significant contribution to streamlining the review and permitting processes as well as preventing and minimizing cumulative impacts.

Conclusion

It is requested that the comments provided in this letter and MPCA's letter dated April 4, 2014, be entered into the record to be addressed in the Draft CEA. We continue to look forward to assisting the Department of Commerce, as desired, during the preparation of the CEA for this project and its subsequent review upon its release. Through this process, the MPCA seeks to obtain further additional information to facilitate the MPCA staff review of the Project, well in advance of the time a decisions on the required MPCA authorizations are needed to commence construction. Ultimately, it is the responsibility of North Dakota Pipeline Company LLC to secure any required permits and to comply with any requisite permit conditions. If you have any questions, please contact me at 651-757-2465.

Sincerely,

Patrice Jensen
Planner Principal
Environmental Review
Resource Management and Assistance Division

PJ:bt

cc: Jamie Schrenzel, MDNR
Desiree Morningstar, U.S. Army Corps of Engineers
Sara Ploetz, Enbridge
Reed Larson, MPCA
Bill Sierks, MPCA
Laurel Mezner, MPCA
Jim Courneya, MPCA
Brian Livingston, MPCA
Jeff Udd, MPCA
Steve Lee, MPCA
Doreen Fier-Tucker, MPCA
Pat Carey, MPCA
Catherine Neuschler, MPCA
Craig Affeldt, MPCA

Minnesota Pollution Control Agency

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August 6, 2014

Mr. Burl Haar, Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

Dear Mr. Haar:

RE: Enbridge Sandpiper Pipeline Project, Docket No PL 6668/PPL-13-474

The Minnesota Pollution Control Agency (MPCA) has reviewed the comments and recommendations submitted by the Department of Commerce (DOC) on July 16, 2014, which will be considered by the Public Utilities Commission (Commission) at the August 7, 2014, hearing for the Enbridge Sandpiper Pipeline project. The MPCA offers the following comments on the project and the DOC's July 16, 2014, recommendations.

The recent boom in the production of oil and gas in North Dakota and surrounding areas has brought about an increase in the number of planned and proposed projects in Minnesota for the transportation, storage, and processing of these resources and their related products and uses. This activity has increased citizen and Agency interest in the amount and quality of information available to adequately assess the individual and cumulative environmental impacts of these projects and to fully inform decision-making processes.

Many alternatives to the proposed Sandpiper project and route have been suggested in the routing (PPL-13-474) and certificate of need (CN-13-473) proceedings, including rail transport, trucking, and numerous pipeline routes. The Commission will determine which alternatives are to be addressed in greater detail as the environmental review, certificate of need, and permitting processes move forward.

Given the high potential of additional pipelines and replacement or upgrading of existing pipelines in the near future, and within the same corridors, it is critical that the current effort consider multiple alternatives, including both route and system alternatives. For the reasons outlined below, limiting the alternatives to route options alone at this stage would unnecessarily narrow the scope of project options to reduce environmental and public health risks.

In our comments, the MPCA has suggested both route and system alternatives; these are discussed in the DOC's July 16, 2014, filing. I am concerned that the system alternative recommended for consideration by the MPCA may not be evaluated in these proceedings, since it does not include the Clearbrook terminal. The DOC evaluated the MPCA's system alternative, SA-03, and developed a connector segment to Clearbrook that would convert SA-03 into a route alternative. The MPCA supports inclusion of the SA-03 route with the connector segment developed by DOC as a less environmentally harmful route alternative than the proposer's route.

The MPCA's view is that the environmental impacts of system alternatives need to be considered as well as route alternatives. A system alternative that will transport oil to an alternative terminal with significantly less environmental harm should be evaluated in these proceedings.

My understanding is that system alternatives are considered in the Certificate of Need (CN) proceeding for this project. I also understand that DOC conducts environmental review of system alternatives in High Voltage Transmission Line certificate of need proceedings in the form of an Environmental Report (ER), but that this review is not conducted for pipeline certificate of need proceedings. The MPCA respectfully requests that the Commission request the DOC to prepare an ER-type review of alternatives to the project, including SA-03 as originally proposed by the MPCA without the connector segment to Clearbrook, for introduction into the CN proceeding. This position is based on MPCA's understanding as follows:

1. The project purpose can be met without constructing new storage capacity in Clearbrook. If the new terminal were to be built at a more westerly location, such as Crookston, a 75-mile long pipeline to Clearbrook could be constructed for the purpose of sending the oil that Enbridge is contractually obligated to send through Clearbrook (for transport to St. Paul refineries), while the remainder of the Bakken crude could be sent via a less environmentally harmful route well to the south of the sensitive water resources, and then on to the Superior, Wisconsin terminal.

2. Locating terminal facilities near Crookston, or at another site closer to the border of North Dakota, could offer other pipeline routes as viable alternatives, such as the proposed "System Alternatives" identified in the July 16, 2014, DOC recommendations. A terminal closer to the Minnesota/North Dakota border could be the point of origination for future pipelines that would travel to the south and avoid the potential threat to sensitive water resources that the MPCA has identified as being associated with the currently proposed Sandpiper route.

Thank you for consideration of our request.

Sincerely,

John Linc Stine
Commissioner

JLS:bt

Minnesota Pollution Control Agency

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August 21, 2014

Mr. Burl Haar, Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

RE: Enbridge Sandpiper Pipeline Project
Docket Nos. PL-6668/CN-13-473 (Certificate of Need) and PL-6668/PPL-13-474 (Route Permit)

Dear Mr. Haar:

This is the response of the Minnesota Pollution Control Agency (MPCA) to the Notice of Comment Period issued by the Minnesota Public Utilities Commission (Commission) on August 12, 2014, for the Enbridge Sandpiper Pipeline project (Sandpiper). The Sandpiper project includes a Route Permit and Certificate of Need proceeding. It is our understanding that the Certificate of Need decision will likely not be made for several months.

The Commission identified three topics open for comment in its August 12, 2014 Notice:

- *What, if any, of the eight system alternatives identified in the Department of Commerce Alternative Routes Summary Report should be considered further in these proceedings?*

  The MPCA evaluated system alternatives SA-03, SA-04, SA-05, SA-06, SA-07, and SA-08 using a number of criteria described below. All these system alternatives have fewer potential environmental effects than the Sandpiper proposal. At a minimum, we recommend system alternatives SA-03, SA-04 and SA-05 for further consideration in these proceedings.

- *What is the legal basis for determining whether a system alternative should be considered in the certificate of need proceeding?*

  The legal basis supporting our position is discussed on page 2 of our response.

- *What is the legal basis for determining whether a system alternative should be considered in the route permit proceeding?*

  See above.

The MPCA is the state agency with responsibilities and authorities related to the issuance of various permits that may be required for the project, including permits and regulations administered under state and/or federal programs for construction stormwater, industrial stormwater, wastewater, and spill and emergency response. A part of our mission is to protect and improve the environment. The MPCA submitted earlier comment letters and provided remarks at the August 7, 2014 prehearing meeting describing our concerns about the potential for adverse environmental effects from the proposed Sandpiper project route. Comments provided by the MPCA included system alternatives that it believes have lesser potential environmental effects.

The MPCA appreciates that the Route Permit and Certificate of Need parts of the Sandpiper proceeding are separate approval processes, each with its own requirements. Our offer of system alternatives was not intended to conflate the Route Permit process with the Certificate of Need process. The MPCA defers to the Commission regarding matters of interpretation and implementation of the Commission's specific statutory authorities and regulations, and of practice and procedure before the Commission. The MPCA's comments, in furtherance of its mission, are intended to provide information regarding the potential environmental effects from the Sandpiper route and to encourage the Commission to obtain additional environmental analysis on system alternatives to inform its Certificate of Need decision. We believe that the Commission has discretion under the Minnesota Environmental Policy Act (MEPA), Minnesota Statutes ch. 116D, to gather information it needs to include in the administrative record and to decide how to gather such information, including soliciting such analysis.

In addition, as the Department of Commerce Division of Energy Resources (DOC-DER) indicates in its August 18, 2014 letter filed in these proceedings, the Commission has authority under Minnesota Rule 7853.0130 to consider system alternatives that can better achieve the claimed need. That rule requires the applicant to meet four separate criteria before the Commission shall grant a Certificate of Need. Analysis of alternatives is governed by Subpart B of this Rule, which states in relevant part:

> A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record by parties or persons other than the applicant...

As the DOC-DER states in its August 18 letter, this subpart allows a party, or individual, who proposes an alternative to provide evidence showing that its alternative can better achieve the claimed need as stated by the applicant or that the claimed need is not reasonable.

Below we provide comment with respect to the need for additional information and assessment of environmental effects to inform your decision-making on the Certificate of Need and with respect to the potential adverse environmental effects of the proposed Sandpiper route for consideration in the Route Permit process as appropriate.

Analysis of Environmental Effects - Certificate of Need

While no environmental report is expressly required by Commission enabling laws or its regulations, the Commission as a governmental entity has discretion under MEPA to investigate environmental effects. Minnesota Stat. § 116D.03. A comparative analysis of system alternatives would provide valuable information to the Commission to be weighed along with other information of record when making the need decision. Conducting environmental analysis of system alternatives in this need decision is similar to what is done in non-pipeline need decisions. The MPCA believes that certain system alternatives present lesser potential for adverse environmental effects than does the proposed Sandpiper route and that they represent more prudent and environmentally protective options. Given the potential for environmental harm from the proposed Sandpiper route noted in the MPCA's previous comments and in this letter, it is reasonable to investigate the potential environmental effects of system alternatives as part of the need decision. The MPCA respectfully requests that the Commission exercise its discretion under MEPA to ensure that environmental values are given equal consideration along with economic and technical considerations.

The MPCA agrees with the comments filed by the Department of Commerce Energy Environmental Review and Analysis (EERA) unit on August 21, 2014 concerning the Commission's authority to consider environmental impacts of system alternatives in these proceedings. EERA emphasized that MEPA requires all departments and agencies to consider environmental impacts and alternatives in their decision making. MEPA further notes in 116D.06, subdivision 2, that the requirements and goals of the act are supplementary to those set forth in an agencies' existing authorizations. MPCA supports EERA's conclusion that the Commission has the ability to determine what it needs to insure that the record

developed in the Certificate of Need proceeding, or any proceeding, is adequate for its decision making, be it through testimony from parties, supplemental reports from the applicant or an Environmental Report-like (ER-like) document prepared by EERA, as was requested in the Xcel Competitive Resource Acquisition proceeding (12-1240).

Environmental Effects - Proposed Routing Project

The MPCA seeks to provide additional comment regarding the potential for negative environmental effects and a scoring analysis of six system alternatives, known as SA-03, SA-04, SA-05, SA-06, SA-07, SA-08, and the Enbridge's Sandpiper route in the context of the criteria set forth in Minnesota Rule 7852.1900 subp. 3 and 7853.0130 as these criteria pertain to the MPCA's regulatory authority. Please note that proposed system alternative SA-02 is not addressed in the following comments because previous examination of this route showed that it did not merit further consideration based on the risk to natural resources that MPCA believes must be considered. SA-01 was also not entered in the following comparison because it would require crossing the border into Canada. This would appear to change the jurisdiction and authority over the project from the state level to federal, and would thus no longer be under Commission authority.

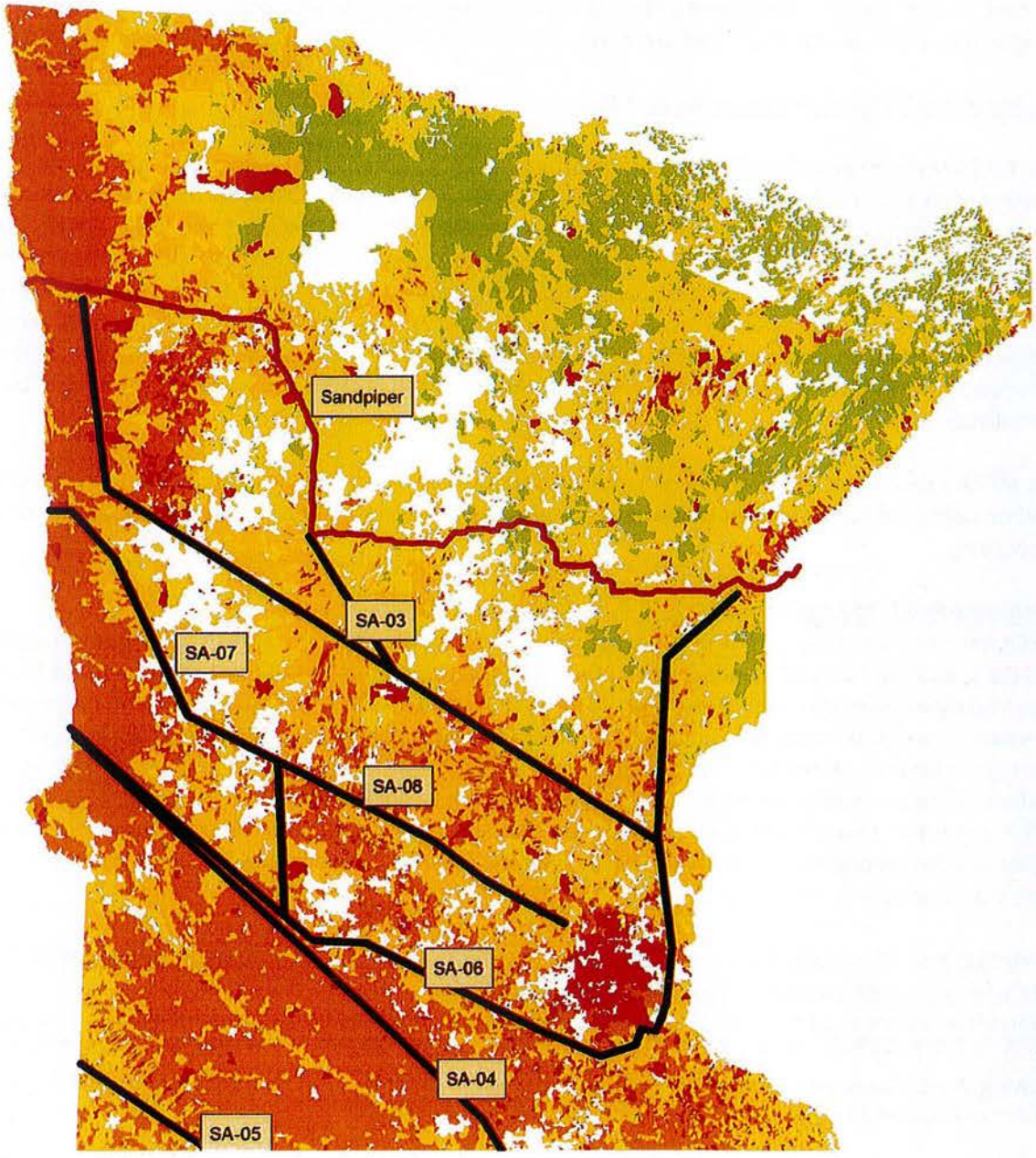
The MPCA's comments are intended to demonstrate the importance and the utility of the Commission developing an environmental effects analysis of the various system alternatives in the Certificate of Need part of this combined proceeding.

