E George	3712 Kentford Road	Fort Collins	CO	80525
G-017106	A	I	33	11	6	W	8/3/1956	103	40	40.87965	-98.00139	Streeter LLC	PO Box 228	Aurora	NE	68818
G-047740	A	I	18	10	5	W	6/1/1967	164	41	40.83786	-97.93800	Ronald L & Leslie G Florea Liv Rev Tr	413 East 9th	Stromsburg	NE	68666
G-160473B	A	Q	21	10	6	W	8/17/2011	83	73	40.82491	-97.99747	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-071925	A	I	31	11	5	W	1/11/1989	200	40	40.88326	-97.93563	D Keller Farms Inc	1308 North T Rd	Aurora	NE	68818
G-032438	A	I	31	11	5	W	3/27/1997	200	85	40.87268	-97.92982	E Keller Farms LLP	1308 North T Road	Aurora	NE	68818
G-006408	A	I	13	10	6	W	6/16/2000	240	100	40.83595	-97.94498	Mildred B Strong Mrs Wallace	11 North Circle Drive	York	NE	68467
G-143498	A	D	5	10	6	W	3/17/2006	213	89	40.85889	-98.01861	Robert Honken	203 1st Street	Aurora	NE	68818
G-024609	A	I	33	11	6	W	7/19/1965	112	42	40.87827	-98.00735	Streeter LLC	PO Box 228	Aurora	NE	68818
G-030931	A	I	32	11	6	W	5/16/1968	183	0	40.87611	-98.02030	Phillip D Wiltfong	RR 1 Box 185	Aurora	NE	68818
G-145549	A	D	18	10	5	W	5/10/2007	154	40	40.84275	-97.93469	Jeff Hoines	180 Limerick Road	Aurora	NE	68818
G-115188	A	C	21	10	6	W	1/1/1966	150	0	40.82494	-97.99776	K A G A Inc	909 South 14th	Aurora	NE	68818
G-064697	A	I	21	10	6	W	5/2/1980	208	90	40.82331	-98.00412	Arthur E George	3712 Kentford Road	Fort Collins	CO	80525
G-024637	A	I	24	10	6	W	7/10/1965	224	86	40.81978	-97.95913	John M Pogue	PO Box 1186	Kearney	NE	68848
G-027105	A	I	34	11	6	W	4/14/1967	210	92	40.88471	-97.98598	Velda Anderson	907 11th Street	Aurora	NE	68818
G-024598	A	I	18	10	5	W	12/24/1964	150	50	40.83323	-97.92578	Melvin Troester		Hampton	NE	68843
G-094184	A	D	33	11	6	W	11/19/1969	152	40	40.87928	-98.01622	George Fort	1340 North P Road	Aurora	NE	68818
G-038049	A	I	33	11	6	W	10/20/1970	156	83	40.88321	-97.99897	Streeter LLC	PO Box 228	Aurora	NE	68818

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
G-011439	A	I	25	11	6	W	3/6/1957	201	68	40.89024	-97.95719	William F Bavinger Trust	1735 East Military	Fremont	NE	68025
G-159356C	A	Q	21	10	6	W	1/26/2011	83	73	40.82504	-97.99723	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-128478	A	Q	25	11	6	W	2/25/2004	114	78	40.89792	-97.95717	United States Geological Survey	100 Centennial Mall North Room 406	Lincoln	NE	68508
G-012230	A	I	9	10	6	W	6/1/1980	257	100	40.84688	-98.01097	Mrs Esther Edgerton	Box 1186	Kearney	NE	68848
G-160473E	A	Q	21	10	6	W	8/18/2011	77	71	40.82481	-97.99676	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-068029	A	I	23	10	6	W	4/22/1982	208	100	40.81616	-97.96628	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-087718	A	D	26	11	6	W	10/26/1995	170	80	40.89059	-97.97845	Thomas C Kell	1507 N North Road	Aurora	NE	68818
G-043913	A	I	23	10	6	W	3/18/1974	214	80	40.82138	-97.97757	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-121158	A	C	21	10	6	W	1/1/1972	150	0	40.82399	-97.99851	Donald H & Deanna R Stearns	907 South Highway 14	Aurora	NE	68818
G-117274	A	D	26	11	6	W	6/20/2002	160	72	40.89056	-97.97728	Thomas C Kell	1507 N North Road	Aurora	NE	68818
A-006020	A	I	8	10	5	W	2/1/1953	0	0	40.84682	-97.92128	Allen Troester Trustee etal	1620 Firetree Ln	Edmond	OK	73003
G-017732	A	I	23	10	6	W	3/4/1954	184	86	40.82208	-97.95925	The Excell Company	PO Box 218	Henderson	NE	68371
G-033518	A	I	27	11	6	W	5/21/1970	221	87	40.89630	-97.99321	Joleen M Traudt	1605 East 14th Road	Aurora	NE	68818
G-160473C	A	Q	21	10	6	W	8/18/2011	81	71	40.82498	-97.99706	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-160473A	A	Q	21	10	6	W	8/17/2011	85	73	40.82503	-97.99797	Kaga Inc	401 Pheasant Drive	Aurora	NE	68818
G-004003	A	I	34	11	6	W	3/1/1954	170	83	40.88677	-97.99696	Glade & Carolyn Snoberger	1308 North Hwy 14	Aurora	NE	68818
G-036122	A	I	24	10	6	W	6/18/1971	220	95	40.82522	-97.95590	Walter B Goertzen	1271 North 10th Street	Henderson	NE	68371
G-059640	A	I	22	10	6	W	12/28/2004	220	90	40.82581	-97.99083	Jessie Ann Anderson Estate	PO Box 2028	Aurora	NE	68818
G-029658	A	I	27	11	6	W	3/20/1990	200	85	40.89050	-97.98347	Nelda Akerson	109 Park Lane	Aurora	NE	68818
A-008170	A	I	31	11	5	W	5/28/1955	0	0	40.87330	-97.92170	E Keller Farms LLP	1308 North T Road	Aurora	NE	68818
G-016024	A	I	33	11	6	W	8/2/1956	122	51	40.87655	-98.01224	George W Eberly	601 Terrie Rd	Aurora	NE	68818
G-048998	A	I	24	10	6	W	12/31/1975	182	100	40.82704	-97.95204	Zimmers & Shaw & Grell	8338 West 120th St	Overland Park	KS	66213
G-006037	A	I	5	10	5	W	5/3/1954	160	82	40.86143	-97.91661	Reubon Ross		Aurora	NE	68818
G-035479	A	I	7	10	5	W	6/19/1971	215	79	40.85048	-97.93081	Ronald L & Leslie G Florea Liv Rev Tr	413 East 9th	Stromsburg	NE	68666
G-001930	A	I	31	11	5	W	3/1/1956	0	0	40.88471	-97.92756	E Keller Farms LLP	1308 North T Road	Aurora	NE	68818
G-061793	A	I	25	11	6	W	5/22/1979	182	40	40.89045	-97.94517	George Farms Inc	1606 East 12 Road	Aurora	NE	68818
G-015435	A	I	18	10	5	W	5/9/1956	122	51	40.83615	-97.93117	Ronald L & Leslie G Florea Liv Rev Tr	413 East 9th	Stromsburg	NE	68666
G-017817	A	I	16	10	6	W	7/10/1956	157	8	40.83964	-98.01582	Ray L Miller	1504 West 11 Road	Aurora	NE	68818
G-050843	A	I	26	11	6	W	4/2/1976	221	88	40.89593	-97.96675	Ed L Ediger Farms Inc	1205 South West Road	Hampton	NE	68843
G-000575	A	I	22	10	6	W	11/13/1987	240	100	40.81791	-97.98254	Wendt & Smith	7529 South 186th Street	Omaha	NE	68136
3-4 Miles																
G-101011	A	P	32	11	6	W	4/12/1999	218	60	40.878771	-98.020930	City of Aurora	905 13th Street	Aurora	NE	68818
G-120889	A	U	22	10	6	W	1/1/1976	0	0	40.818167	-97.996056	Timpte Industries Inc	1827 Industrial Drive	David City	NE	68632
A-005618	A	I	32	11	6	W	4/12/1999	218	60	40.87877	-98.02093	City of Aurora	905 13th Street	Aurora	NE	68818
G-005575	A	I	22	10	6	W	1/1/1976	0	0	40.81817	-97.99606	Timpte Industries Inc	1827 Industrial Drive	David City	NE	68632
G-012606	A	I	4	10	5	W	11/17/1999	220	85	40.86516	-97.89757	Ed L Ediger Farms Inc	1205 South West Road	Hampton	NE	68843
G-058928	A	I	24	11	6	W	5/15/1948	204	93	40.91229	-97.94702	Glade & Carolyn Snoberger	1308 North Hwy 14	Aurora	NE	68818
G-000529	A	I	26	10	6	W	5/22/1957	194	86	40.81070	-97.97301	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-005071	A	I	17	10	6	W	3/31/1975	225	91	40.83247	-98.02167	James B Anderson	1019 11th St	Aurora	NE	68818
G-000558	A	I	5	10	5	W	4/10/2007	220	80	40.86153	-97.90731	Peggy Jean Cronin Trust	711 West Why Worry Lane	Phoenix	AZ	85021
G-050264	A	I	24	11	6	W	9/16/1955	182	81	40.90524	-97.95951	Robert W Jorgensen	1801 East 15 Road	Aurora	NE	68818
G-014293	A	I	22	10	6	W	4/9/1956	0	0	40.81609	-97.98980	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-133954	A	I	30	10	5	W	5/19/1976	210	85	40.81072	-97.93534	Keith Erlenbusch	PO Box 368	Aurora	NE	68818
G-065365	A	I	20	10	6	W	2/25/1977	225	65	40.81791	-98.02139	Rae Ann Anderson Weymouth Trust	548 3rd Street	Ann Arbor	MI	48103
G-005876	A	I	20	10	5	W	3/18/2005	220	71	40.81694	-97.92097	Berdon Epp etal	508 Road E	Henderson	NE	68371
G-049377	A	I	30	10	5	W	2/28/2011	252	77	40.81057	-97.92611	Kurt H Troester	808 South U Road	Hampton	NE	68843
G-142855	A	I	23	11	6	W	11/6/1955	182	81	40.90333	-97.97633	O T Petersen		Aurora	NE	68818
G-115669K	A	Q	5	10	5	W	2/23/1976	234	92	40.87218	-97.91561	Richard Regier	125 East Liberty Drive	Henderson	NE	68371
A-006147	A	C	30	11	5	W	4/1/1976	195	70	40.90124	-97.93600	William R & Joann E Hansen Trusts	4121 N Bloom Road	Manistique	MI	49854
G-016994	A	I	33	11	5	W	1/14/2003	90	85	40.87844	-97.89958	United Farmers Cooperative	312 Crownover Street Box 132	Benedict	NE	68316
G-036325	A	I	6	10	6	W	9/12/2007	240	84	40.87019	-98.04272	Aventine Renewable Energy Inc	1300 South 2nd Street	Perkin	IL	61554
G-001420	A	I	21	11	6	W	11/16/1999	225	86	40.90157	-98.00269	D Keller Farms Inc	1308 North T Rd	Aurora	NE	68818
G-014894	A	I	7	10	6	W	2/23/1972	236	83	40.85615	-98.04363	Dale A Keller	1867 West Barberry Court	Louisville	CO	80027
G-000957	A	I	8	10	5	W	1/8/1956	0	0	40.85772	-97.91187	Sheryl R Hutsell	1103 South V Road	Hampton	NE	68843

