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Memorandum

To: Stefan Higgins, City of Blaine
From: Brian LeMon, PE and John Greer, PG
Subject: Proposed Well Interference Response Plan
Date: December 12, 2017
Project: 23021050.00

1.0 Introduction

The purpose of this document is to provide the City of Blaine with a procedure for responding to well interference complaints that may occur in the future. In addition, the document provides general information regarding the City's obligations to address well interference complaints as required by state statute and Department of Natural Resource policy. With this as a framework a decision tree is provided to guide how interference complaints can be handled. Finally, maps are provided to assist in determining the validity of a complaint. The maps provided were derived from modeling that has been done in support of the recent well field expansion and show areas where future drawdown in the City's supply aquifers may be enough to generate actual interference with private wells.

The document is broken down into the following sections:

- Background
- Existing Well Interference Resolution Process through the Department of Natural Resources (DNR)
- Potential for Well Interference
- Recommended Approach for Responding to Well Interference Complaints

In addition the document contains the following supporting figures:

- Figure 1: Well Interference Potential Quaternary, Prairie du Chien and Jordan Aquifers
- Figure 2: Well Interference Potential Tunnel City-Wonewoc Aquifer
- Figure 3: Well Interference Decision Tree

2.0 Background

The City of Blaine (City) currently operates 16 water supply wells. Construction information for the wells is shown in Table 1. The existing City water supply wells pump from four aquifers:

- Confined Quaternary-age unconsolidated sand and gravel aquifer immediately overlying the bedrock but below the continuous clay layer present across the city
- Jordan Sandstone aquifer (where present)
- Tunnel City-Wonewoc aquifer
- Mt. Simon Sandstone aquifer

Table 1 Existing Water Supply Well Information

Local Well ID	Unique Number	Casing Diameter (in.)	Casing Depth (ft.)	Well Depth (ft.)	Year Constructed	Well Capacity (gpm)[1]	Aquifer
1	208629	12	244	675	1959	500	Tunnel City – Mt. Simon
2	208628	12	229	665	1960	500	Tunnel City – Mt. Simon
3	208646	20	221	681	1960	1000	Jordan – Mt. Simon
4	208645	20	227	520	1964	1000	Jordan - Wonewoc
5	208615	20	234	686	1966	670	Tunnel City – Mt. Simon
6	208634	24 x 16	300	741	1968	800	Tunnel City – Mt. Simon
7	208616	24 x 16	287	487	1969	675	Tunnel City – Wonewoc
8	208630	24 x 16	242	500	1971	700	Tunnel City – Wonewoc
9	208618	24 x 16 x 12	370	480	1972	360	Tunnel City – Wonewoc
10	208643	24 x 16	257	480	1971	800	Tunnel City – Wonewoc
11	208633	24 x 16	290	735	1974	800	Tunnel City – Mt. Simon
12	127264	24 x 20	188	228	1976	1600	Confined Quaternary
13	127270	30 x 24 x 16	355	685	1977	900	Tunnel City – Mt. Simon
14	233109	30 x 24 x 16	461	736	1978	900	Wonewoc – Mt. Simon
16	151587	30 x 24 x 18	298	505	1986	800	Tunnel City -Wonewoc
17	721815	24 x 18	203	244	2005	1750	Confined Quaternary

[1] The capacities for Wells 1-17 are based on observed August 28-29, 2013 system performance (Higgins, 2013).

The City is also installing four new wells (Wells 18-21) in the vicinity of the existing water tower near 125th Avenue NE and Lexington Avenue N. The anticipated well capacities and the aquifer from which each of these wells will pump are shown in Table 2.

Table 2 Modeled Well Capacity and Aquifer – Planned Wells 18-21

Well	Modeled Well Capacity (gpm)	Aquifer
18	1600	Quaternary
19	1500	Tunnel City-Wonewoc
20	1000	Quaternary
21	1500	Tunnel City-Wonewoc

Pumping from any of these existing wells could, in theory, generate a well interference complaint. However, Wells 1 -17 have been in place and operating for many years without generating any well

interference complaints. Reasonable complaints near these wells would likely only be associated with prolonged peak pumping from these wells such as would occur during a long dry period. Even then history would suggest that new complaints are unlikely. However, Wells 18-21 are currently being constructed in the Northeast Well Field and are not yet in operation. Complaints near these wells could potentially be generated from normal use of these wells or from extended use during dry periods.

Valid complaints of well interference are most likely to come from owners of wells that are finished into the same aquifer as one of the City's water supply wells. An important point is that all of the City's wells exist below the continuous clay layer present in the area. This is significant in that any shallow private water table wells could be impacted by drought, construction dewatering, or other groundwater withdrawals but would not be affected by pumping of the City's water supply wells.