Minnesota Rule 7852.1900 Subp. 3, B, D, E, F, G, H, I and J Criteria

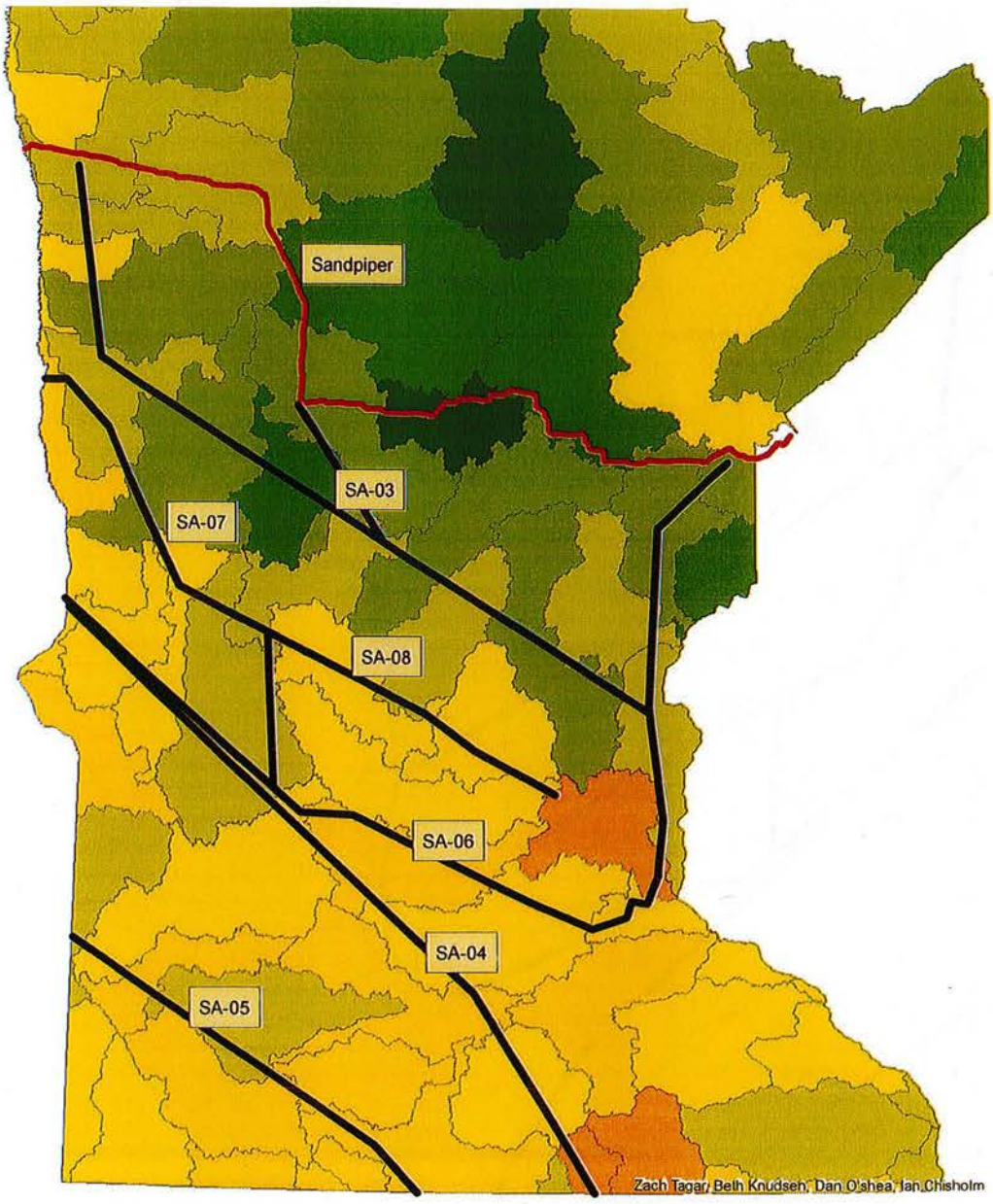
MPCA has considered the criteria in Minnesota Rule 7852.1900 Subp. 3 to compare the proposed system alternatives and the Sandpiper route by identifying corresponding Geographic Information System (GIS) layers to these criteria, and then visually examining the resulting maps. Without having access to specific locations of the proposed system alternatives, a detailed quantification is not possible; however, the MPCA presents this high level approach to help identify the system alternatives which seem to meet the required considerations most effectively. A more detailed analysis of the environmental impacts of system alternatives would be performed in an ER-like document suggested by MPCA and EERA. In the information below, lower numbers represent greater potential environmental effects, while higher numbers represent lesser environmental effects. The information is meant to illustrate one way of roughly comparing one alignment to another.

Minnesota Rule 7852.1900 Subp. 3.B. The natural environment, public and designated lands, including but not limited to natural areas, wildlife habitat, water and recreational lands.

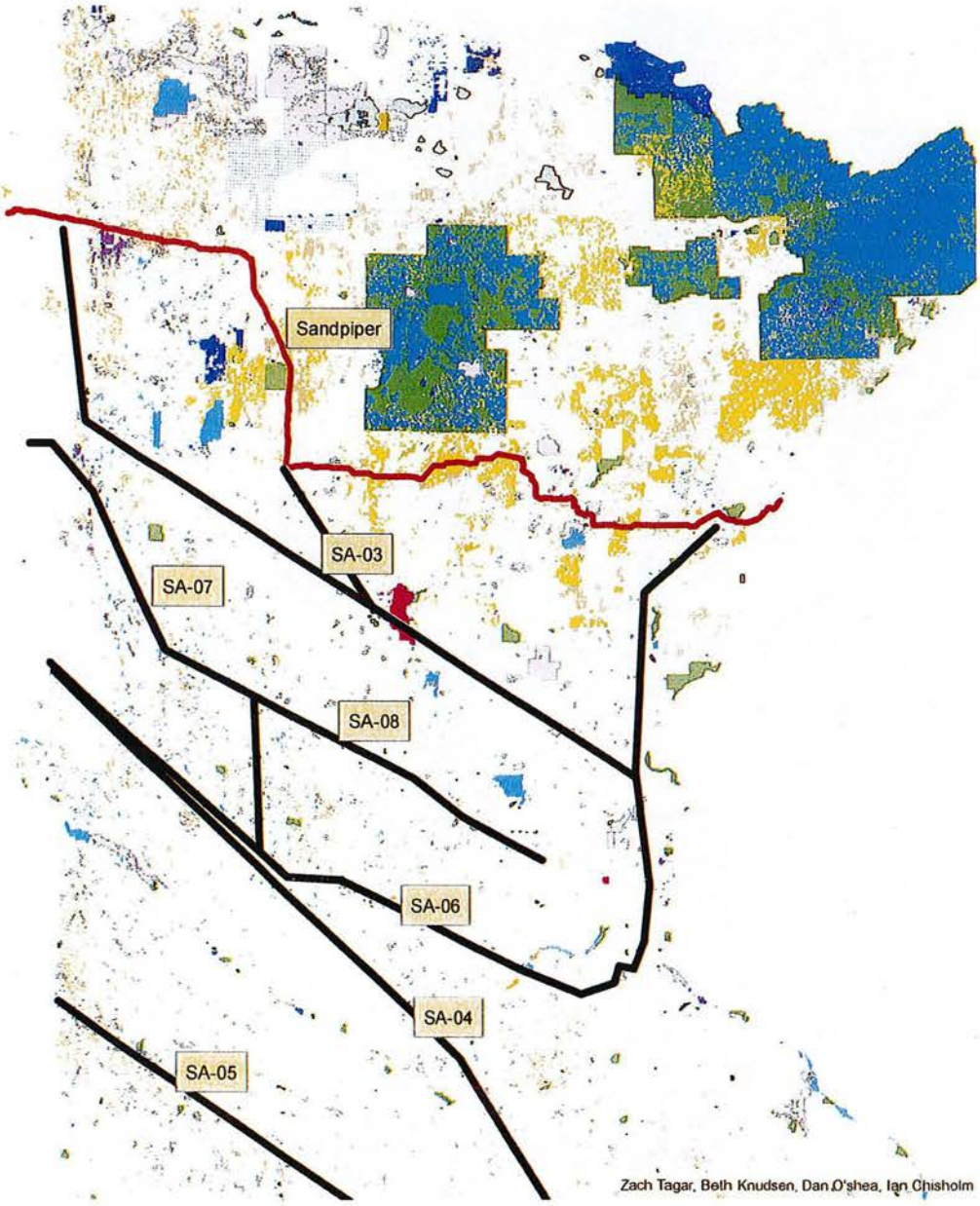
Several layers were used to depict these criteria, including Cumulative Disturbance Index (a score showing how human activity has affected the environment which could be used as an indicator of the quality of wildlife habitat), a map showing Water Quality mean score (the score for overall water quality within a watershed), and another map identifying public land ownership, state parks, and wildlife management areas.



The above map shows Cumulative Disturbance Index scores for the state. The green areas are undisturbed or minimally disturbed areas. The yellow and darker orange to red indicate areas of increasingly heavy human impact, and likely have poor habitat for wildlife; the areas in white have not been assessed. Based on this illustration, it appears that the proposed Sandpiper route has the greatest potential to impact pristine areas of the state and/or areas that have high habitat scores, while the potential for impact decreases with system alternatives located further south in the state.



This map shows mean scores for water quality in the state watersheds. Dark green identifies the best water quality in the state; yellow and orange identify areas of lesser water quality. In this depiction, the proposed Sandpiper route has the greatest potential to impact the areas of the state with the best water quality, while system alternatives SA-04, SA-05, and SA-06 traverse areas of fewer surface waters and lower water quality.



The map above identifies state and federal ownership of lands, state forests, state parks, wildlife management areas, and areas under conservation easements (Nature Conservancy). Wildlife management areas on the map are identified as light pink, darker purple areas are conservation lands, light green are state parks, dark green are national forests, yellow areas are state forests, and bright blue areas are U.S. Forest service land. Notable on this map is that the proposed Sandpiper route borders or crosses a substantial amount of state forest land, and borders several wildlife management areas and one area of nature conservancy land near the North Dakota border. SA-03 crosses near Camp Ripley. All of the proposed system alternatives encroach on some state land, but it appears from this context that the proposed Sandpiper route poses a greater risk to state forests, state parks, and wildlife management areas than any of the system alternatives.

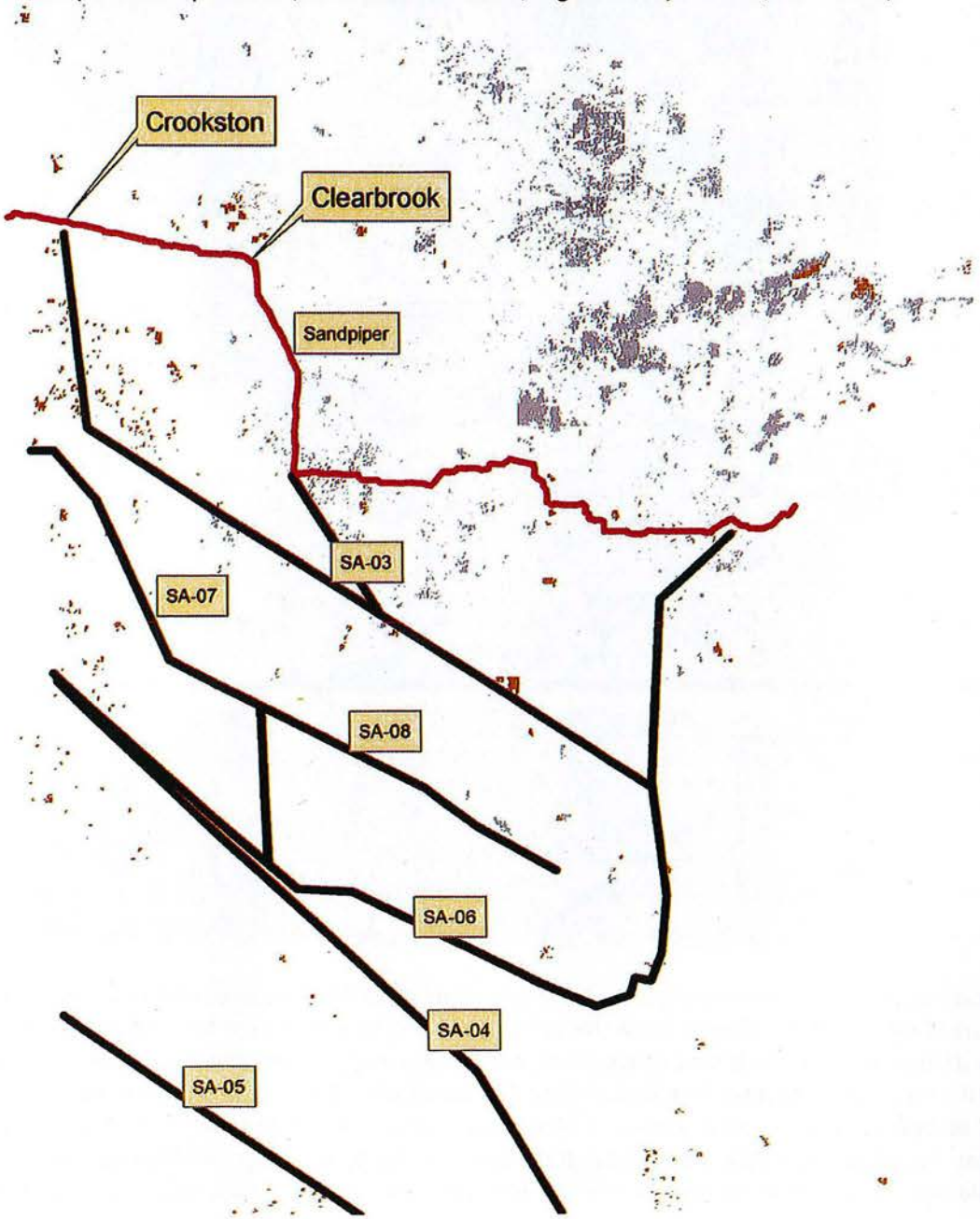
Environmental and natural resource protection and the prevention of impacts tend to be less costly and more effective than restoration; therefore, scoring in this instance is based on preventing impacts to higher quality areas. Scoring of the proposed system alternatives based on criteria in Minnestoa Rule 7852.1900 Subp. 3.B. is as follows:

- 5 points (small potential impact to criteria): SA-04, SA-05, SA-06
- 3 points- (moderate potential impact to criteria): SA-03, SA-07, SA-08
- 1 point (stronger potential to impact criteria): Sandpiper

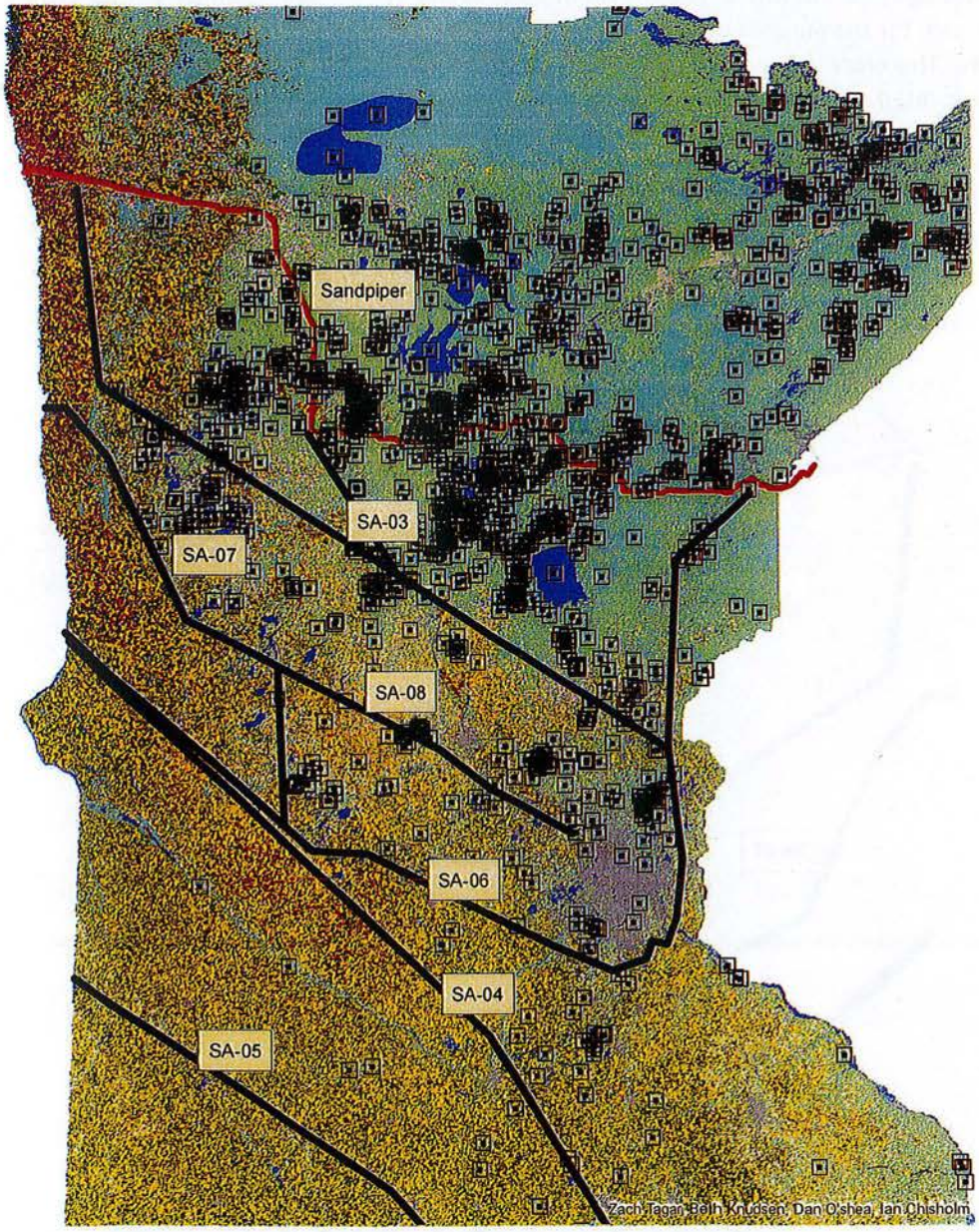
Minnesota Rule 7852.1900 Subp. 3.D. Economies within the route, including agricultural, commercial or industrial, forestry, recreational, and mining operations.

It is noted that an Enbridge pipeline would help the Minnesota economy by creating temporary jobs and also paying property taxes; however, for the purpose of this comparison, these economic benefits would occur regardless of where the pipeline is located. Therefore, this analysis addresses other economies that may be impacted based on where the Sandpiper pipeline is located.

The following map identifies both major industrial lands (paper company lands, potato farms, mining lands, etc. in gray), major non-industrial lands (livestock operations, miscellaneous trusts, sugar beet operations, etc. in tan).



In this example, the proposed Sandpiper route encroaches on relatively few industrial-related facilities compared to SA-06 or SA-08, but the Sandpiper comes closest to or directly encroaches on a number of major industrial lands, particularly potato farms and paper company forests. SA-03 also comes near to several livestock operations. In this view, it appears that SA-04 poses the least potential impact to any of the facilities or lands depicted in this layer.



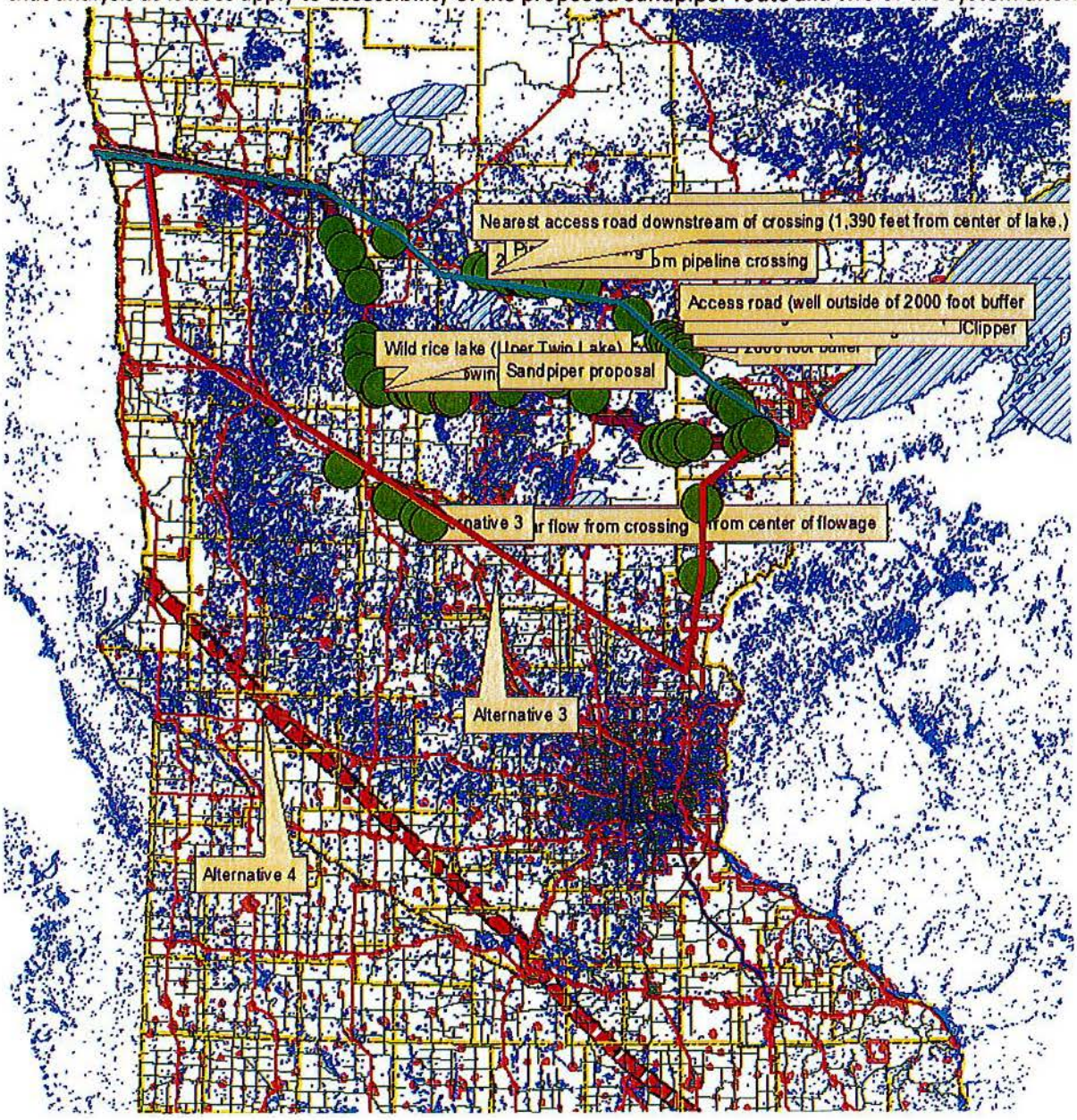
This map identifies cropland in Minnesota, and also stands of wild rice (black squares with black dots). The yellow or dark green areas are corn and soybeans, while the lighter green and blue-green are forested areas. The state appears fairly evenly divided between forest land above SA-03, and heavily cropped land (mostly corn and soybeans) below SA-03. Of special note on this map is the high concentration of stands of wild rice around the proposed Sandpiper route. Unlike corn, soybeans or other exports, stands of wild rice are uniquely sensitive to water quality and disturbance of its native habitat. Therefore, the MPCA concluded that the proposed Sandpiper route would pose a higher threat to the stands of wild rice economy than the system alternatives would pose to other crops. Other Minnesota economic

sectors, such as tourism, resorts, and recreation, are also heavily dependent on water quality; thus with consideration toward potential impacts to the economic sectors that significantly depend on water quality, the MPCA scored the proposed system alternatives as follows:

- 5 points (small potential impact to criteria) SA-04, SA-05, SA-07
- 3 points- (moderate potential impact to criteria) SA-03, SA-06, SA-08
- 1 point (stronger potential to impact criteria) Sandpiper

Minnesota Rule 7852.1900 Subp. 3.E. Pipeline cost and accessibility.

It was not clear whether this criterion applies to the Enbridge's cost and accessibility to route locations, or to potential cost to the State of Minnesota to access the pipeline route, especially in sensitive areas. However, as accessibility to the proposed system alternatives was a major concern of the MPCA's June 24, 2014 letter, it is worth reviewing the result of that analysis as it does apply to accessibility of the proposed Sandpiper route and two of the system alternatives.

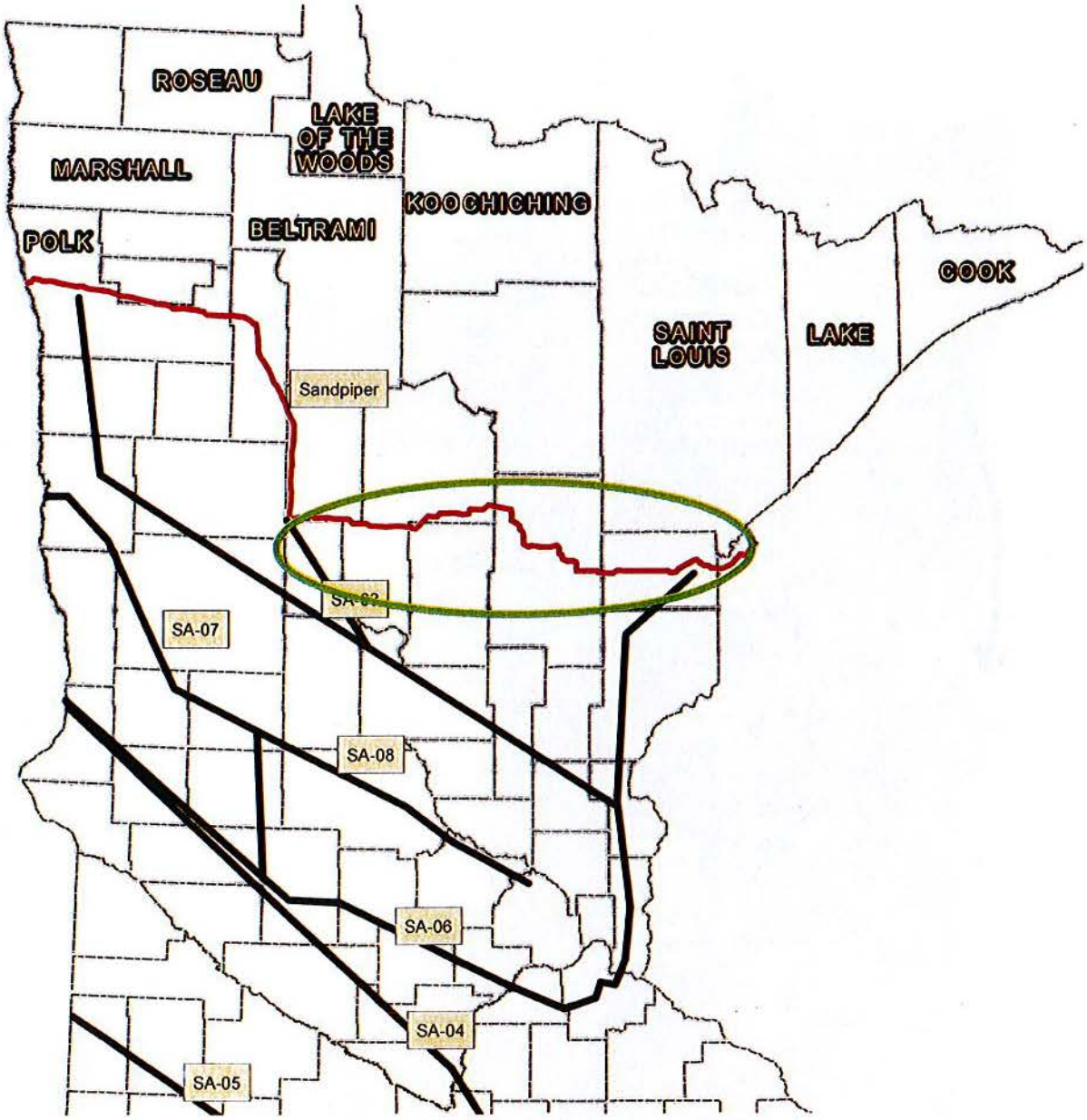


As described in the MPCA's June 24, 2014 letter, the MPCA studied the Sandpiper route proposal, SA-03, and SA-04 for accessibility downstream of water crossings. The criteria set for this study involved road access to water crossing areas within 250 feet of the center of a flowage or water body for a distance of 2,000 linear feet downstream of the crossing. One of the objectives of the analysis was to identify areas with poor or no access to water bodies being crossed by each of the proposed system alternatives, with the above described criteria used to measure this objective. The analysis indicated that SA-03 had seven water crossings with poor or no access as described, SA-04 had zero such access issues, and the proposed Sandpiper route has 28 water crossings with no access within 2000 linear feet.