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
G-045905	A	I	7	10	6	W	5/20/1955	153	73	40.85505	-98.03632	Wesley Smith		Aurora	NE	68818
G-088607	A	D	26	10	6	W	5/3/1956	180	82	40.80698	-97.96603	Eunice M Moore	8 Gray Fox Ln	Hilton Head	SC	29926
G-015818	A	I	9	10	5	W	1/8/1975	184	49	40.85429	-97.89741	Walter B Goertzen	1271 North 10th Street	Henderson	NE	68371
G-059996	A	I	7	10	6	W	7/3/1995	235	74	40.85148	-98.03649	Gary Berthelsen	1107 South Ord	Aurora	NE	68818
G-141401	A	Q	25	10	6	W	6/24/1957	182	82	40.80344	-97.94954	Forrest Hart	2718 11th Avenue	Seattle	WA	98134
G-054754	A	I	28	11	6	W	5/10/1978	221	90	40.89778	-98.00269	D Keller Farms Inc	1308 North T Rd	Aurora	NE	68818
G-003161	A	I	6	10	6	W	7/11/2006	145	87	40.86850	-98.04325	Aventine Renewable Energy Inc	1300 South 2nd Street	Perkin	IL	61554
G-046753	A	I	17	10	6	W	7/19/1976	182	60	40.84066	-98.02387	Timothy L Schaffert LE	1406 West 11 Road	Aurora	NE	68818
G-059193	A	I	33	11	5	W	11/30/1956	205	88	40.87784	-97.90010	Wall Farms Inc	557 5th Street	Hampton	NE	68843
G-058449	A	I	32	11	6	W	3/11/1975	196	35	40.88254	-98.02639	Mankin Farms Inc	1204 16th Street	Aurora	NE	68818
A-005412	A	I	21	10	6	W	5/16/1974	195	78	40.81641	-98.01646	Rae Ann Anderson Weymouth Trust	548 3rd Street	Ann Arbor	MI	48103
G-019280	A	I	27	10	6	W	5/7/1977	231	101	40.81398	-97.99683	Will A & Ben L Baird	PO Box 523	York	NE	68467
G-001085	A	I	20	10	6	W	7/1/1949	0	0	40.82691	-98.02402	Ron L & Penny M Buller	1802 East 8 Road	Aurora	NE	68818
G-143034	A	I	27	10	6	W	6/28/1958	204	92	40.81063	-97.98385	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-062159	A	I	32	11	6	W	9/21/1956	0	0	40.88325	-98.02172	Mankin Farms Inc	1204 16th Street	Aurora	NE	68818
G-124011	A	D	22	11	6	W	1/6/1976	182	97	40.90514	-97.99308	Nelda Akerson	109 Park Lane	Aurora	NE	68818
G-082128	A	I	17	10	5	W	6/13/1979	182	65	40.84154	-97.90935	Joe D Hutsell	175 Driftwood Drive	Aurora	NE	68818
G-037208	A	I	32	11	6	W	6/16/2003	155	67	40.87911	-98.03578	Tom Cornwell	1703 N Street	Aurora	NE	68818
G-006613	A	I	8	10	6	W	6/13/1994	244	92	40.85231	-98.03567	Gloria A Lindberg	5929 Forrestview Lane North	Plymouth	MN	55442
G-015815	A	I	26	11	6	W	3/4/1969	210	76	40.90140	-97.97402	Robert E & Bonita L & Adam R Osward	1705 E 18 Rd	Aurora	NE	68818
G-066756	A	I	17	10	6	W	11/10/1956	162	85	40.83408	-98.02888	Lena Fox		Aurora	NE	68818
A-006731	A	I	4	10	5	W	1/4/1957	165	86	40.86822	-97.90226	Ed L Ediger Farms Inc	1205 South West Road	Hampton	NE	68843
G-026859	A	I	23	11	6	W	3/12/1981	234	92	40.91417	-97.97162	Enderle Family Trust	1506 West 18 Road	Aurora	NE	68818
G-082306	A	D	25	10	6	W	8/1/1954	0	0	40.80165	-97.95677	Ruth Hart		Aurora	NE	68818
G-067561	A	I	5	10	5	W	11/29/1966	171	81	40.86882	-97.90386	Joe D Hutsell	175 Driftwood Drive	Aurora	NE	68818
G-020350	A	I	17	10	6	W	7/15/1994	208	75	40.82910	-98.01780	Mrs Raymond E Anderson	1004 South 14	Aurora	NE	68818
G-025951	A	I	25	10	6	W	12/24/1981	208	85	40.80527	-97.95676	Orville V & V Stuart Nielsen	1220 L Street	Aurora	NE	68818
G-010056	A	I	31	11	6	W	5/20/1959	161	73	40.87259	-98.03818	Edith L Scott	1309 West Highway 34	Aurora	NE	68818
G-013570	A	I	18	10	6	W	11/23/1965	202	86	40.83402	-98.03972	Loren E & Doris L Hunnicutt Trustees	1103 South P Road	Aurora	NE	68818
G-011890	A	I	27	11	6	W	11/6/1954	180	83	40.90140	-97.98362	D Keller Farms Inc	1308 North T Rd	Aurora	NE	68818
A-005668	A	I	22	11	6	W	10/2/1957	192	87	40.90879	-97.98602	Chris C Hansen		Aurora	NE	68818
G-005145	A	I	27	10	6	W	9/5/1947	186	82	40.80582	-97.98745	Darlene F Franz Living Trust	312 South Kennedy Street	Hillsboro	KS	67063
G-045334	A	I	5	10	6	W	9/20/1948	184	0	40.86877	-98.03122	Malcolm Scott Torgerson etal	815 South Pearl St	Macomb	IL	61455
G-157439	A	D	28	10	6	W	5/22/1956	202	91	40.81249	-97.99941	Woodard Family Trust	PO Box 329	Aurora	NE	68818
G-020365	A	I	28	10	6	W	3/5/1975	221	75	40.81068	-98.00180	Woodard Family Trust	PO Box 329	Aurora	NE	68818
G-067282	A	I	7	10	6	W	7/26/2010	195	47	40.84583	-98.03806	Gina Schaffert	1003 So O Rd	Aurora	NE	68818
G-103464	A	I	19	11	5	W	4/27/1959	181	75	40.90537	-97.92840	Shirley M Majors Rev Trust	Box 5	Ericson	NE	68637
G-017503	A	I	29	11	5	W	1/21/1981	156	50	40.89953	-97.91949	Harvey L Nunnenkamp et al	2003 East 15th Road	Hampton	NE	68843
G-019135	A	I	24	11	6	W	11/23/1999	220	89	40.90738	-97.94043	Philip C Troester	908 South U Road	Hampton	NE	68843
G-017464	A	I	30	10	5	W	2/10/1954	183	79	40.81434	-97.94001	Clemens Erlenbusch	Box 368	Aurora	NE	68818
G-098166	A	D	17	10	6	W	6/1/1955	160	73	40.83692	-98.03367	Homer Smith	RR 1	Aurora	NE	68818
G-022490	A	I	20	10	5	W	11/16/1954	180	73	40.82883	-97.91163	Todd Regier	503 South O Road	Aurora	NE	68818
G-036524	A	I	17	10	6	W	8/27/1998	150	80	40.82965	-98.01771	Anderson Ag Enterprise	1004 South Highway 14	Aurora	NE	68818
G-063704	A	I	9	10	5	W	7/4/1963	171	69	40.85072	-97.90214	Walter B Goertzen	1271 North 10th Street	Henderson	NE	68371
G-040470	A	I	17	10	5	W	2/11/1971	172	43	40.83965	-97.90693	Michael Regier	804 South W Road	Hampton	NE	68843
G-046418	A	I	9	10	5	W	4/22/1980	182	90	40.84707	-97.89742	Richard Regier	406 South W Rd	Aurora	NE	68818
G-061553	A	I	32	11	6	W	10/23/1973	233	90	40.88693	-98.01910	Mankin Farms Inc	1204 16th Street	Aurora	NE	68818
G-162491	A	I	22	11	6	W	4/2/1975	223	85	40.91246	-97.99294	Nelda Akerson	109 Park Lane	Aurora	NE	68818
G-004327	A	I	25	11	6	W	5/8/1979	215	95	40.89951	-97.95229	Shirley M Majors Rev Trust	Box 5	Ericson	NE	68637
G-003046	A	I	33	11	5	W	3/23/2012	220	78	40.87248	-97.89777	Sheryl R Hutsell	1103 South V Road	Hampton	NE	68843
G-003968	A	I	27	10	6	W	2/17/1957	181	84	40.80524	-97.99468	Dan H & Julie Newman	1501 North Highway 14	Aurora	NE	68818
G-005215	A	I	8	10	5	W	4/4/1954	164	62	40.84513	-97.90936	David D & Sheryl R	1103 South V Rd	Hampton	NE	68843
G-056060	A	I	30	11	5	W	4/15/1957	160	39	40.89953	-97.92857	Philip C Troester	908 South U Road	Hampton	NE	68843
G-063408	A	I	20	10	5	W	10/31/1987	221	85	40.82380	-97.91797	Beaver Valley Farms Inc	PO Box 246	Hampton	NE	68843

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
G-005706	A	I	21	10	6	W	10/26/1976	221	85	40.81608	-98.00893	R F Schaffert	RR 1	Aurora	NE	68818
G-001699	A	I	17	10	5	W	4/22/1972	195	85	40.84158	-97.90458	Wilbur H L Splinter	RR 1 Box 142	Hampton	NE	68843
G-001700	A	I	32	11	6	W	1/1/1954	165	69	40.88419	-98.03412	Delmer L & Delores Wadell	1401 West 14th Road	Aurora	NE	68818
G-023683	A	I	32	11	5	W	5/25/1954	0	0	40.87816	-97.90651	Jane Jost	908 South Y Road	Henderson	NE	68371
G-038846	A	I	32	11	5	W	4/25/1956	0	0	40.87501	-97.91673	Jane Jost	908 South Y Road	Henderson	NE	68371
G-017504	A	I	5	10	6	W	3/9/1964	193	80	40.86503	-98.03603	Loren E & Doris L Hunnicutt Trustees	1103 South P Road	Aurora	NE	68818
G-059608	A	I	17	10	5	W	3/19/1973	182	65	40.83243	-97.91646	Beverly J Troester	15693 Dresden Lake Court	Chesterfield	MO	63017
G-016699	A	I	30	10	5	W	6/30/1948	182	75	40.80795	-97.94003	Clemens Erlenbusch	Box 368	Aurora	NE	68818
G-036669	A	I	19	11	5	W	3/6/1978	150	84	40.90498	-97.93571	D Keller Farms Inc	1308 North T Rd	Aurora	NE	68818
G-085801	A	D	28	10	6	W	3/5/1942	126	0	40.81319	-98.01659	Gloria A Lindberg	5929 Forrestview Lane North	Plymouth	MN	55442
G-047351	A	I	17	10	5	W	2/22/1968	188	51	40.83156	-97.90815	Susan A L Regier Harthill Farm Ltd	1410 8th Street	Aurora	NE	68818
G-086357	A	Q	32	11	6	W	5/9/1994	232	80	40.87301	-98.03306	Scott A & Cynthia R Gaskill	1417 West Highway 34	Aurora	NE	68818
G-071385	A	I	23	11	6	W	4/4/1975	234	86	40.90507	-97.96440	E Keller Farms LLP	1308 North T Road	Aurora	NE	68818
G-004002	A	I	4	10	5	W	11/1/1995	105	86	40.87225	-97.89771	Upper Big Blue Natural Resources District	105 North Lincoln Avenue	York	NE	68467
G-091297	A	I	32	11	5	W	1/13/1989	225	82	40.88283	-97.90741	Jane Jost	908 South Y Road	Henderson	NE	68371
G-024842	A	I	32	11	5	W	12/6/1956	194	72	40.88508	-97.91934	Joe Fagan		Hampton	NE	68843
A-003340	A	I	8	10	5	W	2/27/1997	220	75	40.85425	-97.90692	Esther M Hutsell	1103 South V Road	Hampton	NE	68843
G-017675	A	I	27	10	6	W	11/10/1964	214	90	40.81422	-97.98511	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-017674	A	I	4	10	5	W	2/6/1980	224	83	40.86156	-97.89758	Ed L Ediger Farms Inc	1205 South West Road	Hampton	NE	68843
G-104188	A	D	26	10	6	W	5/12/1953	183	75	40.81068	-97.96849	Margaret Troester	1341 F Street	Lincoln	NE	68502
G-044166	A	I	25	10	6	W	5/15/1952	195	75	40.81074	-97.95194	Paul Troester	1806 East 9th Rd	Hampton	NE	68843
G-003513	A	I	17	10	6	W	5/18/1999	174	70	40.83062	-98.02327	Douglas & Patricia Anderson	1407 West 10 Road	Aurora	NE	68818
G-083859	A	I	17	10	6	W	10/27/1973	238	88	40.82882	-98.03153	Arthea C Smith Farms		Aurora	NE	68818
G-097562	A	I	28	11	6	W	4/3/1956	183	83	40.89603	-98.01462	D Keller Farms Inc	1308 North T Rd	Aurora	NE	68818
G-017102	A	I	5	10	5	W	1/20/1995	235	92	40.86877	-97.91195	Richard Regier	125 East Liberty Drive	Henderson	NE	68371
G-145254	A	I	20	10	6	W	4/10/1996	210	85	40.81915	-98.02495	Richard J Schaffert	906 South O Road	Aurora	NE	68818
G-015111	A	I	6	10	6	W	6/16/1971	238	85	40.86183	-98.04260	Wendell Mankin	RR 2 Box 180	Aurora	NE	68818
G-006612	A	I	32	11	5	W	5/22/2007	240	75	40.87456	-97.90647	Cory Ohlson	1208 South S Road	Aurora	NE	68818
G-005216	A	I	19	10	5	W	1/26/1945	175	79	40.82475	-97.92759	Philip C Troester	908 South U Road	Hampton	NE	68843
G-084588	A	C	23	11	6	W	6/15/1977	240	102	40.91232	-97.96444	Nelda Akerson	109 Park Lane	Aurora	NE	68818
G-005217	A	I	30	10	5	W	9/15/1948	185	74	40.80698	-97.94000	Donald W Troester Trustee	1813 O St	Aurora	NE	68818
G-005144	A	I	6	10	6	W	4/5/1995	200	90	40.86849	-98.03644	Nebraska Energy L L C	1205 South O Road Box 226	Aurora	NE	68818
G-044624	A	I	17	10	5	W	7/10/1955	179	69	40.83064	-97.91407	Beverly J Troester	15693 Dresden Lake Court	Chesterfield	MO	63017
G-029621	A	I	21	10	6	W	4/1/1955	173	97	40.81605	-97.99939	Woodard Family Trust	PO Box 329	Aurora	NE	68818
G-012605	A	I	8	10	6	W	6/7/1973	249	90	40.84683	-98.03138	Loren E & Doris L Hunnicutt Trustees	1103 South P Road	Aurora	NE	68818
G-014467	A	I	5	10	6	W	5/6/1968	201	87	40.86517	-98.03131	Lee Scott	1309 West Highway 34	Aurora	NE	68818
G-081334	A	I	26	10	6	W	12/18/1970	214	86	40.80334	-97.97339	T & M Inc	PO Box 92	Hotchkiss	CO	81419
A-006019	A	I	23	10	6	W	4/30/1947	165	75	40.81436	-97.97572	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-086358	A	Q	29	11	5	W	3/18/1994	223	80	40.89047	-97.91702	Robert H & Linda J Dose	2407 East 19 Road	Hampton	NE	68843
G-041085	A	I	19	10	5	W	4/1/1946	0	0	40.81979	-97.92143	Robert Wayne Friesen etal	703 South Y Rd	Henderson	NE	68371
G-019134	A	I	4	10	5	W	11/1/1995	195	86	40.87227	-97.89771	Upper Big Blue Natural Resources District	105 North Lincoln Avenue	York	NE	68467
G-061792	A	I	21	10	6	W	2/12/1974	208	70	40.82244	-98.01672	R F Schaffert	RR 1	Aurora	NE	68818
G-029151	A	I	18	10	6	W	4/1/1948	180	80	40.83610	-98.04059	Robert M Kremer	186 Donegal Road	Aurora	NE	68818
G-033933	A	I	25	11	6	W	5/22/1979	182	43	40.89770	-97.94514	Kate Robertson Trust Share A	233 South 13th Street Ste 1012	Lincoln	NE	68508
G-016401	A	I	8	10	6	W	4/7/1967	200	92	40.85623	-98.03604	Gloria A Lindberg	5929 Forrestview Lane North	Plymouth	MN	55442
G-005023	A	I	25	10	6	W	5/20/1970	200	98	40.81080	-97.95895	Phyllis J Troester	RR 1	Hampton	NE	68843
A-007573	A	I	8	10	5	W	11/8/1958	161	73	40.85055	-97.90724	David D Hutsell	1103 South V Rd	Hampton	NE	68843
G-042791	A	I	29	11	6	W	2/14/1955	193	92	40.89743	-98.02347	Robert & Beverly Kremer	186 Donegal Road	Aurora	NE	68818
G-071293	A	I	29	11	6	W	12/15/1995	200	85	40.89333	-98.02801	Albert E Springer	1418 8th Street	Aurora	NE	68818
G-145679	A	D	24	11	6	W	11/20/1974	208	80	40.90500	-97.95007	Beaver Valley Farms Inc	PO Box 246	Hampton	NE	68843
G-006618	A	I	30	11	5	W	4/5/1989	210	70	40.89041	-97.92831	John E Miller	1901 East 14 Road	Aurora	NE	68818
G-036932	A	I	31	11	6	W	6/12/2007	160	65	40.87710	-98.03666	Lee Scott	1309 West Highway 34	Aurora	NE	68818
G-004735	A	I	22	11	6	W	4/23/1974	182	90	40.90522	-97.98361	Fern K Anawalt	1122 13th Street	Aurora	NE	68818
G-003232	A	I	29	11	6	W	5/25/1972	230	89	40.89064	-98.02318	Albert E Springer	1418 8th Street	Aurora	NE	68818