3.0 Existing Well Interference Resolution Process through DNR

The DNR has developed a "Well Interference Resolution Process" which follows Minnesota Administrative Rule 6115.0730. A description of the process is presented in Attachment 1 and can be found on the DNR's website at http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/interference.html. Under the DNR's Well Interference Resolution Process, both domestic well owners and municipal water suppliers may submit a well interference complaint if they have issues pumping water from their well and believe the issue is caused by a well that pumps more than 10,000 gallons per day or one million gallons per year.

DNR well interference complaints can be submitted to the DNR using the Department's "Water Well Information and Complaint Questionnaire". The questionnaire is presented in Attachment 2 and can also be found on the MDNR's website at http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/interference.pdf. The questionnaire contains five separate sections. Three of the five sections need to be completed by a licensed well driller. The licensed well driller will investigate if the complainant's issues are due to the well's pump or the condition of the well. Once the questionnaire is completed, the complainant sends it to the DNR Regional Office for their county.

The complaint will be evaluated by a DNR groundwater specialist and may require an investigation to determine if a well interference condition exists. The groundwater specialist may request that an aquifer pumping test be conducted to measure the water level in the domestic well while the high capacity well is online. The specialist may need to request and analyze additional information on the aquifer and pumping records to determine if a well interference condition exists.

If the DNR determines a well interference condition exists, they will notify the high capacity well permittee and provide them with the findings of the complaint evaluation. According to Minnesota Administrative Rule 6115.0730 - Well Interference Problems Involving Appropriation Subpart 2 Item E, the permittee has 30 days after receiving written notification to complete one or more of the following options:

1. Request the DNR to modify the permit to provide for an adequate domestic water supply.
2. Negotiate a reasonable agreement with the affected domestic well owner(s).
3. Request a public hearing

Well interference conditions are often resolved with the permittee covering the costs associated with correcting the issue. This often includes either lowering the domestic well's pump, replacing the pump, drilling a new well, or connecting the home to a water distribution system.

The permittee can be held responsible for only those well interference issues related to wells constructed prior to when their appropriation permit was issued (see Minnesota Administrative Rule 6115.0730 Subp.3). Owners that install domestic wells after the appropriation permits are issued are responsible for ensuring that their new wells are constructed properly and are at a depth where they will not be restricted by the existing appropriation.

The recommended approach to well interference complaints presented in this memorandum is based on the assumption that the City would prefer to make an attempt to address interference complaints without the involvement of the DNR, to the extent reasonable. To facilitate this approach, the remainder of this document discusses how to identify those complaints that may actually be caused by pumping in City wells and then how to address them in compliance with the statutes and rules noted above.

4.0 Potential for Well Interference

In order to create tools for the City to use in responding to well interference complaints a set of figures are included to help understand the likelihood that a given complaint might be valid. The groundwater model developed in Phase 3 of the Blaine Northeast Well Field Study (Barr, 2016) was used to evaluate the potential for well interference. The aquifers evaluated were the Quaternary sand and gravel aquifers both shallow (above the City-wide clay layer) and deep (below the clay layer), the Jordan Sandstone (where present), and the Tunnel City-Wonewoc (TCW) aquifer. These aquifers were chosen because, with the exception of the sand and gravel aquifer above the clay layer, City wells pump from these aquifers and there are private wells in the vicinity of Blaine in these aquifers. The sand and gravel aquifer above the clay layer was evaluated because private wells located in this unit are most likely to generate a complaint. It should be noted that figures were not created for the shallow sand and gravel aquifer above the clay layer since City water supply well pumping does not impact the aquifer.

There are two main conditions likely to generate valid interference complaints. The first is the start of new pumping from new wells such as will occur in 2017 and beyond as the Northeast well field is brought on line. Average use of these wells will generate local drawdown that may interfere with nearby wells. The second is associated with a prolonged drought or dry spell when most, if not all City wells, would be pumped to meet demand. Under a drought condition the aquifers are often stressed beyond a normal state and well interference can occur. The groundwater model was used to simulate these conditions. Model results were used to identify areas where well interference might occur and these areas were then mapped for use in evaluating the validity of complaints.

The baseline from which drawdown is measured is based on a steady state scenario with Blaine Wells 1-17 pumping at annual average rates based on reported pumping during the period 2011-2015. The assumption is that all interference created by existing pumping up to this point is either too small to generate an interference complaint or that the complaint has already been addressed. Therefore, only increased pumping generated by increasing future demands would result in valid complaints. Pumping

rates for other high capacity wells in the model domain were based on the same time period. With this as a starting point new demand was added to the model to evaluate two future scenarios:

- 2030 Maximum: This steady-state scenario simulates projected 2030 maximum day demand from the City's 2009 Comprehensive Plan (Bonestroo, 2009). Pumping rates for each of the City's wells in this scenario were determined by calculating total system capacity from actual capacities for Wells 1-17 observed by the City (Table 1) and modeled capacities for planned Wells 18-21 (Table 2). The projected 2030 maximum daily demand was then distributed among the wells based on each well's percentage of the calculated total system capacity. This is a long term steady state condition that the City will likely never meet. This represents an upper bound on long term future drawdown due to City water supply well pumping.
- 4-Week Peak: This transient scenario simulates peak demand. In this scenario, Wells 1-17 are pumping at their capacities as identified by the City and Wells 18-21 are pumping at their modeled capacities. In other words, all wells are pumping at their full capacity as can occur during extended dry periods. This represents a condition that could occur as soon as all wells in the Northeast wellfield are connected to the system and all wells are operating for four consecutive weeks.