Based simply on this data and without further analysis, the scoring for SA-03, SA-04 and the proposed Sandpiper route is as follows:

- 5 points (small potential impact to criteria) SA-04
- 3 points (moderate potential impact to criteria) SA-03
- 1 point (stronger potential to impact criteria) Sandpiper

Minneosta Rule 7852.1900 Subp. 3.F. Use of existing rights-of-way and right-of-way sharing or paralleling.
All of the system alternatives follow existing pipeline corridors except for one. The proposed Sandpiper route follows MinnCan pipeline from Clearbrook south, but does not follow any existing pipeline corridor (although some of it follows power line corridor) once it turns east near Park Rapids. Note the area circled on the following map, where the Sandpiper follows either power line corridor, or no corridor:

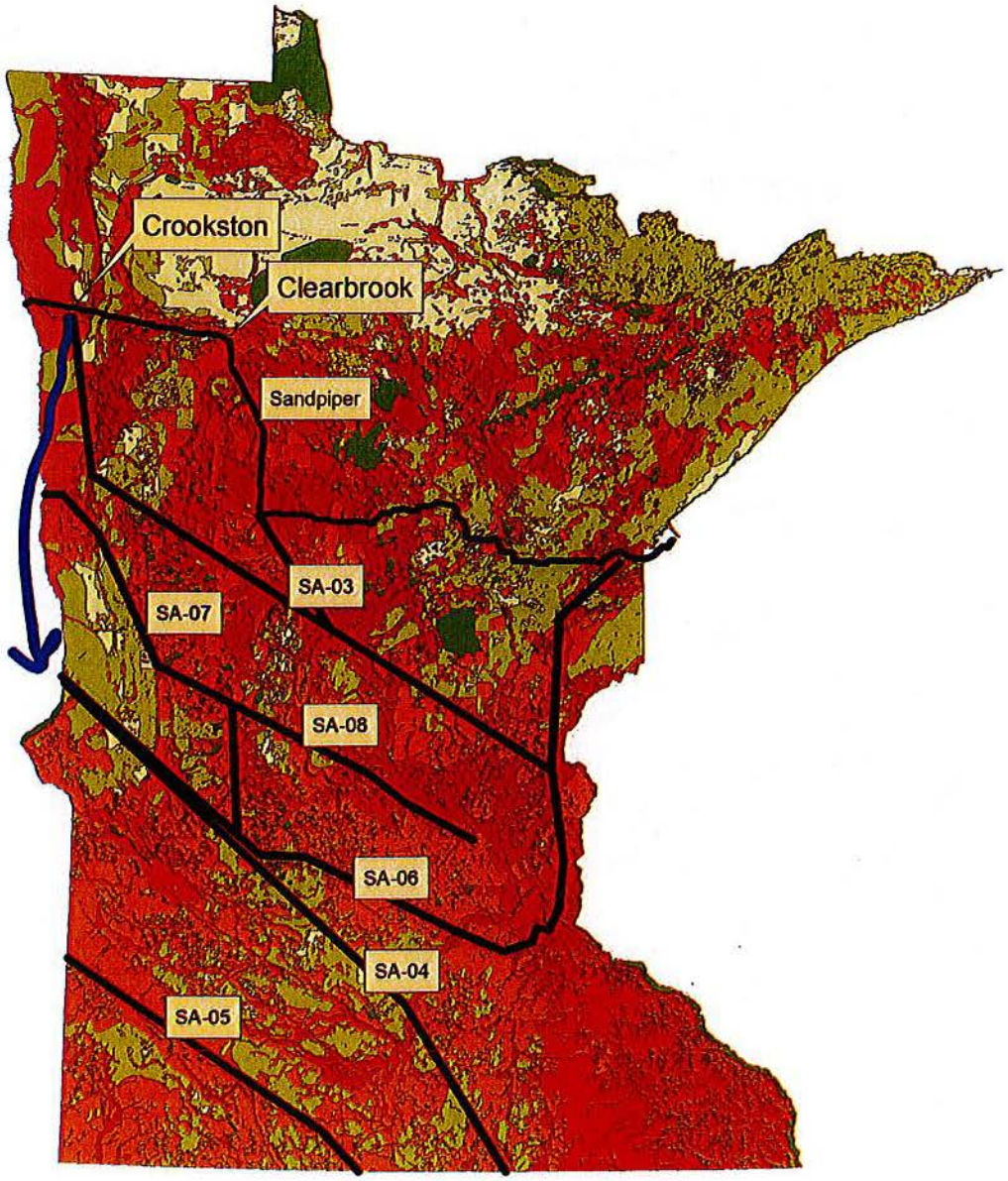


Through much of Aitkin County, and small areas of Carlton County, the Sandpiper proposal does not appear to follow any existing corridors at all. Thus, based on these criteria, the Sandpiper route and system alternatives would score as follows:

- 5 points (small or no variance from criteria) SA-03, SA-04, SA-05, SA-06, SA-07, SA-08
- 3 points- (moderate potential impact to criteria) Sandpiper
- 1 point (significant variance from criteria) not applicable

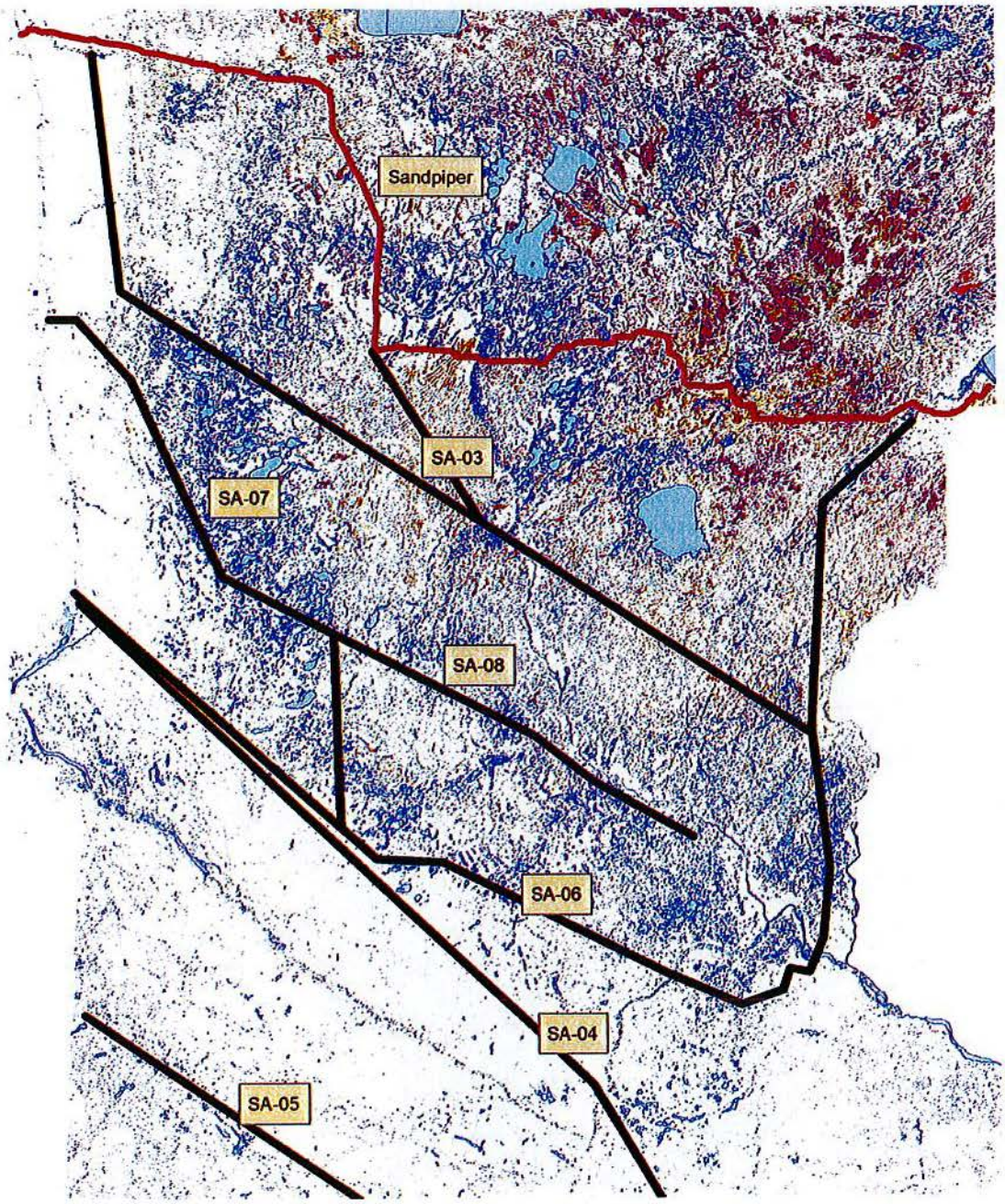
Minnesota Rule 7852.1900 Subp. 3.G. Natural resources and features.

The map below was put together by combined efforts of Minnesota State and federal agencies. It identifies ground water susceptibility to contamination based on a number of criteria. On this map, the color red identifies the highest potential for groundwater contamination, dark orange is second highest, the lighter greens are low susceptibility, and the lightest green being the least susceptible. The dark greens represent lakes.



As seen on this map, the proposed Sandpiper route crosses some of the areas of the state that are most susceptible to contamination of groundwater, especially around the Park Rapids area. SA-03 also crosses significant sensitive areas, while the system alternative that crosses the least susceptible ground water is the SA-04 proposal. Of all the proposals, the Sandpiper route appears to cover the most linear miles of susceptible groundwater, from Red Lake Falls to Clearwater, then down to Park Rapids, and east to Fifty Lakes. SA-03 appears to be a close second in terms of potential to impact susceptible groundwater areas.

The map below identifies state surface waters, including lakes and wetlands. Although all of the proposed alternatives cross some water bodies, or encroach on some, the Sandpiper again crosses or encroaches on more surface waters than does any proposed system alternative. There is also more diversity of surface water types along the proposed Sandpiper route than any system alternative.



Although the proposed Sandpiper route was comparable to SA-03 with regard to potential for groundwater contamination, the Sandpiper route appears to encroach on a much higher density of surface waters. SA-07 and SA-08 also encroach on a significant concentration of surface water, although without as much diversity (i.e. rivers, lakes, streams, wetlands, etc.) as the Sandpiper route, nor as much overall surface water area. When combining the potential for impact to surface water and ground water, the proposed system alternatives average out in this manner:

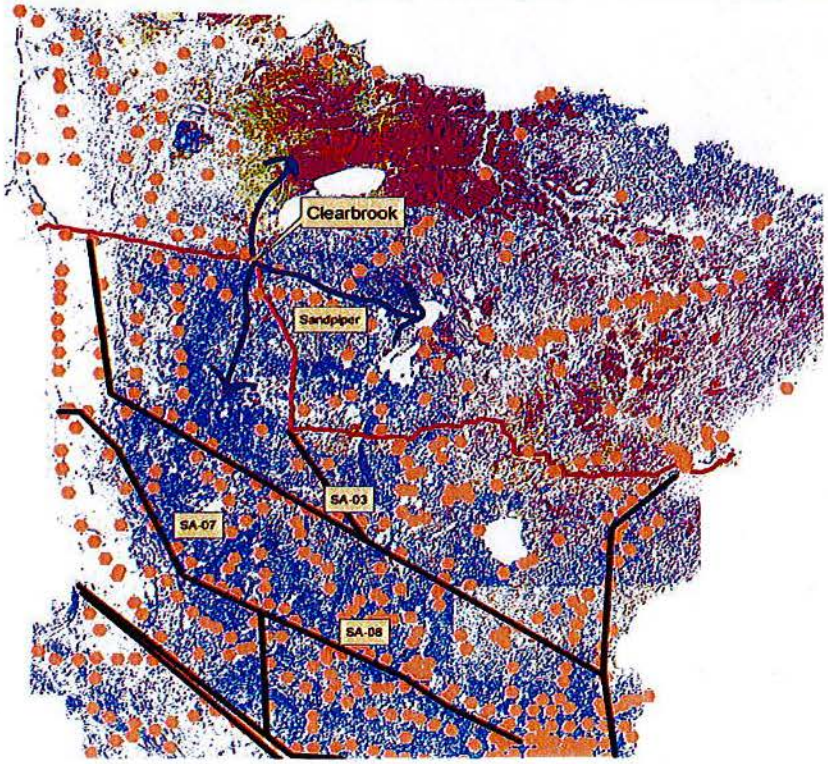
- 5 points (small potential impact to criteria) SA-04, SA-05
- 3 points- (moderate potential impact to criteria) SA-03, SA-06, SA-07, SA-08
- 1 point (stronger potential to impact criteria) Sandpiper

Minnesota Rule 7852.1900 Subp. 3.H. The extent to which human or environmental effects are subject to mitigation by regulatory control and by application of the permit conditions contained in 7852.3400 for pipeline right-of-way preparation, construction, cleanup, and restoration practices.

Although MPCA staff has not identified a GIS layer to correlate with these criteria, exposed sections of Enbridge pipeline in the Tamarac River have raised serious questions regarding regulatory authority to require re-burying of exposed pipe when erosion has uncovered existing infrastructure. Exposed pipe creates a greater risk of spills or injuries to people. The significant number of water crossings along the proposed Sandpiper route would appear to increase the likelihood that similar pipe exposures with their attendant risks will occur in the future.

