Osage Municipal Water Supply

Source Water Protection Plan

PWS #6663001

Prepared For
Osage Municipal Water Supply

Prepared by
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Assistance Provided by
City of Osage
Mitchell County Environmental Health
Natural Resources Conservation Service – Osage Field Office
Iowa DNR Field Office #4

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Note: Any blue underlined words will link to the online database location if one is available when using an electronically formatted version of the Source Water Protection Plan

Introduction

Background of Source Water Protection

In 1974 the United States Congress enacted the Safe Drinking Water Act (SDWA) with the goal of providing safe drinking water for public water supplies and their users. The SDWA gave the United States Environmental Protection Agency (EPA) the authority to develop a uniform national drinking water protection program, and to establish standards for known or suspected drinking water contaminants. In 1996, Congress amended the SDWA to reflect a growing awareness of potential biological and chemical threats to drinking water. The amendment to the SDWA outlines a plan for communities to protect their own source and keep program effectiveness at the local level.

During 1998-1999, the Iowa Department of Natural Resources (IDNR) and the Iowa Geological Survey Bureau (IGSB) started developing a Source Water Protection Program for the State of Iowa. In October 1999, EPA approved the IDNR Source Water Protection Program, including the already active program of Wellhead Protection.

At this time, legislators in the State of Iowa indicated that Iowa will maintain a voluntary approach to Source Water Protection planning. A voluntary implementation (as opposed to regulatory) is appropriate for Iowa due to the uniqueness of each public water supply system. The voluntary approach also conveys a positive image of the Source Water Protection Program

Iowa Rural Water Association (IRWA) has taken an active role in developing Source Water Protection Plans for small communities. IRWA's mission in this regard is to provide technical assistance to small communities in developing Source Water Protection Plans to protect their drinking water supplies.

Currently, IRWA's Source Water Protection Program is serviced by two grants. One supplies a program through a USDA-FSA grant and another through the Iowa Department of Natural Resources (IDNR). The Osage Municipal Water Supply Source Water Protection Plan has been developed through Iowa Rural Water Association's IDNR Source Water Protection Program

Purpose

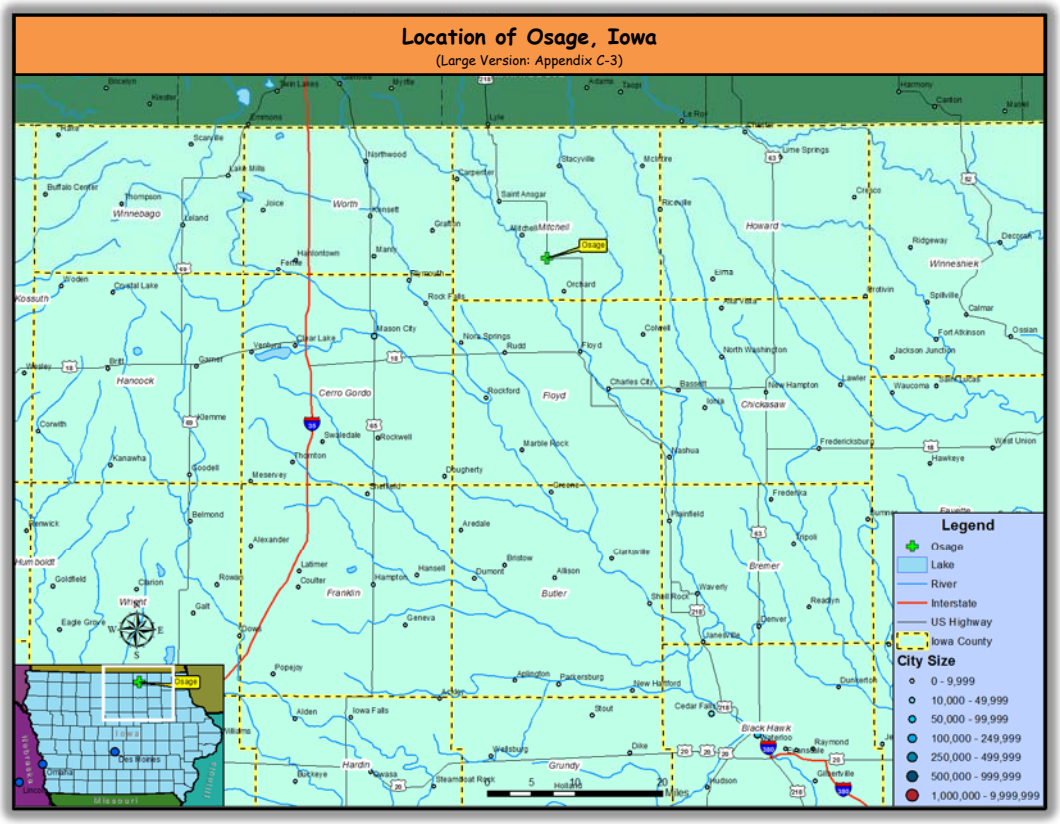
The purpose of the Source Water Protection (SWP) plan is to provide an organized approach to effectively protect public water supplies from contamination. There are many important reasons for protecting the Osage Municipal Water Supply's drinking water.

- Safeguard the health of community residents
- Prevent and reduce financial burdens caused by contaminated drinking water should it occur
- Educate and promote community awareness on drinking water contamination
- Safe drinking water is the life line of the community in the present and in the future
- Develop a contingency plan in the unlikely event that your drinking water supply would happen to become contaminated

Osage Municipal Water Supply #6663001

Location

Osage, Iowa is located in north Central Iowa's Mitchell County near Iowa's northern border with Minnesota. Osage lies to the east of the Cedar River and along the east-west route of Iowa Highway 9.



The utility operates three public water supply wells throughout the City.

Water Supply Information

Source

Osage operates three public drinking water wells drilled into the deep Devonian Limestone aquifer, with wells #2 and #4 extending into the St. Peter Sandstone. These wells were then backfilled to depths that reach in to the Decorah Shale formation. Well #5 is drilled into the Galena formation of the Devonian limestone aquifer. Well #2 is rated at 400 gallons per minute (gpm), well #4 is rated at 450gpm and well #5 is rated at 650gpm. The utility is also looking for locations to drill a new well. This well will be primarily used for a Valent, a new industrial facility that is anticipating using 250,000 gallons of water per day (gpd).

Osage Water Supply Public Well Inventory												
GeoSAM	Tag ID	Local Name	Drill Date	Aquifer	Depth	Status	Elevation	Bedrock Depth	Pump Test Date	Static Water Level	Pumping Water Level	Yield
41189	1020359	Osage #4	1/1/1953	Devonian, Ordovician	710	Active	1158	Unkn	N/A	N/A	N/A	N/A

Osage Water Supply Public Well Inventory												
GeoSAM	Tag ID	Local Name	Drill Date	Aquifer	Depth	Status	Elevation	Bedrock Depth	Pump Test Date	Static Water Level	Pumping Water Level	Yield
35979	0	Osage #1		Ordovician (abv St. Peter), Cambrian-Ordovician	780	Not Used	1179	20	1/1/1938	90	150	200
41188	1020358	Osage #2	1/1/1912	Devonian, Ordovician	676	Active	1179	Unkn	1/1/1942	110	135	0
3216	0	Osage #3	4/10/1948	Devonian, Ordovician	1265	Not Used	1167	7	8/1/1950	175	240	420
16641	1020360	Osage #5	1/1/1964	Devonian, Ordovician	650	Active	1165	10	8/18/1964	71	200	800
Source: www.iowasourcewater.org -> Source Water Tracker -> Osage Water Supply												

Customers

Osage Water Supply provides water to the residents of Osage and a small population outside of the corporate limits. The utility provides water to a population of over 3600 on approximately 1775 connections. The utility water use information is currently unavailable due to a new large industrial water user coming online in the fall of 2014, just after this plan was completed.