REGISTERED WELLS WITHIN 4-MILE RADIUS OF 1704 EAST 12TH ROAD, AURORA, NE

Registration Number	Status	Use Type	Section	Township	Range	Range Direction	Completion Date	Total Depth	Static Water Level	Latitude	Longitude	Owner Name	Address	City	State	Zipcode
G-149858	A	I	27	10	6	W	7/21/1948	176	0	40.81405	-97.98760	Will A & Ben L Baird	PO Box 523	York	NE	68467
G-049284	A	I	28	11	6	W	12/28/1954	174	83	40.88878	-98.01462	Koepke Trustees	1635 Beechwood Drive	Aurora	NE	68818
G-012604	A	I	27	11	6	W	1/1/1960	0	0	40.89850	-97.99513	Aurora Airport Authority	1406 North Hwy 14	Aurora	NE	68818
G-039912	A	I	16	10	5	W	10/14/1974	195	90	40.83799	-97.89982	Henry G Dick		Henderson	NE	68371
G-012100	A	I	26	10	6	W	7/3/1951	181	92	40.81215	-97.97574	T & M Inc	PO Box 92	Hotchkiss	CO	81419
G-000220	A	I	24	11	6	W	5/24/1973	221	98	40.91232	-97.95489	Ann Jorgensen	1801 East 15 Road	Aurora	NE	68818
G-070681	A	I	23	11	6	W	6/2/1992	230	87	40.91246	-97.97648	V Irene Strong Trust	1620 10th Street	Aurora	NE	68818
G-004954	A	I	20	10	6	W	6/1/1955	0	0	40.82681	-98.03356	John Reardon		Aurora	NE	68818
G-003644	A	I	19	10	5	W	6/20/1987	221	85	40.82062	-97.92984	Robert Wayne Friesen etal	703 South Y Rd	Henderson	NE	68371
G-007607	A	I	32	11	6	W	6/10/1957	172	75	40.87375	-98.03127	Arthur E George	3712 Kentford Road	Fort Collins	CO	80525
G-008719	A	I	21	11	6	W	3/15/1957	198	88	40.90333	-98.01465	Beaver Valley Farms Inc	PO Box 246	Hampton	NE	68843
G-065726	A	I	4	10	5	W	11/18/1953	184	82	40.86978	-97.89749	David D & Sheryl R Hutsell	1103 S V Road	Hampton	NE	68843
G-065727	A	I	25	10	6	W	11/19/1985	240	85	40.80532	-97.94722	Ruben D Friesen	1171 18th Street	Henderson	NE	68371

Use Types: P = Public Water Supply (spacing protection) U = Public Water Supply (No spacing protection) D = Domestic I = Irrigation S = Stock J = Injection Q = Water Quality Monitoring R = Recovery
Status A = Active
Range Direction: W = West
Well and Water Level Depths are in feet below ground surface

APPENDIX G

REMOVAL SITE EVALUATION FORM

SUPERFUND REMOVAL SITE EVALUATION and REMOVAL PRELIMINARY ASSESSMENT

I. SITE NAME AND LOCATION:

NAME: Aurora Groundwater Site

ADDRESS OR OTHER LOCATION IDENTIFIER: Volatile organic compounds (VOC), particularly carbon tetrachloride (CCl_4), were identified in private wells between 1605 East 12th Road and 1806 East 12th Road southeast of the City of Aurora, Nebraska.

CITY: Aurora	**STATE:** Nebraska	**ZIP: 68818**

DIRECTIONS TO SITE: From Interstate 80 in Lincoln, Nebraska, go west about 70 miles to Nebraska Highway 14 North (Aurora, Nebraska exit). Go north on Nebraska Highway 14 North for 2.45 miles and turn right onto East 12th Road. Then continue on East 12th Road for ~1.38 miles to 1704 East 12th Road. Additional residences with contaminated wells are within 1 mile east and west of this residence.
MAP ATTACHED: See Figures 1-3 in Appendix A of the Removal Site Evaluation / Site Inspection Report

II. PROGRAM CONTACTS:

REQUESTED BY: Joe Davis	**DATE OF REQUEST:** 3/29/2012	
AGENCY/OFFICE: US EPA Region 7 Superfund Division		
MAILING ADDRESS: 11201 Renner Boulevard		
CITY: Lenexa	**STATE:** Kansas	**ZIP:** 66219
TELEPHONE: (913)551-7909	**FAX:** (913) 551-7948	
EVALUATOR: Cody McLarty		
AGENCY/OFFICE: Tetra Tech EM Inc.		
MAILING ADDRESS: 415 Oak Street		
CITY: Kansas City	**STATE:** Missouri	**ZIP:** 64106
TELEPHONE: (816) 412-1781	**FAX:** (816) 410-1748	

III. REMOVAL SITE EVALUATION CRITERIA [40 CFR 300.410(e)]

IS THERE A RELEASE AS DEFINED BY THE NCP: **YES X or NO __**

EXPLAIN: A release of CCl_4 to groundwater occurred. CCl_4 has been detected at concentrations exceeding the maximum contaminant level (MCL) in five private wells associated with the site. The contamination has been attributed to a potential release of CCl_4 to groundwater, based on chemical analysis, from grain silos between 1605 East 12th Road and 1806 East 12th Road southeast of the City of Aurora, Nebraska.

*(A **RELEASE** is defined as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment of barrels, containers, and other closed receptacles containing any hazardous substances or pollutant or contaminant), but excludes: workplace exposures; engine exhaust emissions; nuclear releases otherwise regulated; and the normal application of fertilizer. For purposes of the NCP, release also means threat of release.)*

IS THE SOURCE A FACILITY OR VESSEL AS DEFINED BY THE NCP: **YES X or NO __**

EXPLAIN: The site is considered a facility as defined by the NCP.

*(A **FACILITY** is defined as any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or POTW), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft or any site or area, where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel. A **VESSEL** is defined as any description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water other than a public vessel.)*

SUPERFUND REMOVAL SITE EVALUATION and REMOVAL PRELIMINARY ASSESSMENT

DOES THE RELEASE INVOLVE A HAZARDOUS SUBSTANCE, OR POLLUTANT OR CONTAMINANT AS DEFINED BY THE NCP: **YES X or NO_**

EXPLAIN: CCl_4 and its degradation product chloroform have been detected in private domestic wells in the source area. Other VOCs such as tetrachloroethene, 1,1-dichloroethene, 1,2,3-trichlorobenzene, and 1,1,1-trichloroethane have also been detected in private domestic wells in the source area.

*(A **HAZARDOUS SUBSTANCE** means any substance, element, compound, mixture, solution, hazardous waste, toxic pollutant, hazardous air pollutant, or imminently hazardous chemical substance or mixture designated pursuant to the CWA, CERCLA, SDWA, CAA or TSCA. The term does not include petroleum products, natural gas, natural gas liquids, liquefied natural gas, synthetic gas or mixtures of natural and synthetic gas. The definition of **POLLUTANT or CONTAMINANT** includes, but is not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions or physical deformations, in such organisms or their offspring. The term does not include petroleum products, natural gas, natural gas liquids, liquefied natural gas, synthetic gas or mixtures of natural and synthetic gas).*

IS THE RELEASE SUBJECT TO THE LIMITATIONS ON RESPONSE: **YES __ or NO X**

EXPLAIN: There are no limitations on response.

*(The **LIMITATIONS ON RESPONSE** provisions of the NCP (40 CFR 300.400(B) states that removals shall not be undertaken in response to a release: of a naturally occurring substance in its unaltered or natural form; from products that are a part of the structure of, and result in exposure within, residential buildings or business or community structures; or into public or private drinking water supplies due to deterioration of the system through ordinary use.)*

DOES THE QUANTITY OR CONCENTRATION WARRANT RESPONSE: **YES X or NO__**

EXPLAIN: The CCl_4 concentrations exceed the MCL in five private wells associated with the Aurora Groundwater site.

HAS A PRP BEEN IDENTIFIED: **YES __ or NO X**

EXPLAIN: The sources of groundwater contamination are believed to be grain silos on residential properties between 1605 East 12th Road and 1806 East 12th Road southeast of the City of Aurora, Nebraska.

IV. CONDITIONS TO WARRANT REMOVAL [40 CFR 300.415(b)(2)]:

ACTUAL OR POTENTIAL EXPOSURE TO HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS: **YES X or NO __**

EXPLAIN: CCl_4 concentrations exceeding MCLs have been identified in private drinking water wells.

ACTUAL OR POTENTIAL CONTAMINATION OF DRINKING WATER SUPPLIES: **YES X or NO __**

EXPLAIN: CCl_4 concentrations exceeding MCLs have been identified in private drinking water wells.

HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS IN DRUMS, BARRELS, OR BULK STORAGE CONTAINERS: **YES __ or NO X**

EXPLAIN: Hazardous substances stored in bulk storage containers were not observed on site.

HIGH LEVELS OF HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS IN NEAR-SURFACE SOILS: **YES __ or NO __UNKNOWN X**

EXPLAIN: No soil samples have been collected at these properties.

CONDITIONS SUSCEPTIBLE TO IMPACT FROM ADVERSE WEATHER CONDITIONS: **YES__ or NO X**

EXPLAIN: No known conditions exist that would be affected by weather.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

THREAT OF FIRE OR EXPLOSION: **YES __ or NO X**

EXPLAIN: No threat of fire or explosion exists at the site.

POTENTIAL FOR OTHER FEDERAL OR STATE RESPONSE MECHANISMS: **YES X or NO __**

EXPLAIN: The Nebraska Department of Environmental Quality (NDEQ) is currently investigating potential sources of groundwater contamination associated with grain storage facilities within the Aurora city limits. The areas targeted are the site of the former U.S. Department of Agriculture grain storage facility on the southwest side of Aurora and the Aurora Coop facilities on the south side of Aurora. NDEQ conducted groundwater sampling in these areas but were not able to identify a source area.

OTHER SITUATIONS OR FACTORS WHICH POSE A THREAT: **YES __ or NO X**

EXPLAIN: No other situations or factors could pose a threat.

V. POTENTIAL REMOVAL ACTIONS [40 CFR 300.415(d)]:

(NOTE: The following identifies potential removal actions which may be determined to be appropriate pending further review and study. The proposed actions should be considered preliminary proposals and are subject to change.)

SITE SECURITY: **YES __ or NO X**

EXPLAIN: Fencing of the site is not required.

STABILIZATION OR REMOVAL OF SURFACE IMPOUNDMENTS: **YES __ or NO X**

EXPLAIN: No surface impoundments exist at the site.

CAPPING OF CONTAMINATED SOIL: **YES __ or NO __UNKNOWN X**

EXPLAIN: No soil samples have been collected at these properties.

USE OF CHEMICALS TO CONTROL/RETARD SPREAD OF CONTAMINATION: **YES X or NO __**

EXPLAIN: In situ chemical oxidation (ISCO) could be used to address groundwater contamination, and soil contamination if present.

CONTAMINATED SOIL EXCAVATION:

YES __ or NO __UNKNOWN X

EXPLAIN: No soil samples have been collected at these properties.

REMOVAL OF DRUMS, TANKS, OR BULK STORAGE CONTAINERS: **YES __ or NO X**

EXPLAIN: No bulk storage containers were observed on site.

CONTAINMENT, TREATMENT, OR DISPOSAL OF HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS: **YES __ or NO__UNKNOWN X**

EXPLAIN: No soil samples have been collected at these properties.

PROVIDE ALTERNATIVE WATER SUPPLIES: **YES X or NO __**

EXPLAIN: CCl_4 has been detected in five private drinking water wells associated with the Aurora Groundwater site at concentrations exceeding the MCL.

SUPERFUND REMOVAL SITE EVALUATION and REMOVAL PRELIMINARY ASSESSMENT

VI. REMOVAL SITE EVALUATION DETERMINATION AND REMOVAL PRELIMINARY ASSESSMENT FINDINGS AND RECOMMENDATIONS:

	REMOVAL NOT WARRANTED—REMOVAL SITE EVALUATION TERMINATED

(Cite one or more of the criteria from SECTION III. REMOVAL SITE EVALUATION CRITERIA, as the basis for the above determination.)