Pumping rates that were modeled for the two scenarios are shown below in Table 3.

Table 3 Scenario Pumping Rates

Well	Aquifer	2030 Maximum Scenario Pumping Rate (gpm)	4-Week Peak Scenario Pumping Rate (gpm)
1	Tunnel City – Mt. Simon	452	500
2	Tunnel City – Mt. Simon	452	500
3	Jordan – Mt. Simon	903	1000
4	Jordan - Wonewoc	903	1000
5	Tunnel City – Mt. Simon	605	670
6	Tunnel City – Mt. Simon	723	800
7	Tunnel City – Wonewoc	610	675
8	Tunnel City – Wonewoc	632	700
9	Tunnel City – Wonewoc	325	360
10	Tunnel City – Wonewoc	723	800
11	Tunnel City – Mt. Simon	723	800
12	Confined Quaternary	1446	1600
13	Tunnel City – Mt. Simon	813	900
14	Wonewoc – Mt. Simon	813	900
16	Tunnel City -Wonewoc	723	800

Well	Aquifer	2030 Maximum Scenario Pumping Rate (gpm)	4-Week Peak Scenario Pumping Rate (gpm)
17	Confined Quaternary	1581	1750
18	Confined Quaternary	1446	1600
19	Tunnel City -Wonewoc	1355	1500
20	Confined Quaternary	903	1000
21	Tunnel City -Wonewoc	1355	1500

Construction information for private wells in the Quaternary, Jordan, and TCW aquifers within approximately 1.5 miles of the existing and planned Blaine wells was obtained from the Minnesota County Well Index (CWI) database. To evaluate the potential for well interference, modeled drawdown at each well location in the two future pumping scenarios was compared to the modeled baseline water column above the open/screened interval in each well (Figures 1 and 2). Potential for well interference was then classified as follows:

- Areas in which modeled drawdowns at a majority of the private wells are less than 25% of the baseline water columns in the wells are classified as having a moderate potential for well interference and are shown in a green background.
- Areas in which modeled drawdowns at a majority of the private wells are 25% to 50% of the baseline water columns are classified as having a high potential for well interference and are shown in a yellow background.
- Areas in which modeled drawdowns exceeded 50% of the baseline water column were to be classified as having a very high potential for well interference. No such extended area was found. Only one such well was found and it is shown as a red dot on Figure 1.

The well interference potential classifications for the Quaternary and Jordan aquifers are shown on Figure 1. Figure 2 shows the well interference potential classifications for the TCW aquifer. It should be noted that no information was available on pump settings in the private wells so it is possible that even in an area where the potential for well interference is classified as moderate, adverse well interference (defined as reduced well capacity) could occur. The appropriate response to such an occurrence is discussed in the next section but would likely be to lower the pump in the affected well.

Figure 1 shows larger extents of high well interference potential in the Quaternary and Jordan aquifers for the 2030 Maximum scenario than at the end of the 4-Week Peak scenario. Figure 2 shows the opposite is true for the TCW aquifer. These seemingly contradictory outcomes suggest that the heterogeneous and complex Quaternary and shallow bedrock aquifer system takes longer to reach a steady state condition than the more laterally continuous, and less heterogeneous, TCW aquifer. Since the pumping rates are higher for the 4-Week Peak scenario, it is likely that a transient scenario longer than 4 weeks in duration would show larger extents of high well interference potential in the Quaternary and Jordan aquifers than the 2030 Maximum scenario.

For reference, Table 4 below shows the modeled drawdowns at the ten existing Blaine observation wells for the two future pumping scenarios. In the event of a well interference complaint, Table 4 in combination with current water level measurements at the observation wells may provide useful supporting information for determining whether or not pumping of the City's wells is responsible for the reported private well issues. Should a complaint occur the City could verify the location of the well and identify the nearest observation well, get a current reading from that well and compare it to normal background levels as a point of reference in the discussion with the well owner regarding their complaint.