Treatment

Treatment for water in Osage is minimal. Chlorine is added to the water at each pump house for disinfection of the water to ensure that it is safe to drink. Osage Water Supply also adds fluoride to the water system to improve dental health in the community.

Water Quality

Water quality in the Devonian aquifer is variable near Osage. Nitrate in well #4 is near the maximum contaminant level (MCL) of 10 parts per million (ppm). Samples are taken monthly to ensure that the supplied drinking water is below the MCL. In well #2, nitrate is low to moderate (3-4ppm), but is only sampled on an annual basis. Well #5 has nitrate that is very low, generally under .5ppm. Water quality outside of the nitrate values is very good. In fact, the utility did not start chlorinating the water until the mid-1990s when chlorination was recommended. Prior to this, the utility met all water quality requirements.

Hydrogeology

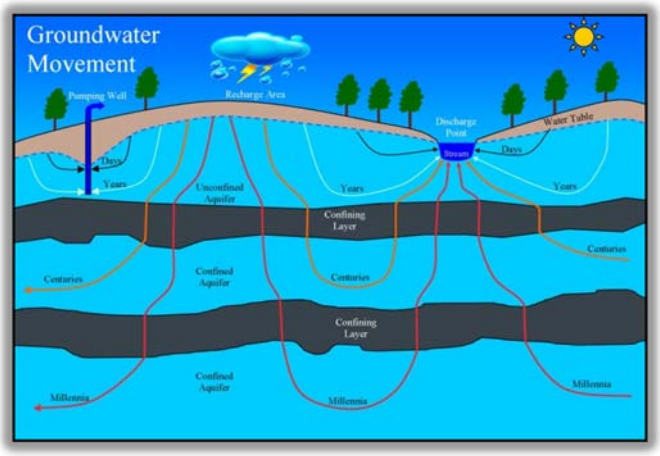
Over 80% of Iowan's obtain their drinking water from groundwater. Groundwater is found in aquifers that vary in depth, size and water quality. Many different aquifers are found and used in Iowa to supply quality drinking water to municipalities and private residences.

Along many of Iowa's Rivers we find surficial or unconfined aquifers. Surficial aquifers are generally made up of sand and gravel with little material overlying them. These are found in the modern river valleys, and are generally referred to as alluvial, drift, or buried channel aquifers. Alluvial aquifers are generally exposed to the surface and located next to modern day rivers. Drift aquifers are small rogue areas of sand and gravel that are generally small in nature and for the most part are only used for local or private wells, not community water supplies. Buried channel aquifers are very good sources of drinking water for all uses and mark out former river

channels.

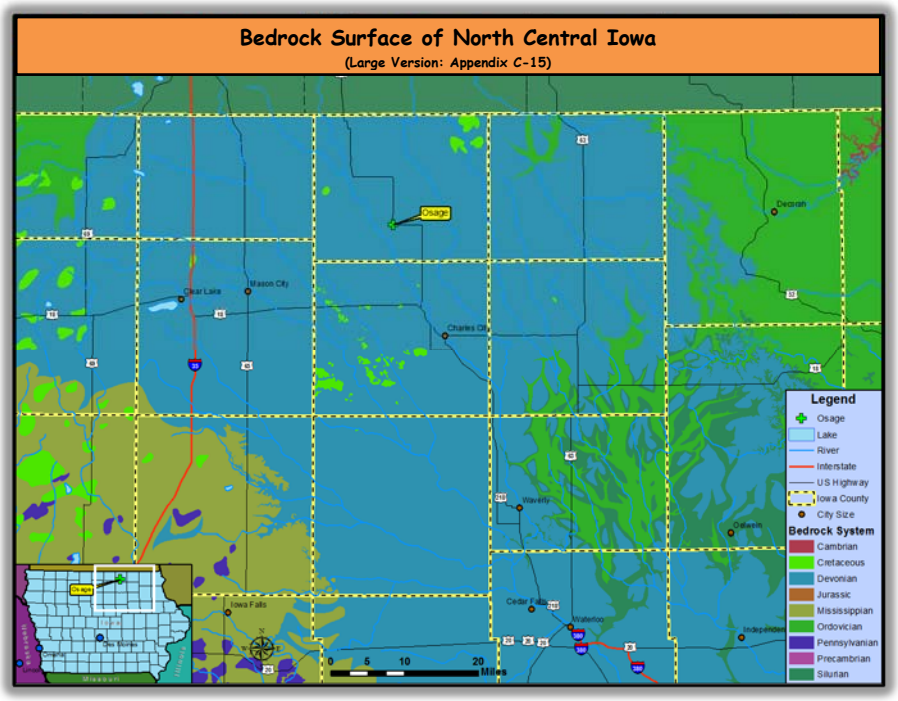
In most of Iowa we find confined aquifers located in the bedrock beneath the glacial till that makes Iowa well suited for farming activities. These aquifers provide a reliable source of good quality water in much of Central and Northeastern Iowa. From Central Iowa southward, the bedrock aquifers are rarely used. These aquifers are deeper as you move southwest across the state and the water generally contains higher amounts dissolved minerals. We like to see water stay in contact with the ground for extended periods of time because it tends to "clean" the water of harmful chemicals. If water stays in contact to long, it will dissolve minerals from the surrounding rock. This creates a very poor quality of water. These aquifers are still used in industries such as ethanol production because the wells produce plenty of water, and require little treatment to be used in these industries.

In Iowa, we are looking for aquifers that have good water quality, are easily recharged, and also have confining layers that are thick. Confining layers are layers of soil or rock that do not easily transmit water. These are generally made up of clay or shale and act as a confining unit depending on its thickness. This is very important when classifying a well as deep or shallow. Iowa's Administrative Code (IAC, Chapter 40.2) defines shallow and deep wells. If an aquifer has a continuous layer of low permeable rock at least 25 feet below the grounds surface and is a minimum of 5 feet thick, a well is considered a deep well. If a well does not meet these criteria, the well is considered shallow. Deep wells are less susceptible to contamination, thus they are given lower susceptibility designations. Osage Municipal Water Supply vary in meeting this criteria. Officially, Osage Municipal Water Supply wells are assigned a ranking of **susceptible** due to the thickness of the confining layer. The thickness of the confining layer has been identified as being between 25 and 50 feet thick. Well information that cannot be confirmed with well logs indicate less than 25ft of till overlying the bedrock. There are layers of shale below this, but it is not known if they are localized. Water quality information supports the theory that well #4 is highly susceptible to surface contamination, but this cannot be confirmed by geology due to lack of information. The official susceptibility designation does indicate that the wells have the potential to be impacted by surface contaminants such as underground storage tanks and agricultural chemicals.