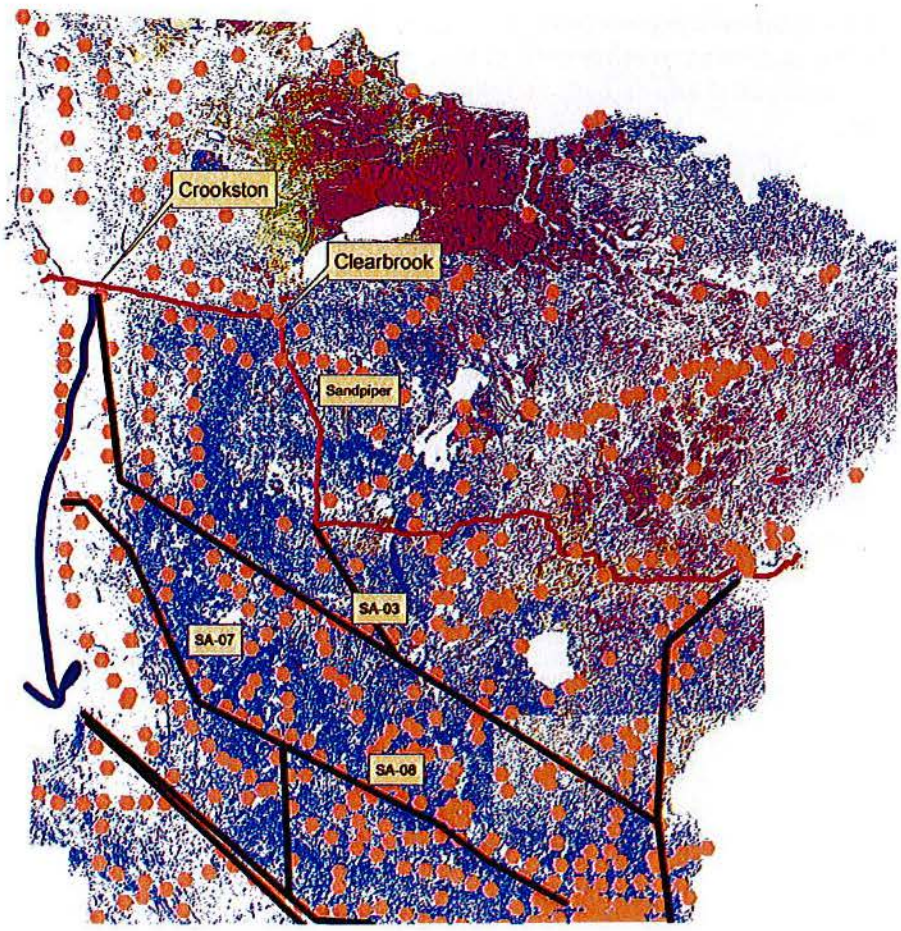
Minnesota Rule 7852.1900 Subp. 3.I. Cumulative potential effects of related or anticipated future pipeline construction.

A significant component of the Sandpiper proposal is the construction of a new terminal at the Clearbrook location. MPCA has expressed concern that with each terminal constructed at Clearbrook, the likelihood of additional or future pipeline infrastructure that will be built will come through Clearbrook. This, in turn, increases the potential for new pipeline to impact the large concentration of sensitive surface and groundwater that lies immediately to the east of Clearbrook, as demonstrated in the map below. The blue color on the map typically identifies open water, with green and purple, etc. indicating various other types of wetlands. The brownish/pink octagons represent cities.



Due to the fact that pipelines are often placed in the same corridors, it is MPCA's concern that by continuing to allow pipelines through Clearbrook, the state will enable expansion of future pipeline infrastructure expansion in areas of the state that will have an increasingly concentrated impact on the state's most valuable surface and groundwater resources. This increases the potential for natural resource impacts and degradation due to spills or releases.

The MPCA believes that cumulative potential effects associated with high-risk crude oil routes can be reduced or avoided if future terminal facilities were constructed at a location west of Clearbrook. Such facilities could be constructed along the old line 3 corridor, or near Crookston as shown on the following map. The possible benefits to reducing potential impact to our state's valuable resources are depicted below:



By relocating new terminal facilities west of Clearbrook, a corridor can be created in which potential resource impacts can be minimized, and a number of possibly less environmentally hazardous routes opened up. The Sandpiper route as currently proposed, as well as future pipelines that may use this same corridor, increase cumulative risk with consideration of most of the criteria from 7852.1900 as described above.

Minnesota Rule 7852.1900 Subp. 3.J. The relevant applicable policies, rules, and regulations of other state and federal agencies, and local government land use laws including ordinances adopted under Minnesota Statutes, section 299J.05, relating to the location, design, construction, or operation of the proposed pipeline and associated facilities.
Minnesota Statute 116.04D, Subd. 6 states: "No state action significantly affecting the quality of the environment shall be allowed, nor shall any permit for natural resources management and development be granted, where such action or permit has caused or is likely to cause pollution, impairment, or destruction of the air, water, land or other natural resources located within the state, so long as there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety, and welfare and the state's paramount concern for the protection of its air, water, land and other natural resources from pollution, impairment, or destruction. Economic considerations alone shall not justify such conduct."

In summary, all the currently proposed system alternatives evaluated by the MPCA here are worthy of further consideration, especially when compared with the Sandpiper proposal. The MPCA recommends that at a minimum, the Commission approve SA-03, SA-04, and SA-05 for further consideration in these proceedings. Further, the MPCA urges the Commission to gather additional environmental effects information on the system alternatives through preparation of an ER-like document and is willing to assist EERA by providing additional data, comments, and review for the document that both agencies recommend here.

The MPCA thanks the Commission for the opportunity to comment upon these issues. The agency continues to emphasize that the environmental effects of system alternatives need to be considered in the Certificate of Need process. System alternatives that will transport oil to an alternative terminal with significantly less environmental harm should be evaluated in these proceedings.

Sincerely,

Craig Affeldt, for

Bill Sierks,
Manager, Environment and Energy Section
Minnesota Pollution Control Agency

BS:bt
cc: Deborah Pile, Department of Commerce
Larry Hartman, Department of Commerce
Sara Ploetz, Enbridge

Minnesota Pollution Control Agency

520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300

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November 12, 2015

Ms. Jamie MacAlister, Environmental Review Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul MN 55101

RE: Draft Impact Analysis Methodology for the Proposed Sandpiper and Line 3 Pipeline Projects
Sandpiper Docket Numbers: 13-473 and 13-474
Line 3 Docket Numbers: 14-916 and 15-137

Dear Ms. MacAlister:

The Minnesota Pollution Control Agency (MPCA) has reviewed the draft impact analysis methodology (IAM) for the proposed Sandpiper and Line 3 pipeline projects. We understand the draft IAM will inform the scope of environmental review for each pipeline project and can be applied to either a comparative environmental analysis (CEA) or environmental impact statement (EIS) when the Public Utilities Commission (Commission) makes that determination.

We offer the following comments on scoping content and analysis, applicable whether the Commission orders an EIS or CEA.

Scope of Analysis

The scoping document should indicate that the analysis will identify which resources actually have the potential to be impacted, and discuss what those impacts might be. As Minn. Stat. § 116D.04, subd. 2a, states, an environmental impact statement must be "analytical rather than encyclopedic"; merely counting resources or features that fall in the area of the described routes is not sufficient. For example, a wetland one half mile upstream from a proposed route would have a much smaller chance to be impacted during construction or during a release than a wetland that is hydrologically connected several miles downstream of a pipeline water crossing. Any resource analysis should identify whether the feature is downstream or downslope of a proposed route, or whether the feature is up-gradient, uphill or otherwise separated from the pipeline route by roads, railroad tracks, or other physical conditions that might protect the feature from impacts.

Alternatives

A scoping document should identify at least one alternative of each of the following types, or provide an explanation of why no alternative is identified for inclusion in the EIS/CEA: alternative sites; alternative technologies; modified designs or layouts; modified scale or magnitude; no action/no build; and alternatives incorporating reasonable mitigation measures identified through comments received during the EIS scoping or draft EIS comment periods. (Minn. Rules 4410.2300.G). For any alternative identified, the scoping document should indicate that the analysis in the EIS/CEA will include a discussion of potentially significant direct or indirect, and adverse or beneficial, effects associated with that alternative.

Project Magnitude
The scoping document should identify that the project magnitude discussion will include topics such as the width of the easements required, the additional land required for material and equipment temporary storage, the land required for the pump stations, eminent domain, and any public displacement.

Environmental Impacts
The scoping document should identify that the EIS/CEA will evaluate and analyze the following additional topics:

- Wildlife in addition to endangered or threatened species
- Water use
    - Locations to private and public water supply sources, depths of the wells, aquifers, etc. Drinking Water Source Management Area (DWSMA) data can be used to help assess risk to public drinking water wells.
- Wastewater
- On-site generation of solid waste, hazardous waste, and storage tanks
- Vehicle-related air emissions
- Stationary sources of air emissions and odors from the pump stations and above ground storage tanks
- Soil conductivity and permeability
- Aquifer hydraulic properties
- Data sources
    - "Counts of areas and acres within each alternative route will be developed using spatial analysis tools within ArcGIS." Again, while this is useful information, it should be accompanied by discussion about how relevant the data is. An explanation of how oil moves underground, and how it might affect the identified resources, will be necessary.
- Multi species assemblage areas should be added to the list of High Consequence Areas (HCAs) to be identified and assessed for potential impacts. Also, we suggest that HCAs are identified for a minimum distance of ten miles downstream of any water crossing.
- Above ground storage tanks (Note: the MPCA prepared an Environmental Assessment Worksheet for the construction of above ground storage tanks at the Minnesota Pipeline facility in Clearbrook.)
- Odors
- Dust
- Noise
    - From construction and pump stations
    - Possible impacts on natural systems (see the following for reference: http://rspb.royalsocietypublishing.org/content/early/2012/03/15/rspb.2012.0230.short?rss=1)
- Prime farmland, organic farming, and other land uses that may not be compatible
- Ecologically sensitive resources

- Groundwater
- Mitigation measures for catastrophic releases, smaller spills and pinhole releases
    - The scoping document should identify that the analysis of pinhole leaks will include an evaluation of how the applicable ground water regulations and cleanup standards will be achieved in the event of a spill, as well as soils and hydrogeological conditions as depicted in sensitivity maps along preferred and alternative routes. Include the potential impacts as a result of a pinhole leak on surface water as well as ground water.
- Wetlands
    - Explain how the potential direct and indirect impacts on wetlands will be evaluated.
- Water resources
    - Identify applicable regulations and standards specific to the potentially affected water resources and evaluate how those standards will be met in the event of a spill.
    - It is unclear whether "Impaired waters for which state and federal monies are being spent" refers to currently funded projects or an assumption that state or federal monies will be spent on all waters listed as impaired. Minnesota state and local agencies are currently developing detailed Watershed Restoration and Protection Strategies (WRAPS) for all 80 major watersheds in the state. As part of this analysis, the MPCA and its partners identify water bodies that are impaired (requiring a TMDL), as well as high quality water bodies that are deemed to be at risk or that require protection to maintain their high quality. This list of waters (includes TMDL waters as well as waters requiring additional protection) is more appropriate for the proposed pipeline environmental review efforts.

Project Design

- Discuss cathodic protection, how joints will be welded, pipeline integrity, and appropriate placement of shut-off valves.

Financial Assurance

- The scoping document should identify that the EIS/CEA will discuss financial assurance to address pipeline restoration, closure, and/or spills if Enbridge is unable to cover those costs.

Economic and Sociological Impacts

- Direct and indirect costs to local and regional economic
- Sociological impacts
- Effects on property values, tax base, and sociological conditions should a release occur
- Projections for expansion of residential or industrial areas over the anticipated lifetime of the proposed project should be analyzed.

Cumulative Effects

The scoping document should identify that the EIS/CEA will evaluate related or connected activities such as power lines that would need to be constructed to power pump stations, access roads that might need to be built, and additional pipelines or refineries that may need to be constructed to add "reliability" to existing shipping routes, or to replace older infrastructure that may be overloaded as volumes increase as a result of the activation of Line 3 or Sandpiper (older Wisconsin lines, for example that will be

receiving additional oil as a result of the increase of volumes through Minnesota). If a new corridor is established, the EIS/CEA should also evaluate the potential impacts that may occur if additional lines are added to that corridor in the future (Line 2 for example, which is currently being tested for integrity with hydrostatic testing and is several decades old).

Impacts of Routine Construction and Operations
The scoping document should identify that the EIS/CEA will evaluate impacts as a result of topographical alterations of landscape, loss of topsoil in forested areas (topsoil is typically separated in agricultural areas but not in natural areas), and subsidence of soils which can create water conveyances (typically resulting from replacement of frozen soils in trenches during winter construction).

Thank you for the opportunity to provide comments regarding scoping for the EIS/CEA for the proposed Sandpiper and Line 3 pipelines. If you have any questions, please contact me.

Sincerely,

Bill Sierks

Bill Sierks, Manager
Environment and Energy Section
Resource Management and Assistance Division

BS/PJ:ld

cc: Jamie Schrenzel, MDNR

Appendix D
Straight River Groundwater Management Area

Straight River Groundwater Management Area Plan

March 2017

DEPARTMENT OF NATURAL RESOURCES

Funding for this project was provided, in part, by the following:

The Clean Water Fund, which receives 33 percent of the sales tax revenue from the Clean Water, Land and Legacy Amendment, approved by voters in November 2008. The Clean Water Fund's purpose is to protect, enhance and restore water quality in lakes, rivers, streams and groundwater.

At least 5 percent of the money is targeted for the protection of drinking water sources. The Legislature allocates funds for water quality work and drinking water protection based on recommendations from the Clean Water Council.

DEPARTMENT OF NATURAL RESOURCES

Office of the Commissioner
500 Lafayette Road, St. Paul MN 55155-4037
651-259-5555

March 2017

Straight River Groundwater Management Area: Designation and Plan

Minnesota is rich in water resources. With more than 10,000 lakes, thousands of miles of rivers and streams, and many thousands of acres of wetlands, it might be natural to think that our water is essentially unlimited. But in some parts of the state, the unseen, underground aquifers that make up our groundwater resources are under pressure to meet growing needs for domestic water supplies, irrigation, industrial and other uses. These groundwater resources also are interconnected with lakes, streams and wetlands that we value for commerce, recreation, and water supplies. Those surface waters also provide the habitat needed by many animals and plants. If we are not careful in how we use water, both economic development and ecosystems could be put at risk.

These concerns led the Minnesota Department of Natural Resources to explore a different approach to groundwater management in three areas around the state where trends suggest groundwater use might be or become unsustainable. After working with an advisory team of 21 people representing agriculture, local government, and other agencies since February 2014, the DNR is establishing the Straight River Groundwater Management Area, which is hereby designated to include parts of southern Clearwater, northeast Becker, southwest Hubbard and northwest Wadena counties. We have created this five-year plan to guide our work in this area to ensure that groundwater supplies remain adequate to meet human needs while protecting lakes, streams and wetlands.

I believe this plan is a very positive step for Minnesota. It draws upon a wealth of technical expertise across a variety of sectors. It has been informed and improved by extensive input and feedback from major water users, local government, concerned citizens and other interests. The plan is comprehensive, yet achievable. It lays out clear objectives and specific actions the DNR will take to ensure sustainable use of groundwater. It also acknowledges that DNR cannot be successful alone and describes the important roles of water users and other agencies.