Table 4 Modeled Drawdowns at Blaine Observation Wells

Well Name	Unique Number	Total Depth (ft bgs)	Aquifer	Modeled Drawdown 2030 Maximum Scenario (ft)	Modeled Drawdown End of 4-Week Peak Scenario (ft)
OW-1	805151	430	TCW	24.2	33.4
OW-2	805152	210	Confined Quaternary	23.6	31.1
OW-3	805153	80	Confined Quaternary	3.9	1.4
OW-4	805154	30	Water table aquifer	0.6	0.0
OW-5	805155	400	TCW	54.2	61.0
OW-6	805156	195	Confined Quaternary	41.9	44.9
OW-7	805157	440	TCW	19.1	22.5
OW-8	805158	210	Confined Quaternary	17.8	22.5
OW-9	805159	30	Water table aquifer	2.1	0.1
OW-10	810686	35	Water table aquifer	2.4	0.2

Figures 1 and 2 should be used as general guides and not actual physical field measurements of water levels. It is unlikely that the condition simulated by the maximum 2030 demand scenario will ever actually be reached. The scenario represents a maximum upper bound to potential drawdown under non-drought conditions. If a well interference complaint is received during a non-peak demand period this is the figure that would be used. The 4-week peak figure is the result of a transient simulation. If a complaint occurs during a dry period where heavy pumping has been going on for a few weeks this figure should roughly approximate the actual drawdown that would be experienced. The aquifer will approach these levels at a rate of approximately ¼ of the drawdown shown on the figure per week.

5.0 Recommended Approach for Responding to Well Interference Complaints

The recommended approach to responding to a well interference complaint is intended to roughly mirror the DNR protocol so that if the complaint is ever formally logged with the DNR the information gathered is relevant to that process. When the City receives a well interference complaint from a well owner, the first step should be to obtain the well owner's name and address, information about the well and its use,

the type of well issues that have been observed, and when the issue(s) were first observed. It is recommended that the City work with the well owner to complete as much of the actual DNR complaint form as possible before involving a well driller. Involving a well driller will add some cost to the process. In order to make a determination regarding the validity of the complaint the minimum information needed is shown in red boxes on the form in Attachment 2. It is possible that a well driller will be needed to gather at least some of this basic information. Also, have the owner complete Part E on the form in Attachment 2 to document the nature of the complaint and generate a history for the well.

The next step should be to evaluate the likelihood that the issue(s) reported by the private well owner are the result of pumping from one or more of the City's wells. This can be done by following the steps outlined below:

1. If the well is completed above the shallow clay layer (less than approximately 40 feet deep) the interference is NOT from the pumping of any Blaine municipal well. Check for dewatering associated with nearby construction as the next possible cause.
2. If possible, determine the aquifer from which the well pumps. This often can be done by referencing the well record in the County Well Index (CWI) and noting the aquifer designation.
    a. If the well is completed in the Jordan aquifer the aquifer designation will start with the letters CJ. If the well is completed in the Quaternary sand and gravel aquifer the aquifer designation will start with the letter Q. For wells in the Jordan or Quaternary aquifers refer to Figure 1 for the next step.
    b. If the well is completed in the TCW aquifer the aquifer designation will start with either the letters CTC or CF. For wells in the TCW aquifer refer to Figure 2 for the next step.
    c. Figures 1 and 2 show the locations of the wells in each aquifer that were available in the CWI at the time this memorandum was prepared.
3. Next determine which of the two maps on the applicable figure to use.
    a. If the complaint occurs during a prolonged dry spell when City wells have been pumping significantly more than normal use the map on the right side of the figure.
    b. If the complaint occurs during a normal use period use the map on the left side of the figure.
4. Roughly locate the well on the appropriate map and record the nearest line of equal drawdown, or interpolate to the nearest whole integer.
5. Calculate the estimated drawdown at the well location: If you are using the left side map record the drawdown from step 4 and multiply it by the adjustment factor noted in Table 5 below based on the year during which the complaint occurs. If you are using the right side map use the drawdown from the map. If the dry period is less than four continuous weeks the drawdown from the map can be scaled by multiplying the drawdown by 25% times the number of weeks of the dry spell. For example, assume the drawdown from the map is 10 feet.
    a. For a dry spell duration of one week use a drawdown of 2.5 feet (10 feet x 25% x1) in the evaluation of the complaint.
    b. For a dry spell duration of two weeks use a drawdown of 5 feet (10 feet x 25% x 2) in the evaluation of the complaint.
    c. Do not exceed the drawdown obtained from the map.