The aquifer that Osage obtains drinking water from is known as the Devonian limestone aquifer. This is the primary surface bedrock feature throughout north central Iowa. In parts of Iowa, this aquifer is extremely shallow, with only a small amount of surface material overlying the

bedrock. Based on well logs, this appears to be the case in Osage. Near well #4, there is only 25ft of cover material overlying the aquifer (Osage Well History, 1987). Other well logs in the area indicate overlying material thickness as thin as ten feet. There are also reports of sinkholes in the area. Sinkholes are indicative of shallow bedrock, but also highly fractured bedrock. This allows water to move fast through the bedrock.

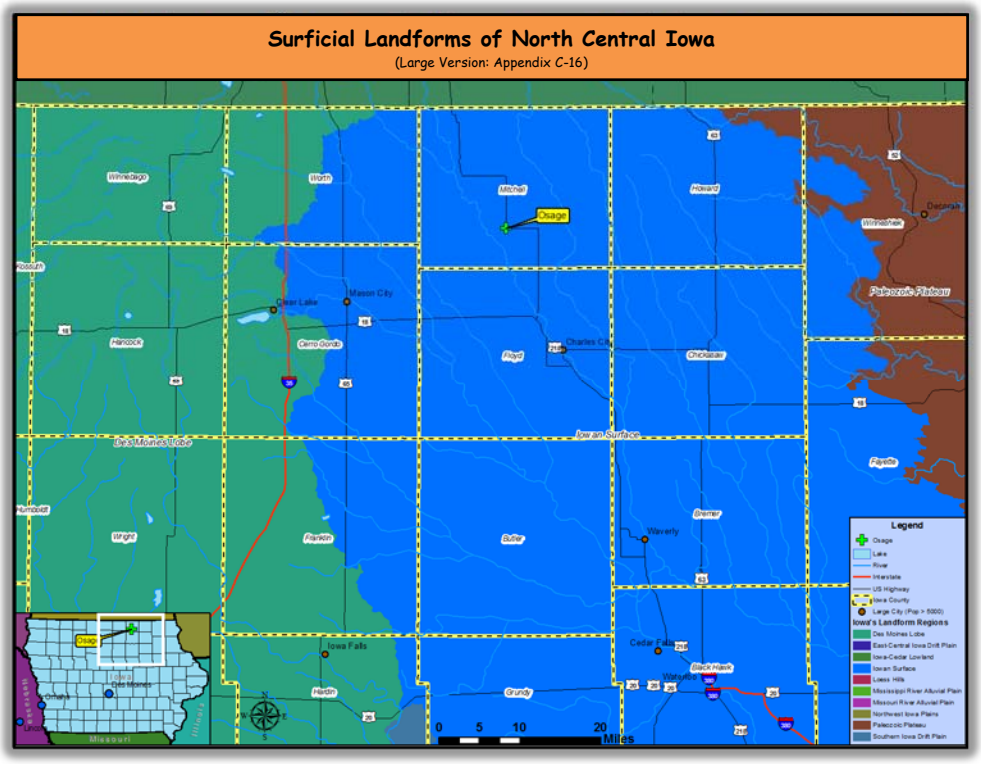


The wells are also open in parts of the Ordovician era limestone below the Devonian limestone. This is much deeper and makes up the surface bedrock formation in northeast Iowa. This aquifer is visible at the surface near the City of Decorah and the Upper Iowa River Valley. The limestone in this area and the notable fractures would be similar to what would be found if you were to see it beneath Osage.

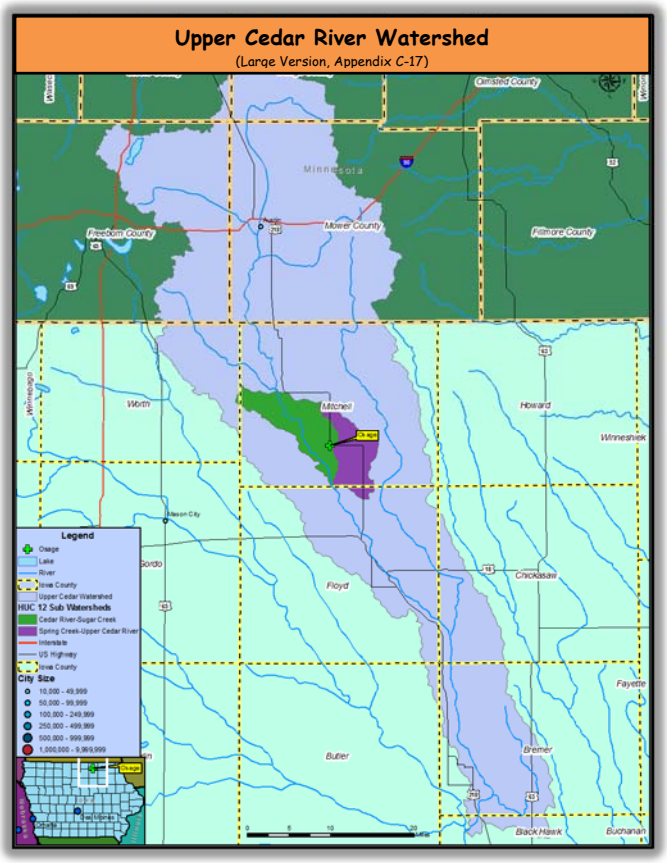
The Devonian bedrock aquifer was formed between 359 and 416 million years ago (Stratigraphic Colum of Iowa, EM-40, 2004). Osage's wells are open in the deeper parts of the Cedar Valley Limestone, and the Maquoketa Formation and Galena Formations of the Ordovician aquifer. The Maquoketa is considered a confining layer due to the amount shale that is found in the layer. The Maquoketa also protects the Ordovician aquifer from contamination from above. The wells drilled through this layer create a pathway for contamination to travel to the deeper aquifer.

Osage lies on the surface landform feature called the Iowan Surface. The Iowan Surface was formed when winds off of the glacial front caused the soils to erode. The winds moved the soils around the surface and deposited elsewhere. The remaining till is of Pre-Illinoian age, deposited between 21,000 and 16,500 years ago (Carbonate Platform Facies… Geologic Guidebook #28, Page 8). This material is a sandy loam with interbedded gravels and pebbly units of unconsolidated material. Due to the nature of the deposits, groundwater is protected as well as water below glacial till that was directly deposited by glaciers. The till material that makes up the Iowan Surface likely was exposed to an oxygen rich environment (i.e. the surface) and

oxidized. This gives the soil a higher hydraulic conductivity allowing more water to move through it than normally would (Geologic Society of Iowa Guidebook #82, Page 6)



Osage is located in the Upper Cedar river Watershed. The utilities wells are located in the Cedar River – Sugar Creek sub-watershed. This is important when completing land use projects and possible funding for projects. If a watershed protection group is formed for Sugar Creek, funding/cost shares may be available for land use project implementation. Surface water impact on the water supply are currently unknown. A sinkhole filled waterway is located to the north of well #4, but does not have standing water in it. Due to unknowns in geology, it may be possible that loosing streams near Osage may be impacting groundwater quality.