	NOT A RELEASE		NOT A FACILITY OR VESSEL
	NOT A HAZARDOUS SUBSTANCE OR POLLUTANT OR CONTAMINANT		SUBJECT TO RESPONSE LIMITATIONS
	INSUFFICIENT QUANTITY OR CONCENTRATION		WILLING/CAPABLE PRP IDENTIFIED

COMMENT:

X	**REMOVAL RECOMMENDED [__ EMERGENCY _X_ TIME-CRITICAL __ NON-TIME-CRITICAL]**

(Cite one or more of the conditions or factors from Section IV. CONDITIONS TO WARRANT A REMOVAL ACTION, as a basis for recommend that a removal action be conducted.)

X	EXPOSURE TO HAZARDOUS SUBSTANCES OR POLLUTANTS OR CONTAMINANTS				ADVERSE WEATHER IMPACTS
X	CONTAMINATED DRINKING WATER		FIRE/EXPLOSION THREAT	?	CONTAMINATED SOIL
	DRUMS, BARRELS OR CONTAINERS		NO OTHER RESPONSE MECHANISM		OTHER FACTORS

(Identify one or more of the removal actions listed in Section V. REMOVAL ACTIONS WHICH MAY BE APPROPRIATE, as examples of the types of response actions which are recommended.)

	SITE SECURITY		DRAINAGE CONTROL		IMPOUNDMENT STABILIZATION
	REMOVAL OF DRUMS, BARRELS, ETC.	?	SOIL CAPPING	?	SOIL EXCAVATION
?	CONTAIN/TREAT/DISPOSE OF WASTES	X	CHEMICAL CONTROLS	X	ALT. DRINKING WATER SUPPLIES

COMMENT: Five private wells associated with the Aurora Groundwater site contain CCl_4 concentrations exceeding the MCL; consequently, provision of alternative water supplies or in-home treatment systems is warranted.

X	**ADDITIONAL REMOVAL SITE EVALUATION RECOMMENDED**

(Cite one or more of the conditions or factors from Section IV. CONDITIONS TO WARRANT A REMOVAL ACTION, as a basis for recommending that additional site evaluation be performed.)

	EXPOSURE TO HAZARDOUS SUBSTANCES OR POLLUTANTS OR CONTAMINANTS				ADVERSE WEATHER IMPACTS
	CONTAMINATED DRINKING WATER		FIRE/EXPLOSION THREAT	X	CONTAMINATED SOIL
	DRUMS, BARRELS OR CONTAINERS		NO OTHER RESPONSE MECHANISM		OTHER FACTORS

(Identify one or more of the removal actions listed in Section V. REMOVAL ACTIONS WHICH MAY BE APPROPRIATE, as examples of the types of response actions which may be appropriate pending the results of further site evaluation.)

	SITE SECURITY		DRAINAGE CONTROL		IMPOUNDMENT STABILIZATION
	REMOVAL OF DRUMS, BARRELS, ETC.		SOIL CAPPING	X	SOIL EXCAVATION
	CONTAIN/TREAT/DISPOSE OF WASTE		CHEMICAL CONTROLS		ALTERNATIVE DRINKING WATER SUPPLIES

COMMENT: No soil samples have been collected at suspected source area properties; therefore, whether soil contamination is present is unknown. Additional investigation may be warranted to further evaluate potential source areas.

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT

VII. ADDITIONAL INFORMATION OR COMMENTS:

EPA USE ONLY

VIII. CERTIFICATION

SIGNATURE: **DATE:**
POSITION/TITLE:
OFFICE/AGENCY:

SUPERFUND REMOVAL SITE EVALUATION
and
REMOVAL PRELIMINARY ASSESSMENT
(Supplemental Waste Inventory Sheet)

IX. HAZARDOUS SUBSTANCES, POLLUTANTS OR CONTAMINANT INFORMATION:

MATERIAL DESCRIPTION	CONTAINER INFORMATION					
TRADE NAME/ACTIVE INGREDIENTS	NUMBER of CONTAINERS	SIZE	TYPE	SOLID or LIQUID	% FULL	CONDITION

APPENDIX E

EMERGENCY RESPONSE PLAN

Emergency Response Plan 2021

City of Aurora Water System

Prepared by JEO Consulting Group Inc.

Table of Contents

Community Water System and Emergency Response Information

Public Water System ID: NE31-08101

905 13th Street
Aurora, NE 68818

(402) 694-6992

Population Served: 4,678

Prepared by JEO Consulting Group Inc.

Reviewed by Adam Darbro, Utility Superintendent

Completed December 13, 2021

Plan Distribution

Recipient	Distributed By	Date

Record of Changes

The most current copy of this document, including any revised pages, is available from the City of Aurora's Utility Superintendent.

Description of Change	Name & Title	Date

Section 1: Introduction

Purpose

This Emergency Response Plan (ERP) was developed as a guideline for the water operators and administration of the City of Aurora Water System to minimize the disruption of normal services to consumers and to provide public health protection and safety during an emergency event. The ERP conveys procedures and processes that address an emergency situation at the water system as well as identify mitigation actions to reduce the system's vulnerability to future hazardous events. This is a living document and will require monitoring, updating, and exercising to ensure functionality.

Authority

This plan is being developed to support ongoing water system operation as well as to certify with the Environmental Protection Agency (EPA) that the City of Aurora Water System has completed an ERP as required in the America's Water Infrastructure Act of 2018 (AWIA). The AWIA requires "community (drinking) water system serving more than 3,300 people to develop or update risk assessments and emergency response plans" by December 31, 2021. Water systems must re-certify every five years with the EPA.

This plan will also comply with Nebraska Department of Health and Human Services regulations Title 179 Chapter 22. It requires that the plan be updated at least every three years with a list of individuals who may be called for help in times of disaster updated annually.

Scope

The scope of this ERP is to address all areas established in the emergency management cycle. Specific topics addressed within this document include water system information; roles and responsibilities; risk awareness communication; response procedures; and mitigation actions. This document represents a collaborative effort between the water system, City of Aurora, and other local, regional, state, and federal resources that have a role related to the water system.

Section 2: Water System Information

This section gives a general overview of the City of Aurora water system. For a detailed breakdown of primary utility components and response resources, please reference *Appendix A* and *Appendix B,* respectively.

Utility Overview

Public Water System ID: NE31-08101

City of Aurora
905 13th Street
Aurora, NE 68818

<u>Owner</u>
City of Aurora

<u>Utilities Office</u>
905 13th Street
Aurora, NE 68818

<u>Total Population Served</u>
4,678

<u>Total Service Connections</u>
Residential: 1,812
Commercial: 233

<u>Primary Contact</u>
Adam Darbro, Utility Superintendent
(402) 694-6992

<u>Alternate Contact</u>
Darrell Eggli, Water Supervisor
308-383-9572

<u>System Demand</u>
Average daily demand is the system's average daily usage, in millions of gallons per day (mgd) based upon operational records maintained during the past several years. Maximum daily demand is typically the highest daily demand experienced in recent years. System capacity is the maximum daily amount of water that the system is capable of treating or producing and distributing. Peak water demand is the maximum hourly demand, gallons per hour (gph) that the system can sustain provided by storage or by production capability plus storage.

Average Daily Demand: 1,038,960 gallons
Maximum Daily Demand: 3,755,200 gallons
System Capacity: 10,512,000 gallons
Peak Demand: 156,467 gph

Power
Primary Power Source: Nebraska Public Power District
Backup Power Source: Southern Public Power District
Secondary Backup Power: Backup Generators

Source Water

Wells
Well #3 and Well #5 have backup generators. Fuel for the generators would come from a local gas station or the co-op. When full the backup generators can run for 24 hours at full load until needing to be refilled.

The City of Aurora has a wellhead protection plan that was adopted in 2016. Possible point sources of contamination identified in the plan that could affect the city's wells include farmsteads, a manufacturing/industrial plants, and a mechanical shop.

Well Name or ID	Depth	Location	Year Built	Available Yield	Treatment Requirements	Critical Water Level*
Well #1 G-028309	170'	40.86613 -98.01338	1956	1,296,000 gpd	None	135'
Well #2 G-035327	223'	40.85948 -98.00374	1965	1,584,000 gpd	None	145'
Well #3 G-035327	247'	40.86412 -98.01198	1973	1,368,000 gpd	None	145'
Well #4 G-028307**	198'	40.87380 -97.99816	1978	1,656,000 gpd	None	145'
Well #5 G-101011	218'	40.87864 -98.02096	1999	1,728,000 gpd	None	125'
Well #6 G-179922	187'	40.88666 -98.00291	2016	1,440,000 gpd	None	135'
Well #7 G-187475	202'	40.88666 -98.01362	2018	1,440,000 gpd	None	145'

*Based upon well and aquifer characteristics
**Emergency use only well

Source Pumps

Location	Pump Type	Manufacturer	H.P.	Capacity (gpm)	Phase, Voltage
Well #1	Turbine	Sargent Pipe Co.	125	900	3, 460
Well #2	Turbine	Sargent Pipe Co.	100	1,100	3, 460
Well #3	Turbine	Sargent Pipe Co.	100	950	3, 480
Well #4	Turbine	Sargent Pipe Co.	150	1,150	3, 460
Well #5	Turbine	Sargent Pipe Co.	125	1,200	3, 460
Well #6	Turbine	Goulds	125	1,000	3, 460
Well #7	Turbine	Borer	125	1,000	3, 460

Interconnections
There are no interconnections to other community public water supplies.

Other Emergency Sources

Type	Company	Comments
Bottled Water Services	Culligan Water	Contact number is (308) 382-7220
Bulk Water Hauler	National Guard	Contact number is (402) 471-7410

Treatment Information

The City of Aurora does not have a water treatment plant as the water from the wells is safe for consumption.

Storage and Distribution System

Finished Water Storage

Name	Location	Type	Capacity	Overflow Elevation
Water Tower	40.86613 -98.01338	Elevated Storage Tank	300,000 gallons	159’

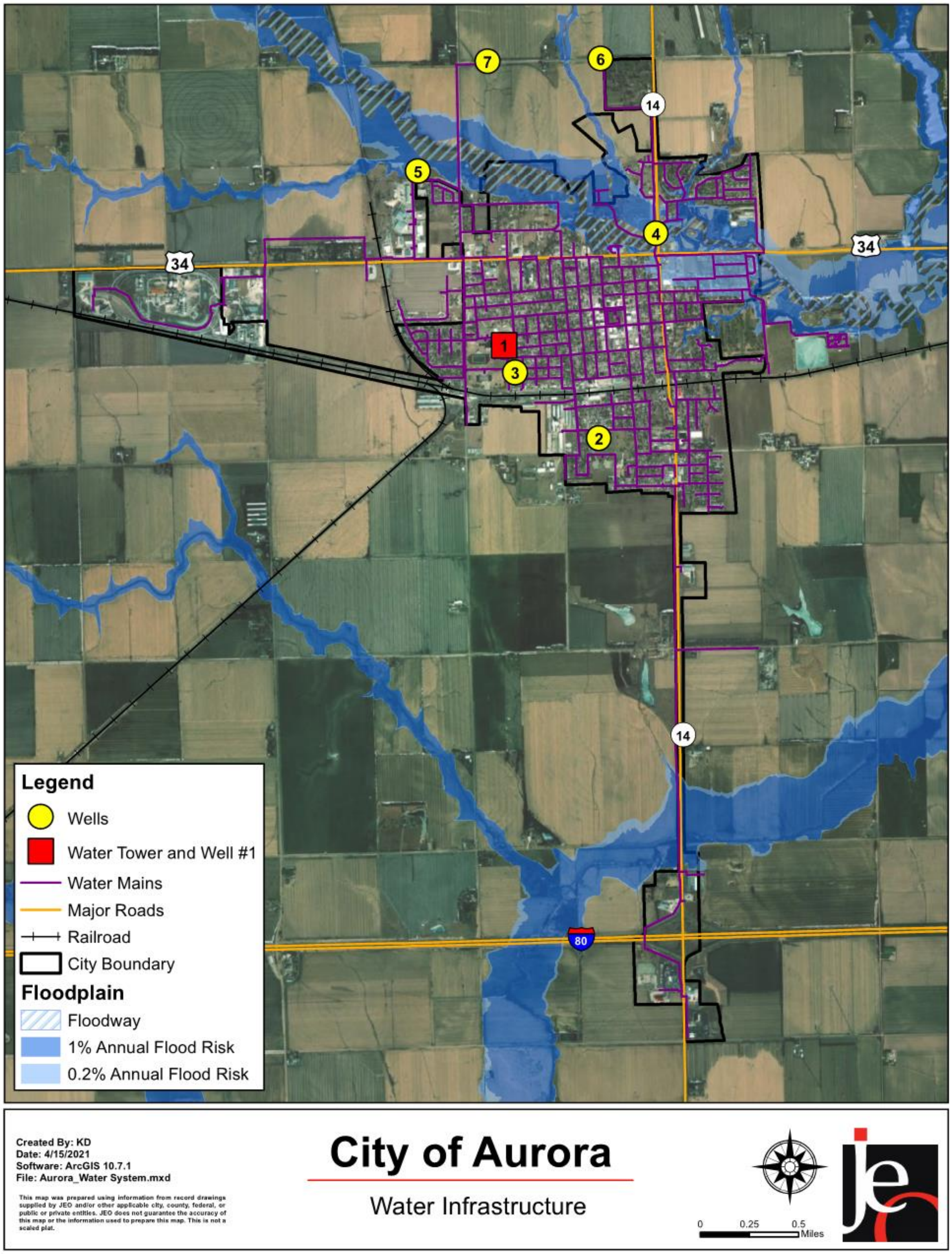
Transmission Mains

Some of the mains are over 100 years old. There are approximately 55 miles of water mains in the water system.