6. Optional step: Identify the nearest City Observation Well located in the same aquifer as the well associated with the complaint. Obtain a current water level measurement from that well. Calculate the difference between the current measurement and the long-term high water level measurement for that Observation Well (this is the current drawdown for the Observation Well). Next, find the appropriate estimated drawdown associated with that well recorded in Table 4. Apply the adjustment calculation performed in Step 5 to the drawdown predicted for the Observation Well in Table 4. Compare the calculated current drawdown to the estimated reading. This comparison provides a relative guide for the remaining steps. The point of this step is that short term cycles of drought or heavy rain will affect water supply system pumping whose effect on the aquifers cannot be reasonably captured in the two modeled scenarios. If the adjusted modeled drawdown from Table 4 differs from the calculated current drawdown, assume that the actual drawdown at the well associated with the complaint will differ from the estimated drawdown calculated in Step 5 by approximately the same percentage.
7. Determine the nature of the complaint.
    a. Well pumps no water at all:
        i. Subtract the adjusted drawdown number calculated in step 5 from the original static depth to water associated with the well to determine the estimated impact on the well from City well pumping.
        ii. Compare the estimated impact to the depth below the static water level in the well at which the pump is set. If the pump depth setting is less than the estimated impact then then the complaint may be valid and should be investigated further to determine the correct remedy.
        iii. Subtract the current depth to water in the well (if known; this assumes there is no pumping in the private well) from the original static depth to water associated with the well. If the difference is greater than the estimated impact to the well then the problem likely has a cause not related to pumping of the City's water supply wells.
    b. Well pumps less water than before:
        i. Check to see if the estimated impact to the private well is commensurate with the reduced pumping. If so proceed to the remedy chart for the appropriate action.

Table 5 Drawdown Adjustment Factors by Year

Year of complaint	Adjustment factor	Year of complaint	Adjustment factor
2017	13%	2024	60%
2018	20%	2025	67%
2019	27%	2026	73%
2020	33%	2027	80%
2021	40%	2028	87%
2022	47%	2029	93%
2023	53%	2030	100%

If it has been determined that pumping by the City is the likely cause of the complaint then the City should work with a well driller or contractor to remedy the situation based on the options shown below in Table 6. If the City determines that the reported well issue(s) are likely not due to pumping of the City's wells, the results of the evaluation should be discussed with the well owner and communicated to the DNR. If the well owner is not satisfied with the evaluation results they should be referred to the DNR. If the City determines that the issue(s) are likely due to interference resulting from pumping of the City's wells, then a remedy can be identified, discussed with the DNR, and proposed to the well owner. If the well owner agrees with the proposed remedy then it can be implemented. If the well owner does not agree with the proposed remedy then the City should refer the well owner to the DNR. It will be important to address well interference complaints quickly. A flow chart that summarizes the recommended approach for addressing well interference complaints received by the City is shown on Figure 3.

Table 6 Modeled Drawdowns at Blaine Observation Wells

Problem with well	Not near city water	Near city water
Out of water but well is not dry	Work with well driller to install more drop pipe so the pump is properly submerged and can handle maximum anticipated drawdown at the well based on future pumping. Pump may need to be replaced if additional depth is too much for the current pump.	If acceptable to owner, abandon well and connect to city water. If not use remedy from column to the left.
Out of water and well is dry	Drill new deeper well that can handle maximum anticipated drawdown at the well based on future pumping. Abandon existing well.	If acceptable to owner, abandon well and connect to city water. If not use remedy from column to the left.
Well is pumping less water than before	Work with well driller to install more drop pipe so the pump is properly submerged and can handle maximum anticipated drawdown at the well based on future pumping. Pump will likely need to be replaced if additional depth is too much for the current pump.	If acceptable to owner, abandon well and connect to city water. If not use remedy from column to the left.
Well is pumping less water than before and is "bottomed out" in the existing well	Drill new deeper well that can handle maximum anticipated drawdown at the well based on future pumping. Abandon existing well.	If acceptable to owner, abandon well and connect to city water. If not use remedy from column to the left.

6.0 References

Barr Engineering Company (Barr), 2016. Northeast Well Field Evaluation – Phase 3. Technical Memorandum from John Greer, PG, Adam Janzen, and Brian LeMon, PE to Stefan Higgins, prepared for the City of Blaine, January 2016.

Bonestroo, 2009. City of Blaine 2009 Comprehensive Plan Update. Prepared for the City of Blaine, November 2009.

Higgins, S., 2013. *Well Siting Study - current well capacities and future need.* [email] Message from Stefan Higgins of the City of Blaine to Brian LeMon and John Greer of Barr Engineering, Sent 10/17/2013.

Certification

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

Brian LeMon
PE #: 20789

December 12, 2017
Date

2030 Maximum Daily Demand Scenario

4-week Peak Capacity Scenario

Municipal Boundary

Modeled Water Column Reduction from Baseline

- < 25% Reduction
- 25 - 50% Reduction
- > 50% Reduction
- Drawdown Contour (ft)

Potential for Well Interference

- High
- Moderate
- Low
- Blaine Municipal Well

0 1
Miles

Potential for interference based on drawdown from baseline of Wells 1-17 pumping at average 2011-2015 rates

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WELL INTERFERENCE POTENTIAL
QUATERNARY, PRAIRIE DU CHIEN AND JORDAN AQUIFERS
Blaine Well Interference Plan
City of Blaine, Minnesota

FIGURE 1

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2030 Maximum Daily Demand Scenario

