DEPARTMENT OF NATURAL RESOURCES

Cold Spring Groundwater Study

Final Report to the Legislature

Issued 01/13/2022

This report was prepared in response to Laws of 2016, Chapter 189, Article 3, Section 44, Part b

The commissioner must conduct necessary monitoring of stream flow and water levels and develop a groundwater model to determine the amount of water that can be sustainably pumped in the area of Cold Spring Creek for area businesses, agriculture, and city needs. Beginning July 1, 2017, the commissioner must submit an annual progress report to the chairs and ranking minority members of the House of Representatives and Senate committees and divisions with jurisdiction over environment and natural resources. The commissioner must submit a final report by January 15, 2022.

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As requested by Minnesota Statute 3.197: This report cost approximately $1,013 to prepare, including staff time, printing and mailing expenses.

Upon request, this material will be made available in an alternative format such as large print, Braille or audio recording. Printed on recycled paper.

Background and Overview

The 2016 Minnesota Legislature directed the Minnesota Department of Natural Resources (DNR) to "conduct necessary monitoring of stream flow and water levels and develop a groundwater model to determine the amount of water that can be sustainably pumped in the area of Cold Spring Creek for area businesses, agriculture, and city needs."

An annual report has been submitted to the legislature each year since 2017. This document is the final report, as required in the 2016 legislation.

Multiple scientific investigations demonstrate that groundwater pumping in and around the City of Cold Spring (City) reduces groundwater flow into Cold Spring Creek (Creek), a designated trout stream. The glacial aquifer system in the vicinity of the City, which is strongly connected to the Creek, supplies groundwater to the City, Cold Spring Brewing Company (CSBC), numerous private residential wells, and agricultural irrigation wells.

The City and CSBC are actively planning for potential growth and developing strategies to meet their current and anticipated water supply needs in a sustainable manner. To support these planning efforts, DNR has built a groundwater flow model that can be used to determine current and projected effects of groundwater use on streamflow in the Creek. DNR built the model using all available data through 2018. DNR convened a technical advisory group (TAG) consisting of outside groundwater experts with modeling expertise to review and advise model development.

The model calculates the average effect of groundwater use on base flow in the Creek over a long period of time (years to decades). Base flow can be defined as streamflow from shallow groundwater in the absence of significant precipitation, runoff events, or supplemental release from storage above the natural flow. The model can also predict how changing pumping in the area of interest will affect base flow in the Creek. The model is sufficient to approximate how much water can be sustainably pumped from the City and CSBC wells while maintaining adequate stream flow in the Creek to maintain habitat and thereby meet Minnesota's statutory requirements.

Previously completed work

During fiscal years 2017 and 2018, DNR conducted the following:

- Identified the project study area
- Compiled available data and identified data gaps
- Implemented additional field monitoring to enhance existing monitoring
- Selected the groundwater modeling code (USGS MODFLOW)
- Identified and engaged stakeholders and technical experts
- Developed the interim groundwater model and shared the model with the TAG

In fiscal year 2019, DNR completed the following:

- Continued monitoring of flow in the Creek and water levels in observation wells
- Ran simulations with the interim model to explore how pumping affects base flow in the Creek
- Met with representatives of the City and CSBC to discuss the interim model results
- Met with the TAG to discuss the interim model and refined the interim model in response to suggestions from the TAG

In fiscal year 2020, DNR completed the following:

- Continued monitoring of flow in the Creek and water levels in observation wells
- Completed construction and calibration of the refined groundwater model
- Ran simulations with the refined model to explore how pumping affects base flow in the Creek
- Published model results on the project website
- Met with representatives of the City and CSBC to discuss the results of the model

In fiscal year 2021 and the first half of fiscal year 2022, DNR:

- Continued monitoring of flow in the Creek and water levels in observation wells
- Published the Technical Findings of Fact from the Cold Spring Groundwater Study
- Issued a correction to the Groundwater Study Model Report
- Met with the City to discuss an amendment to its current water appropriations permit
- Reviewed City's amendment application and issued an amendment to the City to add two new wells at Lot 1 Block 1 and increase total volume
- Extended CSBC's temporary permit 1984-3211 to allow the City time to build a water tower

Data Collection

Hydrologic data has been collected in the Cold Spring area since 1980 by several entities, including the Minnesota Department of Health, Minnesota Pollution Control Agency, DNR, and the United States Geological Survey. The DNR reviewed available data and identified data gaps that were significant to groundwater model construction. Key field data that DNR collected to fill data gaps included:

- Establishing a new flow measurement site on the Creek
- Installing two observation wells near the Creek
- Installing streambed piezometers in the Creek

These data were used to calibrate the refined groundwater flow model.