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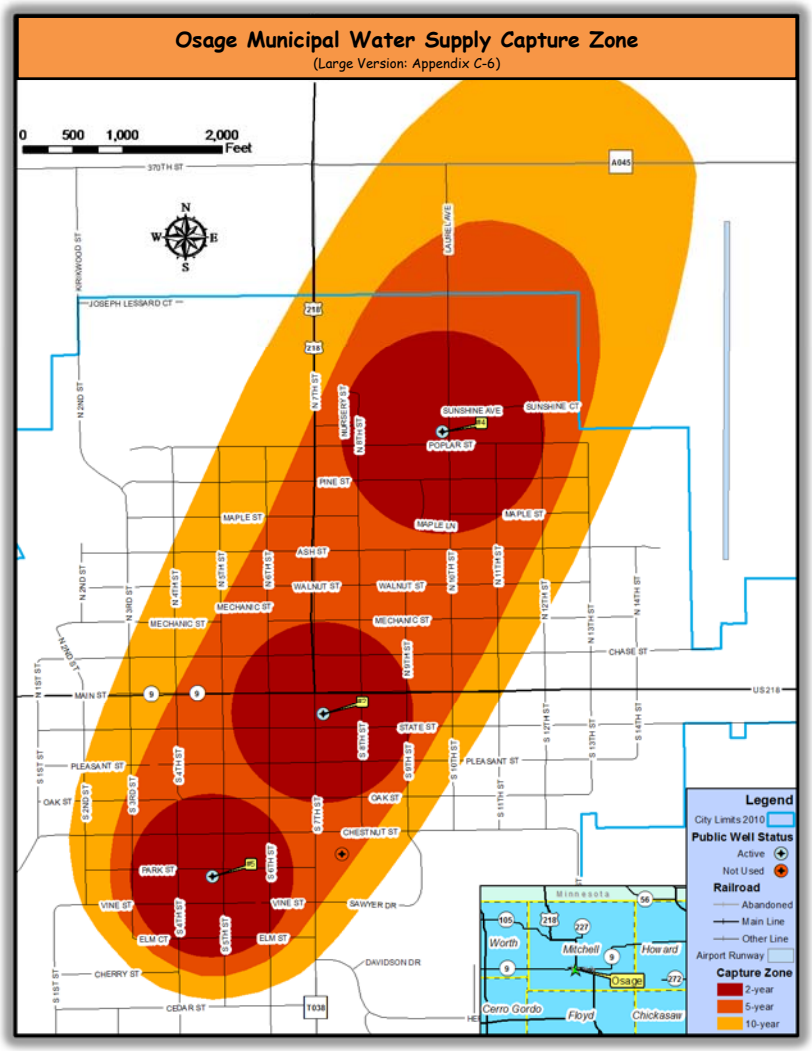
Osage Municipal Water Supply Source Water Protection Plan

Capture Zone



The Osage Capture Zone is defined by 2-year, 5-year and 10-year time of travel capture zones. The capture zones were develop using an element analytical model that was developed for the purpose of determining source water capture zones. Information including driller's logs and pump tests were used to determine the input variables. The final product is a time of travel capture zone that includes a 10-year time of travel that transects Osage near the end of the airport runway northeast of the city to the southwest corner of Osage. The 5-year time of travel covers the inner half of the city. Each active well has an individual 2-year time of travel capture zone.

The majority of the capture zone is residential and commercial with very little industrial areas. There are many different sources of contamination in this area related to normal activities. The northeast portion of the capture zone, mostly impacting well #4, is primarily agricultural. This area has also been identified as having sinkholes by members of the Source Water Protection Committee. This could indicate a pathway from the surface to the deeper aquifer that water and contaminants can easily move through. Soils northeast of well #4 have a larger infiltration and water holding capacity than those to the south and the west.

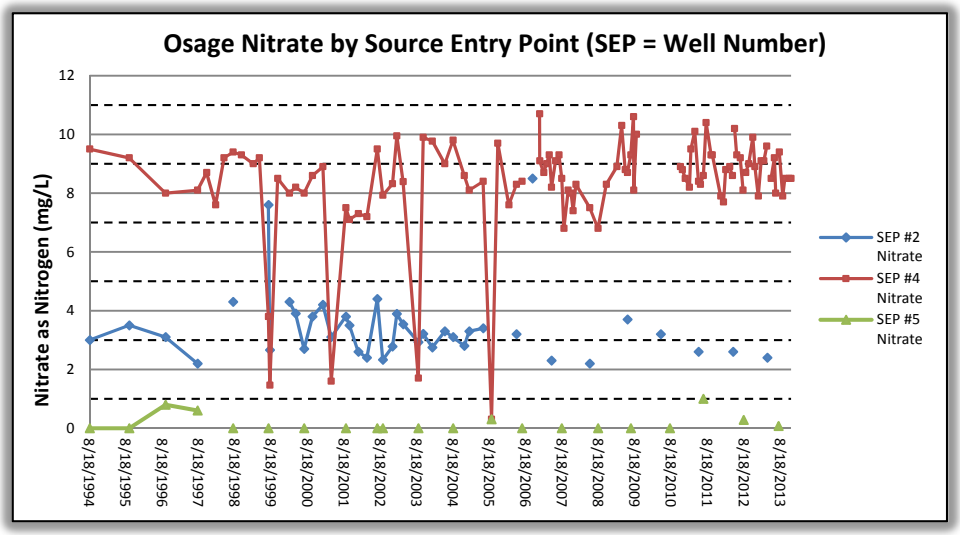
Potential Contaminant Inventory

Osage's potential contaminants has centered on nitrate issues in well #4 on the northeastern edge of the City. Nitrate concentrations have bordered the maximum contaminant level (MCL) for many years. In the past, the City has tried recasing the well deeper to decrease the concentrations, but that has not appeared to make a difference. The focus of this source water protection plan is on the agricultural impacts from nitrate on the drinking water well.

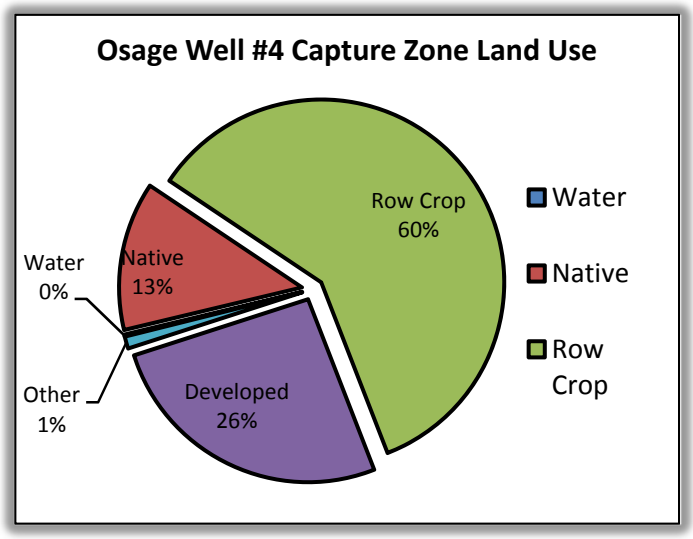
The point source contaminants are numerous in Osage. Most of the facilities have been closed. The utility is focused on working with the operations that are currently in existence and looking at limiting the locations where chemical use facilities can be placed in the future.

Nitrate/Non-Point Source

Nitrate is an issue in part of the Osage water supply. The supply uses three different wells, each with vastly different nitrate concentrations. This is represented on the graph to the right. The concern is in well #4, where over the past decade the City has been required to notify the public due to a violation in the nitrate standard.



Values have reached as high as 10.7ppm, which is above the MCL of 10ppm. There have also been instances where nitrate in this well bottomed out below 2ppm in August of 1999, 2000, 2003 and 2005 during periods of quarterly sampling. It is not know why this occurred as it has not happened since 2005. Nitrate is currently sampled monthly in well #4, and annually in wells #2 and #5. The gap that is noted in 2010 on well #4 is due to well maintenance. In 2010, the casing for well #4 was extended below a possible confining layer. Since this time, nitrate has not exceed the MCL, but has remained elevated.