4-week Peak Capacity Scenario

Blaine_Municipal_Wells

Municipal Boundary

Drawdown Contour (ft)

Modeled Water Column Reduction from Baseline

- < 25% Reduction
- 25 - 50% Reduction
- > 50% Reduction

Potential for Well Interference

- High
- Moderate
- Low

N

0 1

Miles

Potential for well interference based on drawdown from baseline of Wells 1-17 pumping at average 2011-2015 rates

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WELL INTERFERENCE POTENTIAL
TUNNEL CITY-WONEWOC AQUIFER
Blaine Well Interference Plan
City of Blaine, Minnesota

FIGURE 2

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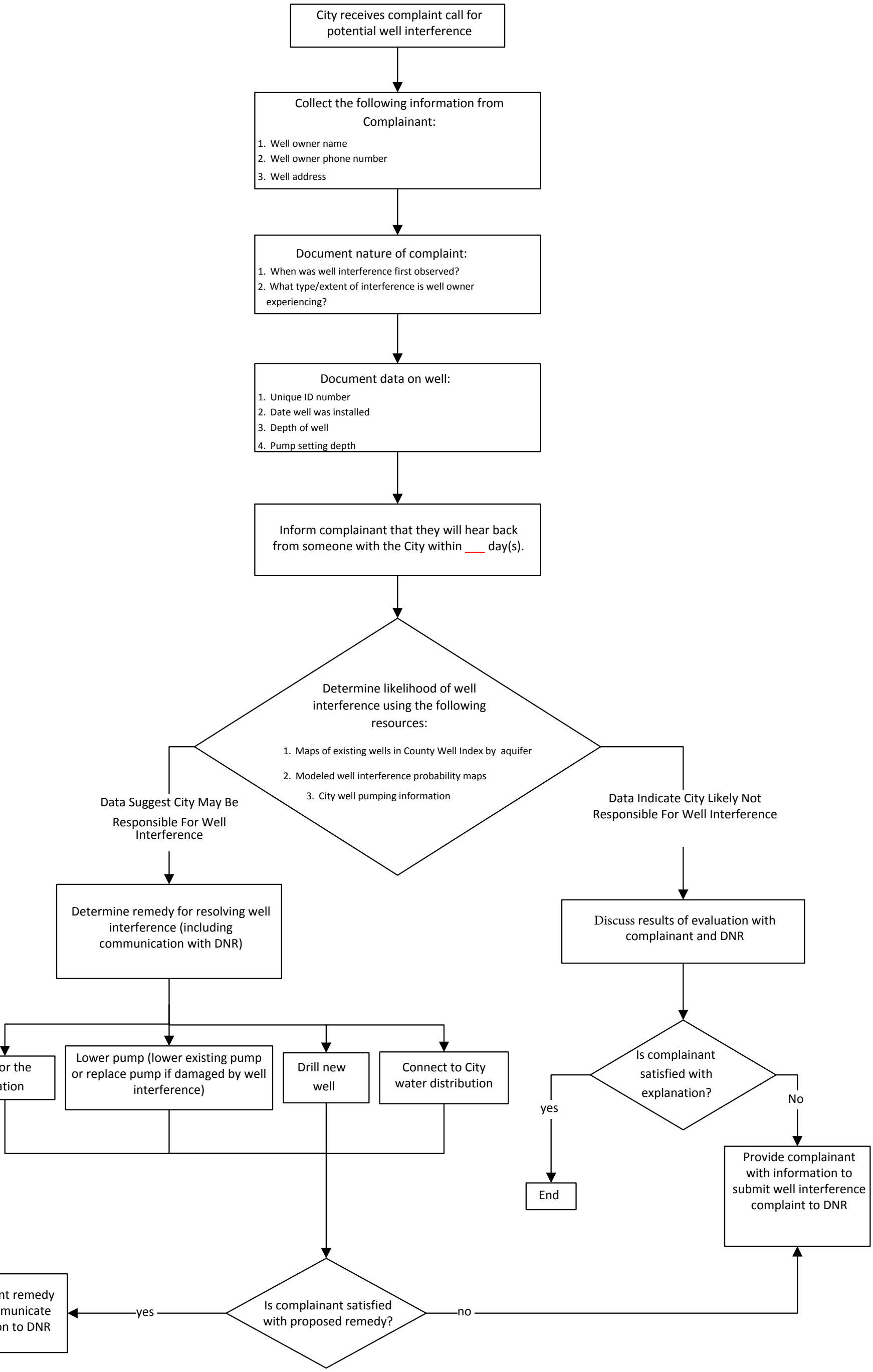

WELL INTERFERENCE DECISION TREE
Blaine Well Interference Plan
City of Blaine, Minnesota

FIGURE 3

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Attachment 1

Well Interference Resolution Process

Well interference resolution process

Guidelines for 2015 Well Interference Law PDF

When a high capacity well is pumping, a portion of the aquifer around it is dewatered in a pattern known as a cone of depression. Wells located within the cone of depression may experience lower water levels and have problems getting water if water levels drop below the pump in the well. This condition is referred to as "well interference". Most well interference problems tend to be localized and short in duration, but being without water is a major inconvenience and can cause damage to well pumps. Some problems can be resolved by lowering the pump in the well or installing a new well pump, but in some situations it may be necessary to construct a new water supply well.