Location of Pertinent Information (Reports, Permits, Plans, and Procedures)

Item	Stored Location
Distribution Systems Map	Secure Online Access
Other Pertinent Maps	Online
Daily Reports	Well Houses
Permits	City Hall
Technical Manuals	Well Houses
O & M Plan	City Hall
Start-up/Shut-Down Procedures	Well Houses
Emergency Power and Light Generation Specification	Generator Locations
SCADA System Operation Instructions	City Hall
“As Built” Drawings	City Hall and Secure Online Access

Distribution System Map



Water System Personnel Information

Name & Title	License Grade	Contact Information	Emergency Information
Adam Darbro, Utility Superintendent	Grade 4	(402) 694-6992	(402) 770-6790
Darrell Eggli, Water Supervisor	Grade 3	(308) 383-9572	
Eric Melcher, Water Operator	Grade 1	(402) 694-6992	
Shawn Dent, Water Operator	Grade 4	(308) 385-8609	
Dustin Brandt, Water Operator	Grade 4	(402) 604-0804	

Section 3: Roles and Responsibilities

This section contains information on the responsibilities of various individuals and agencies during an emergency event. As a part of the overall process, the utility and City of Aurora must be in communication with a wide range of local, regional, state, and federal agencies and decision makers to ensure the health and safety of everyone involved. It should be noted that the implementation of identified roles and responsibilities are contingent upon resource availability and a safe operational environment. If needed the Incident Command System (ICS) will be used and an Emergency Operations Center (EOC) will be activated by County Emergency Management. Further information about the ICS and EOC can be found in *Appendix F*.

Water Utility and Partner Roles

Name/Title	Emergency Response Role	Responsibilities
Adam Darbro Utility Superintendent	Emergency Response Lead (ER)	Responsible for all incident response activities, including developing strategies and tactics and ordering and releasing resources.
Darrell Eggli Water Supervisor	Alternate Emergency Response Lead (Alternate ER)	Perform duties as assigned by ER; assumes duties listed above when ER is not available.
Ross Luzum, Media Communication	Public Information	Responsible for leading the public information effort based on information supplied by either the ER or Alternate ER
Paul Graham, Police Chief	Security	Will provide incident security as needed once notified by ER.
Water Operators	Support Staff	Perform duties as assigned by ER. Responsible for repairs and returning the system back to normal operations.

External Partner Roles

Name/Title	Responsibilities
Local Partners	
County Emergency Management	• Receive emergency conditions information from the city. • Activate the Local Emergency Operations Plan. • Coordinate additional aid, as appropriate, following a disaster declaration by the Mayor. • Inform the state of needs that exceed the locally available resources. • Obtain and coordinate the delivery/use of county emergency resources. • Assist in the coordination of law enforcement, fire and rescue, and other applicable agencies.
Police	• Provide incident security. • Direct traffic control and road closures. • Collaborate with partner agencies to identify necessary response equipment/resources and prioritize the deployment of equipment/resources. • Respond as needed to local calls and emergencies.

Name/Title	Responsibilities
Fire/Haz Mat	• Collaborate with partner agencies to identify necessary response equipment/resources and prioritize the deployment of equipment/resources. • Respond as needed to local calls and emergencies.
City Officials	• Declare a disaster declaration as deemed by the Mayor to receive additional aid if warranted. • Notify Hamilton County Emergency Management Agency and appropriate agencies of changes in emergency level. • Lead the public information effort. • Obtain and coordinate the delivery/use of city emergency responses. • Track and document all utilized resources (people, vehicles, and equipment).
Power Utility	• Repair damaged equipment and resources.
Central District Health Department	• Track any public health outbreaks and determine if it was caused by the local drinking water.
Contractor	• Repair and service damaged equipment and infrastructure as determined by the utility.
Mutual Aid	• Provide resources and personnel as needed and requested by the utility.
State Partners	
DHHS	• Provide expertise and knowledge to aid in response. • Approve the water use from an emergency source. • Approve the stopping of disinfection or other treatment due to an emergency event. • Assist in tracking any public health outbreaks.
NEMA	• Advise Governor, federal, and state agencies regarding incident. • Coordinate state disaster support to local agencies as requested by the County Emergency Management agency. • Tack state-deployed resources (people, vehicles, and equipment). • Request federal assistance as necessary.
NDEE	• Provide expertise and knowledge to aid in response. • Enforce any regulatory requirements as needed.
NeWARN	• Provide resources and personnel as needed as requested by the utility.
Nebraska Rural Water Association	• Provide equipment such as a leak detection draw-down gauge, line locating pressure recorder, and emergency chlorinators. • Provide technical assistance as needed.
Midwest Assistance Program	• Provide technical assistance as needed and requested.
State Health Laboratory	• Provide sampling test kits to the utility as needed. • Test water samples for any contaminants.
Federal Partners	
EPA Regional Office	• Provide technical assistance as needed and requested.
FBI Field Office	• Assist in cyber-attack or terrorist events on the utility. • Partner with local law enforcement and provide support as needed.
CDC	• Assist the state and local health district in tracking any health outbreaks.

Section 4: Communication and Messaging

Communication during an incident is critical to relay information to employees, response partners, and critical customers about potential risks to health, infrastructure, and the environment.

The water system must notify the Nebraska Department of Health and Human Services (DHHS) Division of Public Health (DPH) when water delivery is disrupted to 10% or more of the consumers. The water system must not use water from any emergency source or stop disinfection or other treatment without receiving the approval of DHHS DPH.

In addition, the water system must make public notification when a condition exists which according to DHHS DPH constitutes a public health hazard. As outlined in Title 179 Chapter 4. The water system must also notify the mayor and local law enforcement.

In the event of an emergency, the primary line of communication will be through: telephone/cellphone. If the primary line of communication is not functional, the back-up line of communication will be through: radio.

Contacts

Internal Communication

The following table lists all utility emergency response team members, title, and contact information.

Name	Title	Phone Number	Email
Adam Darbro	Utility Superintendent	Home: (402) 694-4754 Cell: (402) 770-6790	utlysupt@cityofaurora.org
Darrell Eggli	Water Supervisor	(308) 383-9572	streets@cityofaurora.org
Shawn Dent	Water Operator	(308) 385-8609	-
Dustin Brandt	Water Operator	(402) 604-0804	-
Marlin Seeman	Mayor	Home: (402) 694-6883 Cell: (402) 631-3708	mayorseeman@cityofaurora.org
Eric Melcher	City Administrator	(402) 694-6992	ctyadm@cityofaurora.org
Paul Graham	Police Chief	(402) 694-5815	apd4286@yahoo.com
Tom Cox	Fire Chief	Office: (402) 694-3855 Cell: (402) 631-8913 Home: (402) 694-6211	firedept@cityofaurora.org
Dick Phillips	Council President	(402) 694-3302	-
Ross Luzum	Media Communication	(402) 694-6907	-
Aurora Fire Department PA System	-	(402) 694-3855	-

External Response Partner Communication

Organization	Name and Title	Phone Number	Alternate Phone Number	Email or Website
Local Partners				
County Emergency Management	Kirt Smith, Emergency Manager	(402) 694-5126	(402) 631-9580	hcema@hamilton.net
County Sheriff	Jeromy McCoy	(402) 694-5815		-
Central District Health Department	Teresa Anderson, Health Director	(308) 385-5175	(308) 385-5370	health@cdhd.ne.gov
County Roads	Highway Superintendent	(402) 694-6184		-
State Partners				
DHHS Field Office	Eric Cox	(402) 471-0517	(402) 432-4831	-
DHHS Lincoln Office	Sue Dempsey, Administrator	(402) 471-0510	(402) 417-9028	sue.dempsey@nebraska.gov
DHHS Lincoln Office	Andy Kahle, Field Services Program Manager	(402) 471-0521	(402) 432-4692	andy.kahle@nebraska.gov
NDEE Lincoln Office	-	(402) 471-2186		Ndee.moreinfo@nebraska.gov
Nebraska Emergency Management Agency	-	(402) 471-7421		https://nema.nebraska.gov/
Nebraska Rural Water Association	Randy Hellbush	(402) 443-8535	(800) 842-8039	info@nerwa.org
Nebraska Rural Water Association	Mike Stanzel	(402) 672-9084	(800) 842-8039	info@nerwa.org
NDEE Spill Hotline	24 Hour Hotline	(402) 471-2186	(877) 253-2603	-
Poison Control	24 Hour Hotline	(800) 222-1222		https://www.nebraskapoison.com/
NeWARN	-	(402) 631-9607		http://www.newarn.org/contact.aspx
Midwest Assistance Program	Dennis Carroll, Regional Field Manager	(402) 419-6283		map@map-inc.org
Public Health Environmental Lab	-	(402) 471-2122		mary.boden@nebraska.gov
Federal Partners				
EPA Region 7	-	(913) 551-7003	(800) 223-0425	https://www.epa.gov/aboutepa/epa-region-7-midwest
FBI Omaha Office	-	(402) 493-8688		https://www.fbi.gov/contact-us/field-offices/omaha
CDC	-	(800) 232-4636		https://www.cdc.gov/

Organization	Name and Title	Phone Number	Alternate Phone Number	Email or Website
National Spill Response Office	24 Hour Hotline	(800) 424-8802		https://www.epa.gov/emergency-response/forms/contact-us-about-emergency-response

Critical Customers

Critical customers who will be given priority notification due to their reliance on the water supply for either medical reasons, usage, or because they serve vulnerable populations are listed below.

Organization	Point of Contact	Phone Number	Email
Aurora Public Schools	Jody Phillips, Superintendent	(402) 694-6923	Office-District@4rhuskie.org
East Park Villa	Laurie Andrews, Administrator	(402) 694-2300	info@mchiaurora.org
Memorial Hospital	Diane Keller, Administrator	(402) 694-3171	info@mchiaurora.org
Westfield Quality Care of Aurora	Christopher Young, Administrator	(402) 694-2128	-

System Equipment Repair and Supplies

Organization	Point of Contact	Phone Number	Alternate Phone Number
Electrician	Juzyk Electric	(402) 631-3415	
Plumber	-	-	-
Pump Specialist	Doug Yantzie	(888) 496-3902	(402) 759-2929
Soil Excavator / Backhoe Operator	K.C. Pawling, Hamilton County Superintendent of Roads	(402) 694-6184	
Equipment Rental (Generators)	-	-	-
Equipment Rental (Chlorinators)	Randy Hellbush	(800) 842-8039	(402) 443-5216
Equipment Repair	-	-	-
SCADA Repair	HOA Solutions	(402) 467-3750	
Pump Supplier	Doug Yantzie	(888) 496-3902	(402) 759-2929
Well Driller	Doug Yantzie, Sargent Drilling	(888) 496-3902	(402) 759-2929
	Layne Western	(308) 234-1914	(308) 233-4898
Pipe Supplier	Ron Strobl	(800) 395-7473	(877) 860-2259
Central District Health Department Laboratory	Mike Sullivan, Health Director	(402) 694-3191	
Elevated Storage	Jake Dugger, Maguire Iron	(402) 336-1764	(402) 651-6450
	Kent Kuehl, Utility Services Co.	(402) 689-6708	
Radio/Telemetry Repair	Midland Telecom	(308) 381-8434	

Utilities Contact

Organization	Contact Name	Company	Phone Number	Alternate Phone Number
Electric Utility Company	Jarred Rojewski	NPPD	(402) 694-3267	Cell: (308) 380-6956 Night: (877) 275-6773
	-	SPPD	(800) 579-3019	(308) 384-2350
Gas Utility Company	Chad Hoffman	Black Hills Energy	(402) 366-4708	Cell: (402) 239-9571 Night: (402) 362-5548
Sewer Utility Company	Adam Darbro	City of Aurora	(402) 694-6992	(402) 770-6790
Telephone Utility Company	Pat Shaw	Hamilton Telecommunications	(402) 694-5101	Cell: (402) 694-8449 Night: (402) 694-2299
Diggers Hotline	-	Nebraska One Call	(800) 331-5666	(866) 711-7281
BNSF Railway	Adam Putnam	BNSF	(308) 385-8638	

Bulk Water Suppliers

Organization	Point of Contact	Phone Number	Alternate Phone Number
Culligan Water	Dave Walker or Deborah Walker	(308) 382-7220	Cell: (308) 687-6396 Night: (308) 379-4137
National Guard	Gen. Daryl Bohnc	(402) 471-7410	Cell: (402) 471-7430 Night: (402) 309-7300

Communication Equipment Inventory

Communication equipment is vital during and recovering from an incident. The table below lists the inventory of communication equipment for the water system.

Type	Number	Location
Radios	10	Public Works Shop

Media Outreach

Below is a list of contact information for all media outlets that the water system may coordinate with during notification efforts. Included is also the existing risk communication procedures and messages. Media communication is handled by Ross Luzum (402) 694-6907.

Media Type	Point of Contact	Phone Number
Social Media	Aurora Police Department	(402) 694-5815
Local Newspaper	Kurt Johnson, Aurora News Register	Office: (402) 694-2131 Cell: (402) 694-9742 Home: (402) 694-2038
Radio Station	KMTY/KMMJ	(888) 920-5665
	KGRD	(402) 336-3886
TV Station	Hamilton Telecommunications	(402) 694-5101

Public Notification

The City of Aurora Water System must make a public notification when a condition exists which according to DHHS DPH constitutes a public health hazard as outlined in Title 179 Chapter 4. The Utility Superintendent must also notify the mayor and the local law enforcement department.

Consumers will be notified as soon as possible of any emergency that potentially affects them. The public will be notified of emergencies that pose an immediate threat to heal or safety through media outlets such as television, radio, and newspapers. Critical users will be notified directly, if necessary. These are customers of the system who could be severely impacted immediately by a water system disruption and are listed in the “Critical Customers” table above.