Potential Point-Source Contaminant Sites

The potential point sources of contamination are numerous in Osage. There have been leaking underground tanks (LUST) found in the City, but they have yet to impact the water supply. The LUST sites found in Osage have all been closed. The utility hopes to work with the owners of existing underground tanks to report leaks or chemical spills to ensure that the City knows about possible contamination events and so the utility can take preventative measures if necessary.

The City is looking at new regulations related to setbacks from public wells to ensure that no new chemical storage facilities are constructed near existing and future public wells. Currently, since the point source contaminants have not been shown to impact the water source, the city has prioritized these facilities as low priority due to the existing nitrate issues near well #4.

Ranking Criteria

The high risk potential contaminants are listed below alphabetically. The FieldID# links to the table of potential contaminants and numbers on the potential contaminant maps (Appendix C, pages C-7 & C-8). The potential contaminants were ranked on 3 scales. The first was a 1-5 scale based on the chemical type and storage threat with 5 being the highest. The second was on the basis of the aquifer susceptibility. In Osage Municipal Water Supply, the aquifer being taken into consideration is a **Devonian** aged limestone aquifer that is **Susceptible** to contamination. All potential contaminants were given a ranking of 4 for aquifer susceptibility due to known surficial impacts from nitrate. The third scale was the proximity to the well. If the contaminant was in the 2-year it was given a 3, 5-year was given a 2 and 10-year was assigned a value of 1. The assigned risk assessment was developed using the total risk number. If a potential contaminant had a total risk value of 9 or larger, it was ranked as a High threat of contamination, 6-8 were ranked as a Moderate threat of contamination and 5 or lower is a Low threat of contamination. If a facility has been closed for a long period of time and contamination has been listed as cleaned up/no action required, the facility may have received a designation of slightly susceptible. The full potential contaminant inventory is available in Appendix B.

Osage Municipal Water Supply Potential Point Source Contaminant Inventory – High Risk Facilities

Field ID	Facility Name	Address	Site Type	Program ID	Status	Capture Zone	Total Risk	Risk Ranking	Hazardous Material
5	Casey's General Store #1799	309 Main St	Underground Storage Tank	199517790	Active	10-year	10	High	Gasoline
6	Century Link	621 State St.	Underground Storage Tank - Closed	198607723	Active	2-Year	10	High	Heating Oil
8	Ed Seaton	308 Main St	Underground Storage Tank		Active	10-Year	10	High	Gasoline
10	Kwik Star #801	809 Main St.	Underground Storage Tank	198608543/ 7LTV45	Active	2-Year	12	High	Gasoline
11	Left Lane Transport	632 Chase St.	Underground Storage Tank	198602616	Active	2-Year	12	High	Gasoline, Diesel
13	Mitchell County Regional Health Center	616 N 8th St	Underground Storage Tank	198604328	Active	2-Year	12	High	Diesel
15	N 10th Lift Station	N 10th St	Lift Station		Active	2-Year	12	High	Wastewater
16	Osage Middle School		Underground Storage Tank	198600176	Active	5-Year	10	High	Gasoline
22	Scott Tussler Property	703 Chase St	Underground Storage Tank	197910168/ 9LTA31	Closed	2-Year	10	High	Fuel

Full Potential Contaminant Inventory available in Appendix B, Page B-5
Potential Point Source Contaminant Inventory Completed on 5/20/2014

Osage Municipal Water Supply Potential Non-Point Sources of Contamination				
Contaminant	**Location**	**Type**	**Size/Amount**	**Description**
Row Crop	NE Part of the Capture Zone	Agricultural	~216 Acres or 29% of the Capture Zone – nearly 100% of row crop is near well #4	Cash crop corn and soybeans are planted in zoned agricultural land near the wells and to the east throughout the capture zone. The non-point threat is from widespread fertilizer and herbicide/pesticide use

Osage Municipal Water Supply Source Water Protection Committee							
Name	**Affiliation**	**Email**	**Phone**	**Mailing Address**	**City**	**State**	**Zip**
Brent Beste	IRWA	brentbeste@iowaruralwater.org	(515) 205-4026	4221 S. 22nd Ave E.	Newton	IA	50208
Jerry Dunlay	City of Osage	jdunlay@osage.net	(641) 732-3709	PO Box 29	Osage	IA	50461
Gary Schneider	Osage Water Department		(641) 732-3709	PO Box 29	Osage	IA	50461
Kurt Hoeft	Natural Resources Conservation Service	Kurt.hoeft@ia.usda.gov	(641) 732-5504	311 7th St SW, Ste #2	Cresco	IA	52136
Mark Ross	Mitchell County	mross@mitchellcoia.us	(641) 832-3943	117 Plaza lane	Osage	IA	50461

Focus Area

The committee is focusing on the area to the north of well #4. This is an area that is primarily agricultural and has been identified as part of the capture zone. The committee is looking at areas that reach beyond the capture zone and taking it as a multipronged approach for protection. The goal is to convert as little property as possible to native grasses due to land costs and commercial rental rates, but to also get maximum benefit for the cost. Projects include possible CRP enrollment with rental rate incentives, land purchases, and nutrient management planning. In field practices such as cover crops and buffers are options as well.

The committee is not focusing on the point sources of contamination, but is looking at regulations to ensure that they do not impact the drinking water source. This includes an ordinance enforcing IDNR mandatory setbacks, reporting, and water/geothermal well regulations. Other focuses include community education, especially related to turf grass to attack nutrient impacts from another angle. The City has recently completed an analysis of the sanitary sewer system to ensure that there are no leaks or locations for infiltration and inflow. Once the full report is available, the City may prioritize repair efforts to areas that are impacting the well.

Management Strategies

Initial Projects Prepared: 6/16/2014
Small Committee Discussed: 7/15/2014; Updated: 8/20/2014
Project List Finalized by the Committee: 8/27/2014; Final Updates: 8/28/2014

1. **Conduct a meeting with the local land owners to discuss the source water in Osage, the existing issues related to well #4, and the research that has been completed to determine the source of contamination and how landowners/operators can help improve groundwater quality**
    a. Cost: Staff Time
    b. Goal: Meeting to discuss and manage the region near well #4
    c. Timeline: Date TBD, Fall/Winter 2014 in Cooperation with NRCS – Osage Field Office

d. Contact:
   i. Jerry Dunlay, Public Works Director, City of Osage
   ii. Kurt Hoeft, District Conservationist, Natural Resources Conservation Service
   iii. Brent Beste, Source Water Specialist, Iowa Rural Water Association
e. Implementation Status: Meeting scheduled

Project Description

Conducting this meeting in conjunction with the Natural Resources Conservation Service (NRCS) - Osage Field Office and inviting the local land owners to attend will be a starting point to develop relationships with the local landowners. This allows the city to explain what issues the city is facing (high nitrate in well #4) and low cost and highly effective goals to reverse the current trend. Partnering with the NRCS office will allow the City and landowners a direct link to farm programs and management assistance that the landowners need. It also provides landowners with a contact that they already work with to establish management strategies to improve groundwater quality.