I want to thank the volunteers who served on the Project Advisory Team and the people who actively participated in meetings throughout the process. The many hours you dedicated are very much appreciated. This plan provides a good starting point, but working to maintain the Straight River water resources will require many more people, agencies and interests continuing to work together in the years to come. I'm confident that will happen, because Minnesotans have shown their commitment to natural resource conservation and stewardship.

Tom Landwehr
Commissioner

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1. Introduction

The Minnesota Department of Natural Resources (DNR) works with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life. The DNR works to integrate and sustain a healthy environment, a sustainable economy, and livable communities. The DNR shares stewardship responsibility with citizens and partners to manage for multiple interests.

The DNR is responsible for managing the state's water resources to sustain healthy streams, lakes, wetlands and groundwater resources. The DNR plays an important role in supporting sustainable groundwater use through its permit programs, information collection and analysis activities, education, technical assistance opportunities and law enforcement responsibilities.

The DNR is one of several state and local agencies and organizations with responsibility to develop, protect and manage our water resources. The following briefly describes some of the key roles of state agencies in water:

- Department of Natural Resources: collects and analyzes information on water, regulates water use and riparian land use activities, manages public land, and approves water supply plans.
- Department of Agriculture (MDA): responsible for fertilizer and pesticide regulation and management, including implementing the state Nitrogen Fertilizer and Pesticide Management Plans to protect groundwater; developing voluntary best management practices; monitoring groundwater in agricultural settings; product registration; and applicator training and licensing.
- Department of Health (MDH): ensures public drinking water systems protect sources and meet federal drinking water standards, regulates water well construction and sealing to protect groundwater, assesses drinking water contaminant risks to public health, licenses professions impacting drinking water and approves water supply plans.
- Pollution Control Agency (MPCA): develops water quality standards, monitors surface water and groundwater quality, and regulates discharges of pollutants to public waters.
- Board of Water and Soil Resources (BWSR): provides resources and technical assistance to local governments, manages conservation easements, and provides oversight to local water management entities.
- Public Facilities Authority: manages municipal financing programs to help communities build and upgrade drinking water, wastewater and storm water infrastructure.

Groundwater can be at risk of overuse and contamination anywhere in the state, and in some areas this risk is more urgent. To address concerns about long term sustainable use of groundwater in three of these areas, the DNR is establishing Groundwater Management Areas (GWMA) and developing management plans. The purpose of the GWMA Plan (Plan) is to guide DNR actions in managing the appropriation and use of groundwater within the GWMA over five years following adoption of the Plan. The Plan will be updated as needed to allow it to continue guiding sustainable groundwater use. The DNR will form stakeholder advisory committees for each GWMA as prescribed in statute.

The GWMA represents a geographic area within which groundwater users share a distinct aquifer system or groundwater resource. Users include both those who are required to have appropriation permits (high volume users - more than 10,000 gallons a day or 1 million gallons a year) and those who do not require permits to use groundwater (low volume users - less than 10,000 gallons a day or 1 million gallons a year).

Problem

As part of a statewide analysis of groundwater resources, the DNR identified the Straight River area as an area of specific concern where groundwater resources are at risk of overuse and degraded quality. Multiple permit holders (groundwater users) are connected through their use of groundwater and their effect on water resources.

The DNR manages water resources to assure an adequate supply through permitting and tracking water appropriation and use. The Water Appropriation Permit Program balances competing management objectives that include development and protection of Minnesota's water resources. Key challenges for the DNR in managing groundwater appropriations and use in the Straight River GWMA include the following:

- Demand: past and projected growth in water demand, particularly for agricultural irrigation
- Natural Resources: potential for negative effects on groundwater-dependent natural resources such as wetlands, lakes, and streams
- Conservation: a need for improved and expanded application of water conservation and improved water use efficiency
- Contamination: reduction in the availability of clean groundwater
- Information: gaps in the information needed to determine the sustainability of groundwater use

Purpose

The purpose of the GWMA Plan is to guide DNR actions in managing the appropriation and use of groundwater within the GWMA over the next five years. The following points help summarize the purpose of the GWMA Plan by identifying what it is and what it is not:

- The Plan directs the actions of the DNR and is not a plan for others to implement.
- The Plan establishes actions to guide the improvement of the DNR’s appropriation permitting process to ensure sustainable groundwater use.
- The Plan calls for the development of sustainability thresholds for groundwater use in the GWMA.
- The Plan covers a five year period with the expectation that actions will be revised to continue the work beyond the initial 5-year period.
- The Plan directs actions to improve communication for stakeholders within the GWMA.
- The Plan calls for regular review of progress by a GWMA Advisory Group comprised of stakeholders.
- The Plan is not a comprehensive study of the area, but instead uses information from completed studies and suggests future studies to inform the plan and process.
- The Plan does not establish any new or broader regulatory authority. The actions proposed in the Plan are based on existing regulatory authority.
- The Plan itself is not an individual or a collective water supply plan for individual permit holders, industries, or municipalities.

The GWMA is intended to be in place for the long term, which will require updating and renewing the Plan after the first five-year implementation period. During the initial five year implementation period, the Plan, actions and progress will be reviewed annually, evaluated, and revised with the help of a standing GWMA Advisory Group and other stakeholders.

The Plan identifies actions for the DNR to take, in collaboration with other agencies, organizations and individuals active in the GWMA. Other state agencies and organizations have an important role in supporting the DNR’s actions in the Plan. The Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Health (MDH), the Minnesota Department of Agriculture (MDA), and the

Board of Water and Soil Resources (BWSR) have provided specific commitments and actions in support of the DNR's Straight River GWMA. Those commitments are included in Appendix A.

Many of the actions described in Section 5 will develop information, tools, and processes that will form the foundation for better decisions. The Plan does not establish or include a total allocation limit. Rather, it lays the path for determining sustainable thresholds, now and in the future, and managing appropriations to stay within the sustainability thresholds in a planned and transparent framework. Actions oriented toward all five Plan objectives are integral to this process.

Process

The Plan lays out a framework for addressing the groundwater management goal and objectives of the DNR Groundwater Management Program (from the Strategic Plan) in light of the particular challenges within the area. In order to gain insight into specific interests of the diverse groundwater users in the area, the DNR established a Project Advisory Team (PAT) to provide feedback and advice. The PAT was comprised of stakeholders from private businesses (e.g., farmers, food processors, well drillers), state agencies, county and city/township governments, a watershed district, industry, and the federal government (Table 1-1). In response to legislative changes made in 2014 (Minn. Stat., sec. 103G.287, subd. 4) the DNR expanded the membership of the PAT during the planning process to increase the number of team members holding water appropriation permits.

A project team of DNR staff wrote the plan based on feedback from the PAT and other stakeholders. Members of the project team came from the divisions of Ecological and Water Resources, Fish and Wildlife, Enforcement, Operations Services, and Regional Leadership.

The role of the PAT has been to provide advice and feedback on the Plan during development. DNR asked PAT members to be two-way conduits of information about the Plan to other stakeholders. The PAT was not established to generate unanimous agreement with the Plan. Participation on the PAT does not imply agreement with the Plan or specific elements of the Plan. The DNR will establish a new advisory team for implementation of the Plan with a formal charter to match the needs of the GWMA going forward.

Twelve PAT meetings were held from February 2014 through June 2015. Following development of the draft Plan with input from the PAT, DNR sought wider stakeholder review and comment.

At the end of the five year initial implementation period, the DNR will conduct a comprehensive review of the process, actions and results for the GWMA Plan, determine future actions, and if needed, revise the Plan. The new GWMA Advisory Group will be an important part of the comprehensive review.

Table 1.1 Project Advisory Team (PAT)

Last Name	First Name	Affiliation	Water Appropriation Permit Holder (Y/N)
Becker	Todd	Becker Farms	Yes
Becker	Troy	Property Owner - Ag. Irrigator	Yes
Bishop	Alex	Agricultural Irrigator	Yes
Burlingame	Scott	City of Park Rapids	Yes
Christofferson	Dean	City of Park Rapids	Yes
Collins	David	Hubbard Regional EDC	No
Crocker	Tim	MN DNR	No
David	Nick	R.D. Offutt Company	Yes
Dotta	Matt	Hubbard County	No
Elsner	Kelly	Elsner Well Drilling, Inc.	No
Finnerty	Bonnie	MN PCA	No
Flynn	Brian	ConAgra (Lamb Weston)	Yes
Kingsley	Julie	Hubbard SWCD	No
Kluthe	Beth	MN Department of Health	No
Marcussen	Morgan	Park Rapids School District	Yes
Maves	Gene	Agricultural Irrigator	Yes
Monico	Larry	Property Owner	Yes
Parson	Charlie	Trout Unlimited, Bemidji Headquarters	No
Pike	Nate	Agricultural Irrigator	Yes
Stuewe	Luke	MN Department of Agriculture	No
Traut	Steve	Traut Wells, Inc.	No
DNR Staff Support to the Project Advisory Team			
Walker	Michele	MN DNR	No
Miersch	Janell	MN DNR	No
Kingsley	Doug	MN DNR	No
Hoverson	Darrin	MN DNR	No

Plan Structure

The remainder of the Plan is divided into five additional sections.

SECTION 2 - DESCRIPTION OF THE BOUNDARY AND THE GWMA summarizes background information on groundwater connected natural resources, water use, and governance that were used to select the GWMA boundaries. The information also sets the stage for identifying groundwater management challenges in the area.

SECTION 3 - THE GOAL AND OBJECTIVES states the Plan goal and describes five objectives that the DNR will pursue to achieve the overall goal of long term, sustainable groundwater use in the GWMA. Together, the five objectives describe sustainable groundwater appropriation and use based on directives given in Minnesota Statutes.

SECTION 4 – STATUS OF THE GWMA IN TERMS OF THE OBJECTIVES provides additional information about conditions within the GWMA that relate specifically to the five objectives. This information includes a summary of current understanding of the status of each objective within the GWMA, discussion of gaps in knowledge or activities, and recommendations for how to fill those gaps.

SECTION 5 – DNR ACTIONS states the actions that DNR will take over the next five years toward achieving the five objectives. These actions address the highest priority needs identified from the evaluations described in Section 4.

SECTION 6 – IMPLEMENTATION SCHEDULE provides a time frame for implementing the actions.

SECTION 7 - GLOSSARY of terms used in the Plan.

SECTION 8 - REFERENCES

APPENDIX – APPENDICES A-D provide agency statements and additional information.

2. Description of the Boundary and the GWMA

The boundary for the Straight River GWMA includes parts of southern Clearwater, northeast Becker, southwest Hubbard and northwest Wadena counties. Cities within the boundary include Park Rapids, Osage and Ponsford (Figure 2-1).

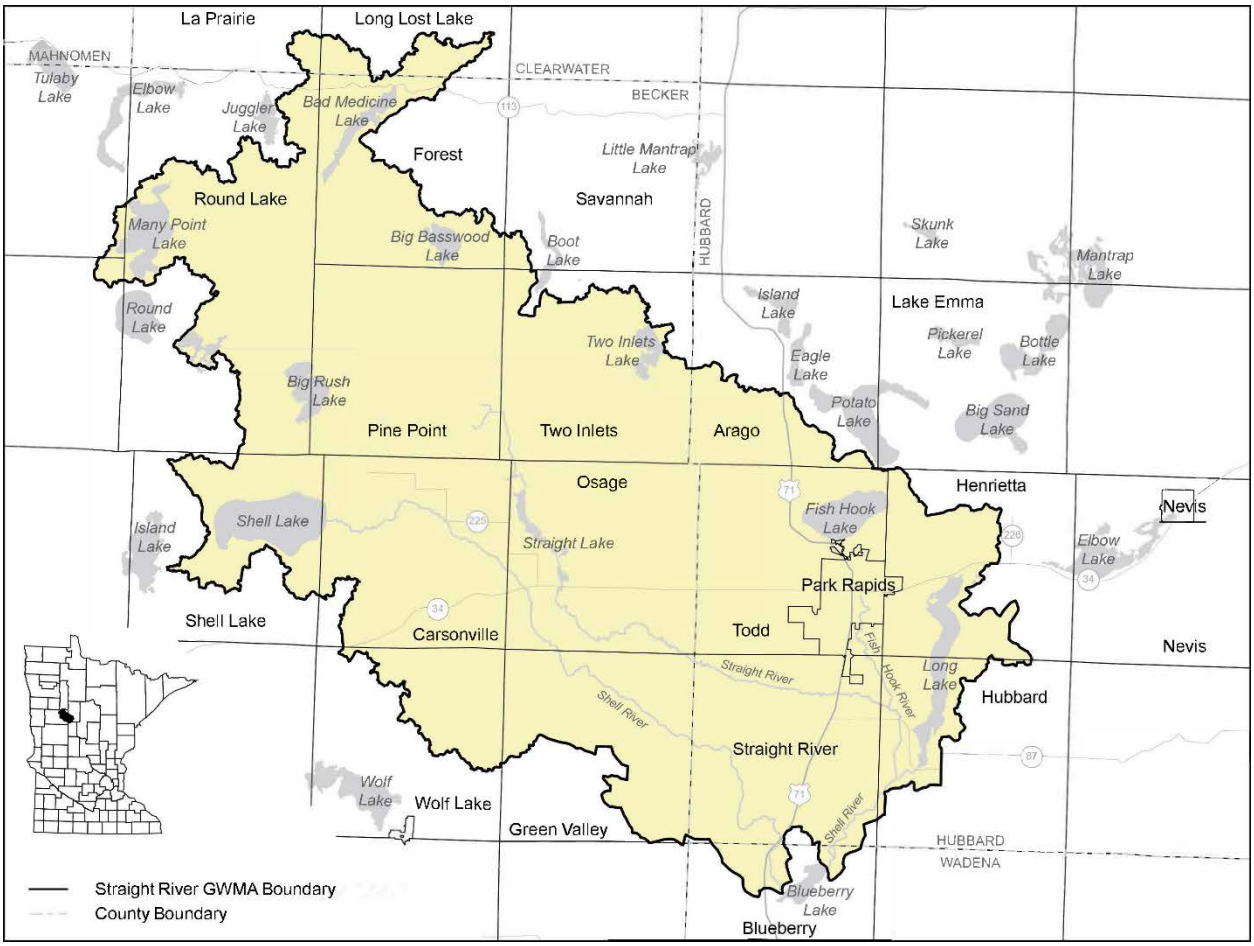

Figure 2-1 Boundary of the Straight River GWMA

Watershed Boundaries

The Straight River GWMA is contained primarily within one major watershed: the Crow Wing River. The area also includes a small part of the Ottertail watershed, specifically the Many Point Lake and Round Lake sub-watersheds. The boundary for the Straight River GWMA includes approximately 236,142 acres, or 369 square miles. As of December 30, 2014, the total acreage under irrigation permits within the boundary was 25,535 acres (Figure 2-2).

Rain, snow and other precipitation are the major sources of water that replenish lakes, rivers and groundwater in the Straight River GWMA. Water can leave the area by way of streams, groundwater flow, and evapotranspiration.

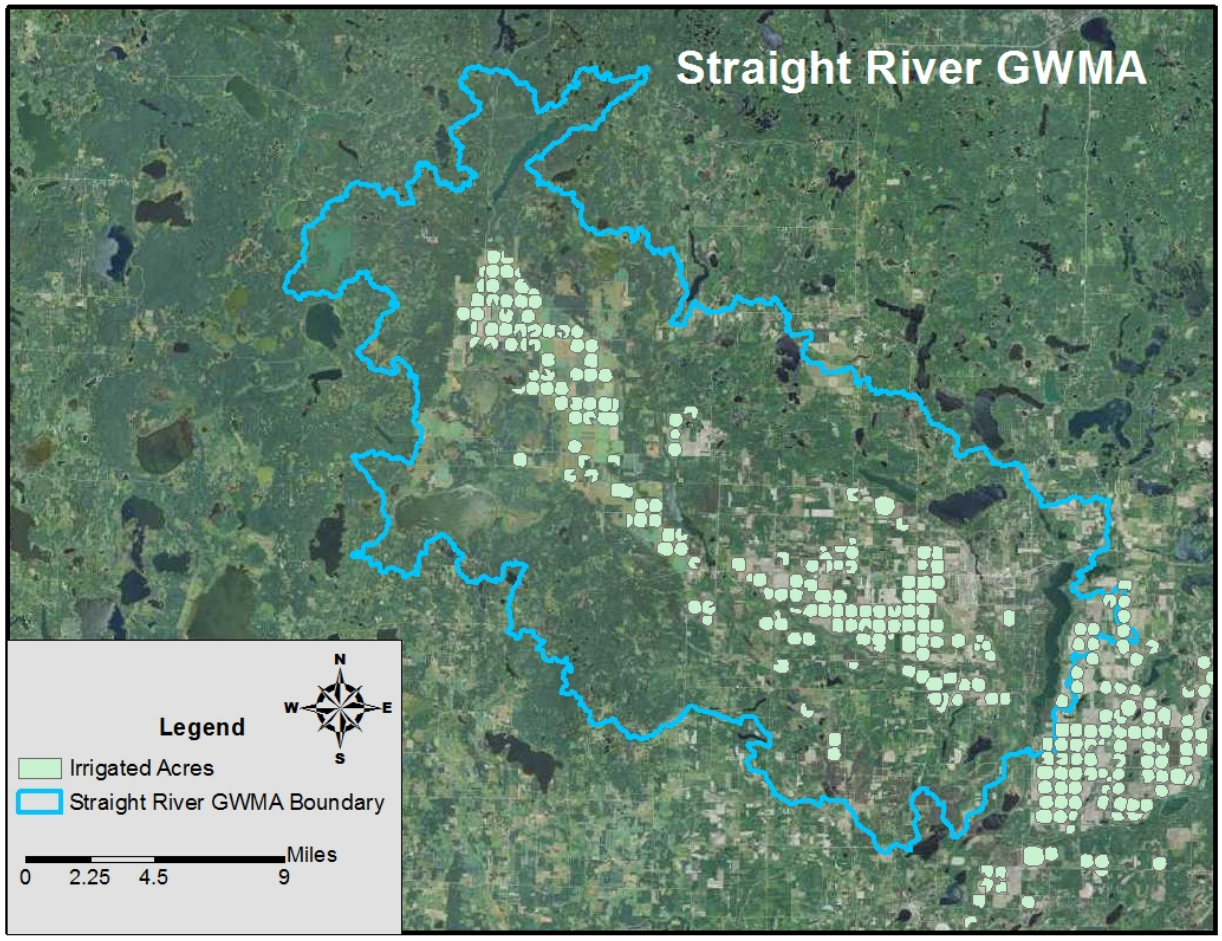

Figure 2-2 2014 Irrigated acreage in the Straight River GWMA

Hydrogeology, Soils and Topography

Hydrogeology defines the natural conditions and boundaries of the groundwater system. Groundwater moves through the geologic system both laterally (side to side) and vertically (up and down).

In three dimensions, the geologic formations found in the Straight River GWMA form a complex groundwater system that is interrelated with the surface water in the area. The surface water resources in this area are streams, lakes, and wetlands. The primary stream is the Straight River, a designated trout stream. Analyses by Stark et al (1994), Helgesen (1977), LaBaugh et al (1981), Siegel (1980) and Walker et al (2009) have shown that groundwater and surface water in this area is interconnected and heavily dependent on recharge from precipitation.

The landscape in the boundary area is generally flat or gently rolling terrain. The area was formed during the last glaciation event and consists of outwash (sands and gravels) and glacial till (sand, clays and silts). This area is part of a region referred to as the Pineland Sands (Figure 2-3). The soils in this region are primarily sandy loams and loams that are coarse textured and rapidly permeable (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx USDA, 2000).

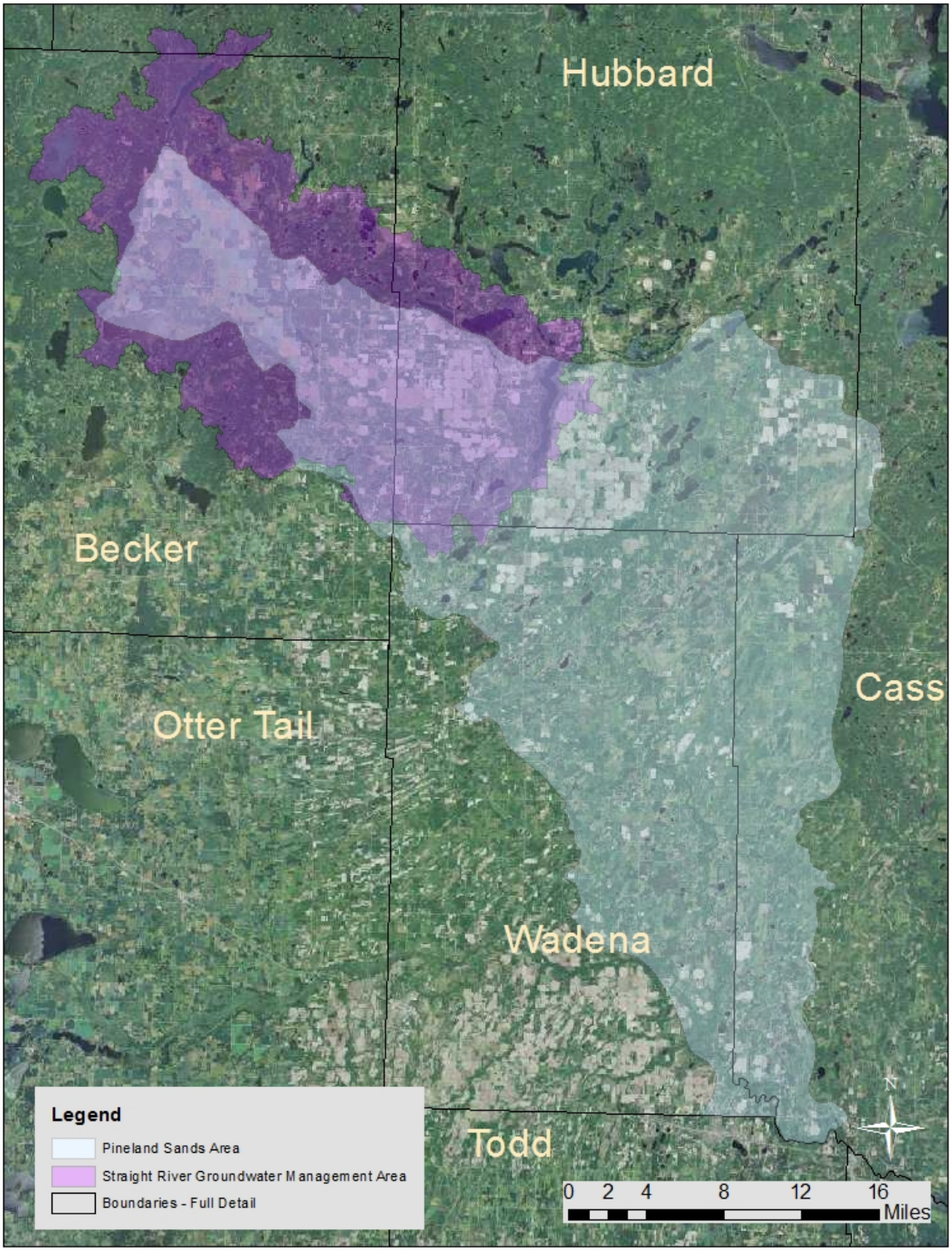

Figure 2-3 Straight River GWMA within context of the Pineland Sands

Two main aquifer types are found in the Straight River GWMA: water table aquifers (Quaternary Water Table Aquifers, or QWTA), which are the uppermost aquifers; and buried aquifers (Quaternary Buried drift Artesian Aquifers, or QBAA), which are found at various depths below the water table aquifer. The QWTA is a laterally extensive unconfined aquifer and is part of the Pinelands Sands aquifer (Helgesen, 1977) that extends through Becker, Cass, Hubbard, and Wadena counties. This outwash formation was deposited by flowing water during the melting of ice at the end of the most recent glacial event approximately 10,000 to 12,000 years ago.

Groundwater from both the QWTA and QBAA aquifers is the source of groundwater supply in the Straight River area. The water table aquifer and deeper buried drift aquifers occur in the Straight River GWMA and share a hydraulic relationship. This relationship has been understood through various scientific studies that include analysis of climate, aquifer testing and long term water level measurement collected from observation wells. A County Geologic Atlas does not yet exist for this area but is in process. When complete, the atlas should provide more information on the connectivity of these aquifers.

Water Use

Agricultural irrigation is the dominant water use within the Straight River GWMA (Figure 2-4). The 2013 permitted water use indicated substantial growth (85%) in water demands in the last 25 years, with most of the growth coming from agricultural irrigation. The statewide increase in water demands over this same period was 35%.

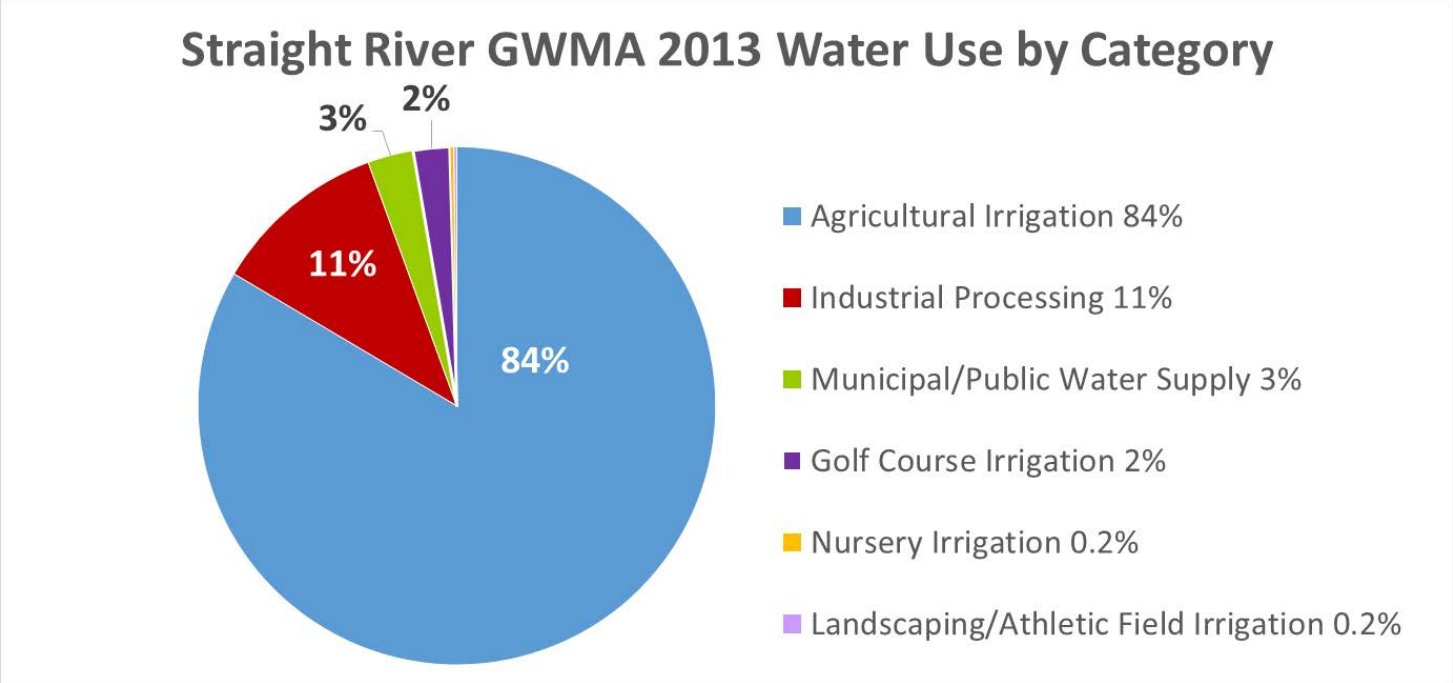

Figure 2-4 - Water use in the Straight River GWMA in 2013 by category

Groundwater appropriations and use

There were 214 active permits to appropriate groundwater in the Straight River GWMA at the beginning of 2014. As of December 2014, there were 252 active water appropriation permits (an 18% increase). There were also 75 inactive groundwater appropriation permits on file at the end of 2014. The DNR uses the Minnesota Permit and Reporting System (MPARS) to keep track of groundwater permit information.

The total number of domestic wells that have been installed in the Straight River GWMA is 2,357. Information on domestic wells is maintained by the Minnesota Department of Health and county governments, not the DNR.

Reported groundwater use for agricultural irrigation in the Straight River GWMA was 5.288 billion gallons in 2013 (Figure 2-5). Not all active permits are pumping or using water, so Figure 2-5 displays only those "permits with use".

Of the reported agricultural groundwater use in 2013, 84% was used for major crop irrigation. Agricultural irrigation has increased water use by an average of 77 million gallons of water per year since 1988.