The public notice examples on the pages below are for more common issues that water systems experience, and do not outline every circumstance where public notice is required. Title 179 Chapter 4 outlines the requirements for public notification of drinking water violations. It outlines when public notice is required, who must be notified, and how they should be notified. The regulation also provides standard health effects languages that can be used in the public notifications.

<u>Water Restrictions</u>

During periods of drought, a major leak, a system failure, or excessive consumption beyond the capacity of the system, the City of Aurora Water System has the capability to conserve and restrict water use based upon the local water system regulations found in Ordinance No. 1082. During times of drought or other problems that limit the availability of water, public notice of water use restrictions will be issued by: City Council or the Water Commissioner.

The following is the text from Ordinance No. 1082

The Council or the Water Commissioner may order a reduction in the use of water or shut off the water on any premises in the event of a water shortage due to fire or other good and sufficient cause. The city shall not be liable for any damages caused by shutting off the supply of water of any consumer while the system or any part thereof is undergoing repairs or when there is a shortage of water due to circumstances over which the city has no control. The Council or Water commissioner may order the following procedures due to drought conditions:

A. There shall be no water of lawns, gardens, outside landscaping, washing vehicles or use of large amounts of water between the hours of six am to six p.m. or as ordered by City Council or the Water Commissioner.

B. Occupants with street number addresses which are even numbers may only water lawns, gardens, and outdoor landscaping on even-numbered days of the month or as ordered by City Council or the Water Commissioner. Occupants with street number addresses which are odd numbers may only water lawns, gardens, and outdoor landscaping on odd-numbered days of the month or as ordered by City Council or the Water Commissioner. This subsection shall not apply to the watering flower gardens when a hand-held sprinkling can is used which makes no use of large amounts of water.

Drinking Water Warning – High Nitrates

DRINKING WATER WARNING

City of Aurora has high levels of nitrate

DO NOT GIVE THE WATER TO INFANTS UNDER 6 MONTHS OLD OR USE IT TO MAKE INFANT FORMULA

Water sample results received [date] showed nitrate levels of [level and units]. This is above the nitrate standard, or maximum contaminant level (MCL) of [state/federal MCL]. Nitrate in drinking water is a serious health concern for infants less than six months old; this includes pregnant women and nursing mothers because of the transfer of nitrate to the fetus or baby through the mother's milk or blood.

What should I do?

1. **DO NOT GIVE THE WATER TO INFANTS.** ***Infants below the age of six month who drink water containing nitrate excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.*** Blue baby syndrome is indicated by blueness of the skin. Symptoms in infants can develop rapidly, with health deteriorating over the period of days. If symptoms occur, seek medical attention immediately.

2. Water, juice, and formula for children under six months of age should not be prepared with tap water. Bottled water or other water low in nitrates should be used for infants until further notice.

3. **DO NOT BOIL THE WATER.** Boiling, freezing, filtering, or letting water stand does not reduce the nitrate level. Excessive boiling can make the nitrates more concentrated, because nitrates remain behind when the water evaporates.

4. Adults and children older than six months can drink the tap water (nitrate is a concern for infants because they can't process nitrates in the same way adults can). However, if you are pregnant or have specific health concerns, you may wish to consult your doctor.

What happened? What is being done?

Nitrate in drinking water can come from natural, industrial, or agricultural sources (including septic systems and run-off). Levels of nitrate in drinking water can vary throughout the year. We'll let you know when the amount of nitrate is again below the limit.

Contamination and location will be identified. Residents will be notified. Treatment issues will be corrected or repaired.

For more information, please contact Adam Darbro at (402) 694-6992.

This notice is being sent to you by City of Aurora, State Water System ID#: NE31-08101
Date distributed: [date]

<u>Drinking Water Warning – E. coli</u>

DRINKING WATER WARNING

City of Aurora water is contaminated with fecal coliform or *E. coli* bacteria

BOIL YOUR WATER BEFORE USING

Fecal coliform or E. coli bacteria were found in the water supply on [date]. These bacteria can make you sick and are a particular concern for people with weakened immune systems.

What Should I do?

1. **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST**. Bring all water to a rolling boil and let it boil for at least one minute then let it cool before using; or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation **until further notice**. Boiling kills bacteria and other organisms in the water.

2. *Fecal coliform or E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.*

3. The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. People at increased risk should seek advice about drinking water from their health care providers.

What happened? What is being done?

Bacterial contamination can occur when increased run-off enters the drinking water source (for example, following heavy rains). It can also happen due to a break in the distribution system (pipes) or a failure in the water treatment process.

[Describe corrective action]. We will inform you when tests show no bacteria, and you no longer need to boil your water. We anticipate resolving the problem within [estimated time frame].

For more information, please contact Adam Darbro at (402) 694-6992. General guidelines on ways to lessen the risk of infection by microbes are available from the EPA Safe Drinking Water Hotline at 1 (800) 426-4791.

This notice is being sent to you by City of Aurora, State Water System ID#: NE31-08101
Date Distributed: [date]

Drinking Water Warning – Boil Notice

DRINKING WATER WARNING

BOIL YOUR WATER BEFORE USING

Disease-causing organism have entered the City of Aurora water supply.

These organisms are causing illness in people served by the City of Aurora Water System. We learned of a waterborne disease outbreak from [insert issue] on [date].

What Should I do?

1. **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST**. Bring all water to a rolling boil and let it boil for at least one minute, then let it cool before using; or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice. Boiling kills bacteria and other organisms in the water.

2. [Describe symptoms of the waterborne disease.] If you experience one or more of these symptoms and they persist, contact your doctor. People with severely compromised immune systems, infants, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers.

What happened? What is being done?

[Describe the outbreak, corrective action, and when the outbreak might end.]

We will inform you when you no longer need to boil your water.

For more information, please contact Adam Darbro at (402) 694-6992. General guidelines on ways to lessen the risk of infection by microbes are available from the EPA Safe Drinking Water Hotline at 1 (800) 426-4791.

This notice is being sent to you by City of Aurora, State Water System ID#: NE31-08101
Date Distributed: [date]

Drinking Water Warning – High Turbidity Levels

DRINKING WATER WARNING

City of Aurora Water has high turbidity levels

BOIL YOUR WATER BEOFRE USING

The City of Aurora routinely monitors your water for turbidity (cloudiness). This tells us whether we are effectively filtering the water supply. A water sample was taken on [date] showed turbidity levels of [number and units]. This is above the standard of [number and units]. Because of these high levels of turbidity, there is an increased chance that the water may contain disease-causing organisms.

What Should I do?

1. **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST**. Bring all water to a rolling boil and let it boil for at least one minute, then let it cool before using; or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice. Boiling kills bacteria and other organisms in the water.

2. *Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. People with severely compromised immune systems, infants, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers.*

3. The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice.

What happened? What is being done?

[Describe reason for high turbidity, corrective action, and when the system expects to return to compliance.]

We will inform you when turbidity returns to appropriate levels and when you no longer need to boil your water.

For more information, please contact Adam Darbro at (402) 694-6992. General guidelines on ways to lessen the risk of infection by microbes are available from the EPA Safe Drinking Water Hotline at 1 (800) 426-4791.

This notice is being sent to you by City of Aurora, State Water System ID#: NE31-08101
Date Distributed: [date]

<u>Drinking Water Problem Corrected</u>

DRINKING WATER PROBLEM CORRECTED

Customers of the City of Aurora Water System were notified on [date] of a problem with the drinking water and were advised to [describe recommended action]. We are pleased to report that the problem has been corrected and that it is no long necessary to [describe recommended action]. We apologize for any inconvenience and thank you for your patience.

[Add further details here when appropriate].

As always, you may contact Adam Darbro at (402) 694-6992 with any comments or questions.

This notice is being sent to you by City of Aurora, State Water System ID#: NE31-08101
Date Distributed: [date]

Section 5: Emergency Response Procedures

This section contains the response procedures that can be implemented in the event of a malevolent (manmade) act or natural hazards that threaten the water system's ability to deliver safe drinking water. *Appendix E* includes a Recovery Checklist and Damage Assessment that can be used during and after an emergency evet. *Appendix F* provides an after-event evaluation report.

The water system must notify the Nebraska DHHS DPH when water pressure drops below 20 psi in more than 10% of the system. The water system must not use water from any emergency source or stop disinfection or other treatment without receiving the approval of DHHS DPH.

In addition, the water system must make public notification when a condition exists which according to DHHS DPH constitutes a public health hazard. The water system must also notify the mayor and local law enforcement.

Core Response Information

Core response information is the building blocks for incident specific response procedures, as they are typically a part of every incident.

<u>Access</u>

Item	Description
Debris Cleaning	- Debris cleaning and road clearing would be done by the Public Works Department, NDOT, and Hamilton County Roads Department.
Alternate Routes	- Water Tower/Well 1: Multiple access points. - Well #2: Multiple access points. - Well #3: Multiple access points. - Well #4: Multiple access points. - Well #5: Two access points. - Well #6: Two access points. - Well #7: Two access points.
Identification Badges	- Staff: Everyday identification badges and Salamander Badges. - Equipment: In the process of getting Salamander Tags.
Emergency Fuel	- Generators: Diesel powered. Fuel comes from the Aurora Cooperative or local gas stations. - Trucks, Loaders, Backhoes: Gasoline powered. Fuel comes from the Aurora Cooperative or local gas stations. - Emergency Heaters: Propane fueled. Propane comes from local gas stations.

Physical Security

Item	Description
Access Control Procedures	Wellhouses: Fenced, locked door, intrusion alarms, signs • Access: All public works staff Water Tower: Fenced, locked access points • Access: All public works staff
Restricted Areas	- None
Evidence Protection Measures	- Follow police directions.
Security Culture	- Onboarding training. - No annual training.

Safety Materials

Listed below are the safety materials that the water system has to help protect utility personnel during an incident.

Type	Description
MSDS Sheets	- N/A
Personal Protective Equipment	- Safety glasses, gloves, hard hats, hearing protection. - Stored in the shop.
Fire Extinguisher	- Located in every wellhouse and in the equipment trucks.

Sampling and Analysis

Item	Description
Sampling Procedures	- Sampling schedule and procedures sent out by DHHS.
Pre-Identified Sampling Locations	- See approved DHHS Sampling Plan. - Other: Wells
Sample Collection	- Five staff.
Sample Transportation	- Driven to the Central District Health Department.
In-House Laboratory Capabilities	- None.

Utility Personnel Well Being

Item	Description
Assembly Area	- Primary: Public works shop (1103 G St) - Secondary: Fire Hall
Supplies	- Break area, bathrooms, microwave, toaster, refrigerator at the public works shop.
Alternate Work and Shelter Locations	- Staff not able to work from home. - Only utility superintendent and water supervisor can access the SCADA through their phones.

Incident-Specific Response Procedures

Listed below in alphabetical order are specialized procedures tailored to specific high-risk hazards and events. Although response procedures are given in a step-by-step fashion, some steps may occur simultaneously. Each set of procedures outlines the general response actions taken by the water system. However, steps may need to be added or removed given the individual situation.

As a reminder**, the water system must notify the Nebraska DHHS DPH when water pressure drops below 20 psi in more than 10% of the system**. The water system must not use water from any emergency source or stop disinfection or other treatment without receiving the approval of DHHS DPH. In addition, the water system must make public notification when a condition exists which according to DHHS DPH constitutes a public health hazard.

Cyber Attack – Business System

1. Notify city officials and the Aurora Police Department.
2. Contact the city's IT firm and have them send someone to fix the issue.
3. Notify the employees and customers who are set up on the ACH auto-withdrawal.
4. Once the IT firm has restored the system, work with them and the Aurora Police Department to determine how the cyber-attack occurred.

Item	Description
Detection	• Firewall • City's IT Firm
Notification	• Aurora Police Department • City Officials • Employees on auto-withdrawal • Customers on auto-withdrawal • City's IT Firm

Cyber Attack – SCADA System or Loss of SCADA

1. Monitor the SCADA and see what the issue is.
2. If issue is from a cyber-attack, notify the Aurora Police Department, city officials, and DHHS Field Representative.
3. Disconnect the water system from the SCADA.
4. Call HOA Solutions and have them either remote into the SCADA or send someone out to fix the issue.
5. Send staff to the wells and the water tower to manually operate the water system. Ideally 6 or 7 staff is needed.
6. Notify the Aurora Fire Department that the water system is being manually operated.

Item	Description
Detection	• SCADA • Water Operator
Notification	• HOA Solutions • Aurora Fire Department If a cyber-attack has occurred: • Aurora Police Department • City Officials • DHHS Field Representative

Drought/Loss of Source Water

1. Monitor the static water level in all the wells. Biggest trigger would be the static water level in Well #7.
2. Notify city officials if static water levels are to the point that water restrictions are needed.
3. Start implementing odd/even water restrictions.
4. If static water levels continue to drop, implement no outdoor watering restrictions.
5. If needed, contact Hamilton County Emergency Management, the National Guard, and Culligan to bring in outside sources of water. Notify DHHS Field Representative.

Item	Description
Detection	• Static Water Levels
Notification	If water restrictions are needed: • City Officials • Media • Public If water needs to be brought in: • Culligan • Hamilton County Emergency Management • DHHS Field Representative • National Guard

Earthquake

1. Monitor the SCADA to see if there are any issues in the water system.
2. Physically check the wells and water tower to see if any damage occurred.
3. If any large damages or structural issues, bring in an engineer to inspect. Notify city officials about the damages.
4. If water main breaks have occurred, follow the procedures for *Transmission and/or Distribution System Failure*.
5. If water tower is damaged and not operations, follow the procedures for *Loss of Water Tower*.
6. Make repairs to damaged infrastructure as needed.