Goal

- Conduct a meeting with the agricultural landowners near well #4 that partners with NRCS to discuss land management options that improve water quality

Results

A meeting with the landowners has been scheduled for 9/19/2014 in cooperation with the NRCS Osage field office. The goal of the meeting is to introduce landowners to the source water protection program, benefits for their operations, and the current impacts of agriculture on drinking water in Osage.

2. **Work with landowners to enroll approximately 15 acres into the Wellhead CRP Program (see map in Appendix C on page C-14)**
   a. Cost: Staff time to promote, City may choose to supplement the difference between commercial rental rates and CRP rental rates
   b. Goal: 15ac listed on map
   c. Timeline: Implemented so that 2015 is the last cropping year
      i. Contact: Gary Schneider, Water Operator, City of Osage
   d. Implementation Status: Committee discussed

Project Description

This project will convert 15ac of row crop property to native grasses. Native grasses have been shown to reduce nutrient contamination in many places in Iowa. The deep root system, reconstruction of organic matter, and the removal of nutrient application are the prime reasons that these plants work so well to improve water quality. The wellhead Conservation Reserve Program (CRP) pays the landowner a rental rate of x amount of dollars plus a 10% bonus per acre.

Wellhead CRP – De Soto, IA

Another option may allow the city to purchase the property and rent it back to the landowner. The landowner can collect the CRP payments after a 1-year delay per CRP requirements (The CRP allotment for municipalities has a very long waiting list, most under continuous programs will not give up their allotment)

Goal

- Work with the landowners to enroll in the Wellhead CRP program through NRCS and the Farm Service Agency
    - This could work in place of purchasing property

Results

The committee has discussed this management strategy.

3. **Encourage the landowners to work with NRCS to complete a nutrient management plan to determine the actual input needs for the property in the protection zones**
    a. Cost: Staff time to work with NRCS to promote (NRCS completes the management plans at no cost to the landowners)
    b. Goal: Work with NRCS and the landowners to promote nutrient management planning and how it benefits the landowner and the water supply
    c. Timeline: Nutrient management plans developed for keys areas by 2016
    d. Contact:
        i. Jerry Dunlay, Public Works Director, City of Osage
        ii. To be discussed with NRCS and the Landowners at the landowner meeting
    e. Implementation Status: Committee discussed

Project Description

Nutrient management planning is the first step to decreasing the nutrient input on agricultural property.

> *"Nutrient management addresses the rate, form, timing, and placement of organic and inorganic nutrients. The purpose is to adequately supply soils and plants the nutrients they need to produce food, forage, and fiber and at the same time, minimize nutrient losses from fields and protect surface and groundwater supplies. Properly applied, the practices combines with others can:*

- *Budget, supply and conserve nutrients for plant production*
- *Minimize agricultural nonpoint source pollution of surface and groundwater resources*
- *Use manure or organic by-products as a plant nutrient source*

- *Protect air quality by reducing odors, nitrogen emissions (ammonia, oxides or nitrogen) and formation of atmospheric particulates*
- *Maintain and improve physical, chemical, and biological condition of the soil"*

Reference: *Environmental Quality Incentives Program, Key Iowa Practices for General Funding. June 2014. United States Department of Agriculture, Natural Resources Conservation Service.*

Management includes switching to spring only application, split applications, and possibly reductions in total nutrient application. This benefits operators in the form of reduced input costs (fertilizer and fuel) and decreases nutrient leaching. This benefits the water supply because it is a no cost effort, decreases inputs, so it has the potential to decrease nitrate in groundwater.

Goal

- Encourage the local operators to complete a nutrient management plan with the assistance of NRCS
- Recommend follow ups if nutrient management plans exist
- Recommend that operators use soil testing on the recommended schedule to determine nutrient needs
- Recommend following Iowa State nutrient application guidance if an operator does not want to complete a nutrient management plan

Results

The committee has discussed this management strategy.

3. **Work with the landowners to the NE of well #4 to install conservation practices such as cover crops and complete nutrient management planning with the assistance of NRCS (See map in Appendix C on page C-14)**
    a. Cost: Staff time to work with NRCS to promote
    b. Goal: Work with NRCS and the landowners to promote cover crop installation
    c. Timeline: Installed on all listed property, with incremental installation as the distance from the well increases
    d. Contact:
        i. Jerry Dunlay, Public Works Director, City of Osage
        ii. To be discussed with NRCS and the Landowners at the landowner meeting
    e. Implementation Status: Committee discussed

Project Description

Cover Crops are a great way to begin improving organic content in soil, improving water quality in groundwater, surface water, and to decrease erosion. Implementing this practice is not an overnight cure all. Cover crops take an average of 3-5 years to make changes in the soil (increase the organic material content) and if managed properly may even decrease the demand for added fertilizer and other chemical needs. Cover crops will also improve the stability in the

soil and improve infiltration. This will potentially allow for earlier field work. Cover crops also decrease soil temperatures during the hot summer months by shading the soil from direct sunlight.

Working with the landowners to fine tune the nutrient use will also help in decreasing the excess nutrients in groundwater. Moving from fall to spring application is a great first step.

Goal

- Encourage landowners to use cover crops to decrease nutrient loss in the capture zone

Results

The committee has discussed this management strategy.

4. **Work with the landowners along the waterway to the north of Well #4 to install a buffer strip along each side of the waterway (See map in Appendix C, Page C-14)**
    a. Cost: To be determined
    b. Goal: Buffer along the full waterway to filter water before it enters the waterway
    c. Timeline: Spring 2016
    d. Contact:
        i. Jerry Dunlay, Public Works Director, City of Osage
    e. Implementation Status: Committee Discussed

Project Description

Installing native vegetation buffers along the waterway will allow runoff to slow and filter before reaching the waterway. Since this waterway is known to contain sinkholes, it is necessary to ensure that water that enters it is as nutrient free as possible. These sinkholes act as pathways to deeper groundwater and the best way to prevent contamination from them is to protect them as much as possible. The major benefit is the filtering of surface runoff prior to entering the waterway, and likely the aquifer due to the sinkholes. This will also slow water movement into the waterway and capture sediment that contains a larger amount of nutrients. Slowing the movement of water into the waterway will likely also decrease the erosion that is helping to expose more sinkholes in the waterway.

Goal

- Large vegetative buffer along each side of the waterway north of well #4 from the airport to Highway 218 (West 7th St.)

Results

This project has been discussed by the source water protection committee.

5. **Purchase property for a new well, develop, and implement source water protection measures before the new well comes online**
    a. Cost: Appraised Value of the acreage
    b. Goal: Minimum of 4ac (Approximately the size of a squared off 200ft radius)
    c. Timeline: Based on engineers recommendations
    d. Contact:
        i. Jerry Dunlay, Public Works Director, City of Osage
        ii. Contact: Source Water Technical Assistance provider
    e. Implementation Status: Committee discussed

Project Description

Osage is considering drilling a new well in the near future due to increased demand and need for redundancy for the new Valent facility in Osage. The facility is ex pected to use a significant amount of water and the City would like to have a well near the facility.

Goal

- Contact Iowa DNR Water Supply to have a well forecast completed
    - Contact: Chad Fields, chad.fields@dnr.ia.gov; (515) 725-3407
- Purchase land for a new well
- Develop protection measures to protect the new well
    - Contact a source water protection technical assistance provider for assistance
- Implement protection measures to protect the new well from contamination prior to drilling (i.e. agricultural management, ordinances, etc.)