In the future, DNR will continue to operate two continuous stream flow gages and one flow measurement site along the Creek. Two flow measurement sites will be discontinued, as will the two streambed piezometers. Two of the observation wells near the Creek will continue to be monitored until the end of 2023, at which time we will review the data and determine if continuing these sites is warranted. The remaining observation wells in the study area will be monitored indefinitely into the future.

Groundwater Model Summary

The DNR first built an interim groundwater flow model, using existing data. The DNR sought feedback on the interim model from the TAG, which consisted of the following members:

- Dr. Bob Tipping, Minnesota Geological Survey - University of Minnesota (now at Minnesota Department of Health)
- Mr. Jeppe Kjaersgaard - Minnesota Department of Agriculture
- Dr. Jon Walker - United States Geological Survey
- Mr. John Woodside - Minnesota Department of Health
- Mr. Larry Kramka - Foth Engineering (representing CSBC)
- Mr. Mark Brigham - United States Geological Survey
- Mr. Mark Janovec - Stantec (representing the City)
- Mr. Mike MacDonald - Minnesota Department of Agriculture
- Mr. Perry Jones - United States Geological Survey

The TAG provided comments on the interim groundwater model, and DNR refined the model based on those comments. The refined model also incorporated field data that was collected as part of this study. The DNR completed the refined groundwater model for the Cold Spring area in December 2019. The model results showed that:

- In 2018, groundwater pumping within the model area, reported at 1.3 billion gallons, reduced base flow in the Creek by about 20 percent.
- Groundwater pumping within ¼ mile of the Creek has the most impact on base flow in the Creek.
- Current groundwater pumping more than 2 miles from the Creek has very little impact on base flow in the Creek.
- If all existing wells in the model area pumped their permitted volumes, it would reduce base flow by about 25 percent.
- If any of the current pumping volume was shifted from the City's existing well field to a well field farther from the creek, there would be more base flow in the creek.

What do the model results mean?

The model results showed that pumping groundwater at 2018 volumes or at permitted volumes reduces base flow by 20 percent or more. Based on aquatic science literature and the DNR's recommendations described in the Report to the Minnesota Legislature: Definitions and Thresholds for Negative Impacts to Surface Waters, the DNR has determined that reductions in base flow exceeding 20% in the Creek are very likely to result in an adverse impact to the stream's ecology by reducing the available habitats, and not meet the statutory requirement for sustainability.

We also learned that pumping very close to the Creek strongly impacts flow in the Creek but pumping farther from the Creek has much less impact. The model results show that it is possible for groundwater users to meet

their current and future needs while also protecting the ecosystem by shifting the location of their groundwater pumping to use much less water near the creek. The DNR, as permitting authority, is working with appropriators to strategically manage existing appropriations near the creek and locate new wells farther from the Creek.

Engaging Stakeholders

In December 2017, DNR held a public meeting to provide area residents with information about the project. The DNR then met with representatives from the City and CSBC in February 2019 to share interim model results. The DNR also met with Senator Howe and Representative Demuth in March 2019 to inform them of the progress and to discuss the City's water use needs and the requested permit amendment for Well 7.

After the refined groundwater model was completed in December 2019, DNR met with representatives from the City and CSBC in January 2020 to discuss modifications to, and findings from, the groundwater model.

Permit Revision

The City submitted a permit amendment application in October 2020. The amendment request was for adding three new wells (well number 7 – at the existing wellfield, and well numbers 8 and 9 – at the Lot 1/Block 1 site) to the permit (1976-3179) and for increasing the total volume of the permit to 750 million gallons per year (MGY). Due to unforeseen issues experienced with the City's new wells, the City and CSBC also asked the DNR to extend existing permit 1984-3211, which authorizes appropriations from CSBC's wells near the Creek, for a maximum of 6 months while the City builds a new water tower. To avoid increased impact, while the CSBC wells are also still pumping near the stream, the City was asked to reduce the permit 1976-3179 amendment request to 605 MGY. The DNR amended permit 1976-3179, authorizing a volume increase of 605 MGY, on November 5, 2021. Once the water tower is put in place and the CSBC permit has expired, the City may then request another amendment to permit 1976-3179 for an additional 145 MGY. The November 5 amendment allows groundwater to be pumped from the City's new wellfield (Lot 1/Block 1, farther from the Creek) and continued pumping from the City's existing wellfield. Current City Well 3, near the Creek, was dropped from use under the amendment. The City initiated discontinuation of City Well 3 in the fall of 2020.

Once CSBC permit 1984-3211 expires, only 20 MGY will be pumped near the stream, under CSBC permit 1988-3220. By reducing groundwater use near the Creek, the DNR anticipates that the authorized groundwater appropriations in the area will meet industry and municipal needs while avoiding negative ecological impacts to the Creek.

The DNR also evaluated the City's amendment request to determine if domestic wells are at risk of going out of water as a result of groundwater pumping from the new municipal wells or the overall increase in authorized volume. The DNR determined that, with some adjustments, including lowering the pumps at several private residential wells, well interference could be avoided, and industry and municipal needs could be met at proposed pumping volumes.

Final Project Disposition

The model results show that it is possible for groundwater users to meet their current and future needs while also maintaining adequate streamflow in the Creek. The DNR, as permitting authority, is working with appropriators to strategically manage existing appropriations near the creek and locate new wells farther from the Creek.

In the future, DNR will continue to operate two continuous stream flow gages and one flow measurement site along the Creek. Two of the observation wells near the Creek will continue to be monitored until the end of 2023, at which time we will review the data and determine if continuing these sites is still warranted. The remaining observation wells in the study area will be monitored indefinitely. The DNR will continue to use the groundwater model to determine the amount of water that can be sustainably pumped in the area of the Creek for area businesses, agriculture, and city needs.

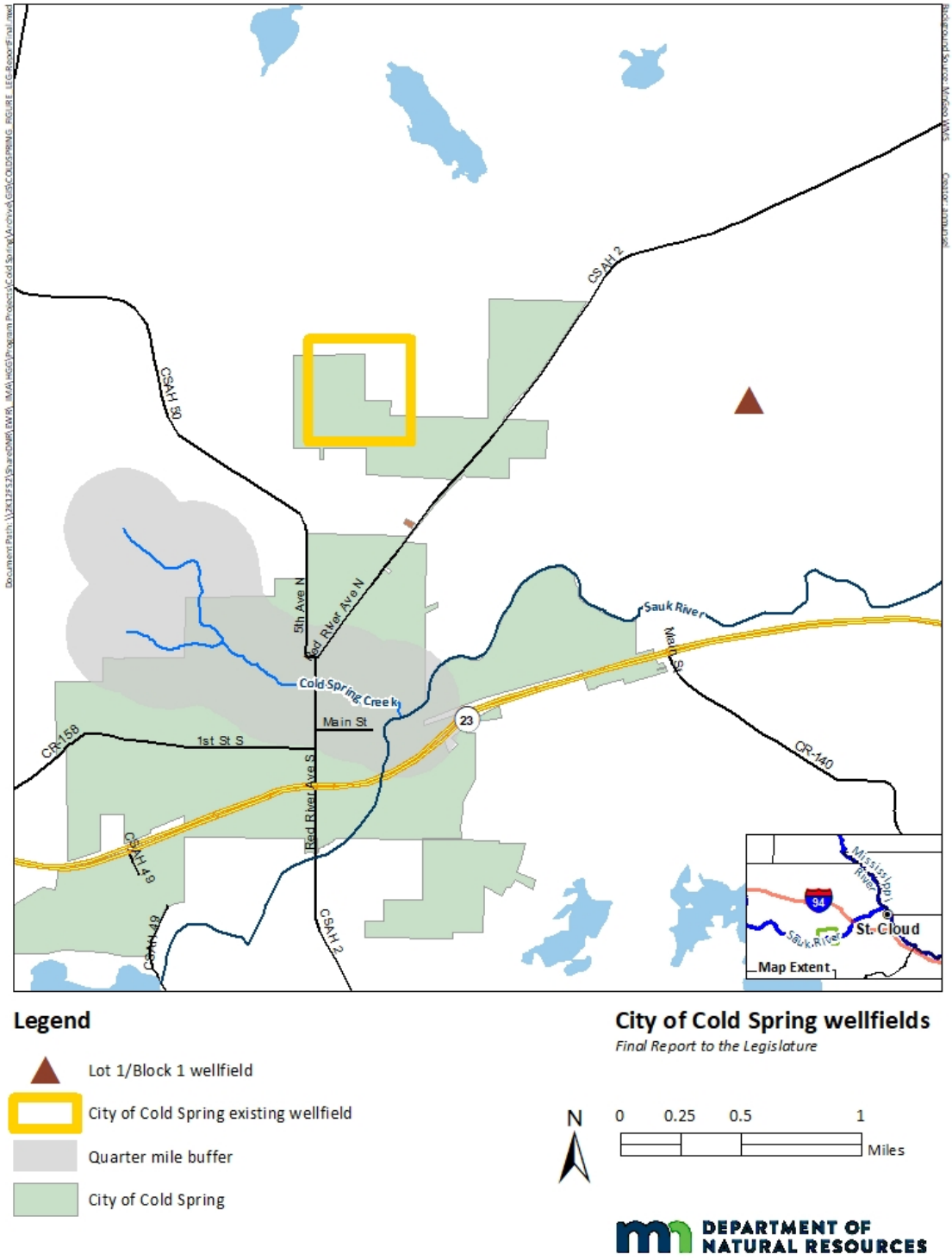

Figure 1. Map showing location of City's existing wellfield and the newly developed (Lot 1/Block 1) wellfield relative to Cold Spring Creek