Item	Description
Detection	• SCADA • Public
Notification	If major damages occurred: • City Officials

Finished Water Contamination

1. Notify the DHHS Field Representative and city officials of the situation.
2. If terrorism is suspected, contact the Aurora Police Department.
3. Issue a Boil Water Notice or a Do Not Use Notice depending on the contaminant. If contaminant is unknown issue a Do Not Use Notice.
4. Determine if the contaminant can be contained by isolating part of the distribution system. If it can, flush the affected system and sample as instructed by DHHS.
5. If the entire distribution system is affected, flush the distribution system and sample as required. Follow DHHS instructions for sampling and ensuring the water is safe to drink.
6. If needed, contact Hamilton County Emergency Management, the National Guard, and Culligan to bring in outside sources of water.

Item	Description
Detection	• Routine Sample • Public • Hospital • Health Department
Notification	• DHHS Field Representative • City Officials • Media • Public If terrorism is suspected: • Aurora Police Department If water needs to be brought in: • Culligan • Hamilton County Emergency Management • National Guard

<u>Fire</u>

Wildfire

1. Notify the Aurora Fire Department. Follow any instructions that they have.
2. If possible, have the farmer that owns the land around the Well #6 and Well #7 come in a remove any vegetation surrounding the wellhouses.
3. Use the hydrants at the Well #6 and Well #7 to soak the area around the wellhouses.

Building Fire

1. Send out staff to the affected wellhouse to check on the situation.
2. Assess the size of the fire.
3. If a small fire, use a fire extinguisher to put out the fire.
4. Notify the Aurora Fire Department of the situation.
5. Contact Nebraska Public Power District and have them shut down power to the wellhouse.
6. Shut off the well until the fire is put out.
7. If an electrical fire shuts down a well, follow the procedures for *Source Pump Failure*.

Item	Description
Detection	• Aurora Fire Department • SCADA • Water Operator
Notification	• Aurora Fire Department • Farmer that owns property near the wellhouses • Nebraska Public Power District

Flood

1. Sandbag Well #4 for protection.
2. If access to the wells is blocked, go east out of the city, then head north and circle back around to the wells.
3. Shut off Well #4 if flooding is occurring near the wellhouse.
4. Monitor the SCADA to ensure no issues are occurring in the water system.
5. If water main breaks have occurred, follow the procedures for *Transmission and/or Distribution System Failure*.

Item	Description
Detection	• High Water Sensor at the Wellhouse • Water Operator • Hamilton County Emergency Management
Notification	• None

*Note: Well #4 is the only well located in the FEMA designated floodplain.

Loss of Water Tower

1. Notify the DHHS Field Representative and city officials.
2. Isolate the water tower and start wells to ensure system pressure.
3. Program the VFDs to maintain adequate pressure in the system. If needed, install pressure regulators on fire hydrants for additional pressure control.
4. If assistance is needed, contact the Nebraska Rural Water Association.
5. Notify the Aurora Fire Department and keep them informed of the situation.
6. Issue a press release to keep the public informed.
7. If contamination occurred during the event, follow the procedures for *Finished Water Contamination*.
8. Follow any additional DHHS instructions or requirements.

Item	Description
Detection	• SCADA
Notification	• DHHS Field Representative • City Officials • Aurora Fire Department • Media • Public If additional assistance is needed: • Nebraska Rural Water Association

Power Loss

1. Ensure the backup generator at Well #5 is operating.
2. Start up the backup generator at Well #3.
3. Use the small backup generator to plug into the panel at the SCADA terminal so the SCADA can be operated.
4. Contact Nebraska Public Power District emergency on call individual and let them know of the situation. If necessary, contact Southern Public Power District and let them know of the situation.
5. Notify the Aurora Fire Department that there is less water.
6. If needed, implement water restrictions based on usage and time of year.

Item	Description
Detection	• SCADA • Water Operators
Notification	• Aurora Fire Department • Nebraska Public Power District If the outage is from them: • Southern Public Power District If water restrictions are necessary: • City Officials • Media • Public

<u>Prolonged Water Outage</u>

1. Notify the DHHS Field Representative, city officials, and Hamilton County Emergency Management.
2. Implement water restrictions and use stored water.
3. Work with Culligan, the National Guard, and Hamilton County Emergency Management to bring in outside sources of water.
4. If needed, contact Nebraska Rural Water Association for further assistance.

Item	Description
Detection	• SCADA • Water Operators
Notification	• DHHS Field Representative • City Officials • Media • Public • Hamilton County Emergency Management • Culligan • National Guard If further assistance is needed: • Nebraska Rural Water Association

<u>Severe Weather</u>

Tornado

1. Monitor the SCADA to see if there are any issues in the water system.
2. Physically check the well houses, water tower, and water tower hatch for any damages.
3. If there are a high number of damages to buildings, bring in contractors and/or Nebraska Rural Water Association for assistance in repairs.
4. If power has been lost, follow the procedures for *Power Loss*.
5. If any wells have been damaged, follow the procedures for *Source Pump Failure*.
6. If the water tower has been damaged, follow the procedures for *Loss of Water Tower*.
7. If water main breaks have occurred, follow the procedures for *Transmission and/or Distribution System Failure*.
8. If individual homes are damaged and water pipes are impacted, go out and turn off water to the homes until issues are repaired.

Winter Storm

1. Physically check the wellhouses to ensure the electric heaters are operating.
2. If temperatures get too low at a wellhouse, take a propane heater to increase the temperature in the wellhouse. A new tank will need to be brought in every 24 hours.
3. Contact the streets supervisor, NDOT, or Hamilton County Roads Department for any blocked access roads.
4. Ensure that the water level in the water tower is one foot lower than the normal operating level to reduce the chance of freezing.
5. If water meter issues occur, go out and shut off water to the homes. Repair or replace the affected water meter and turn the water back on.

Item	Description
Detection	• Tornado Sirens • SCADA • Public • Water Operator • Hamilton County Emergency Management
Notification	If access roads are blocked: • NDOT • Streets Supervisor • Hamilton County Roads Department If additional help is needed: • Contractors • Nebraska Rural Water Association

Source Pump Failure

1. Shut down the affected well(s). The SCADA will drop the well off the rotation automatically when it identifies an issue.
2. Inspect the well(s) to see what the issue is. Ensure that all other well system components are operating correctly.
3. If the SCADA controls are the issue, contact HOA Solutions and have them send out a service technician.
4. If it is a pump issue, contact Sargent Drilling to come and repair the pump.
5. If more than three wells are down, notify city officials and implement water restrictions.

Item	Description
Detection	• SCADA • Water Operator
Notification	If the SCADA is having issues: • HOA Solutions If it is a pump issue: • Sargent Drilling If more than three wells are down: • City Officials • Media • Public

<u>Source Water Contamination</u>

1. Notify the DHHS Field Representative and city officials.
2. If terrorism is suspected, contact the Aurora Police Department.
3. Issue a Boil Water Notice or a Do Not Use Notice depending on the contaminant.
4. Sample and determine which well is contaminated and isolate the well. Contact Sargent Drilling to see what can be done to clean the well and/or the water source.
5. Sample to determine if the contaminant has entered the distribution system. If confirmed that the contaminate entered the distribution system, follow procedures for *Finished Water Contamination*.
6. If all wells need to be turned off, follow procedures for *Prolonged Water Outage*.

Item	Description
Detection	• Public • Hospital • Health Department • Routine Sample
Notification	• DHHS Field Representative • City Officials • Media • Public If terrorism is suspected: • Aurora Police Department

Terrorism or Vandalism

1. Notify the Aurora Fire Department, Aurora Police Department, Hamilton County Sheriff's Department, city officials, and DHHS Field Representative.
2. Monitor the SCADA to see if the water system was affected.
3. If needed, physically check water system infrastructure.
4. If the water tower is damaged, follow the procedures for *Loss of Water Tower*.
5. If any wells are damaged, follow the procedures for *Source Pump Failure*.
6. If any wells are contaminated, follow the procedures for *Source Water Contamination*.
7. If the water tower or distribution system is contaminated, follow the procedures for *Finished Water Contamination*.
8. If any water mains are impacted, follow the procedures for *Transmission and/or Distribution System Failure*.
9. Follow DHHS and local law enforcement instructions and recommendations.
10. Isolate and work to repair any damaged infrastructure. Contact contractors and/or Nebraska Rural Water Association for assistance if needed.

Item	Description
Detection	• SCADA • Water Operators • Police Department • Public
Notification	• Aurora Fire Department • Aurora Police Department • Hamilton County Sheriff's Department • City Officials • DHHS Field Representative If additional help is needed: • Contractors • Nebraska Rural Water Association

Transmission and/or Distribution System Failure

1. Isolate the break by closing valves nearest to the break.
2. Notify the affected property owners that water will be shut off by door-to-door notification or phone calls.
3. Call Diggers Hotline (811).
4. Fix the break. If needed, bring in contractors if the break is along a creek crossing or under railroad tracks. If the break is under the railroad, notify Burlington Northern Santa Fe Railway.
5. Take bacteria samples to ensure the water system is safe for consumption. Chlorinate if necessary.
6. If a backflow or other event occurs that contaminates the distribution system, follow the procedures for *Finished Water Contamination*.

Item	Description
Detection	• SCADA • Public
Notification	• Affected Public If break occurs under the railroad: • Burlington Northern Santa Fe Railway If break occurs along a creek crossing: • Contractors

Section 6: Mitigation Alternatives

This section contains actions, procedures, and equipment the utility has identified as possible mitigation alternatives to consider implementing to significantly lessen the impact of a manmade or natural hazard disrupting the operation and safety of the water system. The following actions were identified during the risk and resiliency assessment and development of this ERP. It is recommended that these actions be cross listed in the community's local hazard mitigation plan (HMP) to enable potential eligibility to fund these actions through one of FEMA's Hazard Mitigation Assistance grant programs. The utility may follow up with the HMP plan sponsor (i.e. Upper Big Blue NRD) or the Hamilton County Emergency Manager to add these actions to the HMP.

Mitigation Actions

Mitigation Action	Acquire Identification Resources
Description	Acquire Geographic Information System (GIS) to relocate water lines.
Hazard(s) Addressed	All Hazards
Estimated Cost	$2,000+
Funding	General Fund
Timeline	2-5 Years
Priority	High
Lead Individual	Utility Superintendent
Status	Not Started

Mitigation Action	Backup and Emergency Generators
Description	Provide permanent or portable backup generators for at least two more wells.
Hazard(s) Addressed	Power Loss
Estimated Cost	$115,000
Funding	American Rescue Plan Act
Timeline	1 Year
Priority	High
Lead Individual	Utility Superintendent
Status	On Order

Mitigation Action	Detailed Cybersecurity Assessment for the Business Enterprise System
Description	Perform a detailed cybersecurity assessment for the businesses enterprise system with IT Department or outside cybersecurity firm.
Hazard(s) Addressed	Cyber Attack – Business Enterprise System
Estimated Cost	Unknown
Funding	Unknown
Timeline	2-5 Years
Priority	Medium
Lead Individual	Utility Superintendent
Status	Not Started

Mitigation Action	New Well
Description	Provide a safe backup water supply for the community; replace existing wells affected by drought, increase in demand, and additional water for fire protection.
Hazard(s) Addressed	Drought
Estimated Cost	$350,000 - $450,000
Funding	CDBG, State Revolving Fund
Timeline	2-5 Years
Priority	Medium
Lead Individual	Utility Superintendent
Status	Not Started

Potential Future Sources of Water

The city would like to add a new well to increase supply for future increases in demand and to help protect against the impacts of drought. This project has not been started at this time.

Appendix A: Response Resources

Available Equipment

Portable Generators

Make/Model	Phase / Voltage / Amps	Contact Individual	Phone Number	Location of Storage
DOW'R GARD/30D36R	120/240 VAC/25/12.5 AC	Darrell Eggli	(402) 694-2511	Public Works Shop
Honda/EU2200i	120V/15 AMP	Darrell Eggli	(402) 694-2511	Public Works Shop

Pickup Trucks, Vans, and Other Vehicles

Make and Model	4x4	Phone Number	Location of Vehicle
Ford F150	Yes	(402) 694-6992	City Hall
Ford F150	Yes	(402) 694-6500	WWTP
Ford F150	Yes	(402) 694-2052	Cemetery
Ford F150	Yes	(402) 694-2511	Public Works Shop
Ford F150	Yes	(402) 694-6992	Parks and Recreation
Chevrolet Silverado 1500	Yes	(402) 694-6500	WWTP
Chevrolet Silverado 2500HD (3)	Yes	(402) 694-2511	Public Works Shop
Ford F250 (2)	Yes	(402) 694-2511	Public Works Shop
Fold F350	No	(402) 694-2511	Public Works Shop
Chevrolet Silverado 1500 (3)	No	(402) 694-6992	Parks and Recreation
Ford F350 Bucket Truck	No	(402) 694-6500	WWTP

Dump Trucks

Make and Model	Capacity (tons)	Phone Number	Location of Vehicle
International 7300 (3)	5 Yard	(402) 694-2511	Public Works Shop
Ford	5 Yard	(402) 694-6500	WWTP

Construction Equipment

Item (Make & Model)	Phone Number	Location
Backhoe	(402) 694-2511	Public Works Shop
Mini Excavator	(402) 694-2511	Public Works Shop
Street Sweeper	(402) 694-2511	Public Works Shop
Motor Grader	(402) 694-2511	Public Works Shop
Skid Steer	(402) 694-2511	Public Works Shop
Skid Steer	(402) 694-2052	Cemetery
Skid Steer	(402) 694-6500	WWTP
Pay Loaders (2)	(402) 694-2511	Public Works Shop
Jet Vac Truck	(402) 694-2511	Public Works Shop