Results

This project has been discussed by the source water protection committee.

6. **Work with owners of private wells to abandon and properly plug all private wells in City Limits and the Capture Zone (if an alternative water source is available)**
    a. Cost: Staff Time/Education Material
    b. Goal: See guidance below
    c. Timeline: 1yr after a well is located
    d. Contact:
        i. Gary Schneider, Water Operator, City of Osage
        ii. Contact: Mark Ross, Mitchell County Sanitarian
    e. Implementation Status: Committee discussed

Project Description

Osage requires all water users to connect to the Public Water Supply if available. Few wells are left in the City or capture zone. Plugging private wells eliminates possible pathways for contamination to reach deeper drinking water aquifers. This happens when chemicals enter the soil and groundwater system. When chemicals in the soil or groundwater reach a well that has

failing casing or improper construction, there is a possibility that deeper aquifers can be contaminated. The State of Iowa requires all abandoned or not used wells be properly plugged. (See IAC information below)
The Iowa Administrative Code, Section 567, Chapter 39 contains the following regarding private wells:

> ***"Abandoned well"*** **-** means a water well which is no longer in use or which is in such a state of disrepair that continued use for the purpose of accessing water is unsafe or impractical.
>
> **39.5(4) -** Wells abandoned after April 25, 1990. All classes of wells which are abandoned on or after April 25, 1990, must be properly plugged within 90 days of the date of abandonment.

This requires owners of wells that are no longer in use or in disrepair to plug them within 90 days of abandoning.

Goal

- Locate private wells during normal water supply activities (i.e. meter reads/checks)
  - Conduct an inspection of the home to ensure that there are no cross connections between the well and the public water supply
- Recommend wells that are found be plugged
- If the well is found to be in a deteriorating condition, a cross connection is found, or the well is not used require the well owner to plug the well and provide the contact information for the Mitchell County Sanitarians office
  - Follow up in 30 days to check progress
  - Follow up within 90 days to ensure the well has been plugged (require City notification)
- If the well is in good condition, in use, and no cross connections are found, recommend that the well be plugged
  - Follow up in 6 months to check progress
  - Follow up in one year to complete a status check on the well
- Require copies of the well plugging record be sent to the City/Water Department

Results

This project has been discussed by the committee.

7. **Enact a 200ft Zone of Control and mandatory IDNR setback Ordinance to ensure surface protection and to comply with mandatory set back distances for Public Wells (see map in Appendix C, page C-10)**
   a. Cost: Ordinance Development Costs, Staff time

b. Goal: Ordinance protecting 200ft from public wells and instituting IDNR mandatory setbacks
c. Timeline: Spring 2015
d. Contact:
    i. Jerry Dunlay, Public Works Director, City of Osage
    ii. Sample Ordinances: Brent Beste, Source Water Specialist, Iowa Rural Water Association
e. Implementation Status: Committee discussed

Project Description

The IAC requires that all wells drilled after 1979 are required to have 200ft of control. This can be established through land purchases, ordinances or easements. Osage's public wells were drilled in 1912 (Well #2), 1953 (Well #4), and 1964 (Well #5). These wells are not required to have this protection, but all future wells must.

This ordinance will be a starting point for new wells that are constructed in the future. It is also a starting point in protecting the existing public wells from surface contamination. The ordinance will allow the city to ban chemical application, use, and storage within 200ft of public wells.

This will also protect well #4 in the event that the area near the well is developed in the future. This will prohibit those that live in the area around well #4 from applying chemicals and fertilizers on their lawns (private lawns are possibly just as harmful as row crop agriculture if commercial lawn chemicals are applied).

Adding the mandatory IDNR setbacks to the City code will allow for the city to control what is constructed where and what limitations are put on the facilities. This will make it more difficult for new chemical storage facilities to be constructed near public wells.

Reference: Iowa Administrative Code, Environmental Protection Committee, 567, Chap. 43.3(7) Water Supplies - Design and Operation

Goal

- Enact a 200ft ordinance to prevent chemical storage and application within 200ft of public wells. This may also contain an area of secondary protection where chemical storage can be placed with a variance from the City Council so as not to hinder economic development.
- The ordinance should also include the mandatory chemical setbacks as outlined in Table A of IAC 567 Chap43.3(7) (link above)
- Assign an Ordinance enforcement officer (i.e. Water Superintendent) to ensure that all setbacks requirements are followed

Results

The source water protection committee has discussed this project.

8. Public Education Campaign

a. Cost: Staff Time, Material Development, Refreshments for Event(s)

b. Goal: Hold an educational event for residents to learn about the water supply and supplemental materials for distribution
c. Timeline: Spring 2015
d. Contact:
    i. Gary Schneider, Water Superintendent, City of Osage
    ii. Educational Assistance: Brent Beste, Iowa Rural Water Assn.
e. Implementation Status: Committee discussed

Project Description

This project is a benefit because it promotes the project to the residents of Osage. Information about where their water comes from, how it gets there, what is in it, and projects the City is working to ensure the long term protection of the supply. It makes it easier to sell spending tax dollars/water income on projects such as land purchases or assisting landowners with project implementation.

Educating the residents also provides an opportunity to explain the differences between water supplies. Due to recent information mistakes made about water quality in public water supplies near Osage, it is necessary to identify the difference between them. It also allows the City to get information to the residents prior to any potential nitrate issues and what the City is doing to mitigate the threat of a violation.

This can be done through brochures, city website links/articles, and utility newsletter articles. All of this is a great way to inform the water utilities customers that the utility is trying to do something before it is too late to protect the drinking water source.

Another activity is a public relations event, possibly at well #5 to explain what the utility does to ensure a violation does not occur and what the residents can do to help. This includes turf grass measures and storm water activities. Holding the event at well #5 allows the city to show residents where their water comes from, what is done to treat the water, and how it gets to their homes.

An education event at the Osage schools is also a way to teach the community about water resources. Demonstrating to the students where water comes from and how to protect will go towards long term protection efforts. Educating students about chemicals and groundwater will teach them about the precious resource. Youth also bring information home to their parents and often encouraging them to make changes to the way they do things.

Goal

- Brochures to all residents
- Educational events for residents to learn about the water source
- Newsletter articles about the water quality with explanation
- Classroom educational events at Osage Schools

Results

This project has been discussed by the committee.

9. **Install water supply protection area signs and federal offense for tampering stickers**
    a. Cost: Staff Time to Install
    b. Goal: Signs near the wells and red stickers on water supply facilities
    c. Timeline: Fall 2014
    d. Contact:
        i. Gary Schneider, Water Operator, City of Osage
        ii. Signs Provided by: Iowa Rural Water Association
    e. Implementation Status: Committee discussed

Project Description

IRWA provides communities completing source water protection plans with IRWA's assistance with signs that can be put up in the capture zone. These signs are visible, but the goal is to deter illegal dumping and make people think when they enter these areas. The signs can be installed where the utility feels they would have the most benefit.

The federal no tampering signs are provided at no cost to communities by IRWA field staff. These stickers are to be placed on water utility structures to deter vandalism. If vandalism does occur, the offender can face federal prosecution, not just local due to the potential impact to public health.

Goal

- Metal signs in strategic locations
- Small signs in public areas
- Stickers on each well facility and all above ground water/wastewater infrastructure

Results

This project has been discussed by the source water protection committee.