Minnesota Statutes 103G.261 establish domestic water use as the highest priority of the state's water when supplies are limited. Procedures for resolving well interferences are defined by Minnesota Rules 6115.0730. Domestic well owners and municipal water suppliers that have problems obtaining water and believe the situation is due the operation of a high capacity well that pumps in excess 10,000 gallons per day or one million gallons per year can submit a well interference complaint to the Department for investigation. However, before the Department will investigate a well interference complaint the well owner must have the well inspected by a licensed well driller to determine if the water supply problems are related to the condition of the domestic well.

Process

1. Contact your Area Hydrologist PDF to request a ***Water Well Information and Complaint Questionnaire***, or download the questionnaire PDF from this page.
2. Submit the completed ***Water Well Information and Complaint Questionnaire*** to the appropriate DNR Regional Office for your county. A licensed well driller is required to complete parts B, C & D of the questionnaire.
3. Your complaint will be evaluated to determine whether an investigation is necessary.
4. Some investigations require that an aquifer pumping test be performed. The high capacity well would be pumped and water levels in the domestic well(s) involved in the complaint and possibly other wells in the area are measured to determine the extent of any well interference.

5. Aquifer test data and/or other information will be analyzed and a determination will be made regarding the existence and extent of the interference.
6. If the Department determines a well interference condition exists, the permitee will be required to perform one or more of the following actions within 30 days of notification:
    - Request a modification or restriction of the permit in order to provide the affected well owner with an adequate domestic water supply.
    - Negotiate a reasonable agreement with the affected domestic well owner(s).
    - Request a public hearing.

Forms

Water Well Information and Complaint Questionnaire PDF

Contacts

Please contact your Area Hydrologist PDF or Carmelita Nelson, 651-259-5034, if you have questions regarding well interference problems.

Connect with us

Questions?
Call 651-296-6157 or 888-MINNDNR (646-6367)
Email us: info.dnr@state.mn.us
Sign up for email updates
Enter you email address Subscribe
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Attachment 2

Well Interference Questionnaire

Water Well Information and Complaint Questionnaire Instructions

Warning: All data submitted becomes public information

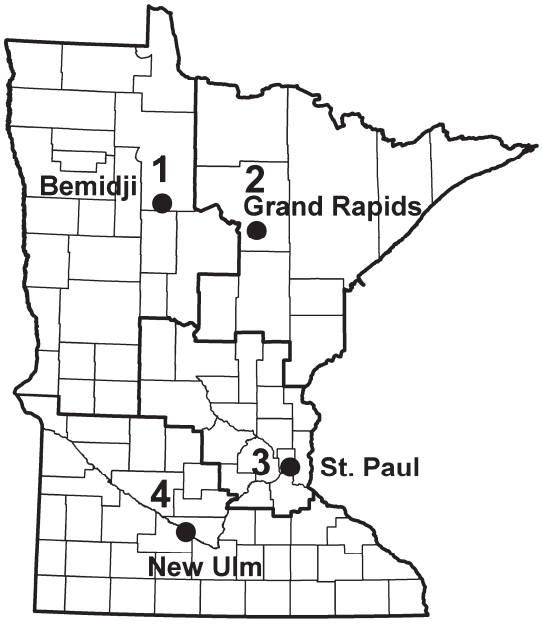
Parts B, C, and D must be completed by a licensed well driller or the complaint will not be validated and the questionnaire will be returned.

Part A: **To be completed by the complainant.**

Part B & C: **To be completed by a licensed well driller.**

Part D: **To be completed by the complainant and a licensed well driller.**

Part E: **To be completed by the complainant.**



NOTE: Omission of any data requested will delay the processing of the complaint and may result in its dismissal. Specific additional information on the complaint may be required upon notification.

MAILING: Submit the completed water well information and complaint questionnaire to the appropriate DNR Regional Office for your county.