Spare Pumps

Pump Type	Manufacturer	Capacity (gpm)	Fuel
Trash Pump	Gorman Rupp	400	Propane

Spare Parts for Pumps and Wells

Part	Location
All Parts	Sargent Drilling, Aurora, Geneva

Spare Piping

Part	Location
All Piping	Municipal Supply, Hastings

Spare Valves

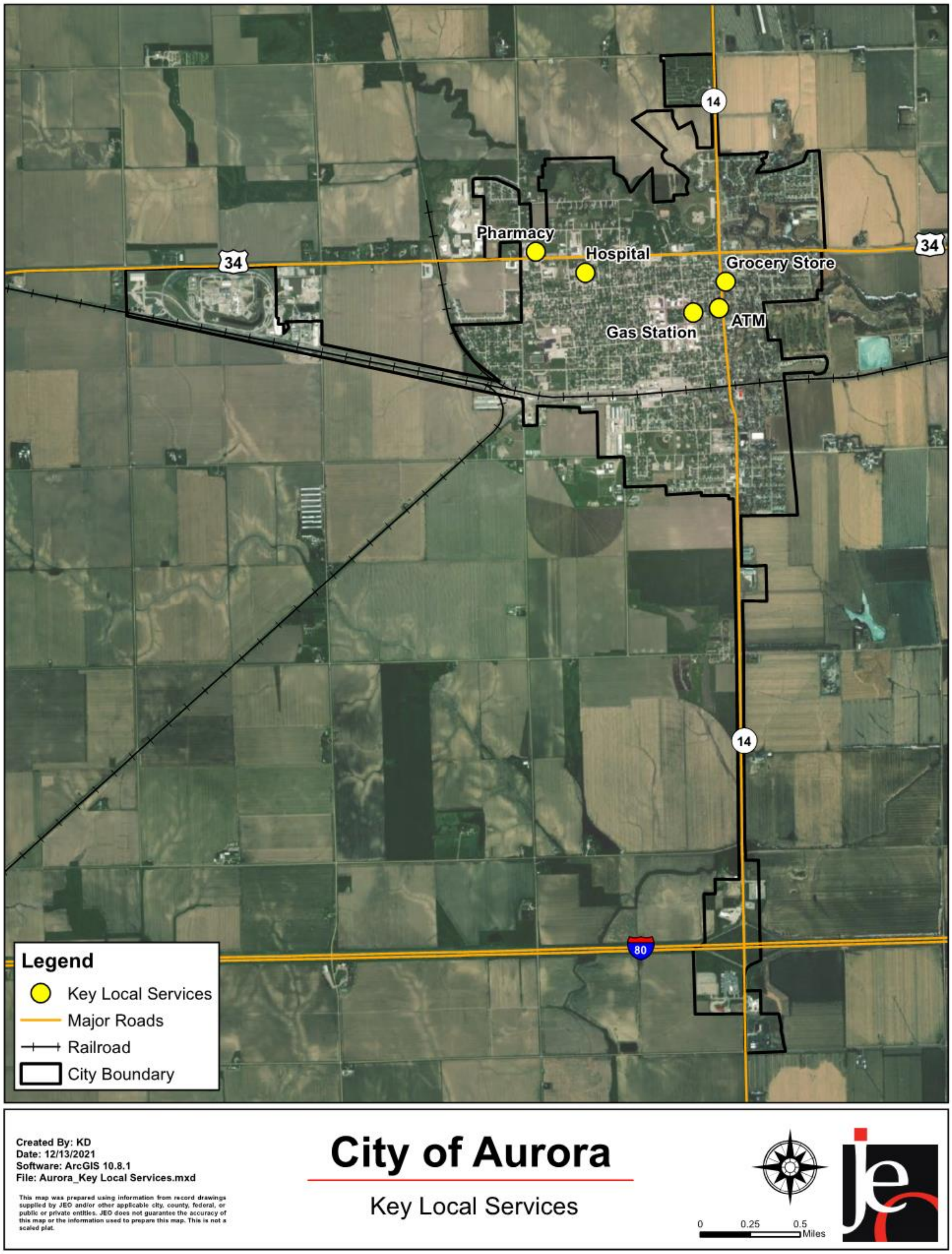
Part	Location
Water Main Valves	Public Works Shop, Municipal Supply, Hastings

Key Local Services

The closest locations of key logistical and medical services that may be needed during an incident are listed below.

Facility	Location and Description
Hospital	Memorial Hospital: 1423 7th St, Aurora, NE 68818
Gas Station	Aurora Cooperative: 1318 M St, Aurora, NE 68818
Pharmacy	Jim's USave Pharmacy: 219 Q St, Aurora, NE 68818
ATM	Pinnacle Bank: 1119 16th St, Aurora, NE 68818
Grocery Store	Aurora Mall: 1320 16th St, Aurora, NE 68818

Key Local Services Map



Appendix B: Work Order Log

As response activities are undertaken, City of Aurora Water System personnel may keep a record of work activities using the work order log form below.

Work Order Number	Crew	Assignment	Estimated Time of Repair	Assignment Made By	Completed By	Date Completed

Appendix C: Communication Log

Date	Time	Request	Action Taken

Appendix D: Recovery Checklist and Damage Assessment

Returning to normal operations is vital to rapid restoration of clean, safe water to the community and is essential to the assessment and recovery process. The following is a checklist of actions to be taken during the recovery period. A copy of this checklist can be kept for each water supply emergency event. Also included is a preliminary damage assessment to be used in the recovery process. Following the damage assessment, notify DHHS DPH of the findings.

1. Assessment and Recovery Period Checklist

☐ Perform in-depth damage assessment of system to determine long-term effects of damaged areas (use assessment form below). Prepare a preliminary damage report.

☐ Notify your local health department and DHHS DPH of system status and situation.

☐ Will there be a need to use mutual aid agreements and/or implement standby contracts or other emergency agreements for equipment and operations?

☐ Prepare written documentation of emergency work performed for possible compensation by emergency agencies. Make sure that crews make a record of work effort, written logs (see Work Order Log) and take pictures. This will all be helpful in recovery of funds.

☐ After completion of emergency repairs, rest the crews and return, if possible, to more normal work schedules.

☐ Notify appropriate insurance carriers. Provide written and photo documentation of damage.

☐ Assist in the survey of emergency repairs and scheduling of permanent repairs.

☐ Assist in the inventory of repair supplies and replacement stock.

☐ Servicing of emergency equipment, when able (oil changes, lubrication, etc.)

☐ Make sure the public is kept informed throughout the extent of the emergency.

2. Preliminary Damage Assessment

General Overview:

☐ Determine need to repair, replace, or abandon facilities

☐ Evacuate Buildings in danger of collapse

☐ Estimate cost to repair damage

Treatment Plants

☐ Check if power is available and condition of mechanical and electrical equipment

☐ Check for structural damage

☐ Check for chemical spills or releases

☐ Closures and tags damaged facilities; and equipment

Tanks:

☐ Check for evidence of failure of subbase

Reservoirs: Check for

☐ Leaks

☐ Seepage

☐ Landslides

☐ Embankment slump

☐ Cracks

☐ Broken inlet/outlet pipes, underdrains

☐ Buckling

Distribution System: Check for

☐ Leaks

☐ Pressure loss in lines

☐ Check mechanical couplings

☐ Breaks

☐ Cross-connections

☐ Lower water levels to reduce possibility of structural damage

Wells:

☐ Check for physical damage

☐ Name, address, phone # for private lab

☐ Check power source

☐ Test for contamination

☐ Check for pump or motor failure

Appendix E: After-Event Evaluation Report

At the conclusion of the emergency event the water system can assemble and prepare an after-event evaluation report. This report assesses the actions and responses to an emergency. A sample form for this evaluation report follows:

1. Introduction
    a. Emergency Declaration
    b. Purpose of Report
    c. Emergency Mitigation Planning
    d. History

2. Description of Emergency
    a. Geography
    b. Chronology
    c. Damages and Impacts
    d. Statistics

3. Recommendations
    a. Issue
    b. Background
    c. Recommendation
    d. Lead
    e. Support
    f. Funding
    g. Schedule

4. Appendices
    a. Maps
    b. List of Participants

Appendix F: Incident Command System (ICS)

ICS is used to organize both near-term and long-term field-level operations for a broad spectrum of emergencies, from small to complex incidents, both natural and manmade. The State of Nebraska recognizes and requires that ICS be utilized by responders and officials during disaster response. The ICS allows responders to have:

- A single set of objectives for a given time period;
- Tactical plans developed using a collective, strategic approach;
- Improved information flow and coordination between responders and decision makers;
- A common understanding of joint priorities and restrictions;
- Assurance that no agency's legal authority is compromised or neglected; and
- Use of resources and the combined efforts of all agencies under a single plan.

The following discussion will provide insight related to the positions associated with the ICS Structure.

Incident Command

Single Incident Commander (IC): When an incident occurs within a single jurisdiction and there is no overlap with other jurisdictions or functional overlap with multiple agencies, a single IC should be designated with overall incident management responsibilities by the appropriate jurisdictional authority. The IC will be responsible for the development of incident objectives on which subsequent incident action planning will be based.

Unified Command (UC): UC is an important element in multi-jurisdictional or multiagency incident management. UC provides guidelines to enable agencies with different legal, geographic, and functional responsibilities to coordinate, plan, and interact effectively. As a team effort, UC allows all agencies with jurisdictional authority or functional responsibility related to the incident to jointly provide management direction through a common set of incident objectives and strategies and a single incident action plan. Each participating agency maintains its authority, responsibility, and accountability. UC functions as a single integrated management organization, which involves:

- Co-located command at the incident command post;
- An Operations Section Chief to direct tactical efforts;
- A coordinated process for resource ordering;
- Shared planning, logistical, and finance functions, wherever possible; and
- Coordinated approval of information releases.

All agencies in the UC structure contribute to the process of:

- Selecting/identifying objectives;
- Determining overall incident strategies;
- Ensuring that joint planning for tactical actives is accomplished in accordance with approved incident objectives;
- Ensuring the integration of tactical operations; and
- Approving, committing, and making optimum use of all assigned resources.

The structure and composition of the UC will be contingent upon the location(s) of events and the type and magnitude of a given incident.

Emergency Operations Center/Area Command (EOC/AC): Traditionally, an EOC and emergency management agency are not part of the incident response structure, but rather serve as facilitators of events associated with incident response. EOC staff work to ensure resources are identified and made available to facilitate a timely, efficient, and effective response. The EOC and associated staff are the strategic level of the response and help implement policy directives and critical resource allocations.

An Area Command oversees the management of (1) multiple incidents that are each being handled by an ICS organization, or (2) large or multiple incidents to which several Incident Management Teams have been assigned. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources according to priorities, ensure that incidents are properly managed, objectives met, and strategies followed. Area Command becomes “unified” when incidents are multi-jurisdictional. Area Command may be established at an emergency operations center facility or at some location other than an Incident Command Post. Dependent on the situation and jurisdictions involved, the hybrid EOC/AC model may be implemented to achieve appropriate direction, control, and coordination.

Incident Command Staff

Public Information Officer (PIO): The PIO is responsible for interfacing with the public and media and/or other agencies with incident-related information requirements. The PIO gathers, verifies, coordinates, and disseminates accurate, accessible, and timely information related to the incident. The PIO may also perform a key public information-monitoring role (i.e. monitoring of social media and/or news releases). Regardless of incident command structure (IC/UC), there should only be one designated PIO. Assistants from different involved agencies/departments may be assigned to support the PIO.

Safety Officer: The Safety Officer monitors incident operations and provides guidance on all matters related to operational safety, including the health and safety of emergency responder personnel. The Safety Officer is responsible to the IC/UC for the systems and procedures necessary to ensure ongoing assessment of hazardous environments, including an Incident Safety Plan, coordination of multi-agency safety efforts, and implementation of measures to promote emergency responder safety, as well as the general safety of incident operations. The Safety Officer has authority to prevent and/or stop unsafe acts during incident operations.

Liaison Officer: The Liaison Officer is IC/UC’s point of contact for representatives of other governmental agencies and relevant stakeholders to provide input on their entities’ policies, resource availability, and other incident-related matters.

Subject Matter Expert: During response to levee-related incidents it is likely that subject matter experts will be necessary as a part of the command structure. The Subject Matter Expert is responsible for providing information and insight related to the levee system and the events associated with the levee or how the incident might escalate.

General Staff

The General Staff are responsible for the functional aspects of the ICS. The General Staff typically consist of the Operations, Planning, Logistics, and Finance sections – each of which have a section chief. The section chiefs may have one or more deputies assigned, with the assignment of deputies from other agencies encouraged in the case of multi-jurisdictional incidents.

Operations Section: The Operations Section is responsible for all tactical activities focused on reducing the immediate hazard, saving lives and property, establishing situational control, and restoring normal operations. Lifesaving and responder safety will always be the highest priority and the first objective in the Incident Action Plan. The Operations Section Chief is responsible for the direct management of all incident-related tactical activities.

Planning Section: The Planning Section collects, evaluates, and disseminates incident situation information and intelligence to the IC/UC and incident management personnel. The Planning Section is also responsible for the preparation of status reports, displays of situational information, maintaining the status of resources assigned to the incident, and preparation and documentation of the Incident Action Plan (based on input and guidance from the IC/UC).

Logistics Section: The Logistics Section is responsible for all service support requirements needed to facilitate effective and efficient incident management, including ordering resources from off-incident location. This Section also provides facilities, security, transportation, supplies, equipment maintenance and fuel, food services, communications and IT support, and emergency responder medical services.

Finance Section: The Finance Section should be established when the incident management activities require on-scene or incident-specific administration support. This Section is responsible for recording personnel time, maintaining vendor contracts, administering compensation and claims, and conducting an overall cost analysis for the incident. It is essential that the Finance Section coordinate with the Planning and Logistics Sections to ensure that operational records can be reconciled with financial documents. During large, complex incident response it is critical that the Finance Section be in communication with IC/UC, tracking incident expenditures, and projecting additional needs.

ICS Training

During a disaster event, all city and utility staff will participate in ICS and EOC activities as established in the county's Local Emergency Operations Plan. It is recommended that all utility staff are trained in at least introductory ICS: ICS-100, ICS-200, and ICS-700. Courses can be found on FEMAs website: https://training.fema.gov/nims/.