10. **Promote lawn chemical application reduction for private homes**
    a. Cost: Materials for brochures/printing/staff time
    b. Goal: Brochures to homeowners
    c. Timeline: Spring 2015
    d. Contact:
        i. Gary Schneider, Water Operator, City of Osage
        ii. Educational Materials: Brent Beste, Iowa Rural Water Association
    e. Implementation Status:

Project Description

Working with homeowners to decrease fertilizer use and application will help get landowner buy in and will also likely decrease the nutrient concentration, especially from homes around well #4. The big if is to get the homeowner to buy in. This can be accomplished through recommending soil testing and simply following the instructions that are on the fertilizer container.

This can be completed through brochures sent to residents or one on one efforts. The benefit is a cheap and easy way to meet the residents and promote source water protection.

Goal

- Educational materials to promote nutrient application reduction
- Brochures
- Materials from other governmental agencies
- Work with local business that sell chemicals for private application to post educational materials about over application
- Work with Private companies/applicators to decrease rates to only what is necessary

Results

This project has been discussed by the source water protection committee.

11. Promote Urban Storm Water Management for Homeowners

a. Cost: Staff time, Printing
b. Goal:
   i. Educational materials made available to residents
   ii. Demonstration projects completed by groups looking for service projects
c. Timeline: Ongoing demonstrations; spring 2016 establishment of demo projects
d. Contact:
   i. Gary Schneider, Water Operator, City of Osage
e. Implementation Status: Committee discussed

Project Description

Encourage residents and commercial/industrial facilities to install storm water management practices to minimize runoff and the chemicals that are in runoff such as excess nutrients or industrial waste. This can be done using brochures and other educational materials provided through the source water protection project.

Rain Barrels in Denver, IA

Working with a community organization (i.e. Boy Scouts, Girl Scouts, 4H, etc) that would like to complete community service projects is a way to get these type of projects started. These groups can install and maintain their management strategies until they are established and ensure that they are taken care of. The projects may also inspire residents to do the same on their own properties. This benefits the city because they do not have complete the project, but have many of the other benefits (demonstration project, no maintenance from the City, water quality improvements, etc).

Downspout Rain Garden - EPA

Residents are eligible for SRF Loans through IDALS and the local SWCD to install management strategies.

Goal

- Filters/Filter Strips
- Rain Barrels
- Rain Gardens
- Native grass planting

Work with a community organization to complete one of the above as a service project. This project can then be promoted to the rest of the community for installation on private properties.

Results

This project has been discussed by the source water protection committee.

12. **Develop Urban Storm Water Management practices in areas with significant amounts of impervious surfaces to improve infiltration and filter out excess nutrients and chemicals prior to reaching the storm water system**
    a. Cost: Installation costs, engineering fees, etc.
    b. Goal: Incorporate storm water management in street/downtown upgrades
    c. Timeline: As streets are repaired/redesigned
    d. Contact:
        i. Jerry Dunlay, Public Works Director, City of Osage
    e. Implementation Status: Committee discussed

Project Description

During redevelopment and construction of the downtown areas, consider newer storm water management practices to treat storm water prior to entering the storm sewer system. Some projects also allow the water to naturally enter the groundwater system, decreasing the need for constructed storm water retention.

Encouraging commercial/ industrial facilities to install storm water management practices to minimize runoff and the chemicals that are in runoff such as excess nutrients or industrial waste.

The City is eligible for SRF Loans through IDALS and the local SWCD to install management strategies. Many grants are also available through different organizations to install management strategies.

Goal

- Filters/Filter Strips
- Rain Gardens in City parks

- Bio retention cells
- Bioswales
- Native grass planting – converting existing turf grasses to native turf grasses to increase nutrient uptake and infiltration
- Porous Pavement

When completing redesigns on city streets in the downtown area, consider using porous pavers/concrete, or other storm water management techniques to drive infiltration and bio-removal/filtration of nutrients/chemicals in runoff from impervious surfaces

Results

This project has been discussed by the source water protection committee.

13. **Encourage homeowners/business to replace threaded faucets with anti-siphon threaded faucets connections**
    a. Cost: Promotional materials/distribution
    b. Goal: Educational information on replacement to residents
    c. Timeline: Fall 2015
    d. Contact:
        i. Gary Schneider, Water Operator, City of Osage
        ii. Education Materials: Brent Beste, Iowa Rural Water Assn.
    e. Implementation Status: Committee discussed

Project Description

The City may be interested in encouraging homeowners to convert existing hose bibs to newer ones with anti-siphon technology. This will ensure that if somebody is filling a pool for example, especially a large one, that water is not sucked back into the distribution system in the event of negative pressure.

Goal

Encourage residents and local business with hose connections to install anti-siphon hose bibs

Results

This project has been discussed by the source water protection committee.

14. **Develop Geothermal Well installation guidance, especially within the capture zone**
    a. Cost: Ordinance development fees
    b. Goal: Ordinance guiding development and placement
    c. Timeline: Spring 2016
    d. Contact:
        i. Jerry Dunlay, Public Works Director, City of Osage
    e. Implementation Status: Committee discussed

Project Description

Develop an ordinance guiding the development, placement, and installation of geothermal wells in the City of Osage. Geothermal systems, specifically large deep systems, can impact the drinking water source. These generally require numerous wells to supply the necessary heating/cooling of the facility where a geothermal system is installed. The more wells that are installed, the more pathways to the aquifer that are created, and the higher the chance of well failure.

The ordinance should be a guide to the maximum depth and establish separation distances from the public water supply wells. Guidance could ensure that deep systems are not placed in areas near the well (still allowing horizontal systems), and that no systems are allowed within a certain distance. It might also be advantageous to enact a permit fee to locate all systems using a GIS Database containing pertinent information including GPS coordinates of the system, type, depth, etc. This ensures that the location is known to prevent accidental damage of the system.

Goal

- Work with local geothermal installers to develop guidance to protect the drinking water source
- Develop an ordinance containing the following
    - Ban the installation of new systems within **x**ft of a public well
    - Restrict the type of system within the 10-year capture zone to horizontal systems
    - Require that all systems use food grade materials as the liquid in the system
    - Require that all wells are constructed to drinking water standards (cased, sanitary seals, grouted)
    - Allow the City to allow for exemptions with City Council Approval

Results

This project has been discussed by the source water protection committee.

15. Work with underground storage tank owners to report spills/leaks to the city

a. Cost: Staff time
b. Goal: Develop a relationship with underground storage tank owners
c. Timeline: Spring 2015
d. Contact:
    i. Jerry Dunlay, Public Works Director, City of Osage
e. Implementation Status: Committee discussed

Project Description

There are a number of active underground storage tanks near the center of Osage near well #2. These underground tanks have the potential to leak or spills may occur during filling. If this occurs, the groundwater could be contaminated or the distribution system could be compromised if plastic pipe or rubber gaskets are in use near a leaking tank.

The benefits of developing a relationship prior to a spill or a leak helps mitigate the threat to the water supply. If the business is comfortable with the City, they will report the leak or spill as soon as possible to prevent contamination. Having this relationship gives the City and the business an opportunity to work together to ensure that there is no impact to the public if a mistake happens.

Goal

- Develop relationships with the business' operating underground tanks closest to well #2
    - Kwik Star, Scott Tussler Property, Left Lane Transport
- Develop relationships with other business' near threatened water main

Results

This project has been discussed by the source water protection committee.

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