REGION 1 - Northwest Minnesota 2115 Birchmont Beach Rd NE Bemidji, MN 56601	**Peter Busseler** - Regional Manager Phone (218) 308-2621 Fax (218) 755-4066
REGION 2 - Northeast Minnesota 1201 East Highway 2 Grand Rapids, MN 55744	**Pat Collins** - Regional Manager Phone (218) 327-4417 Fax (218) 327-4243
REGION 3 - Central Minnesota 1200 Warner Road St. Paul, MN 55106	**Terri Yearwood** - Regional Manager Phone (651) 259-5766 Fax (651) 772-7977
REGION 4 - Southern Minnesota 261 Highway 15 South New Ulm, MN 56073-8915	**Rob Collett** - Regional Manager Phone (507) 359-6050 Fax (50) 359-6018

DNR Waters

WATER WELL INFORMATION

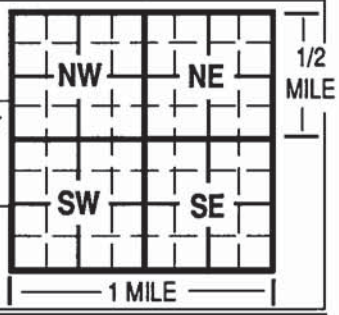
PART A — WELL LOCATION

☐ Owner's Name
☐ Authorized Agent

Telephone Number
Home ( )
Work ( )

Mailing Address

Place an "X" on the grid showing the exact location of your well. The grid is one section (640 acres divided into 1/4, 1/4, 1/4 sections). (1960, 40, 10 acres). *Attach a map or aerial photograph indicating the location of well(s).*



County	Township Name	Township No.	Range	Section	Fraction
					___1/4 ___1/4 ___1/4

PART B — WELL CONSTRUCTION *(Submit a copy of original Water Well Record, if available)*

Name of Company which drilled well:	Date Completed	Drilled Depth	Present Depth

CASING

MATERIAL:
☐ Steel
☐ Plastic
☐ Concrete
☐ Wood
☐ Other _____

Height Above (Below) Land Surface: ft.

Diameter: inches

Length: feet

Interval: from _____ feet to _____ feet

DRILLING METHOD: (if known)
☐ Mud Rotary ☐ Air Rotary ☐ Cable Tool ☐ Bored/Augered ☐ Driven ☐ Dug ☐ Other _____

USE: Type & Amount in gallons per day (gpd) ☐ Other _____ gpd
☐ Domestic _____ gpd ☐ Public Supply _____ gpd
☐ Livestock _____ gpd ☐ Commercial _____ gpd
☐ Irrigation _____ gpd ☐ Industrial _____ gpd

SCREEN

SCREEN:
Make _____
Type _____ Dia.: _____
Slot/Gage _____ Length: _____
Set between _____ ft. and _____ ft.

Or open hole from _____ ft. to _____ ft.

FITTINGS:

Original & Current Non-Pumping Water Level (Above) Land Surface:

Original	Current	
		feet
		date measured
		method of measurement (steel tape, etc.)

PUMP

TYPE:
☐ Submersible
☐ Jet, Shallow
☐ Jet, Deep
☐ Reciprocating
☐ Centrifical
☐ Other _____

Age: years

Pumping Rate: gpm

Pump Setting-submersible (Below Ground Level) ft.

Drop Pipe Length--non-submersible (Below Ground Level) ft.

Original & Current Pumping Water Level Below Land Surface:

Original	Current	
		feet
		date measured
		method of measurement (steel tape, etc.)

Flowing Well: ☐ Yes ☐ No

PART C — WELL CONDITION

NOTE: Attach additional sheets as needed.

CASING: ☐ Cracked ☐ Holes ☐ Filled with Sediments ☐ Incrusted ☐ Other _____	Comment (Describe method of inspection):
SCREEN (if one exists): ☐ Incrusted ☐ Plugged ☐ Rusted/Corroded ☐ Other _____	Comment (Describe method of inspection):
PUMP: ☐ Incrusted ☐ Rusted/Corroded ☐ Electrical ☐ Other _____	Comment (Describe method of inspection):
DROP PIPE: ☐ Rusted/Corroded ☐ Holes/Cracks ☐ Water Marks ☐ Other _____	Comment (Describe method of inspection):
DISTRIBUTION: ☐ Plugged Lines ☐ Vacuum in Lines ☐ Other _____	Comment (Describe method of inspection):

OTHER (Describe method of inspection):

Does this well comply with the MN Health Department Water Well Construction Code? _____. If not, why not?

PART D — SIGNATURES

Well Owner or Agent:	Date:	Driller: Address: Phone:	Date:

PART E COMPLAINT QUESTIONNAIRE

Please answer the following questions by providing as much information as possible. Attach any documents involved, such as receipts, worklists, bids, water level measurements, observation or related investigative information, etc.

1) Describe the problem:

2) Indicate the number of people, livestock and other type(s) of water use supplied by the well(s):

3) Suspected cause of the problem:

4) Have you contacted well owner(s) whose well(s) you suspect might be affecting yours? Explain *(provide their name, address and phone number)*

5) Past well problems? *(when and what was the problem?):*

6) Describe any maintenance that has been done on this well:

7) Have you corrected the problem? Explain:

8) How do you feel this problem can be fairly resolved? *(if possible, attach a list of work, materials, and costs needed to resolve the problem)*

9) Have you complained before? When? To whom?

10) General Comments: