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City of Ashland, Nebraska

Wellhead Protection Plan

Review Draft 1.0 Prepared: November 2020
Adopted by Ashland: DATE TO BE INSERTED
Approved by NDEE: DATE TO BE INSERTED

Acknowledgements

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Prepared for: *City of Ashland, Nebraska*

Prepared by: *JEO Consulting Group, Inc.*

JEO Project Number: *181343.00*

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This wellhead protection plan has been prepared to assist the City of Ashland to proactively protect and manage the aquifer that is the source of community drinking water. It has been written with guidance published by the Nebraska Department of Environment and Energy (NDEE).

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USB (located in binder cover pocket) - Digital copy of the plan, appendices, and GIS data

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LIST OF ABBREVIATIONS AND ACRONYMS

BMP	Best Management Practice		
CRP	Conservation Reserve Program	NDEE	Nebraska Department of Environment and Energy
CSD	Conservation & Survey Division		
CSI	Contaminant Source Inventory	NeDNR	Nebraska Department of Natural Resources
Database	Quality Assessed Agrichemical Contaminant Database	NEWARN	Nebraska Water/Wastewater Agency Response Network
DHHS	Department of Health and Human Services	NI	Nitrogen Inhibitor
EPA	Environmental Protection Agency	NPDES	National Pollutant Discharge Elimination System
ET	Evapotranspiration	NRD	Natural Resources District
ETJ	Extraterritorial Jurisdiction	NPS	Nonpoint Source Pollution
Gpcpd	Gallons per customer per day	Ppb	Parts per billion
GWMA	Groundwater Management Area	PWSS	Public Water Supply System
		SDWA	Safe Drinking Water Act
GWMP	Groundwater Management Plan	The city	City of Ashland
		TOT	Time of Travel
GWMPA	Groundwater Management and Protection Act	UNL	University of Nebraska-Lincoln
		USDA	United States Department of Agriculture
LPNNRD	Lower Platte North Natural Resources District	USGS	United States Geological Survey
LPSNRD	Lower Platte South Natural Resources District	VRI	Variable Rate Irrigation
		WARN	Water/Wastewater Agency Response Network
MCL	Maximum Contaminant Level		
Mg/L	milligrams per liter	WhAEM	Wellhead Analytic Element Model
NDA	Nebraska Department of Agriculture	WHP	Wellhead Protection

NEBRASKA'S WELLHEAD PROTECTION PROGRAM SUMMARY

A WELLHEAD PROTECTION AREA IS THE SURFACE AND SUBSURFACE AREA SURROUNDING A COMMUNITY DRINKING WATER WELL OR WELL FIELD, THROUGH WHICH CONTAMINANTS ARE REASONABLY LIKELY TO MOVE TOWARD AND REACH SUCH WATER WELL OR WELL FIELD (§46-1502).

NEBRASKA'S WELLHEAD PROTECTION PROGRAM

The Nebraska Department of Environment and Energy (NDEE) administers the Wellhead Protection (WHP) Program, which began after the Nebraska Legislature passed LB 1161 in 1998 (Neb. Rev. Stat. §46-1501 – 46-1509), authorizing the Wellhead Protection Area Act. The Act sets up a voluntary process for public water supply systems to use in order to implement a local WHP plan. The intent of this WHP planning process is to establish guidelines for communities and other public water suppliers to develop local WHP plans. A WHP plan does not provide any new powers to a community; it serves as a guide to local decision makers tasked with protecting the community drinking water supply. All community public water supplies in Nebraska have a Wellhead Protection Area map as of October 1, 2004.

WELLHEAD PROTECTION PLAN REQUIREMENTS

1. **Delineate the WHP Area** – A WHP area map that shows the area that is critical for protecting a community's drinking water supply source.
2. **Perform a Contaminant Source Inventory (CSI)** - Conducting a CSI involves locating and documenting activities, structures, and locations which could affect the quality of the drinking water source.
3. **Manage potential contaminants** - After identifying potential contaminant sources within the WHP area, the community can develop projects or other management tools to ensure a safe drinking water supply. This can include: zoning, local ordinances, working with landowners to implement best management practices (BMPs), and public outreach education.
4. **Develop emergency and contingency plans** - These plans assist a community in responding to events such as natural disasters, contamination, and drought.
5. **Educate and involve the public** - Community awareness helps provide citizens with the information they need to protect drinking water, reduce pollution, and increase their participation in wellhead protection efforts.

CHAPTER 1. INTRODUCTION

1.01 ABOUT THIS PLAN

This planning document is prepared for the City of Ashland (the city) as a general guide to manage the source of their drinking water, particularly as it relates to water quality. Adoption of the document is indicative to water system users, the community, and outside agencies that the city values its water system and desires systematic and proactive protection for its drinking water sources. This plan confers no new legal requirements or regulatory authority to the city, or any other entity. Projects and programs implemented through the plan are voluntary.

The planning process is an opportunity to continue to build and develop relationships between all stakeholders while also developing projects and programs. It is a valuable component through which communities engage with the public and project partners to develop source water planning documents. Source water refers to water used as drinking water for public or private water supplies. This can include surface water from streams, rivers, and lakes, as well as groundwater from aquifers. Ashland's source of drinking water is from local groundwater. Protecting source water reduces risks to public health from contaminated water exposures (EPA, 2018). This planning process brings together community leaders, agency representatives, landowners, and technical specialists – many of which may have competing interests, differences in viewpoints, conflicting terminologies, or a general lack of knowledge about water management. This process challenges stakeholders to re-evaluate their own ideas and continue learning more about source water issues.

1.02 FUTURE UPDATES TO THE PLAN

It is recommended that the plan, goals, and action items be reviewed annually by the WHP Stakeholder Committee. Groundwater and WHP related actions should be documented, reported, evaluated, and revised during this time. Five-year updates should include any changes to potential sources of contamination or land use within the WHP area or the addition of a municipal well. Long-term water quality and use trends should be evaluated and extrapolated into future projections to ensure sustainability of the source water is maintained.

NDEE, the Nebraska Department of Health and Human Services (DHHS), the Lower Platte North Natural Resources District (LPNNRD), and Lower Platte South Natural Resources District (LPSNRD) should be consulted during each update to determine if additional information has been developed or if any related regulations or other requirements require a review of the plan.

1.03 COMMUNITY BACKGROUND

The City of Ashland is located in eastern Nebraska, in Saunders County, along the Interstate-80 corridor approximately equidistant between Lincoln and Omaha (Figure 1). The city sits on small bluffs straddling

Salt Creek, which joins the Platte River approximately two miles to the east The population of Ashland, now approximately 2,588, has seen steady growth throughout the 20th century (Figure 2). The city is a popular bedroom community for professionals commuting into Omaha and Lincoln.

In addition to the City of Ashland, private drinking water systems within the WHP area will also benefit from this plan. Approximately 22 rural homes and five privately owned registered domestic wells currently exist throughout the WHP area. If groundwater nitrate pollution continues unchecked, safe drinking water may not be available in the future both for the city and private citizens without expensive treatment alternatives. Proper management of water resources within the WHP area is vital to the city's future.

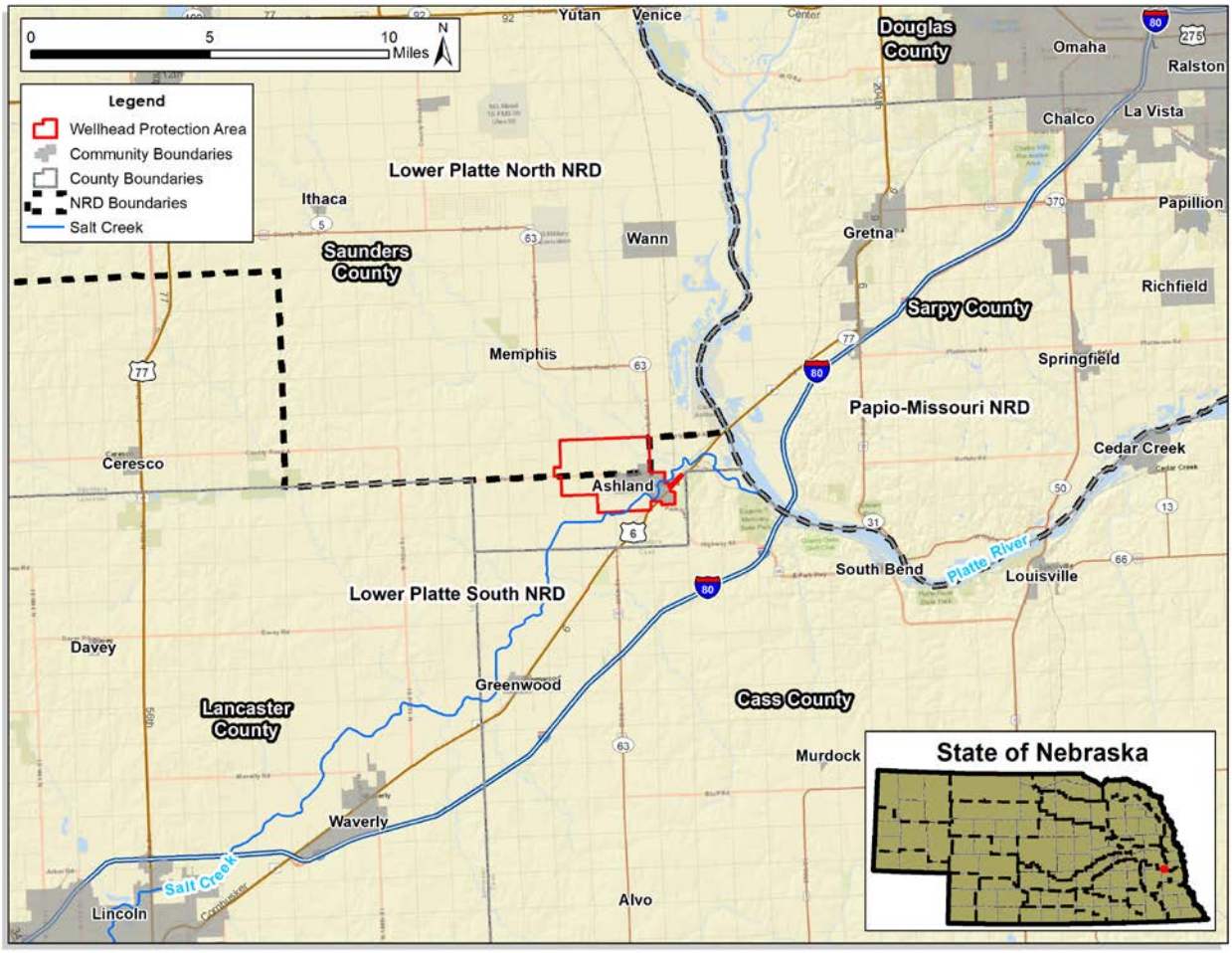
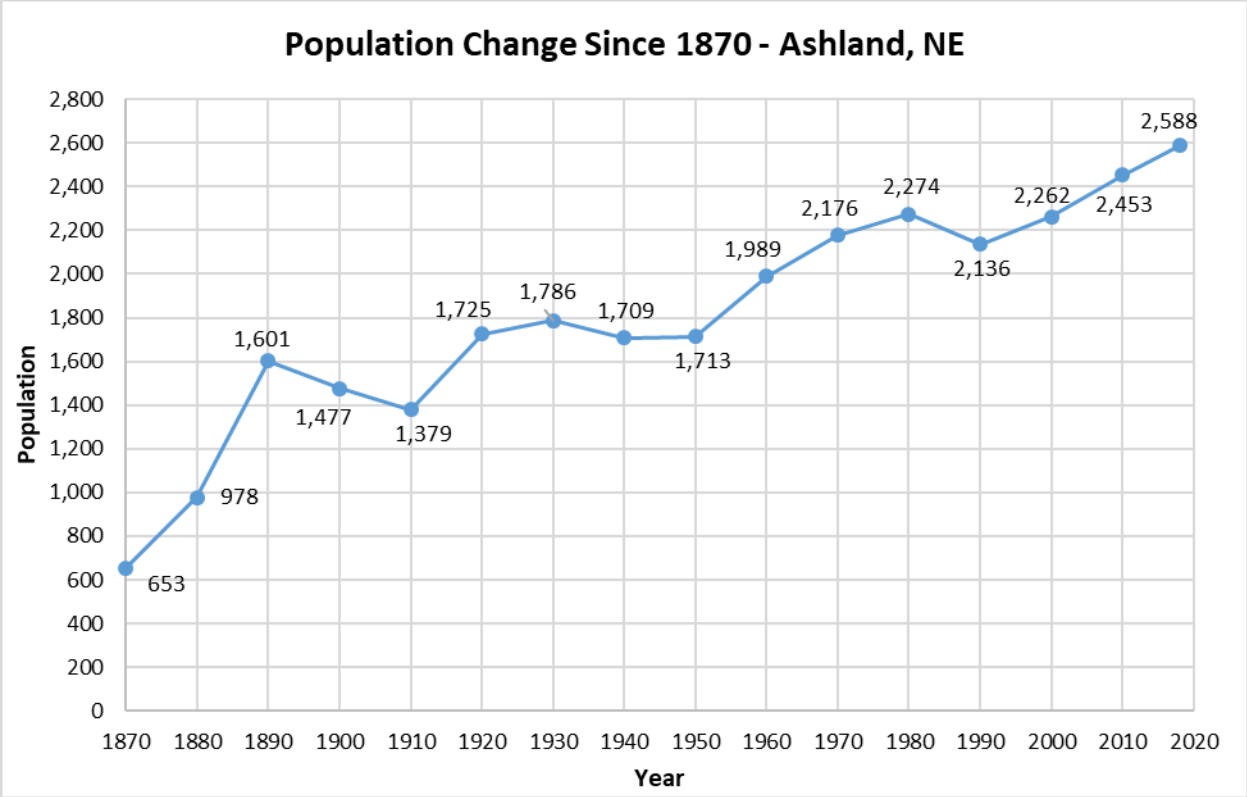


Figure 1: Location of Ashland



Source: US Census Bureau, 2018

Figure 2: Historical Population of Ashland

1.04 NATURAL RESOURCES DISTRICTS

Natural Resource Districts (NRDs) are government entities, led by a locally elected board of directors, with broad responsibilities to protect natural resources. Major Nebraska river basins form NRD boundaries, enabling districts to respond best to local needs. Nebraska's NRDs are involved in a variety of projects and programs to conserve and protect the state's natural resources, especially groundwater. The board of directors govern district and much of their funding is provided by local property taxes. The city's WHP area falls within both the LPNNRD and LPSNRD boundaries (Figure 3).

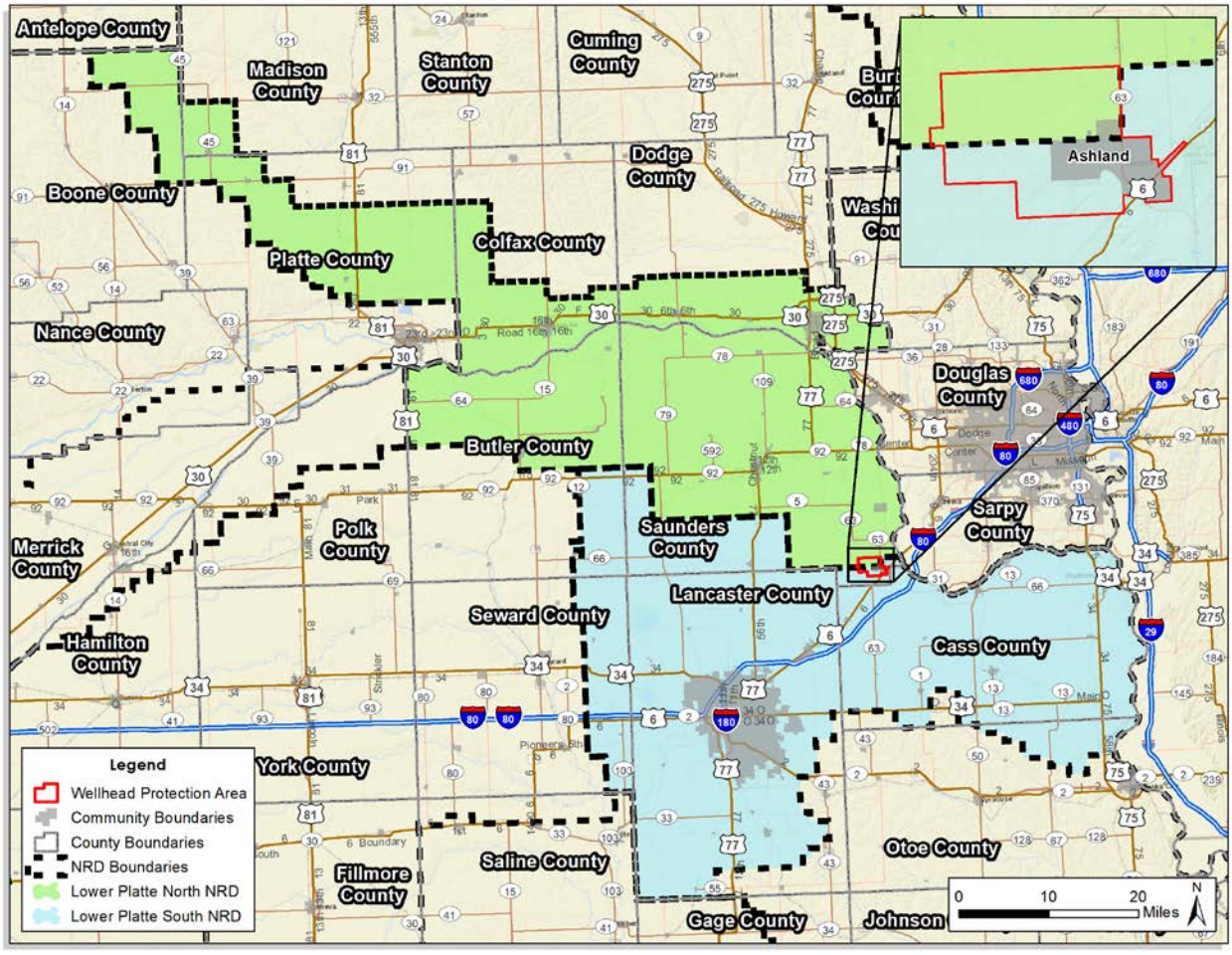
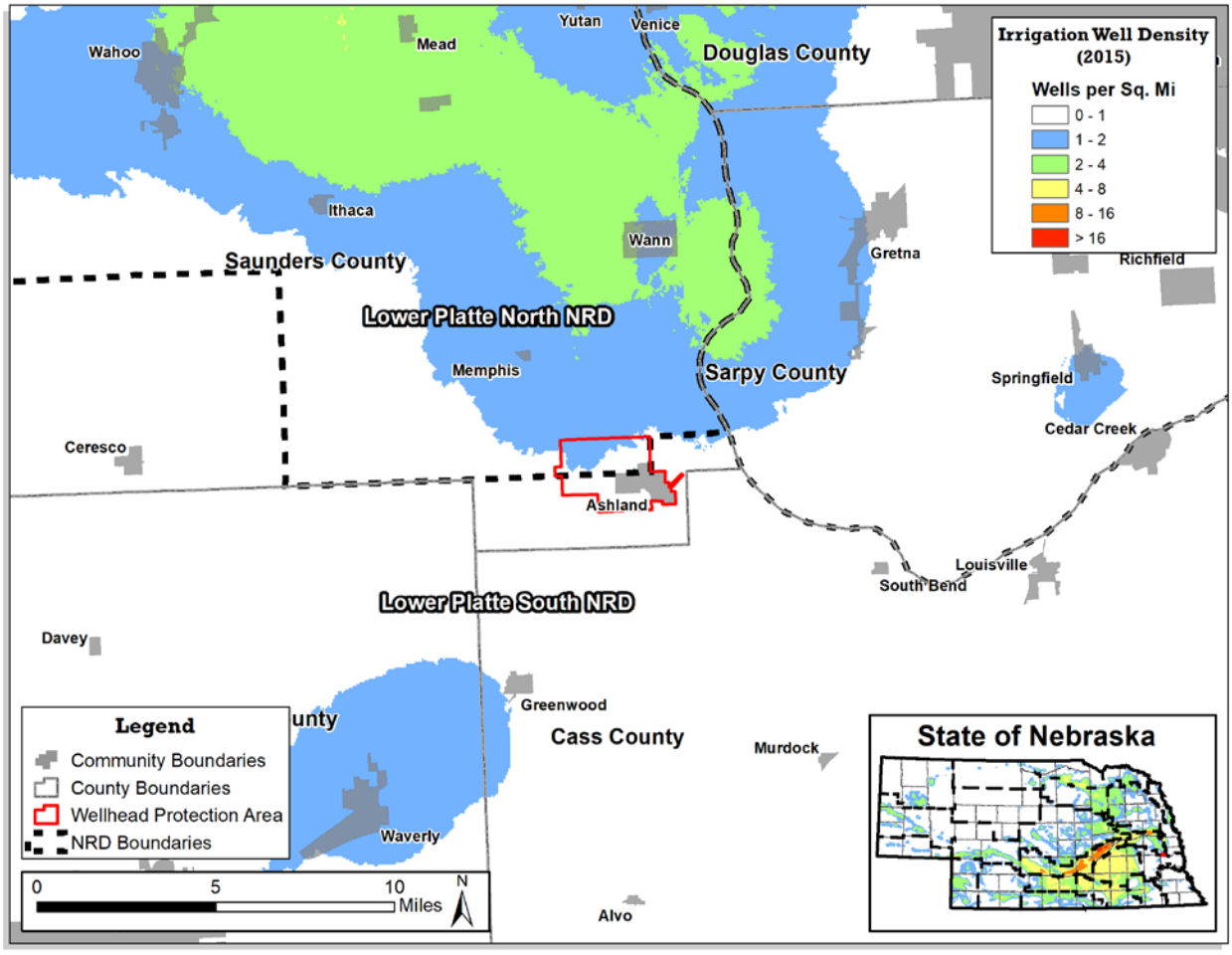


Figure 3: Lower Platte North and South NRD Boundaries

1.05 NEBRASKA GROUNDWATER

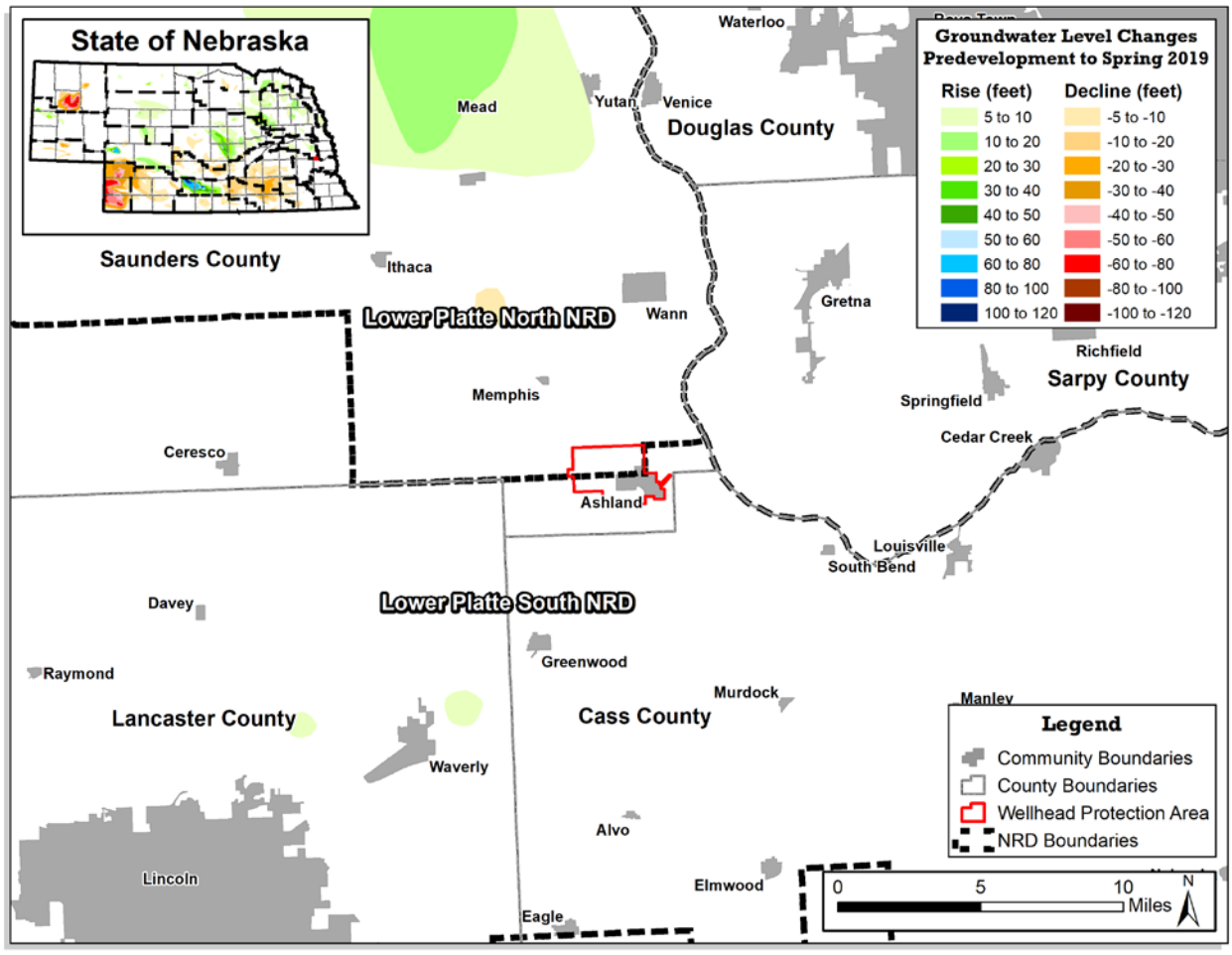
Nebraska has significant groundwater sources throughout the state. Groundwater uses include irrigation, water supply for humans and animals, and uses for commercial and industrial activities. Nebraska receives nearly 88% percent of its public drinking water and nearly 100% of its private water supply from groundwater sources (NDEE, 2019). Agriculture, the state's largest industry, is dependent on this resource as well. As of November 2018, the Nebraska Department of Natural Resources (NeDNR) listed over 96,000 active irrigation wells and over 31,000 domestic wells registered in the state (NDEE, 2019). Figure 4 displays the density of registered irrigation wells near Ashland. Domestic wells were not required to be registered with the state prior to 1993, therefore thousands of unregistered domestic wells also exist in unknown locations.



Source: UNL Conservation & Survey Division

Figure 4: Density of Active Registered Irrigation Wells – December 2015

In respect to groundwater withdrawal, aquifer elevation is measured to establish trends in groundwater level and availability. Figure 5 characterizes the change in groundwater levels from pre-development to the spring of 2019. Most of Nebraska, which is underlain by the High Plains Aquifer, has groundwater available in adequate amounts. However, other areas, primarily those in the east and northwest regions of the state, have difficulty providing adequate yields. Groundwater in the east can be more limited because glaciation and erosion have deposited many geologic formations with variable properties. While some areas of Nebraska have seen rises and declines in excess of 100 feet, the region around Ashland has seen little to no change.



Source: UNL Conservation & Survey Division

Figure 5: Groundwater Level Changes – Predevelopment to Spring 2019

1.06 GROUNDWATER POLLUTION IN NEBRASKA

Groundwater pollution throughout Nebraska varies by the type of pollutant and scale of the contamination. Generally, three types of pollutants are of concern to water quality in Nebraska: nitrates, pesticides, and bacteria (coliforms, *E. coli*, etc.). The presence of pesticides in water supplies is an increasing concern. Atrazine is one of the commonly detected pesticides found in drinking water wells of Nebraska which is consistent with usage, as well as its relatively high mobility and persistence. Coliform group bacteria are microscopic, generally harmless organisms living in the digestive system of warm-blooded animals. Although coliform bacteria do not directly cause diseases, they are often indicators of other, more dangerous bacteria. Sources of fecal coliform are septic systems, barnyards, and animal waste lagoons (Gosselin, 1997).

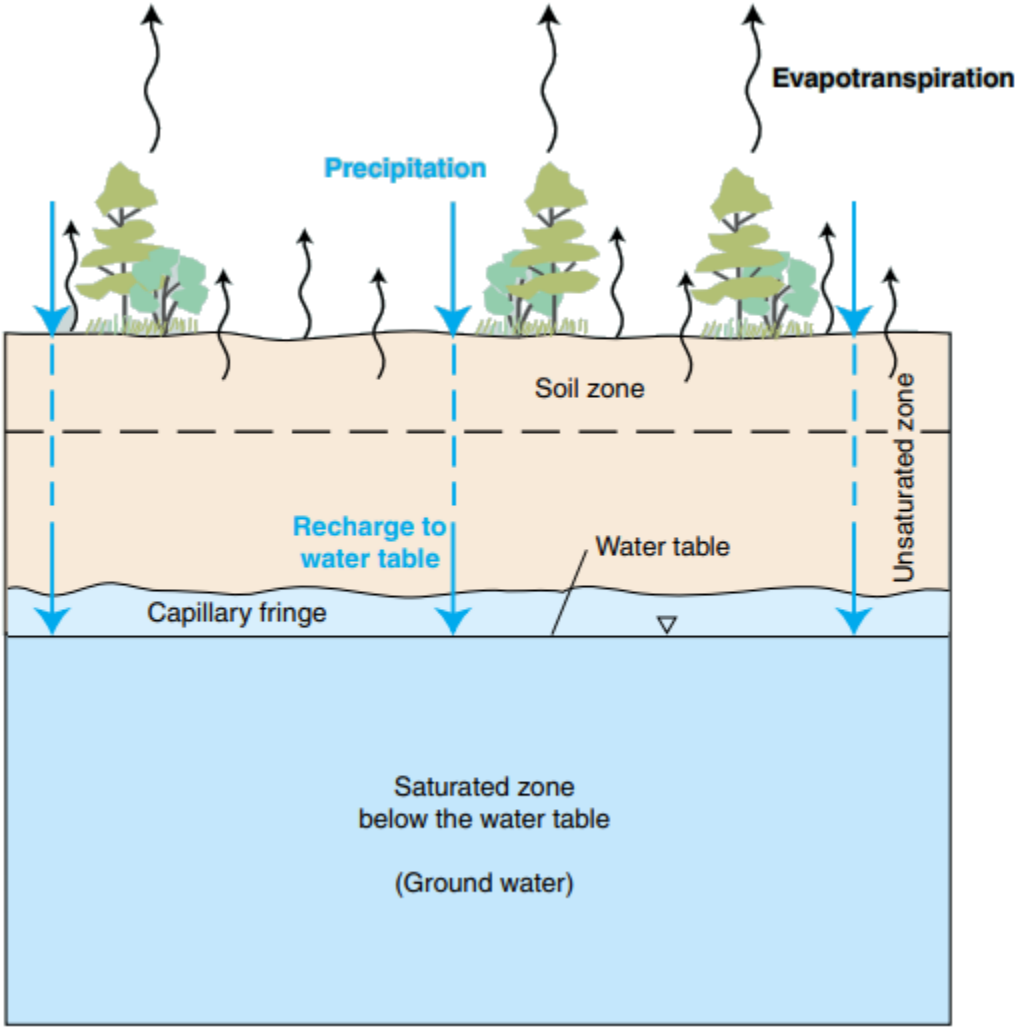
NITRATE POLLUTION

Of the three most common municipal water source pollutants, the most pervasive is nitrate-nitrogen (nitrate). Groundwater pollution, especially due to nitrate, is a growing concern for many communities in Nebraska. Nitrates in public water systems are also a concern for state agencies such as the NDEE and DHHS, which are responsible for working with public drinking water systems.

In an undisturbed natural system, perennial vegetation utilizes nitrogen, thus limiting available nitrate that can leach into groundwater. However, agricultural development throughout the area has removed much of the perennial vegetation, replacing it with annual crops, and increased the application of both organic and inorganic forms of nitrogen as a fertilizer for crop fields. When crops do not fully utilize the nitrogen, it leaches through the vadose zone and into groundwater (Figure 6). In general, nitrates that are present below the root zone (approximately six feet below the soil surface) cannot be utilized by plants or crops. These nitrates eventually migrate to the aquifer unless they encounter a geologic formation that prevents this, such as a thick clay layer between the ground surface and the aquifer.

High levels of nitrates in drinking water are known to cause methemoglobinemia, or “blue baby syndrome” in infants and immune-compromised adults. Methemoglobinemia reduces the oxygen-carrying capacity of blood, often resulting in blue skin coloring around the mouth, hands, and feet. In severe cases methemoglobinemia can cause seizures and death from reduced oxygen levels in the body. Additionally, when nitrates in the body are broken down and converted into the chemical compound nitrite, they can react with other compounds (amines) in the body and form nitrosamines - a cancer-causing compound (NHDES, 2006). Other carcinogenic compounds have been known to become more prevalent when high levels of nitrates are present in drinking water. Due to these risks, the US Environmental Protection Agency (EPA) has set a Maximum Contaminant Level (MCL) of 10 milligrams per liter (mg/L) for nitrate-nitrogen in drinking water.

The city monitors nitrate levels in all municipal wells annually and routine water quality testing has shown that nitrate levels have not exceeded the MCL. As of August 2020, the water systems nitrate concentration was 4.68 ppm (HHSS, 2020)



Source: USGS, 1999

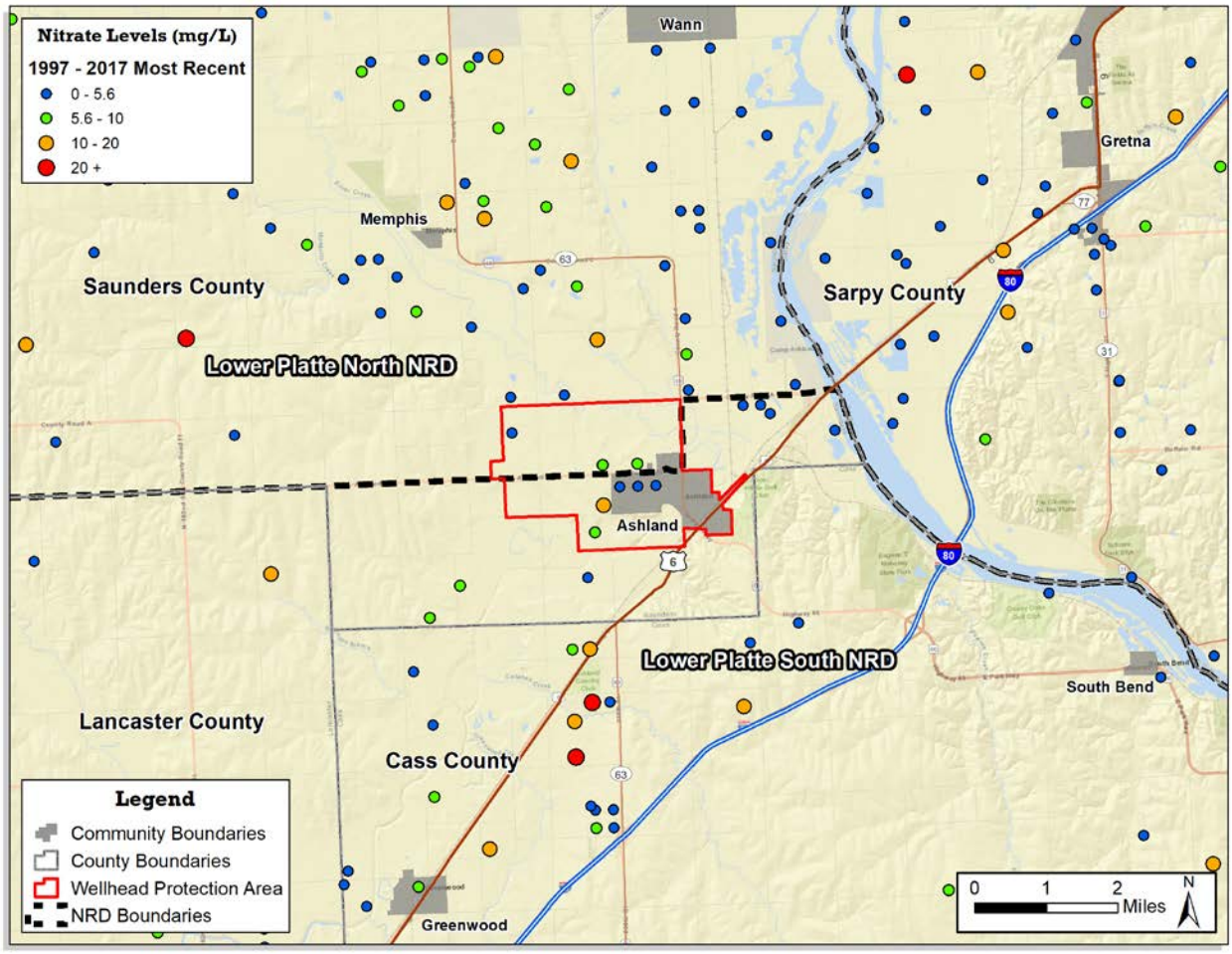
Figure 6: Illustration of the Root Zone, Unsaturated Zone, and Groundwater

An extensive network of groundwater monitoring and quantity/quality evaluation exists throughout the State. This effort involves multiple entities, including:

- Natural Resources Districts (23 in total)
- Nebraska Department of Agriculture (NDA)
- NeDNR
- NDEE
- DHHS
- Public Water Suppliers
- University of Nebraska-Lincoln (UNL)
- United States Geological Survey (USGS)

Monitoring results are compiled in the Quality Assessed Agrichemical Contaminant Database for Nebraska Groundwater (Database). The Database compiles groundwater monitoring data from different sources and provides public access to the results. Available water quality data ranges from 1974 to the present. Monitoring data is collected from irrigation and domestic supply wells in addition to dedicated groundwater monitoring sites. The number of designated groundwater monitoring wells has increased through the past several years across the State. The Database is available online at: https://clearinghouse.nebraska.gov/Clearinghouse.aspx.

A review of the Database provided the most recent nitrate concentrations for each well sampled in and around the WHP area since 1997 (Figure 7). Of the eight wells sampled within the WHP area, four have nitrate concentrations of 5.6 mg/L or less, three have concentrations between 5.6 – 10 mg/L, and one has a concentration greater than 10 mg/L.



Source: Quality-Assessed Agrichemical Contaminant Database for Nebraska Groundwater (NDEE, 2018)

Figure 7: Most Recent Nitrate Concentrations from Wells Sampled 1997-2017

EMERGING CONTAMINANTS

In recent years, groundwater managers in Nebraska have become concerned that the overall groundwater chemistry is changing and naturally occurring elements in the aquifer material are being released into the groundwater. A recent study (Weber, 2015) considered the relationship of elevated groundwater nitrate levels and uranium concentrations in groundwater. Elevated uranium concentrations are found in many regions, including those without anthropogenic uranium activity (mining, nuclear testing, etc.), indicating a source of natural uranium contamination. Research indicates that natural uranium in the subsurface may be oxidized and mobilized as the nitrate (in many forms) moves through the root zone and eventually to groundwater. Shallow groundwater was determined to be the most susceptible to co-contamination. Weber (2015) indicated that nitrate concentrations near the MCL are correlated to elevated groundwater uranium concentrations; thus, nitrate, a primary groundwater contaminant, can be a factor leading to secondary uranium concentration.

This correlation is significant because consumption of uranium contaminated drinking water has been linked to nephrotoxicity (toxicity in the kidneys) and ototoxicity (damage to the inner ear) and, thus, poses a health risk (Weber, 2015). Some public water supply systems treat not only nitrates, but also uranium (NDEQ, 2018). In addition to drinking water concerns, food crops irrigated with contaminated water have been demonstrated to accumulate uranium, thus leading to an additional uranium exposure through food crops (Weber, 2015).

While Ashland's drinking water has not yet violated the MCL for any emerging contaminants, a wide range of regulated contaminants such as arsenic and selenium has been found in the city's drinking water. The highest reported value of arsenic in 2018 was 4.27 parts per billion (ppb), while the MCL is 10 ppb (City of Ashland, 2019). This is not yet a widespread issue but may become so in the future and will require close monitoring.

1.07 GROUNDWATER AQUIFER

SETTING AND CHARACTERISTICS

The availability of groundwater in an area depends heavily upon the local subsurface geology. Areas with low bedrock elevation and high saturated ground thickness are desirable for well construction, as these areas are more likely to provide high quantities of groundwater with lower effort from well pumps. The quality of groundwater will vary based on geology. The geology of the WHP area contains portions of the Todd Valley and the Platte River Valley. In this area, the Platte River and its supporting channels used to exist, cutting away the bedrock to a deeper depth. As the river migrated, alluvial sands and gravels were deposited in the valley left by the river, and this alluvial fill was capped with fine materials like silt, loess, and clay. These conditions form a paleovalley aquifer. This area is well suited for high capacity groundwater pumping due to the deep Pennsylvanian Bedrock surface overlain by a thick layer of porous materials like sand and gravel (JEO, 2020).

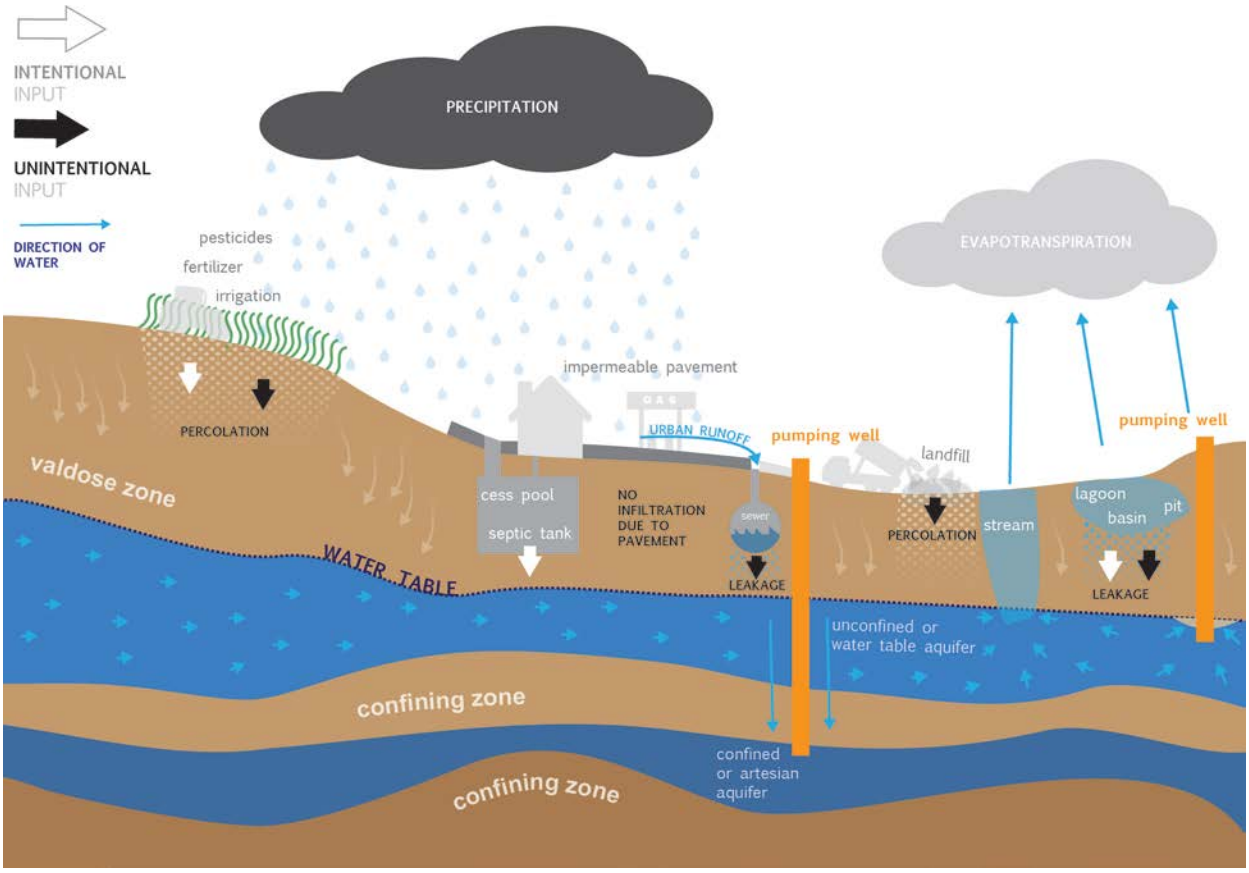
VULNERABILITY TO CONTAMINATION

Regions that are within an aquifer zone or rely on the groundwater produced by a well are vulnerable to contamination from human activities. There are various computer models available that serve as a practical visualization tool for decision making which quantify or illustrate that vulnerability. Alone, they do not fill a direct role, but cumulatively contribute to understanding the issues. In general terms, it is relatively easy to delineate areas of high vulnerability, difficult to determine that an area has very low vulnerability, and nearly impossible to reliably define fine gradations between the two.

Solely utilizing any model to address management decisions should be done conservatively and with additional information. Groundwater management requires cooperative efforts between regulatory agencies, policy makers, natural resources managers, educators, the public, and technical experts. Actions based solely on a vulnerability assessment should be tempered by the uncertainty of the assessment and the confidence of the technical experts in the assessment they have produced (National Research Council, 1993).

Groundwater vulnerability is a function of the properties in the natural system where groundwater is found; however, the risk of contamination may be relativity low or high regardless of the vulnerability. Contamination risk is assessed by the proximity or siting of a source where potential introduction of a pollutant into a vulnerable area may exist. Additional groundwater monitoring of vulnerable areas may aid in reducing the risk of contamination. It is important that decisions and management of resources distinguish between vulnerability and risk (Rahman, 2008). Figure 8 illustrates the many ways in which contamination may be introduced to a groundwater system (risk factors). Contamination risk increases when there are more contaminate sources that are present, regardless of the vulnerability.

BECAUSE THE WELLHEAD PROTECTION AREA IS THE MOST CRITICAL AREA FOR RECHARGE OF THE COMMUNITY'S SOURCE OF DRINKING WATER, IT SHOULD BE CONSIDERED HIGHLY VULNERABLE AND EVERY RISK FACTOR SHOULD BE EVALUATED CAREFULLY.



Source: Adapted from University of Texas at Austin – Center for Research in Water Resources

Figure 8: Typical Routes of Groundwater Contamination

A detailed hydrogeologic vulnerability assessment was conducted for the Ashland WHP area in support of this plan. The assessment was completed to better understand the vulnerability of the aquifer to contaminant infiltration. This information can be used to help the city identify low vulnerability locations for potential future well sites, and areas to target in order to mitigate future contamination and evaluation of land management strategies. The assessment was completed utilizing NeDNR well logs, UNL-CSD test hole data, and the most recently available nitrate concentration data for select wells in the WHP area.

The assessment resulted in two geologic cross sections showing the paleovalley aquifer underlain by the Pennsylvanian Bedrock (Figure 9 and Figure 10), and an aquifer vulnerability map (Figure 11). Three

separate wells are identified on the cross sections with nitrate concentrations between 5-10 mg/L, and one well with a concentration of 12 mg/L. The majority of the WHP area is classified as highly vulnerable to contamination based on the results of this assessment (LRE, 2020). Areas classified as highly vulnerable should be the top priority for the city to investigate potential sources of contamination and implement the recommendations in this plan to protect water resources. The complete assessment report is available in Appendix X.

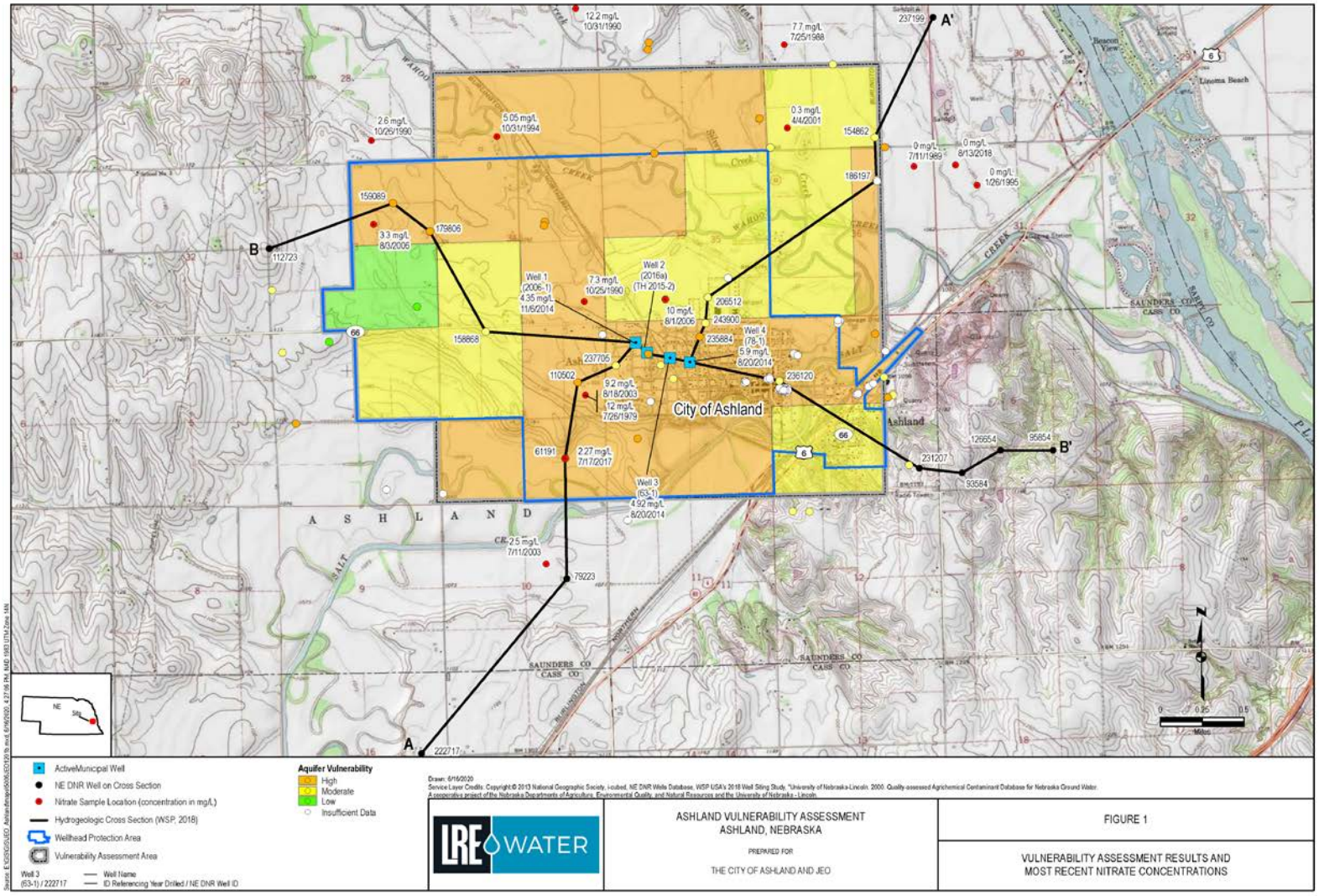
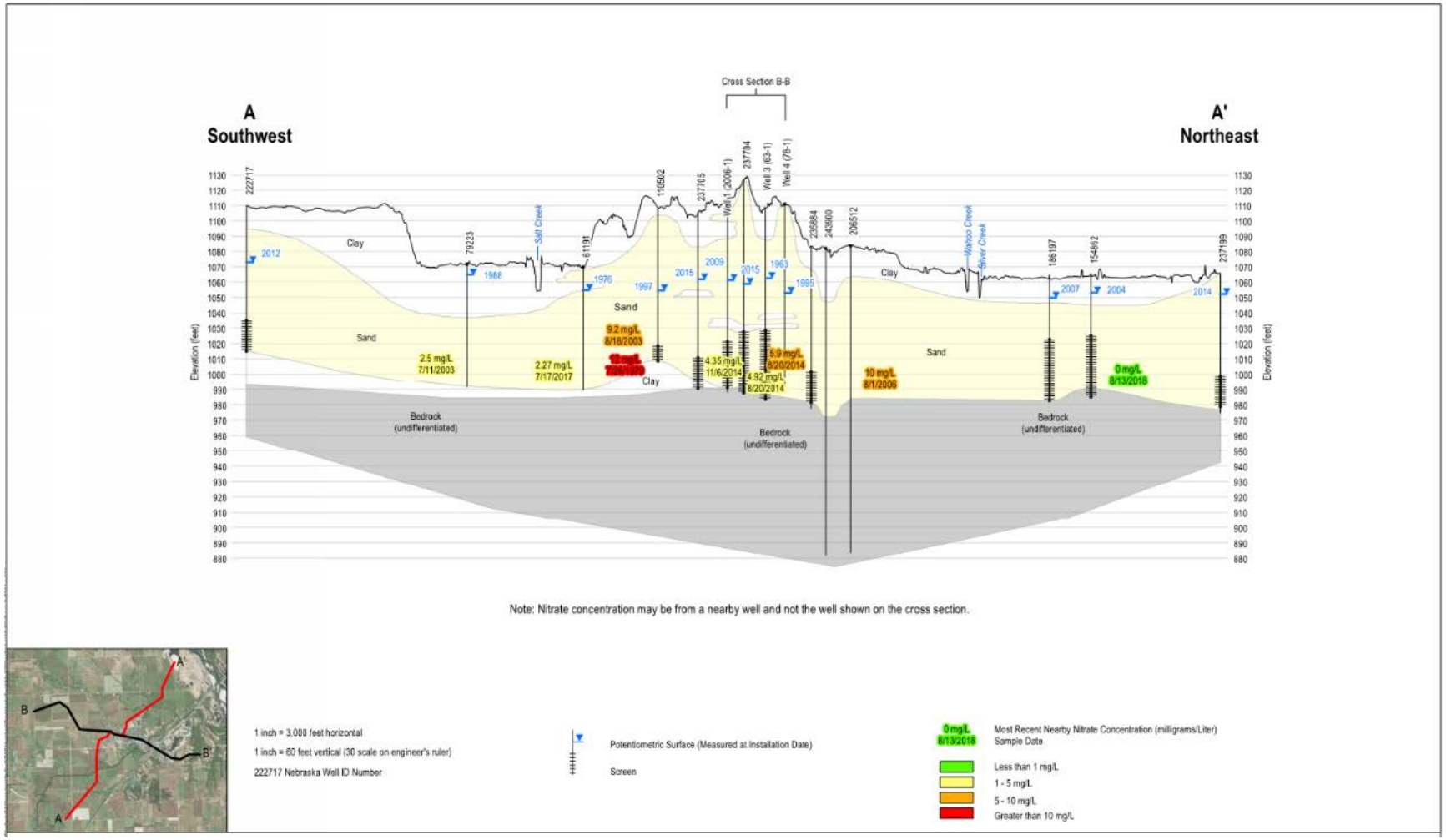
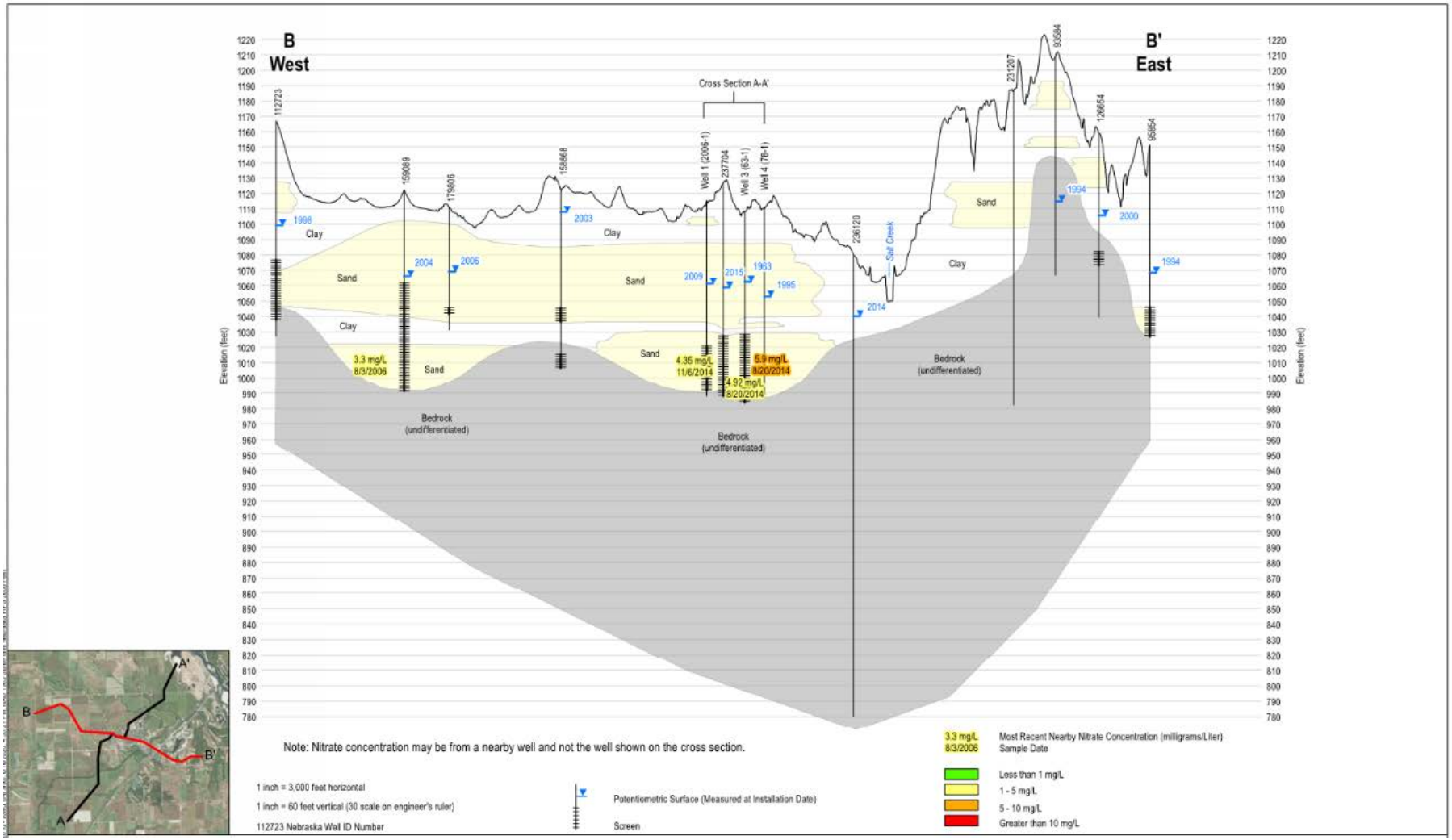


Figure 9: Aquifer Vulnerability, Geologic Cross Section Locations, Nitrate Concentrations



Source: LRE, 2020

Figure 10: Hydrogeologic Cross Section A-A'



Source: LRE, 2020

Figure 11: Hydrogeologic Cross Section B-B'

CHAPTER 2. COMMUNITY WATER SYSTEM

2.01 NEBRASKA'S PUBLIC WATER SYSTEM PROGRAM

The EPA established the Public Water System Supervision Program under the authority of the 1974 Safe Drinking Water Act (SDWA). With the SDWA and subsequent 1986 Amendments, EPA regulates the limits of contaminant levels in drinking water nationwide to ensure that public water supplies are safe for human consumption. Within the State of Nebraska, the Division of Public Health of the DHHS administers the Public Water System Supervision Program, under EPA guidance. The mission of the Public Water System Program of DHHS is to protect the health and welfare of Nebraskans by assuring safe, adequate, and reliable drinking water

PEOPLE EXPECT THEIR DRINKING WATER WILL BE SAFE WHEN THEY TURN ON THE FAUCET.

DHHS's Department of Regulation and Licensure visits all Public Water Supply Systems (PWSSs) to conduct sanitary surveys once every three years for community water systems. A sanitary survey is an on-site review of the water source, facilities, equipment, operations, and maintenance of a public water system for the purpose of evaluating the system's adequacy and ability to reliably produce and distribute safe drinking water within the confines of regulatory requirements. The city's most recent sanitary survey was completed in 2018, and a copy can be found in Appendix X. The State of Nebraska requires communities to provide a Water Quality Report annually to residents. The report consists of a single page summary of water quality test results for the year. The most recent water quality report is included in Appendix X and is also available at the city office.

2.02 WATER SYSTEM INFORMATION

The city's drinking water supply system includes four active wells located throughout the community (Figure 12), two water towers, and a distribution system serving over 2,450 people (JEO, 2020). The supply wells provide water of high quality that does not currently require any treatment for contaminants. Water from all wells is blended at the city's treatment plant, where fluoride and chlorine are added for public health and safety, before being distributed. A summary of the water system's information is included in Table 1. Specific information about each municipal well is presented in Table 2.

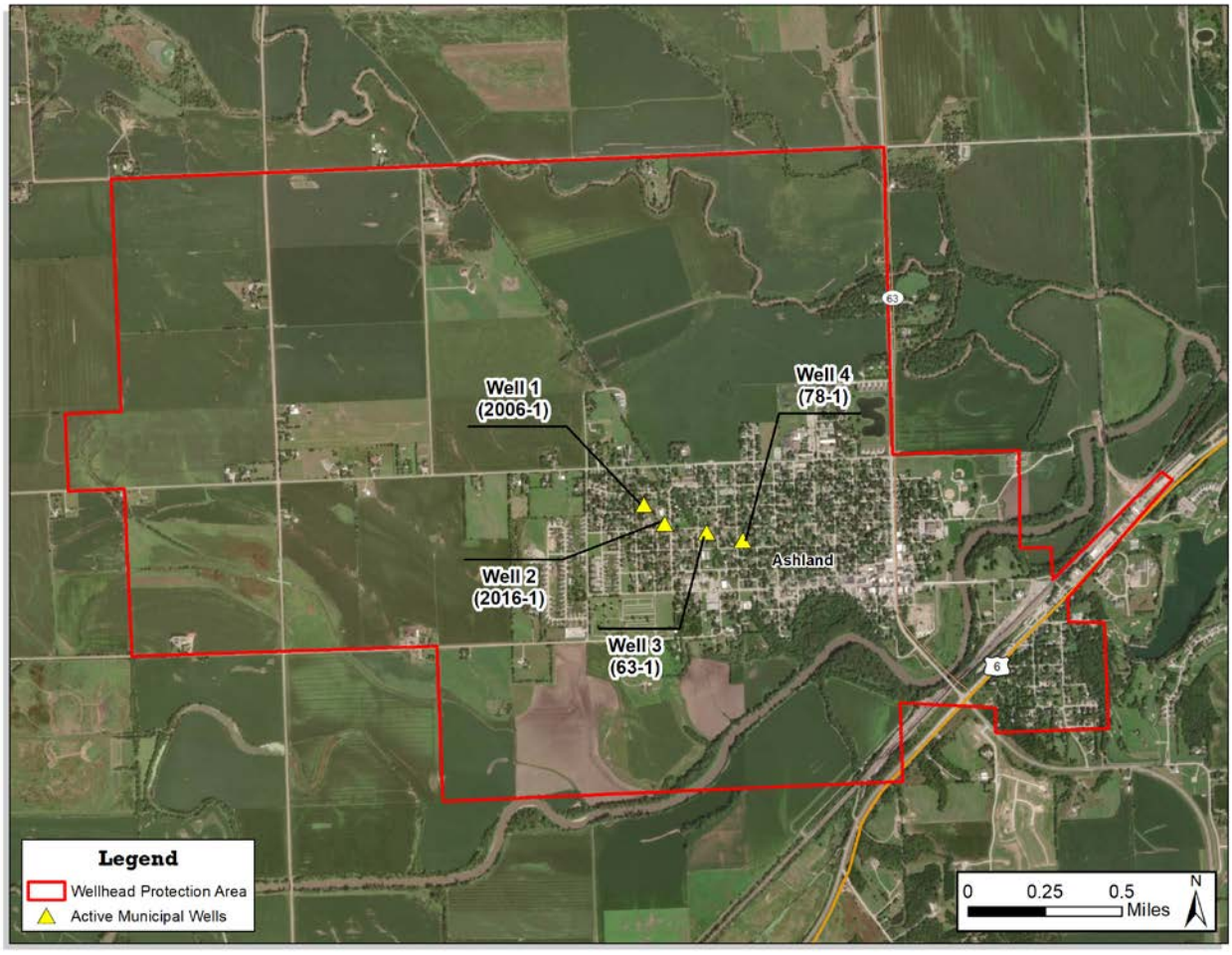


Figure 12: Active Municipal Well Locations

Table 1: Municipal Water System Information

General System Information	
System ID	NE31-15506
Meters Connected	99%
Maximum Daily (24-hour) Production Capability	2.707 million gallons/day
Total Production for past year	132.9813 million gallons
Active service connections	1,052
Population served	2,453

Source: Public Water Supply Routine Sanitary Survey (2018)

Table 2: Active Municipal Water Supply Well Information

Registration #	Local Name	Year Drilled	Year Rehabbed	Total Well Depth (ft)	Top of Screen Depth (ft)	Static Water Level (ft)	Pumping Water Level (ft)
G-140851	Well 1	Unknown	2006	127	97	56	73
G-185065	Well 2	1954	2005	105	85	27	54
A-010589C	Well 3	1963	1994	125.5	80.5	51	62
G-070339	Well 4	1982	2007	131	96	53	69

Source: JEO, 2020

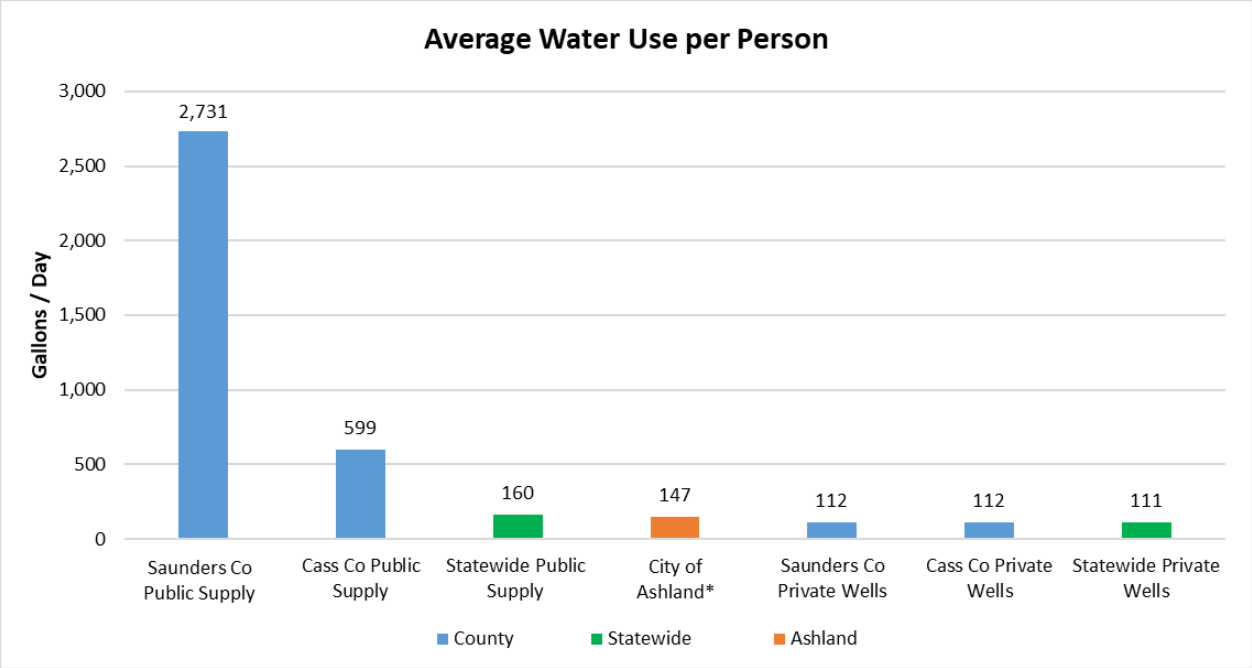
MUNICIPAL WATER USE

Pumping information for each of the municipal wells is summarized below in Table 3. Pumping volumes increased annually between 2016-2018. Based on the three-year average pumping volume, the daily water use of the city is 147 gallons per customer per day (gpcpd). This volume is greater than the typical industry-standard range of 80-120 gpcpd. However, this volume is lower than the Nebraska statewide public supply average of 160 gpcpd (Figure 13). Pumping volumes vary greatly on a local, county, and statewide basis between both public and private water supplies. There are likely measures that Ashland water system customers can take to become more efficient in their uses. Additionally, the city should look at improving their accounting of unmetered activities to identify places that savings could be made. These actions will not only reduce utility bills but will also ease the burden on the water system and groundwater aquifer during drought years. Current estimates are projecting Ashland's population to continually increase; therefore, it is expected that water consumption volumes will continue to increase over time. Implementing water conservation measures now could help minimize the pumping volumes necessary in the future.

Table 3: Ashland Water Use Summary (2016-2018)

Year	Well 1	Well 2	Well 3	Well 4	Total
2016 (gal)	52,821,000	NA	43,145,000	28,029,000	123,995,000
2017 (gal)	54,040,000	10,709,000	43,198,000	25,034,000	132,981,000
2018 (gal)	58,584,000	32,072,000	36,111,000	8,969,000	136,016,000
3-Yr Avg (gal)	55,148,333	21,390,500	40,818,000	20,677,333	130,997,333

Source: JEO, 2020

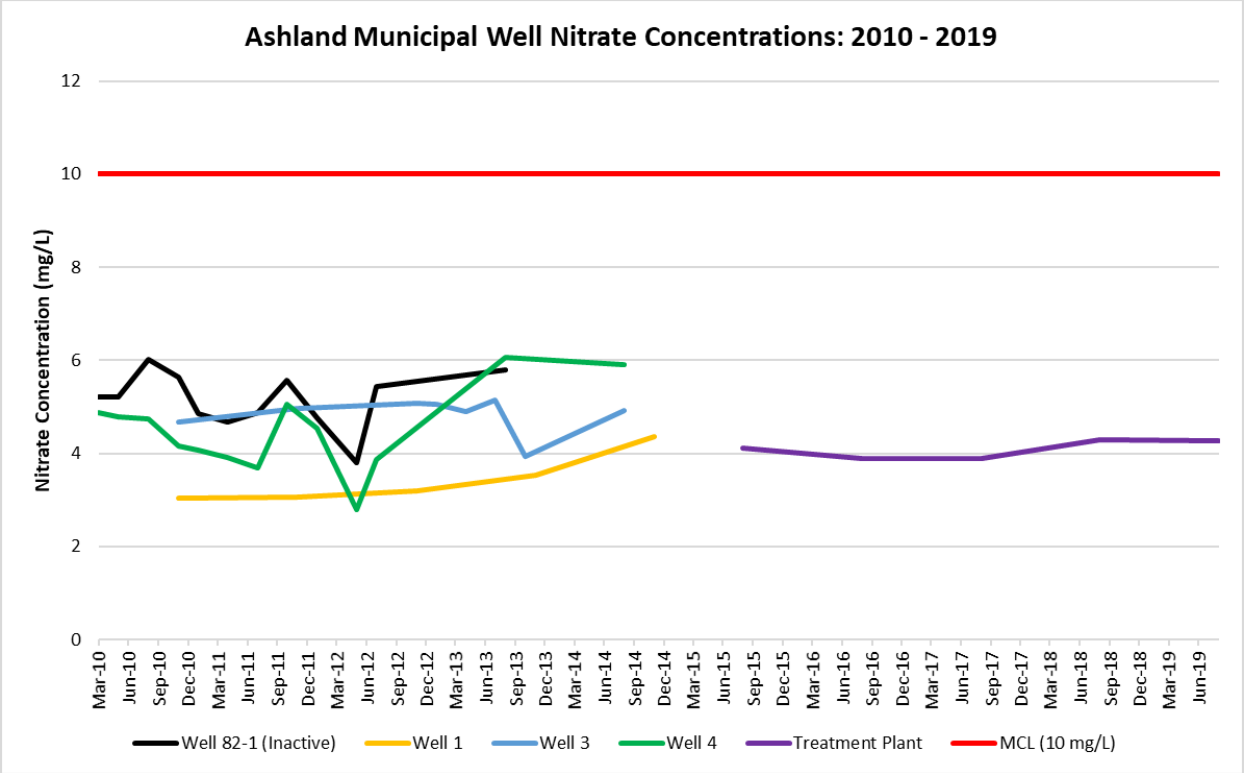


*Sources: Maupin and others, 2014; *JEO, 2020*

Figure 13: Average Water Use Between Ashland and Other Populations

2.03 COMMUNITY WELL NITRATE SAMPLING

DHHS maintains a database of public drinking water system data on their website through the Drinking Water Watch. Nitrate sampling data from the last decade has been compiled for the city and can be seen in Figure 14. The chart also displays the EPA MCL for nitrates at 10 mg/L as a red line. Nitrate concentrations in individual municipal wells varied between approximately 3-6 mg/L. However, individual wells have not been sampled since 2014. Beginning in 2015 water was instead sampled at the water treatment plan where water from all municipal wells is mixed before being delivered to consumers. Nitrate concentrations in the mixed water have hovered around 4 mg/L for the last five years, well below the MCL of 10 mg/L. Nitrates are known to occur naturally in groundwater, with a typical background concentration of 3 mg/L. Concentrations above 3 mg/L indicate a level of indirect human impact, while concentrations above 5 mg/L are indicative of direct human activity (Gosselin, 1997).



Source: DHHS Drinking Water Watch

Figure 14: Nitrate Concentrations in Ashland City Wells

CHAPTER 3. WELLHEAD PROTECTION AREA

3.01 DELINEATION

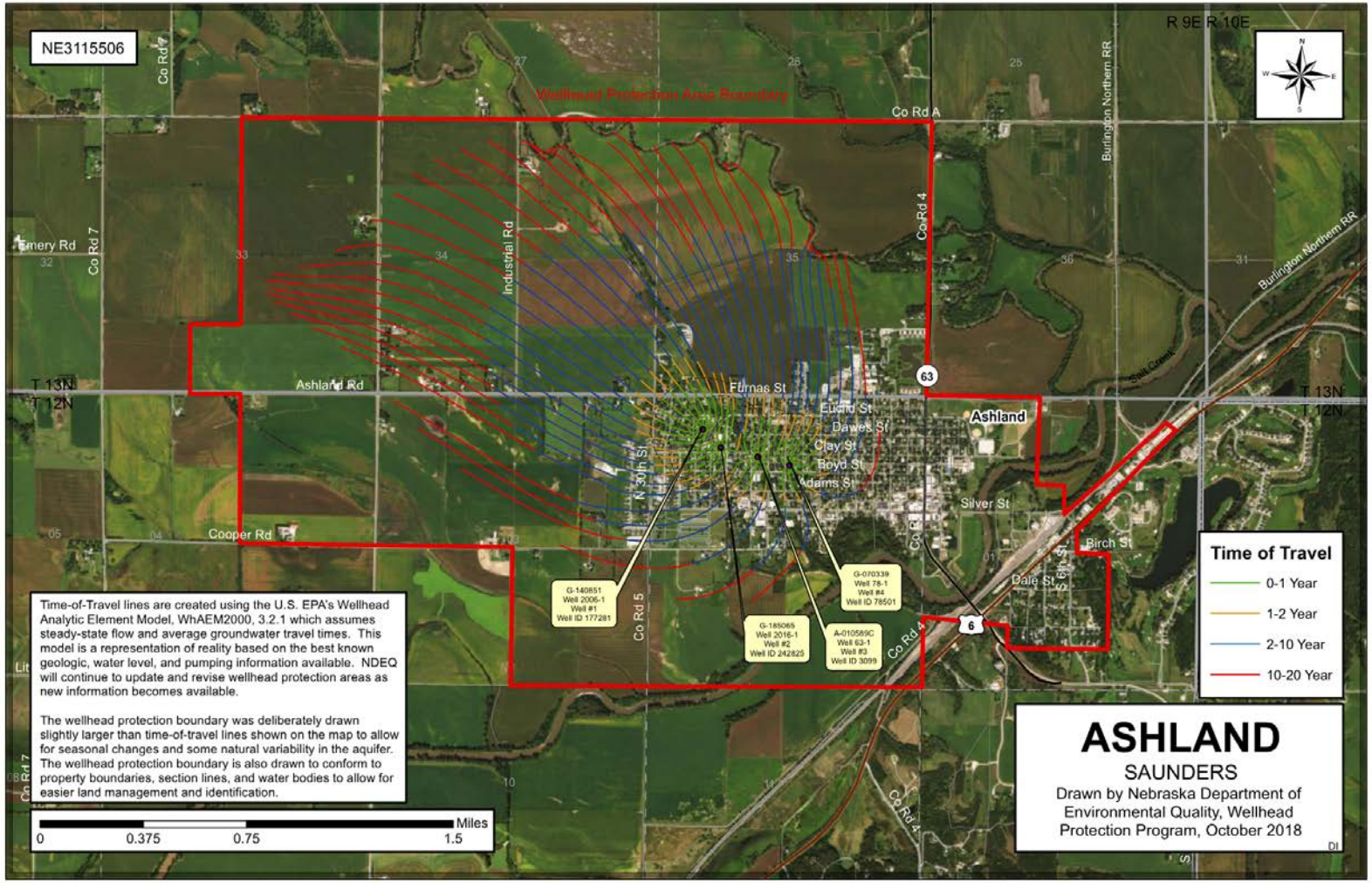
The city's previous WHP area map was provided by NDEE in January 2009. The WHP area map was updated in October 2018 (Figure 15). The updated WHP area was created by NDEE using the modeling software "Wellhead Analytic Element Model (WhAEM) 2000, 3.2.1." The WhAEM software was developed by the EPA and designed to facilitate capture zone delineation and protection area mapping in support of the state WHP programs.

WhAEM uses hydrogeologic modeling for steady pumping wells, including the influence of hydrological boundaries, annual recharge estimation, and no-flow boundaries such as rivers, recharge areas, and no-flow contacts like the local geological formations of bedrock. Groundwater flow direction and velocity, pumping volumes, and well construction data are used in the model. The modeling generates flow lines, which depict the approximate path groundwater, or a contaminant in groundwater, will take to reach a well. These flow lines are associated with an estimated time-of-travel (TOT). One set of TOT path lines are delineated for each active well: one, two, 10, and 20-year.

The WHP boundary is drawn slightly larger than the time-of-travel lines shown on the map to accommodate seasonal changes and natural variability of the aquifer. The WHP area is statutorily recognized as a boundary in which a community manages potential contaminant sources though the WHP program. The WHP area is drawn around the 20-year time-of-travel along visible or easily identifiable boundaries such as roads, rivers, creeks, section, quarter-section, and quarter-quarter sections lines. This allows for easier land management and identification. Maps are periodically updated as modeling advances, the science behind aquifers advances, as wells are added/removed from use, or as well pumping volumes change.

Ashland's WHP area is made up of a continuous area covering approximately 3,300 acres. The city officially recognized the updated WHP area with an adoption ordinance on **DATE**. The ordinance can be found in Appendix C.

THE WELLHEAD PROTECTION AREA MAP BY ITSELF DOES NOT GIVE A COMMUNITY ANY ADDITIONAL AUTHORITY OR PROTECTION OF THE PUBLIC WATER SUPPLY. IT IS PURPOSELESS UNLESS A COMMUNITY ENACTS ORDINANCES, ZONING, OR INITIATES VOLUNTARY ACTIVITIES WITHIN THE WHP AREA.



Source: NDEE, 2018

Figure 15: Official 2018 Ashland WHP Area Map with Aerial Background

3.02 LAND USE

Land use and land cover are two separate terms, yet they are often used interchangeably. Land use describes how people utilize the land (i.e. urban or agriculture), while land cover describes the physical material of the earth's surface (i.e. types of vegetation). For the purposes of this plan, the term land use will be used with the understanding that intentional management of the land is implied.

Certain types of land uses are commonly associated with varying potential for different types of contaminates, as shown in Figure 17.

Agriculture areas, particularly row-crops may contribute to non-point source (NPS) pollution. They can potentially contribute to nitrates, herbicides, and other contaminants flowing into surface water and infiltrating through the soil into groundwater. Irrigated cropland is particularly vulnerable to increased nitrogen leaching.

Urban land areas, particularly areas of impervious surfaces, may contribute to NPS by increased runoff, overapplication of lawn fertilizers, oils, solvents, or grease spills, or other industrial byproducts. Urban areas can contribute to water pollution at a high rate due to the high concentration of facilities or land uses which can contribute to water pollution.

A

B

C

Figure 16: Varying Types of Land Use. (A) Irrigated Row crops; (B) Urban setting; (C) Natural vegetation.

Natural vegetation, such as trees, grasses, and shrubbery are generally considered to have the capability of improving or protecting water quality. Natural vegetation may serve as a buffer and filter between pollutant sources and water bodies. The vegetation often partially removes contaminants and nutrients before they enter waterbodies.

Land use data from 2019 was collected from the United States Department of Agriculture (USDA) National Agricultural Statistics Service CropScape – Cropland Data Layer online platform (Table 4). A majority of land in the WHP area is used to grow row crops (59.4%), especially corn and soybeans (Figure 17). The second largest land use category is developed (20.9%), which includes all urban areas (single/multi-family homes, city parks, streets and roads, etc.). This category is primarily made up of the community itself. The remainder of the WHP area is taken up by grass and pasture (12.3%), and relatively small amounts of forest, wetlands, open water, and other perennial vegetation.

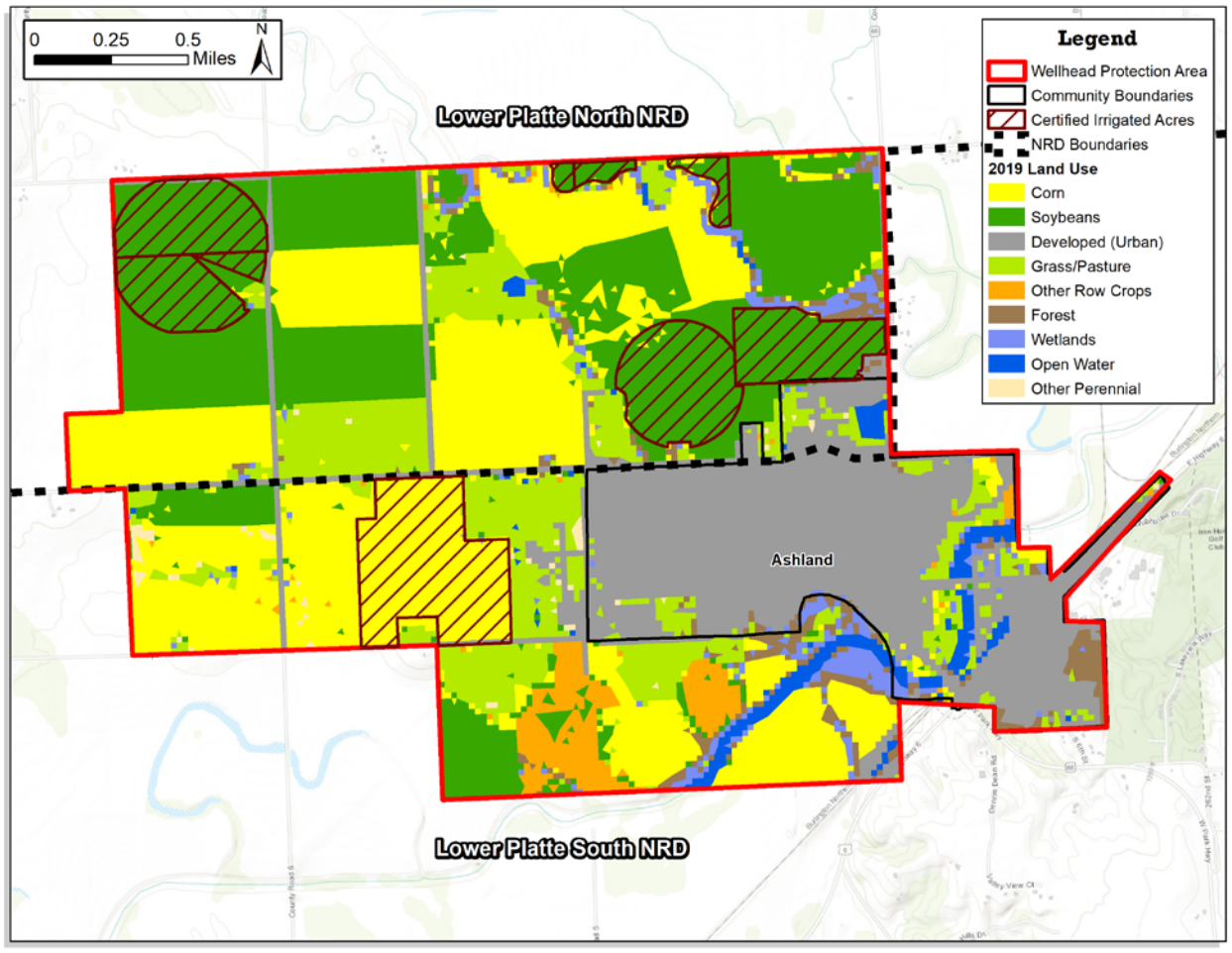
Table 4: 2019 Land Use in the WHP Area

Land Use Category	2019 Acres	% of WHP Area
Corn	971	29.4%
Soybeans	897	27.2%
Developed (Urban)	689	20.9%
Grass/Pasture	405	12.3%
Other Row Crops	92	2.8%
Forest	87	2.6%
Wetlands	81	2.5%
Open Water	64	1.9%
Other Perennial	15	0.5%
Total	3301	100.0%

Source: USDA, 2020

IRRIGATED ACRES

Nitrate leaching losses from applied fertilizer and the spreading of manure can be exacerbated by irrigation water application. Identifying and utilizing BMPs that improve irrigation management and/or reduce the levels of applied nitrate fertilizer will result in decreased nitrate loading to both surface and groundwater resources. Within the LPNNRD and LPSNRD, all irrigated acres are certified by the NRDs in order to manage groundwater quantity and quality concerns. Figure 17 displays the certified irrigated acres in the Ashland WHP area. In total there are approximately 435 certified irrigated acres making up 13% of the WHP area. Of these, 296 acres are located in the LPNNRD, and 139 acres in the LPSNRD. 88 acres in the LPNNRD are irrigated with surface water, and none in the LPSNRD. In 2019, approximately 67% of irrigated acres were used to grow soybeans and 32% were used to grow corn. Irrigation wells make up 24% of all registered wells in the WHP area.



Source: USDA, 2020

Figure 17: 2019 Land Use in the Ashland WHP Area

CHAPTER 4. POTENTIAL CONTAMINANT SOURCE INVENTORY

BACKGROUND

The purpose of a potential contaminant source inventory (CSI) is to identify potential drinking water contaminants or sources that the contaminants may originate from. The CSI is a major step in establishing a WHP plan and includes recording locations and information on potential contaminant sources such as fuel storage tanks, livestock operations, equipment storage yards, and many others (Figure 18).

A CSI allows a community to plan for and manage potential contaminant sources and decide where to focus educational and management efforts to minimize the likelihood of source water contamination. Strategies to limit pollution may vary greatly within the WHP area because of the varying types of potential contaminant sources. Several management strategies are discussed to limit NPS in Chapter 7: Management Strategies. The inventory is compiled from existing databases and on-the-ground observations. Even if identified in the CSI, a feature may not be contributing to contamination presently but may still present a risk.

> ***UNDERSTANDING WHAT POTENTIAL CONTAMINANT SOURCES EXIST WITHIN THE WHP AREA ALLOWS A COMMUNITY TO MAKE INFORMED DECISIONS AND SAFELY MANAGE THREATS TO THEIR DRINKING WATER SUPPLY.***

It is important to note that this inventory only represents a snapshot of the area's history. There may be features which have already contributed to groundwater contamination and left no record of their existence on the surface. Features recorded in the past may not be actively operating today. It is important to record historical land uses and activities due to the long period of time required for groundwater to respond to changes at the land surface. It is important to note that, even if identified in the CSI, a feature may not be contributing to contamination presently but may still present a risk.

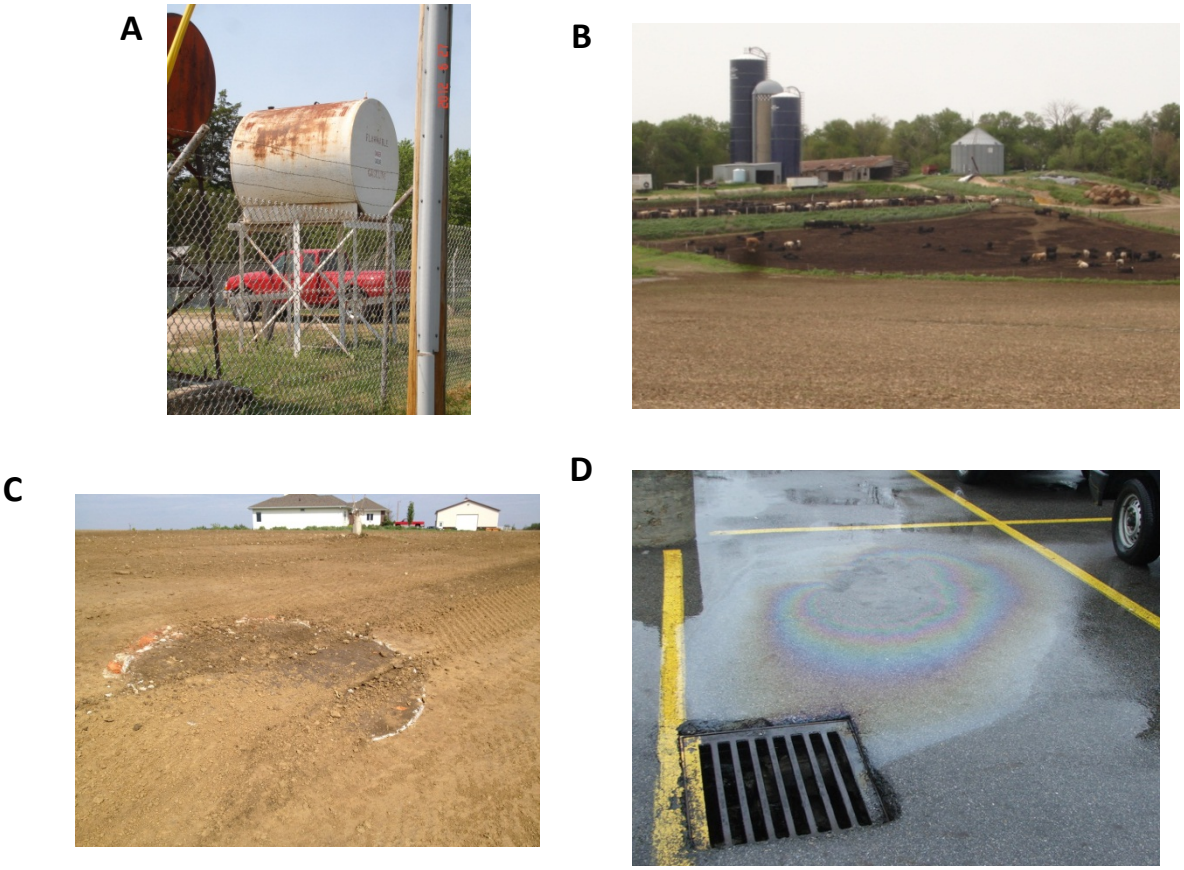


Figure 18: Common Types of Potential Contaminant Sources. (A) Leaking Fuel Drums; (B) Livestock Waste; (C) Abandoned Wells; (D) Parking Lot Runoff

Based on guidance provided by NDEE, the inventory typically consists of the following types of points:

Agricultural

- Fuel Storage
- Grain Storage
- Water Wells
- Chemigation
- Livestock
- Abandoned Wells

Commercial and Light Industrial

- Auto Repair
- Dry Cleaners
- Fuel Stations
- Machine Shops
- Rail Yards
- Large Parking Lots

Industry

- Manufacturing Plants
- Gas/Oil Wells
- Junk Yards
- Landfills
- Sewage Treatment Facilities

Other

- Cemeteries
- Golf Courses
- Highway/Road Maintenance Yards
- Other Wells

METHODOLOGY

Ashland's CSI is a compilation of multiple sources:

- NDEE Regulated Facilities Database
- Nebraska Department of Agriculture Registered Pesticide Dealers Database
- State Fire Marshal Underground Storage Tank Database
- Nebraska Oil and Gas Conservation Commission Gas and Oil Wells Database
- NeDNR Registered Wells Database
- JEO Consulting Group, Inc. in-field survey completed May 2020

Note that the data made available through outside agencies was furnished for interpretive reasons. To the extent possible, the data is current, accurate, and reliable. However, there may be discrepancies in the information and not all map location coordinates have been verified. In addition, JEO assumes no legal responsibility, either implied or expressed, about the accuracy, completeness, reliability, or appropriateness of this data made available through or retrieved from these agencies.

SUMMARY

A summary of all sites identified through the CSI is displayed in Table 5. CSI points are displayed in Figure 19, NDEE regulated facilities in Figure 20, and registered wells in Figure 21. Note that locations of underground storage tanks and registered pesticide dealers could not be mapped reliably.

The CSI identified 58 possible contaminant sources within the Ashland WHP area. Of these sites, 22 were residences, including 11 acreages and 11 farmsteads. Equipment storage (11) and grain storage (three) sites that were identified include those that are found on acreages or farmsteads and were counted separately as they pose different threats to drinking water quality. A single livestock operation was identified. Various other sites included a cemetery, center pivots, gas stations, a landfill, a machine shop, a medical clinic, a vet clinic, and a general 'other' category. Further information on the CSI, including the master table of all identified potential contaminant sources, is available in Appendix X.

There are 77 applicable NDEE regulated facilities in the WHP area (not including pesticide dealers or underground storage tank sites). The majority of these sites are made up of leaking storage tanks (21), onsite wastewater treatment systems (20), and National Pollutant Discharge Elimination System (NPDES) compliance sites (16). The remainder of the sites include SARA Title III (five), integrated waste management (four), resource conservation recovery (four), livestock waste control (two), release assessment (two), brownfield (one), superfund (one), and underground injection control (one).

There are 17 active registered wells in the WHP area. Of these, five are used for domestic water supply, five for closed loop underground heat exchange, four for irrigation, one for groundwater level observation, and two for 'other' uses. Note that 'other' is a use category provided by NeDNR. There are no oil or gas wells in the WHP area. There are likely additional wells in the WHP area that are inactive,

abandoned, or decommissioned. Additional studies could identify the locations of unused or abandoned wells for proper decommissioning.

Table 5: Summary of Ashland Contaminant Source Inventory

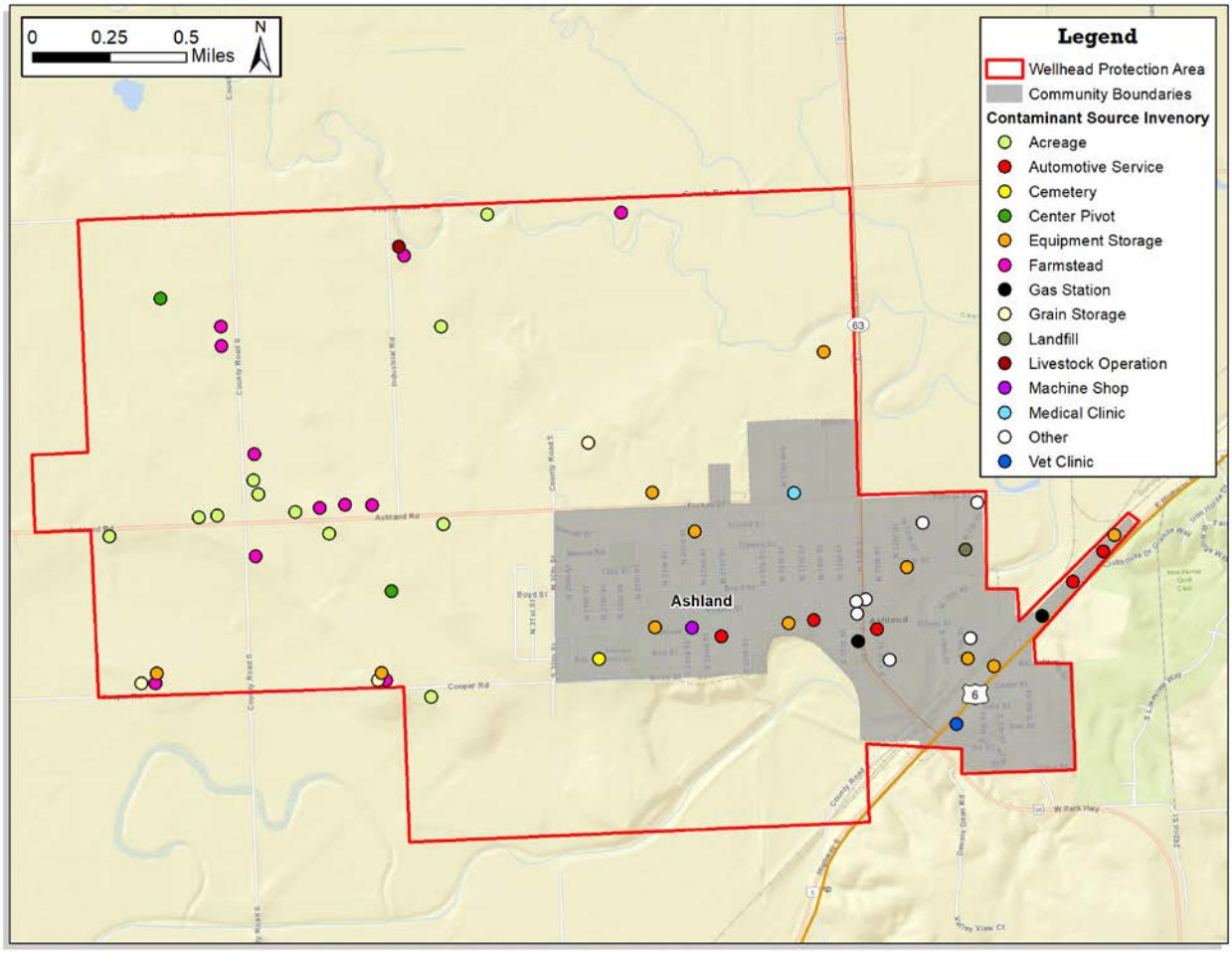
NeDNR Registered Wells	
Well Use	**Count**
Domestic	5
Heat Exchange	5
Irrigation	4
Other	2
Observation	1
Oil & Gas Wells*	0
Total	**17**

*Regulated by Oil & Gas Conservation Commission
Note: Includes only active wells.

Applicable NDEE Registered Facilities	
Program	**Count**
Underground Storage Tank Sites*	28
Leaking Storage Tanks	21
Onsite Wastewater Treatment	20
NPDES Permits and Compliance	16
SARA Title III	5
Integrated Waste Management	4
Resource Conservation Recovery	4
Pesticide Dealers**	3
Livestock Waste Control	2
Release Assessment	2
Brownfield	1
Superfund	1
Underground Injection Control	1
Total	**108**

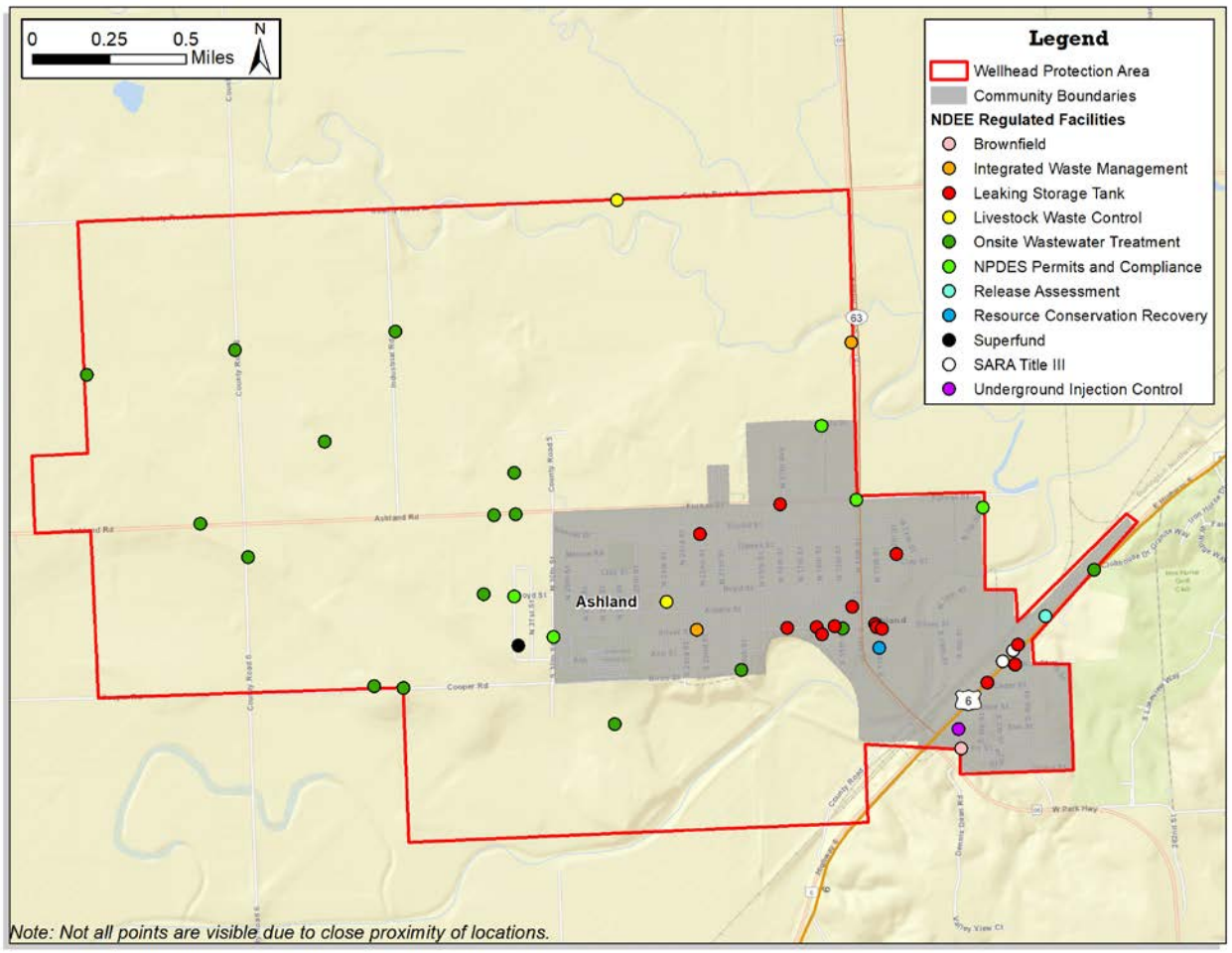
*Regulated by State Fire Marshall. Each site may have multiple tanks.
**Maintained by NE Department of Agriculture

Potential Contaminant Source Type	Count
Acreage	11
Equipment Storage	11
Farmstead	11
Other	7
Automotive Service	5
Grain Storage	3
Center Pivot	2
Gas Station	2
Cemetery	1
Landfill	1
Livestock Operation	1
Machine Shop	1
Medical Clinic/Office/Hospital	1
Veterinary Clinic/Office	1
Total	**58**



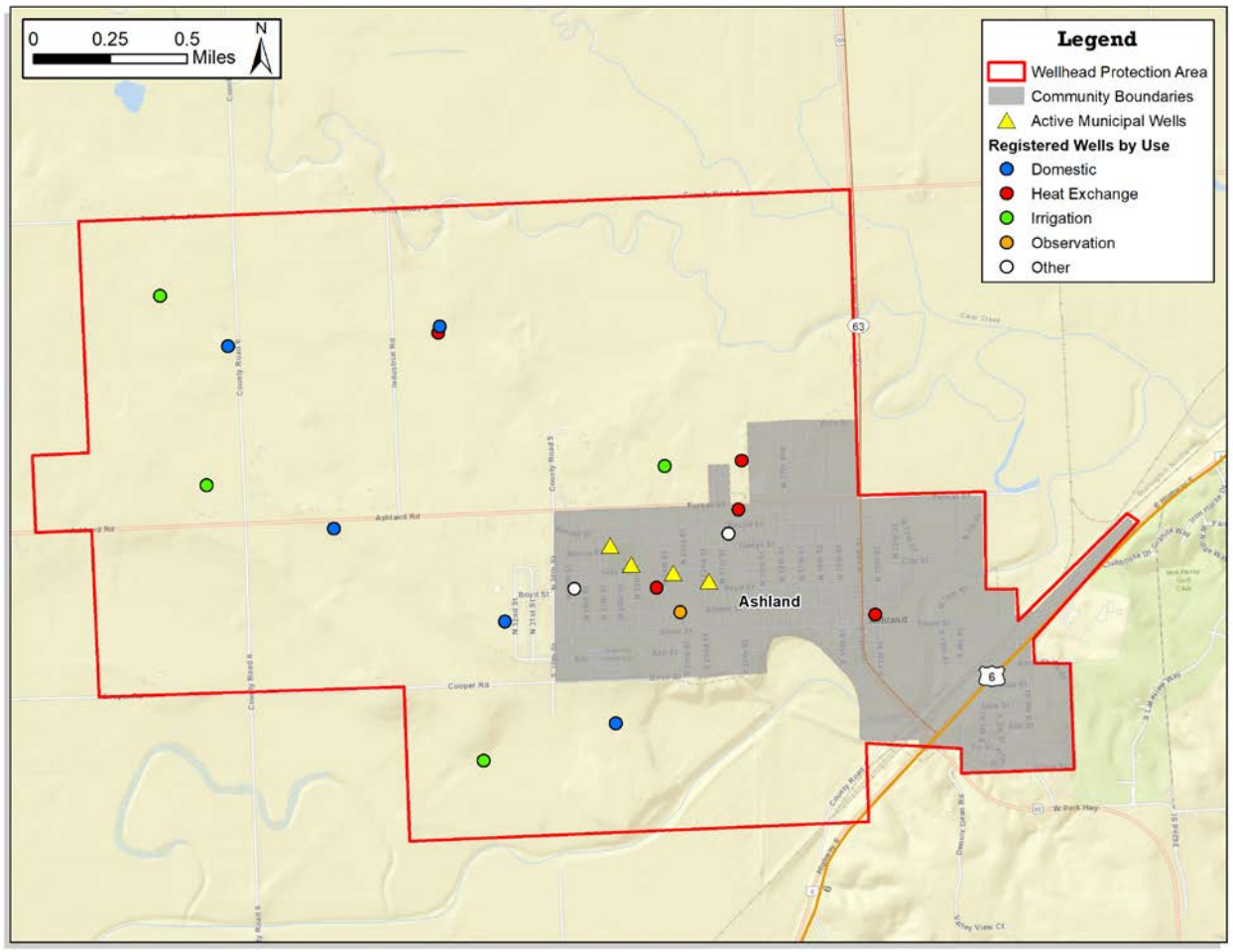
Source: JEO Consulting Group CSI - May 5, 2020

Figure 19: Contaminant Source Inventory in the Ashland WHP Area



Source: NDEE Regulated Facilities Database

Figure 20: NDEE Regulated Facilities in the Ashland WHP Area



Source: NeDNR Registered Wells Databse

Figure 21: Registered Wells in the Ashland WHP Area

4.01 EXISTING GROUNDWATER CONTAMINATION

There are existing sites, listed as NDEE regulated facilities, within the WHP area that are known to have, or have had, contamination of the potential for contamination of soil and water. These sites are under the regulatory authority of NDEE. While specifically addressing those sites or activities is not the focus of this plan, they are discussed here as their presence may play a role in the public's perception of the risks to their drinking water. Table 6 describes these facilities as provided by NDEE. Additional information can be found in Appendix X or may be obtained by contacting NDEE.

Table 6: Summary of Existing Groundwater Contamination in the Ashland WHP Area

Name	Status	Summary
M&M Towing & Storage	Active	Complaints of oil and tire dumping since 2014. 1,100 tires removed in 2015.
Unknown Tanks	Active	Storage tanks removed in 2019, contents unknown.
USDA Grain Bin	Active	Historical fumigant usage contaminated soil and groundwater.
50-60 Gasoline UST Overfill	Inactive	Gasoline spill in 2007.
Ashland City Offices	Inactive	Dumping and disposal of railroad ties.
Ashland City Shed	Inactive	Soil contamination in 1989.
Ashland High School	Inactive	Storage tank rmeoved in 1993.
Ashland RV Campground	Inactive	Lead contaminated soil was removed from the site and disposed of.
Ashland Salvage Inc	Inactive	Assessment conducted; cleanup grant denied in 2003.
Ashland Salvage Inc	Inactive	Large amounts of hazardous wastes removed in 2007.
Ashland-Greenwood Public Schools	Inactive	Old lab chemicals removed in 1999.
Barger's Oil Company	Inactive	5 storage tanks removed in 1991.
Barger's Oil Company	Inactive	5 dispensers and lines removed in 2000.
Co-op Service Station	Inactive	3 storage tanks removed in 1994. Remediation system installed.
Country Market	Inactive	6 storage tanks removed and 1 abandoned in 2003.
Environmental Assessment, Groundwater Contamination	Inactive	Site assessment completed in 2014. Low levels of contamination detected at former filling station.
Gas N Shop	Inactive	Dispenser and lines removed in 1995. Remediation system installed.
Gas N Shop 40	Inactive	4 storage tanks removed in 2001.
Heating Oil Tank	Inactive	1 storage tank removed in 1994.
Jerry's Tire & Service	Inactive	3 storage tanks removed in 1994.
Lee Sapp Ford-Mercury	Inactive	Hazardous waste generator in 1986. Waste removed in 1999.
Lee Sapp Ford-Mercury	Inactive	3 storage tanks removed in 1993.
Lee Sapp Ford-Mercury	Inactive	1 storage tank removed in 1994.
Martin Marietta Aggregates	Inactive	2 storage tanks removed in 1992.

Rite Way Oil & Gas Co Inc	Inactive	Gasoline fumes noted in building after flooding in 1984.
Saunders County Hwy Dept	Inactive	1 storage tank removed in 1988.
Silver Street Tank Site	Inactive	3 storage tanks removed in 1993, 3 more in 2000.
Tank Site	Inactive	1 storage tank removed in 2002.
U-Stop Convenience Shop 13	Inactive	Contaminated soil removed and disposed of.
Warren Mackey Service Station	Inactive	3 storage tanks removed in 2000.

Source: (NDEE, personal communication October 15, 2020)

CHAPTER 5. REGULATORY AUTHORITY

5.01 CITY OF ASHLAND

Due to the different threats and limits of jurisdiction across the WHP area, it is important that any current or future ordinances and/or zoning districts are flexible, enforceable, and developed with citizen/landowner input.

ASHLAND MUNICIPAL CODE

Communities, including Ashland, have the legislative authority to implement and enforce ordinances in order to protect the public health, safety, and general welfare of its residents. This power gives the city the ability to regulate actions within the corporate limits and potentially within its extraterritorial jurisdiction (ETJ), which is discussed in detail below. Currently, Chapter 3 Article 1 of the city's municipal code provides information on the Water Department's authorization, operations, and protection of the community's drinking water, within the city and its jurisdiction. Existing ordinances that may protect groundwater include:

- Section 3-113: Restricted Use
- Section 3-115: Pollution
- Section 3-116: Mandatory Hookup; Wellhead Protection
    - Includes well setback distances

In order to enforce regulatory control over the WHP area outside of the corporate limits, zoning controls would need to be considered in cooperation with Saunders county. The relevant pages of the Municipal Code can be found in Appendix C, or at the city office.

WELL SETBACK DISTANCES AND ENCROACHMENTS

Well setbacks are regulated by nine different state regulations as summarized in Table 7. The most commonly recognized setbacks are maintained by DHHS and established in the latest version of Nebraska Title 179 – *Public Water Systems*, Chapter 7 (DHHS, 2010). While these setbacks are identified by DHHS, it is the responsibility of the local public water system and community to actively enforce or ensure compliance with the setback distances. Any setback distance or encroachment violations found by DHHS must be eliminated or justified by an engineer to DHHS. If necessary, DHHS will take enforcement measures against the water system, but not on the violator or owner of the encroachment. This could include, but is not limited to, identifying a system as "vulnerable" or requiring additional monitoring. Essentially, if a community does not adopt and enforce these setbacks there is no active protection.

It is recommended by NDEE that communities formally recognize and enforce well setback distances through ordinance or zoning. This should be done in a way that the distances are automatically updated in accordance with any changes to the law. The City of Ashland has recognized the WHP area through

their code of ordinances and does enforce well setback distances; however, it does not appear to be written to automatically update in accordance with Title 179, Chapter 7. The ordinance was last amended in 2003 and this plan recommends the ordinance be updated to follow the most recent recommended setback distances and be written to automatically update with Title 179, which was most recently updated in 2017.

Table 7: Required Well Setback Distances, by Nebraska State Titles

Category	Distance (ft)	Nebraska State Title								
		179	178	119	122	123	124	126	130	198
Water Well*	1,000	X	X							
Sewage Lagoon	1,000	X			X	X	X			
Land application of municipal/industrial waste material	1,000	X					X			
Feedlot or feedlot runoff/Livestock waste control facility	1,000	X								
Underground disposal system (septic, cesspool, etc.)	500	X			X		X			
Corral	500	X								
Pit/Vault toilet	500	X					X			
Wastewater holding tanks	500	X					X			
Sanitary landfill/Dump	500	X								
Chemical or petroleum product storage	500	X								
Sewage treatment plant	500	X								
Sewage wet well	500	X								
Sanitary sewer connection	100	X								
Sanitary sewer manhole	100	X								
Sanitary sewer line	50	X				X				
Class V domestic wastewater disposal wells	1,000				X					
Class V wells constructed above water table	1,000				X					
Class V well injecting into or constructed through uppermost aquifer	1,000				X					
Livestock waste control facility	1,000								X	
Fertilizer (paunch manure)	500							X		
Static pile or wind row paunch storage	500							X		
Paunch storage lagoon	500							X		
Paunch manure static pile or wind row storage	500							X		
Wastewater land application and effluent	500			X						
Absorption, infiltration, and evaporative systems	500						X			
CAFO manure, litter, or process wastewater applied	100								X	
New Secondary Containment/Loadout Facility	100									X

**Only enforceable on Public Water System Wells.*
Source: Nebraska Department of Environmental Quality, personal communication, May 15, 2017

ZONING CONTROLS

The city has an adopted comprehensive plan (2014), zoning ordinance (2016), and subdivision regulations (2016). All these documents are available at the city office. The city and Saunders County could work collectively to create resolutions and ordinances in accordance with Nebraska Revised Statute 13-327 that apply to the WHP area outside of the city ETJ. Figure 22 illustrates the city's ETJ in comparison with the WHP area. The western portion of the WHP area is not included in the city's ETJ. City zoning ordinances only apply to areas within the ETJ.

Currently, Ashland's planning and zoning documents do not specifically mention wellhead protection planning or groundwater protection, nor do they currently provide for a wellhead protection district. The city has not indicated it intends to amend their zoning regulations and adopt a wellhead protection overlay district in the near future. Such amendment would involve a public hearing and recommendation by the Planning Commission and a public hearing and ordinance adoption by the city board. The wellhead protection overlay district will be illustrated on the Official Zoning Map and any adopted wellhead regulations would take priority over the underlying zoning district. An "overlay" district does not replace other zoning districts that may be located in the same area, it simply adds additional requirements (related to the districts purpose) that uses in the district must meet.

Saunders County has adopted a Comprehensive Plan, per the Nebraska Association of County Officials, which gives them the authority to enact zoning. Saunders County Planning and Zoning Department has jurisdiction over the unincorporated areas of the County, and currently has zoning regulations, last revised in April 2020. Saunders County's zoning regulations do not currently have a wellhead protection overlay district within their regulations.

15-MILE STATUTE

Should the city need to pursue protection to their WHP area outside of their ETJ in the future, the city is able to utilize the Nebraska Revised Statute 17-536 (the 15-mile Statute). This State Law, which applies to villages and second-class cities, allows communities to protect sources of drinking water outside the community's ETJ.

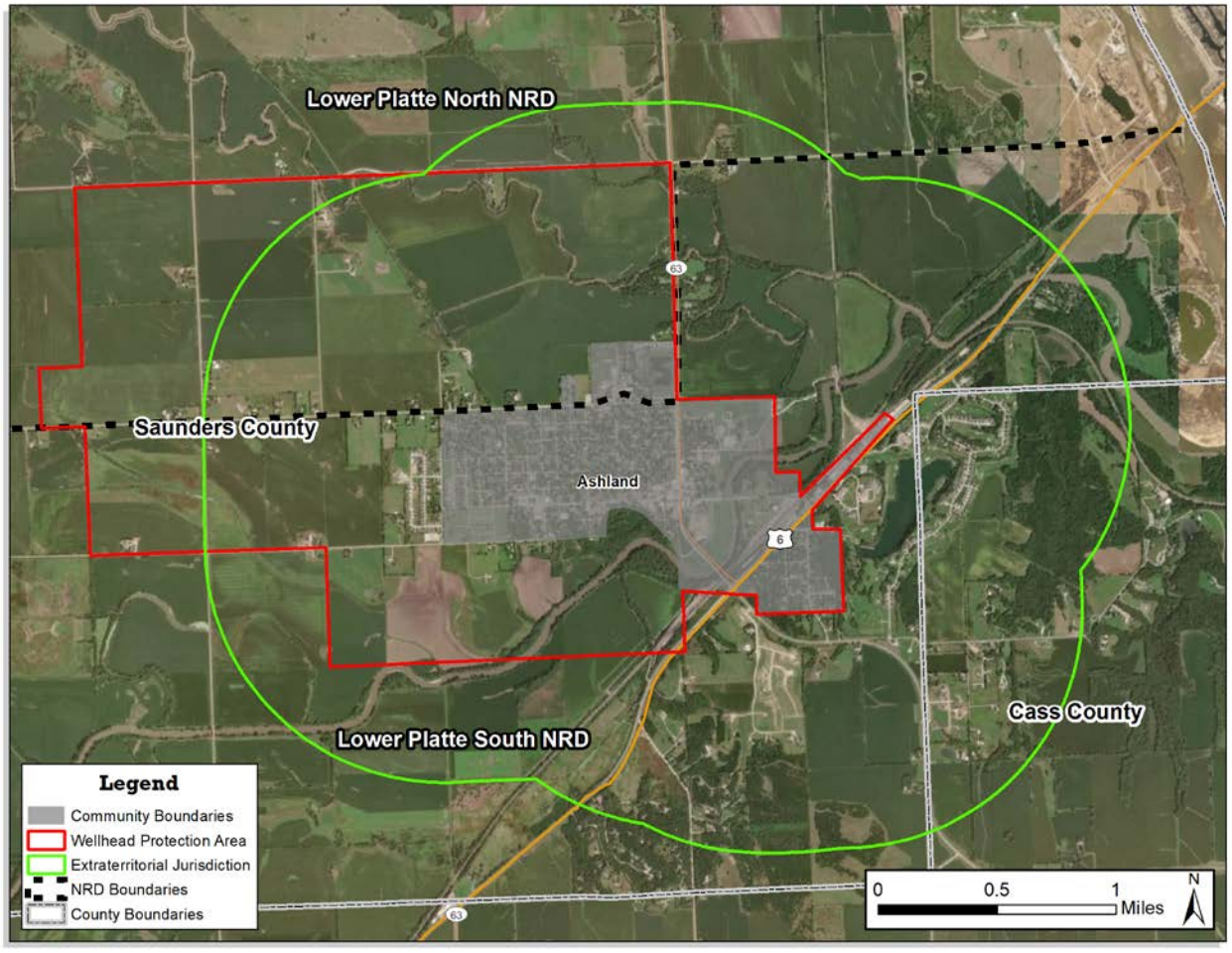


Figure 22: City of Ashland ETJ and WHP Area

5.02 NATURAL RESOURCES DISTRICTS

All NRDs have the ability to require BMPs or to regulate practices in groundwater management areas (GWMAs) to protect groundwater quality and quantity. This authority originated in the Groundwater Management and Protection Act (GWMPA), which was passed by the Nebraska Legislature in 1984. In 1985, the state passed LB 1106 which required the NRDs to prepare groundwater management plans specific to their area and submit these plans to the NeDNR. In 1991, LB 51 was enacted, requiring NRDs to expand their management plans to include ground water quality protection. The LPNNRD's policies and rules are outlined in their Groundwater Management Area Rules and Regulations available online at: https://lpnnrd.org/downloads/. The LPSNRD's policies and rules are outlined in their Groundwater Management Plan (GWMP), available online at: https://www.lpsnrd.org/publications/lpsnrd-plans. Pertinent information is summarized below.

GROUNDWATER MANAGEMENT PLAN SUMMARIES

Lower Platte South NRD

LPSNRD's GWMP was last updated in 1995, however the groundwater rules and regulations were most recently updated in January 2020. The rules and regulations outline the triggers and actions related to GWMAs. Ashland's WHP area partially overlaps with the LPSNRD's Lower Salt Creek GWMA. Currently, the entire Lower Salt Creek GWMA is in a Phase II management area for elevated nitrates and has been designated as such since 2001. In recent years, LPSNRD's groundwater monitoring has indicated Ashland's municipal wells have exceeded the Phase II trigger as outlined in the GWMP. The Phase II trigger is met when half of wells in the monitoring network are at or above 5 mg/L (50% of the MCL) for nitrate concentrations. At that time, a two-year verification study is undertaken before the Phase II designation is officially applied. At the time this plan was being prepared, LPSNRD staff were in the process of determining if the remainder of Ashland's WHP area within the LPSNRD should be designated as a Phase II management area for nitrate contamination. If the phase status does change, this plan will be updated and additional information specific to the new phase status will be added to this section. Note that although the WHP area is split between the LPSNRD and LPNNRD, all of the city's municipal supply wells are located within the LPSNRD.

Landowners or operators who make nitrogen management decisions within designated Phase II areas may be required to attend a nitrogen certification class every four years. Cost-share programs available through the LPSNRD may differ for areas that fall into both WHP areas and GWMAs. Phase II Rules and Regulations include educational certification for anyone engaged in the use, application, or storage of contaminants, and increased cost-share opportunities for the installation of best management practices in the Phase II area.

Lower Platte North NRD

The LPNNRD Groundwater Management Plan was first implemented in 1997 and last amended in 2018. Currently the LPNNRD has designated the area around Ashland as a Phase I GWMA, and a Limited Development Groundwater Control Area. Development within this area is restricted to no more than 200 new acre-feet of irrigation per year. Phase I requirements include:

- Operators using fertilizer must be certified every four years
- Water well permits are required for new and replacement wells
- Restrictions on application rates of organic fertilizer
- Restrictions on application timing of commercial fertilizer in certain soil groups

5.03 STATE OF NEBRASKA

State statues and laws are summarized in Appendix C as well as a listing of Nebraska's legislature statutes that allow local jurisdictions to protect public health and safety. Generally, the regulatory authority to manage WHP areas falls to local government entities. At the state level, NDEE approves WHP areas and

can assist communities with WHP planning, including funding to support certain activities such as well closures, public meetings, incentives for BMPs, etc.

CHAPTER 6. EMERGENCY, CONTINGENCY, AND LONG TERM PLANNING

6.01 EMERGENCY AND CONTINGENCY PLANNING

Ashland's Public Water System Emergency Response Plan is required by DHHS and is available in Appendix D. The plan provides information and actions to be utilized in the event of a short-term emergency. The plan contains contingency plans and emergency contact information to deal with the following emergencies/contingencies:

- Power outage
- Prolonged water outage
- Transmission and/or distribution system failure
- Treatment equipment failure
- Source pump failure
- Loss of controls
- Contamination of supply
- Chemical incidents
- Drought
- Flood
- Severe weather
- Fire at water supply system facility
- Hazardous materials release
- Terrorism or vandalism
- Earthquake

NEBRASKA WATER/WASTEWATER AGENCY RESPONSE NETWORK

The city is not currently a member of the Nebraska Water/Wastewater Agency Response Network (NEWARN). NEWARN is a statewide Water/Wastewater Agency Response Network (WARN) of "utilities helping utilities" to:

- Prepare for the next natural or human-caused emergency.
- Organize response according to established requirements.
- Share personnel and other resources statewide, by agreement.

NEWARN provides water and wastewater utilities with:

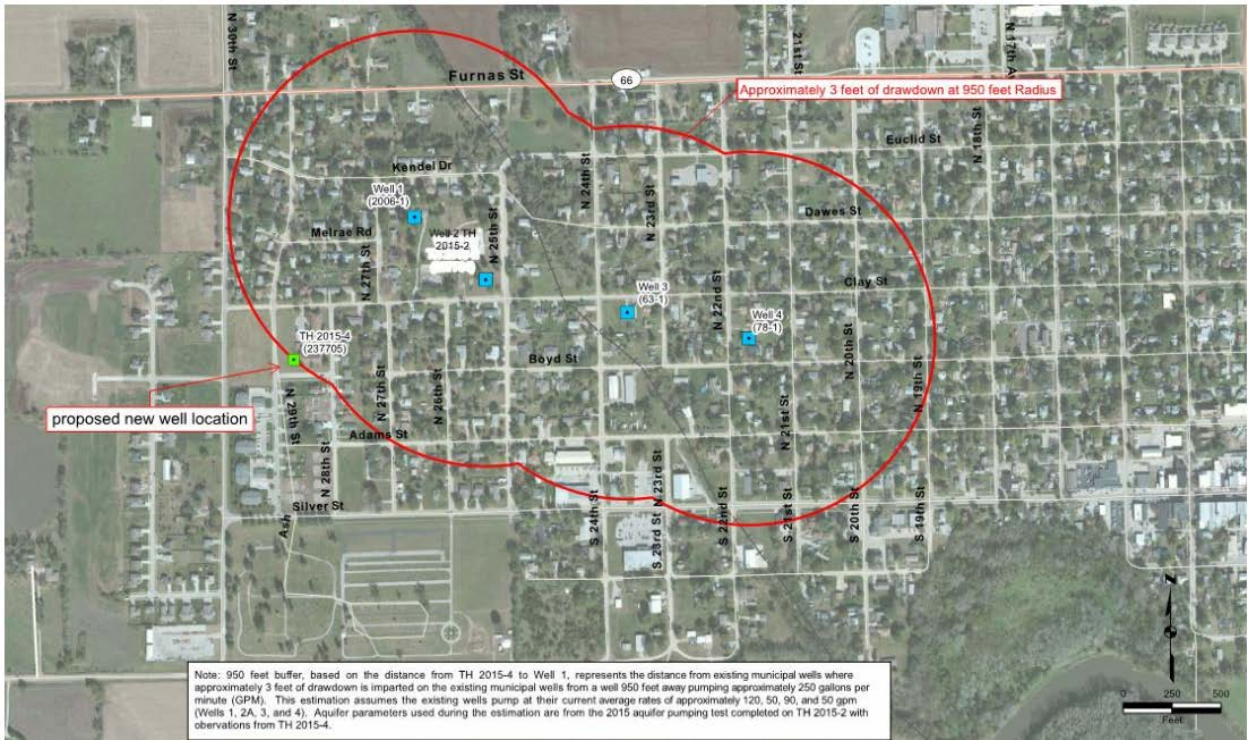
- A Mutual Aid Agreement and process for sharing emergency resources among water and wastewater agencies statewide.
- A mutual assistance program consistent with other statewide mutual aid and assistance programs and the National Incident Management System.
- The resources to respond and recover more quickly from a natural or human caused disaster.
- A forum for developing and maintaining emergency contacts and relationships.

Additional information can be found at http://www.newarn.org/

6.02 LONG TERM PLANNING

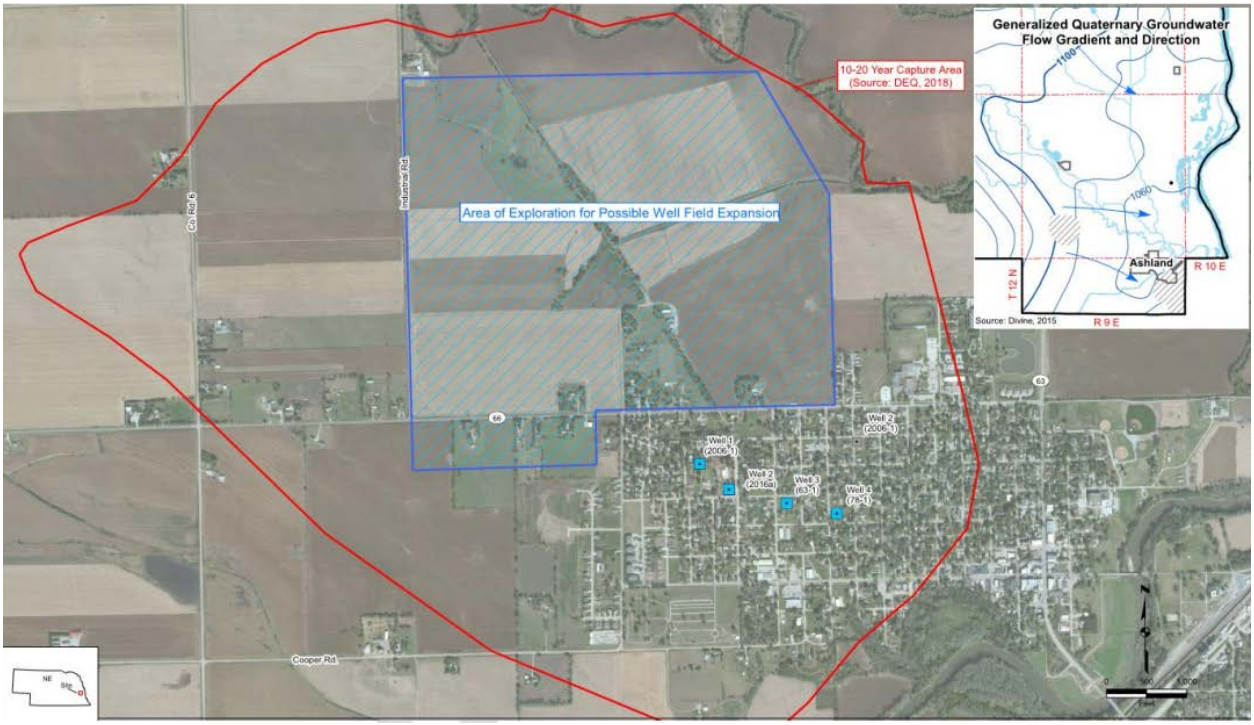
In January 2020 the city completed a Supply Source Water Plan which evaluated potential locations for new water supply wells. While the city is not currently in an immediate need of an increased water supply, population is projected to continue growing and water resources will need to be secured in the future. The Supply Source Water Plan provides an outline for expansion in three phases (JEO, 2020):

- Phase 1: Develop a new well location within the city (Figure 23)
- Phase 2: Investigate a new well field location northwest of the city (Figure 24)
- Phase 3: Development of the new well field and transmission lines to the city system



Source: JEO, 2020

Figure 23: Potential New Well Location



Source: JEO, 2020

Figure 24: Potential New Wellfield Location

6.03 DROUGHT PLANNING

Agriculture is the primary sector affected by drought; however, impacts on rural and municipal water supplies can be severe. A drought plan can be an effective means to improving information flow on drought conditions, severity, and impacts. Thus the timelines of mitigation and emergency response actions can be adequately updated. Mitigation actions for water supply systems commonly fall under the following categories:

- Assessment programs
- Water supply augmentation/development of new supplies
- Public awareness/education programs
- Water use conflict resolution
- Drought contingency plans
- Mutual aid agreements between communities/organizations

The LPSNRD completed a Drought Emergency Response Plan in 2015 which details the technical definition of a drought, as well as the short- and long-term impacts of drought. The document also outlines recommendations for drought response actions in the LPSNRD, which includes enforcement of

groundwater allocations, administration of surface water rights based on seniority, and public outreach and education (LPSNRD, 2015).

WATER CONSERVATION PLAN

A water conservation plan is a strategy or combination of strategies developed by a public drinking water system. The intent of a water conservation plan is to identify actions to reduce water losses, waste, or consumption and increase the efficiency with which water is used, treated, stored, and transmitted. Additionally, water conservation leads to increased energy conservation and cost savings for utilities and their customers. Recommended actions/elements of a plan include:

- Conduct water use audits for consumers
- Offer fixture retrofits and replacements
- Offer rebates and incentives
- Promote water reuse and recycling
- Encourage landscape efficiency
- Reduce excessive distribution system pressure
- Identify Voluntary or Mandatory Water-Use Restrictions

The city does not currently have a water conservation plan. It is recommended that the city develop one, as discussed in Chapter 7.

DROUGHT READY COMMUNITIES

The National Drought Mitigation Center, located at UNL, has developed a program known as "Drought-Ready Communities". The intent of the program and associated "Guide to Community Drought Preparedness" is to help communities understand and reduce their drought risk. A certified drought ready community has taken steps to:

- Involve a representative cross section of the community
- Learn how drought has affected them in the past and how it would likely affect them in the future
- Set up a system to monitor and communicate about drought conditions in the community
- Prepare and document a set of actions to take before and in response to drought
- Educate the public about water, drought, and the community's drought plan

Currently, Ashland is not a certified Drought Ready Community. It is recommended that the city become one, as discussed in Chapter 7. Additional information is available online at: https://drought.unl.edu/droughtplanning/AboutPlanning/PlanningProcesses/Drought-ReadyCommunities.aspx.

CHAPTER 7. MANAGEMENT STRATEGIES

The intent of this plan is to provide a guideline for protecting the city's drinking water source. This chapter outlines what has been done in the past and practical management alternatives that could be utilized by the city, landowners, producers, and resource managers to further protect the drinking water supply from nonpoint source pollution. Actions include a variety of approaches such as education, on-the-ground BMPs, data collection, regulatory options, and other projects.

7.01 ACTIVITIES COMPLETED TO DATE

The city has maintained a proactive stance in managing water quality in the WHP area. As summarized below, efforts completed before or during development of this plan include the following:

- The city completed a long-term Supply Source Water Plan in January 2020 to evaluate potential future municipal water sources.
- The city hosted a Test-Your-Well night in February 2020 in cooperation with LPNNRD and LPSNRD where private citizens and landowners could bring water samples to be tested.
- The city received a NDEE Source Water Grant in 2020 to assist with decommissioning abandoned wells in 2021.
- A hydrogeologic assessment was completed to determine aquifer vulnerability in the WHP area in June 2020.
- The LPSNRD is conducting a vadose zone assessment in the Ashland WHP area throughout 2020-2021 to gain a better understanding of the region's geology and how contaminants reach groundwater.
- **NOTE: Are there any additional completed activities to add to this list?**

7.02 PLANNED ACTIVITES FOR THE NEAR FUTURE

NOTE: These items will be discussed at the stakeholder meetings before finalization.

The merits of many potential management activities were discussed during the planning process. While no specific plans were developed, the city will explore the activities below and anticipates executing one or more in the near future:

- **Decommission Abandoned Wells** – Abandoned wells can directly channel contaminated surface water into groundwater, and so pose a considerable risk to water supplies. Abandoned wells must be decommissioned (filled, sealed, and plugged) according to state law or they are deemed "illegal".

  - The LPSNRD provides cost-share for certain components of well decommissioning at a set payment rate, which includes well casing/pit removal, gravel, concrete cap, bentonite, native soil, grout, cistern filling, and pump removal. Closure must be completed by a licensed well driller and approved and documented by the LPSNRD to receive cost-share.
  - The LPNNRD will pay up to 75% of well decommissioning costs. Work must be done by a licensed well driller to qualify for cost-share, and a cost estimate must be obtained beforehand and submitted to the NRD for approval and inspection. If approved by LPNNRD, reimbursement will be provided to the well owner after work has been completed and paid for.

- **Update Well Setback Ordinance** – The city currently recognizes well setback standards, however, the ordinance does not appear to be written to automatically update with state standards, and has not been updated since 2003.
- **Ongoing Public Education** – Education is often the first step in a successful WHP program. Ashland has provided education opportunities in the past and will continue to provide opportunities to educate all ages of citizens and property owners, in and around the WHP area, of the importance of source water protection. There are many entities which could assist in education efforts such as local schools, LPNNRD, LPSNRD, the Groundwater Foundation, UNL Extension, and the Nebraska Rural Water Association.
  - **Public education efforts may include, but are not limited to:**
    - Focus groups
    - Community workshops
    - Press releases
    - "Test-Your-Well" nights
    - Distributing brochures
    - School poster contests
    - News/information articles
    - Utility bill stuffers
  - **Education could be on a variety of topics, such as:**
    - Nonpoint source pollution
    - Proper animal waste handling
    - Aquifer and groundwater basics
    - Private well and wastewater system management
    - Fertilizer and Pesticide application
    - Urban and Rural BMPs

7.03 POTENTIAL ACTIVITIES FOR CONSIDERATION

- **Drought / Water Conservation Planning & Readiness –** As previously discussed in Chapter 6.03, Ashland could work with the National Drought Mitigation Center to become a certified Drought Ready Community. This would further enhance water conservation, help the city prepare for

times of drought or water shortages, and provide another avenue for community involvement. Part of this process would be creating a water conservation plan for the city. This could also include completing a drought mitigation plan, completing drought planning exercises, and updating the city's existing ordinances to improve how drought is handled.

- **Additional Test-Your-Well Nights** – Hosting additional "Test-Your-Well Nights" with the NRDs will provide the city with outreach opportunities for public education about the WHP plan.
- **Provisional WHP Area Update** – If the city moves forward with investigating a new wellfield to the northwest, NDEE should be consulted to provide a provisional map of the updated WHP area so the city can see the full impact of this expansion.

7.04 BEST MANAGEMENT PRACTICES FOR CONSIDERATION

Many BMPs have proven effective in reducing nonpoint source pollution and are commonly employed in Nebraska. In 2019 the NRCS expanded their National Water Quality Initiative to include source water protection. In 2020, the NRCS identified a list of BMPs with the greatest impact to source water protection (Table 8). These, along with BMPs identified through stakeholder feedback, are detailed in the following sections. NRCS offers up to 90% cost share on priority BMPs implemented in source water protection areas (WHP areas) through the National Water Quality Initiative. Implementation efforts are likely to be focused on these priority BMPs; however, this does not preclude other innovative practices that may be appropriate to specific projects or site conditions from being pursued. Information and education should always accompany BMP implementation efforts. Selection of BMPs or other actions should always consider field level characteristics, a producer's management goals, and technical or financial resources available. Additionally, because this is a voluntary plan, all BMPs will need willing landowners to implement them. The city could work in cooperation with the NRDs on a program to place nutrient reducing BMPs within the WHP area.

Table 8: NRCS Source Water Protection Priority Practices

Practice Code	Practice Name	High Priority Practice*
327	Conservation Cover	No
328	Conservation Crop Rotation	Yes
332	Contour Buffer Strips	No
340	Cover Crop	Yes
342	Critical Area Planting	No
351	Water Well Decommissioning	No
355	Well Water Testing	No
386	Field Border	No
390	Riparian Herbaceous Cover	No
391	Riparian Forest Buffer	No
393	Filter Strip	No
412	Grassed Waterway	No

430	Irrigation Pipeline	No
441	Irrigation System, Micro Irrigation	Yes
442	Sprinkler System	Yes
449	Irrigation Water Management	Yes
512	Forage and Biomass Planting	No
550	Range Planting	No
590	Nutrient Management	Yes
595	Integrated Pest Management	Yes
635	Vegetated Treatment Area	No
656	Constructed Wetland	No
657	Wetland Restoration	No
659	Wetland Enhancement	No

**High Priority Practices have the potential to receive up to 90% cost-share.*
Source: (NRCS, 2020)

CHAPTER 8. PUBLIC EDUCATION AND NOTIFICATION

8.01 OPPORTUNITY FOR PUBLIC INPUT

There must be proper documentation of public involvement to achieve NDEE approval. Development of this plan has followed the guidance of NDEE to ensure proper opportunity for public input. The following steps below are the basic minimum requirements that must be documented:

1. Prepare a WHP Plan
2. The plan is made available for public review at least 30 days prior to the meeting where public comment will be taken on the plan
3. Public comment is taken at a regularly scheduled meeting of the "controlling entity" (meaning the village board, city council, rural water district board, etc.)

Materials documenting the fulfillment of each of these items (copies of newspaper notices, affidavit of publication, minutes, etc.) are located in Appendix E.

8.02 PLANNING STAKEHOLDER COMMITTEE

A XX-member stakeholder committee was established at the initiation of the WHP planning process (Table 9). The stakeholder committee was responsible for plan review and served as local contacts to residents to provide information during the planning period.

Table 9: Ashland Wellhead Protection Stakeholder Committee Members

Name	Representing	Title

8.03 MEETING SUMMARY

During the development of this WHP plan, the city established a stakeholder committee, which met multiple times, and a held public open house to offer residents and property owners an opportunity to voice their opinion or ask any questions about wellhead protection and the planning process. Below is a summary of the types and dates of meetings. Notifications for stakeholder meetings were by email, phone calls, and word of mouth. Sign-in sheets and other public notification materials are located in Appendix F. Note that some meetings were held virtually due to the COVID-19 pandemic.

Project Kickoff Meeting – March 24, 2020

City representatives met with JEO, LPSNRD, LPNNRD, and NDEE to discuss the planning process, roles and responsibilities, stakeholder group selection, public involvement needs, the aquifer vulnerability assessment, contaminant source inventory, other data collection efforts, and the overall project schedule.

Notification: Attendees were invited to the meeting by email and phone calls.

Stakeholder Meeting #1 -

Meeting summary

Notification:

Stakeholder Meeting #2 -

Meeting summary

Notification:

Public Open House -

Meeting summary

Notification:

REFERENCES

Aller, L., T. Bennet, J.H. Lehr, and R.J. Petty. 1985. DRASTIC: A Standardized System from Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings. Ada, Oklahoma: U.S. Environmental Protection Agency.

Aller, L., T. Bennet, J.H. Lehr, and R.J. Petty. 1987. DRASTIC: A Standardized System for Evaluating Groundwater Pollution Potential Using Hydrogeologic Settings. USEA Document #EPA/600/2-85-018.

City of Ashland, 2019. Annual Water Quality Report for January 1 to December 31, 2019.

JEO Consulting Group, Inc. 2020. Ashland Supply Source Water Plan. Prepared for the City of Ashland, Nebraska. Published January 2020.

Lower Platte South Natural Resources District (LPSNRD), 2015. *Lower Platte South Natural Resources District Drought Emergency Response Plan.* Published November 2015. Prepared by JEO Consulting Group, Inc. Retrieved from: https://www.lpsnrd.org/publications/plans/drought-emergency-response-plan.

LRE Water. 2020. City of Ashland, NE Wellhead Protection Plan Hydrogeologic Assessment Results. Prepared for JEO Consulting Group, Inc. Published June 17, 2020.

Maupin, M.A., Kenny, J.F., Jutson, S.S., Lovelace, J.K., Barber, N.L., and Linsey, K.S., 2014. Estimated use of water in the United States in 2010. U.S. Geological Survey Circular 1405, 56 p, https://dx.doi.org/10.3133/cir1405.

National Research Council, 1993. Ground Water Vulnerability Assessment: Contamination Potential Under Conditions of Uncertainty: Washington, DC. National Academies Press, 210p.

Natural Resources Conservation Service. 2020. Source Water Protection Practices. Presented at the January 2020 Nebraska Association of Resources Districts Legislative Conference.

Nebraska Department of Environment and Energy. 2019. 2019 Nebraska Groundwater Quality Monitoring Report. NDEE Groundwater Section. Prepared November 2019. Retrieved from: http://deq.ne.gov/Publica.nsf/PubsForm.xsp?documentId=7AA33E82AAC4119C862584C400682884&action=openDocument.

Nebraska Department of Environmental Quality (NDEQ). 2018. 2018 Nebraska Groundwater Quality Monitoring Report: Lincoln, NE, Water Quality Division. Retrieved from: http://deq.ne.gov/publica.nsf/pages/WAT258.

Nebraska Department of Health and Human Service, 2010. Title 179 Public Water Systems: Chapter 7 Siting, Design, and Construction of Public Water Systems. Available at:

https://sos.nebraska.gov/rules-and-regs/regsearch/Rules/Health_and_Human_Services_System/Title-179/Chapter-07.pdf

Nebraska Department of Health and Human Service, Drinking Water Branch Water Watch, https://sdwis-dhhs.ne.gov/, accessed November 4, 2020.

New Hampshire Department of Environmental Service (NHDES). 2006. Environmental Fact Sheet: Nitrate and Nitrite: Health Information Summary: Concord, NH, NHDES Water Division. Retrieved from: https://www.des.nh.gov/organization/commissioner/pip/factsheets/ard/documents/ard-ehp-16.pdf.

Rahman, A., 2008. A GIS based DRASTIC model for assessing groundwater vulnerability in shallow aquifers in Aligarh, India: Applied Geography, v. 28, no. 1, p. 32-53. https://doi.org/10.1016/j.apgeog.2007.07.008.

Rundquist, D. C. Rodekohr, Donn A., Peters, Albert J., Ehrman, Richard, L., Di, Liping, & Murray, Gene. 1991. Statewide groundwater-vulnerability assessment in Nebraska using the DRASTIC/GIS model. Geocarto International, 6:2 p. 51-58.

United States Bureau of the Census, 2018. American Community Survey 5-year Estimates: U.S. Census Bureau

United States Department of Agriculture, 2020. Cropland Data Layer, Washing, DC: National Agricultural Statistics Service. Available at: https://nassgeodata.gmu.edu/CropScape/.

Weber, K., Nola, J., 2015. Natural Uranium Contamination in Major U.S. Aquifers Linked to Nitrate: Environmental Science and Technology Letters, vol. 2, no. 8, p. 215-220. https://doi.org/10.1021/acs.estlett.5b00174.

LIST OF APPENDICES