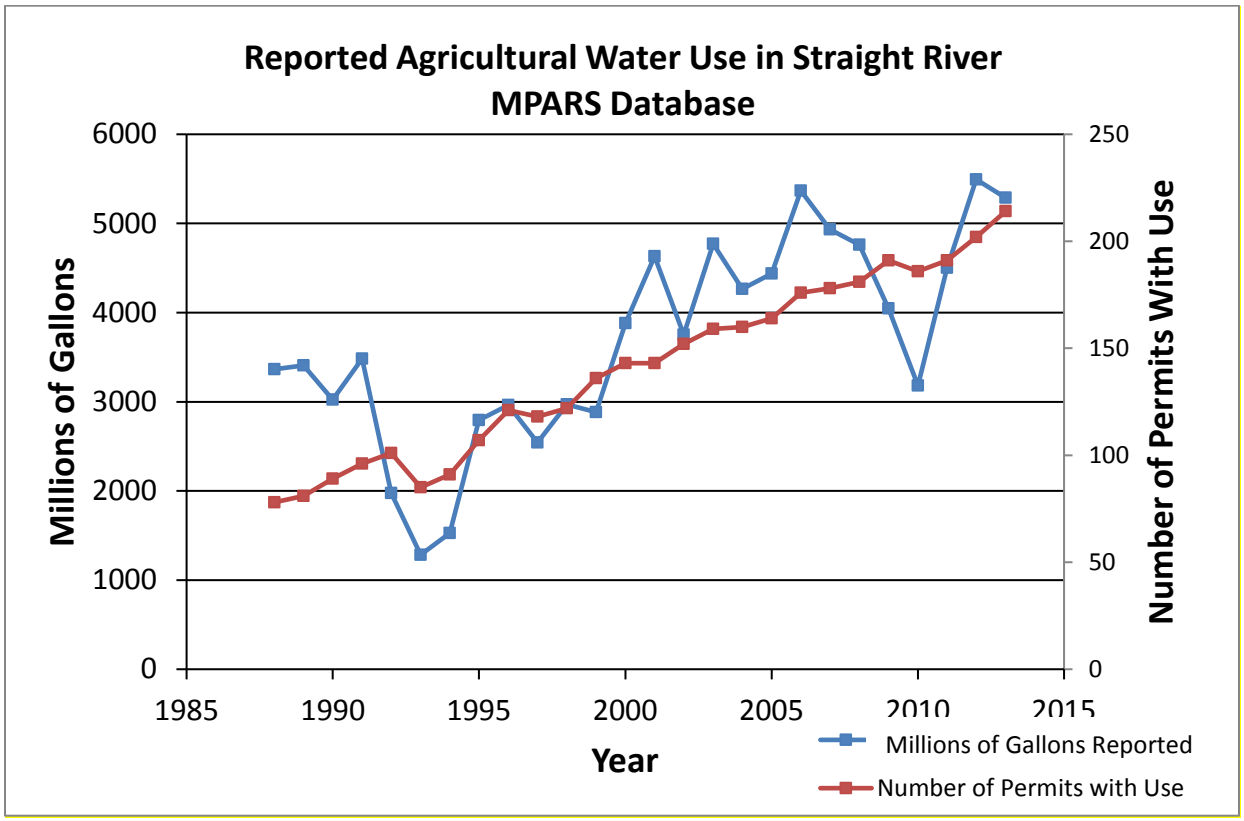

Figure 2-5 Agricultural groundwater use (1998 to 2013)

Groundwater use can change the amount of groundwater flowing toward and discharging into surface water features. The ecology of surface water features such as trout streams, calcareous fens, other wetlands, and springs can be sensitive to groundwater flow variations. Permit holders in the GWMA have helped develop important information to understand groundwater pumping impacts on surface water features through aquifer testing and water monitoring.

Water appropriation permits are designed to ensure that permitted volumes are reasonable, for a beneficial use, incorporate water conservation principles and help protect water quality. The DNR may require specific conservation practices as explicit conditions on some water appropriation permits. For example, some permits for golf course irrigation include conservation requirements.

Municipal Water Supply

Public water supply systems serving more than 1,000 people must have a water supply plan that is approved by DNR (Minn. Stat., 103G.291). In the Straight River GWMA, the City of Park Rapids is the

only city required to have such a plan. Water supply plans must address projected demands, adequacy of the water supply system and planned improvements, existing and future water sources, natural resource impacts or limitations, emergency preparedness, water conservation, supply and demand reduction measures, and allocation priorities that are consistent with MN Statutes section 103G.261. Public water suppliers must update their plan and, upon notification, submit it to the commissioner for approval every ten years.

Water supply planning provides an opportunity for DNR to engage with public water suppliers on conservation issues. Public water suppliers set goals for residential per capita demand, maximum- to average-day demand, and unaccounted for water in these plans. These goals may be updated when suppliers renew their plans. Water supply plans may include other conservation measures such as ordinances that set odd/even sprinkling restrictions to reduce peak demand.

Water Dependent Natural Resources

The GWMA boundary was defined in part based on natural resource considerations, particularly the surface water features that are most influenced by changes in groundwater levels. The boundary includes unique ecological features that are directly connected to the hydrogeology of the GWMA. Understanding and managing groundwater appropriations will have a direct impact on the health of these natural resources. The following features exist within the Straight River GWMA:

- Three designated trout streams (the Straight River, Upper Straight Creek, Straight Lake Creek)
- Other streams that are sustained by lesser groundwater contributions
- Lakes that may be influenced by changing aquifer levels
- Wetland complexes across the entire area
- 19 types of groundwater-associated native plant communities
- 14 State-listed rare plant and animal species associated with groundwater
- Numerous additional plant and animal species that inhabit streams, lakes, and wetlands associated with groundwater

Trout Streams

The Department of Natural Resources has authority to designate trout streams, which provides increased protection from alterations and appropriations. In addition, the Minnesota Pollution Control Agency (MPCA) maintains higher water quality standards for cold water streams to protect these sensitive systems.

Three designated trout streams are found within the GWMA boundary: the Straight River, Upper Straight Creek and Straight Lake Creek. Upper Straight Creek and Straight Lake Creek are north of Straight Lake and are considered the headwaters of the Straight River.

The flows in the Straight River and its headwaters are strongly influenced by groundwater contributions, and the health of this stream is dependent upon a steady supply of groundwater. These streams provide habitat for a unique community of animals, including invertebrate groups such as midges, caddis flies, stoneflies, and mayflies, several mussel species, and several fish species including trout. Changes in groundwater flow to these trout streams due to pumping are an important consideration in determining whether use is remaining sustainable.

Streams, Lakes and Wetlands

The Straight River Ground Water Management Area is rich in surface water features – streams, lakes and wetlands (Figure 2-6). Water levels and/or chemistries of many of the lakes, streams and wetlands are strongly influenced by groundwater or have at least some hydraulic connection to the regional

groundwater system. Many lakes, streams and wetlands, therefore, may be affected by changes in groundwater elevations.

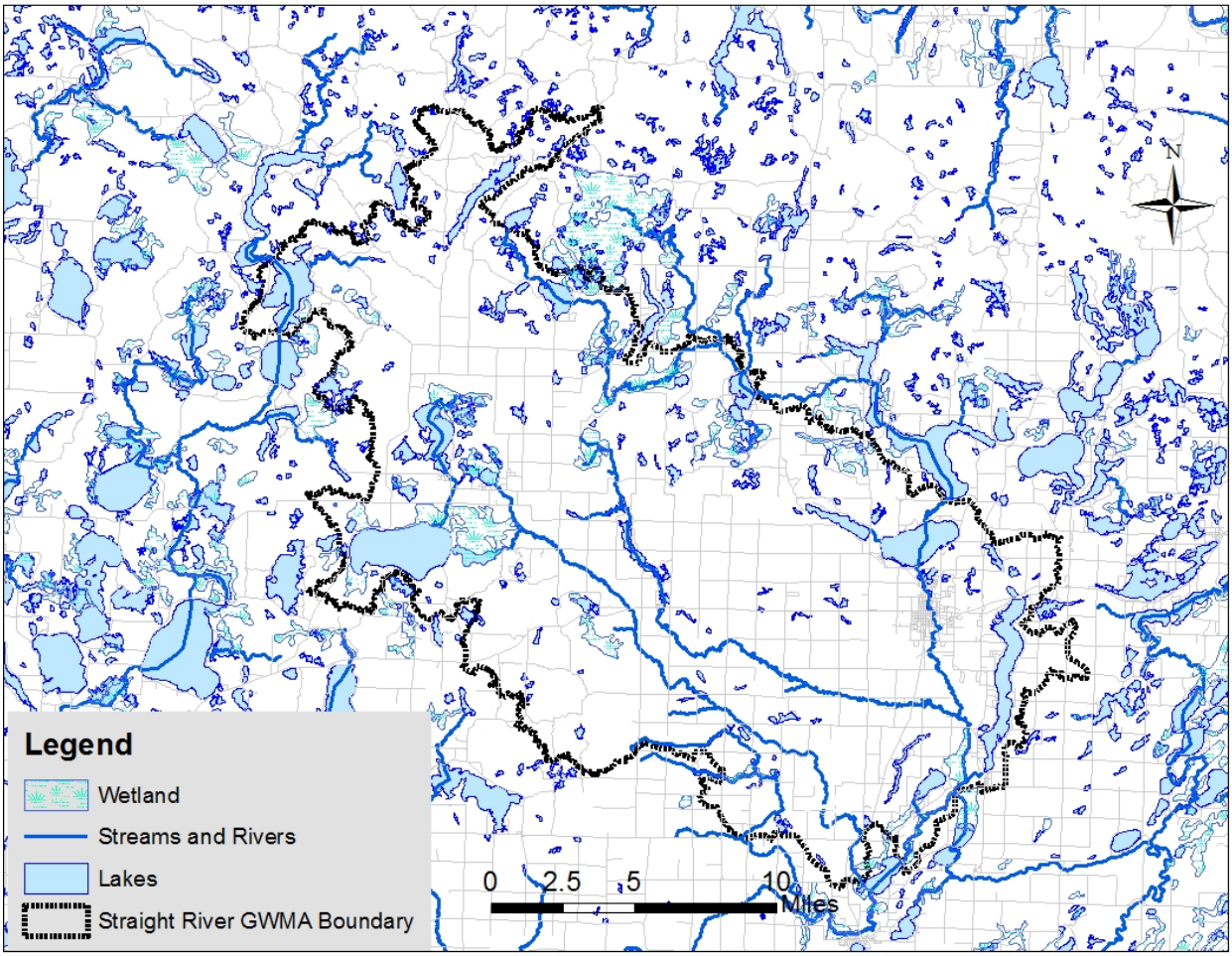

Figure 2-6 Surface water features within and around the Straight River GWMA

There are an estimated 28 public watercourses (streams) and 172 public water basins (lakes and wetlands) within the GWMA**.** All public waters are subject to regulation under MN Statute 103G. Many public water basins and wetlands are small and very shallow and are strongly influenced by fluctuations in groundwater levels.

The presence of cold water fish species like brook and brown trout and cold/cool water dependent aquatic insect species in some of the other streams in the GWMA (not designated as trout streams) indicates the contribution of groundwater to their flow. The presence of several sensitive fish species and species of aquatic insects in many streams in the area indicate good to excellent water quality. A few stream reaches in the GWMA have aquatic insect assemblages lacking cold water taxa and a diversity of functional feeding groups due to a lack of coarse substrate or poorer stream morphological characteristics. Biological impairments in a few stream reaches, particularly in the upper Shell River sub-watershed, may be due to natural factors like wetlands or beaver impoundments, but are more likely due to dams, poor road crossing structures, land use changes, or other anthropogenic causes. Over time and space, many factors may limit a biological population. Often habitat quantity and quality are found to limit populations, and hydrologic conditions are considered the primary determinant of habitat conditions in streams.

Lakes in the GWMA are varied. Large, deep lakes like Bad Medicine, Many Point, Straight, Long and Fish Hook are oligotrophic or mesotrophic, have good to excellent water quality, and support cold water fish species like trout or tullibee (cisco). Shallower, sometimes smaller basins like Shell, Big Rush, Portage, or Moran are often mesotrophic to eutrophic and may experience periodic winter fish kills. Despite that, all the larger lakes in the GWMA support good to excellent populations of game fish and are heavily used for angling, other recreation, and are often heavily developed with lake homes or seasonal cabins.

The smaller, shallower lakes and wetlands are difficult environments for native game fish to overwinter and sustain their populations. In some basins, particularly deeper ones or those with flowage connections to rivers and tributaries, populations of fish species like northern pike, bullheads, or other non-game fish or minnow species may be supported. These basins are important for catching runoff, filtering nutrients and groundwater recharge, and can provide excellent wildlife habitat.

Rare Natural Features of the Straight River Watershed

Rare natural features contribute to the health of the habitat and environment that surrounds us. Some even contribute directly to local economies in the form of outdoor recreation, such as wildlife viewing, camping, hunting and fishing. Rare features can include species of unique plants and animals, as well as native plant communities.

There are many rare and uncommon plants, animals and plant communities in the Straight River Watershed (Figure 2-7). The majority of the rare vegetative features are concentrated in two distinct areas. One surrounds Big Rush Lake in Becker County and the other one is along the headwaters of the Straight River in Becker County.

The communities associated with groundwater and seepages are dominated by large forested rich peatland complexes, consisting of four different plant communities. One of these, the white cedar swamp, is vulnerable to extirpation while the other three are considered fairly secure. There are five different open peatlands, one imperiled, one vulnerable to extirpation, and the rest considered fairly secure. There are two wet forest communities, one vulnerable to extirpation while the other is considered relatively secure. There are two wet meadow communities, both considered secure. Additionally, there is a wet-mesic to mesic northern hardwood forest that is vulnerable to extirpation.

Straight River Headwaters Area

Intermixed through the area surrounding the headwaters of the Straight River are the majority of state-listed rare orchid flora and other special concern plants and animals. Included in this group are the bog adder's mouth orchid (an endangered plant), the white adder's mouth (a special concern species), and the limestone oak fern (a state special concern species). All three of these are threatened by changes in the hydrologic regime of their habitat and damage to the soil and tree cover. Also found here are a variety of birds, including the Virginia rail, the swamp sparrow, the trumpeter swan and the common loon, all of which are special concern species or species of greatest conservation need threatened by habitat degradation and loss.

The majority of state forest land in this area is designated as a high conservation value forest, named Straight River Headwaters (aka Belden Swamp). The site is described as a large forested, rich peatland complex that contains the headwaters of the Straight River, with a diverse and rare orchid flora. There is subsurface water movement beneath the swamp conifers, and the site is home to one of the two cedar swamp sites in the county that are identified as candidate old growth sites. Upland areas contain significant acreage of two native plant communities designated as critically imperiled to vulnerable.

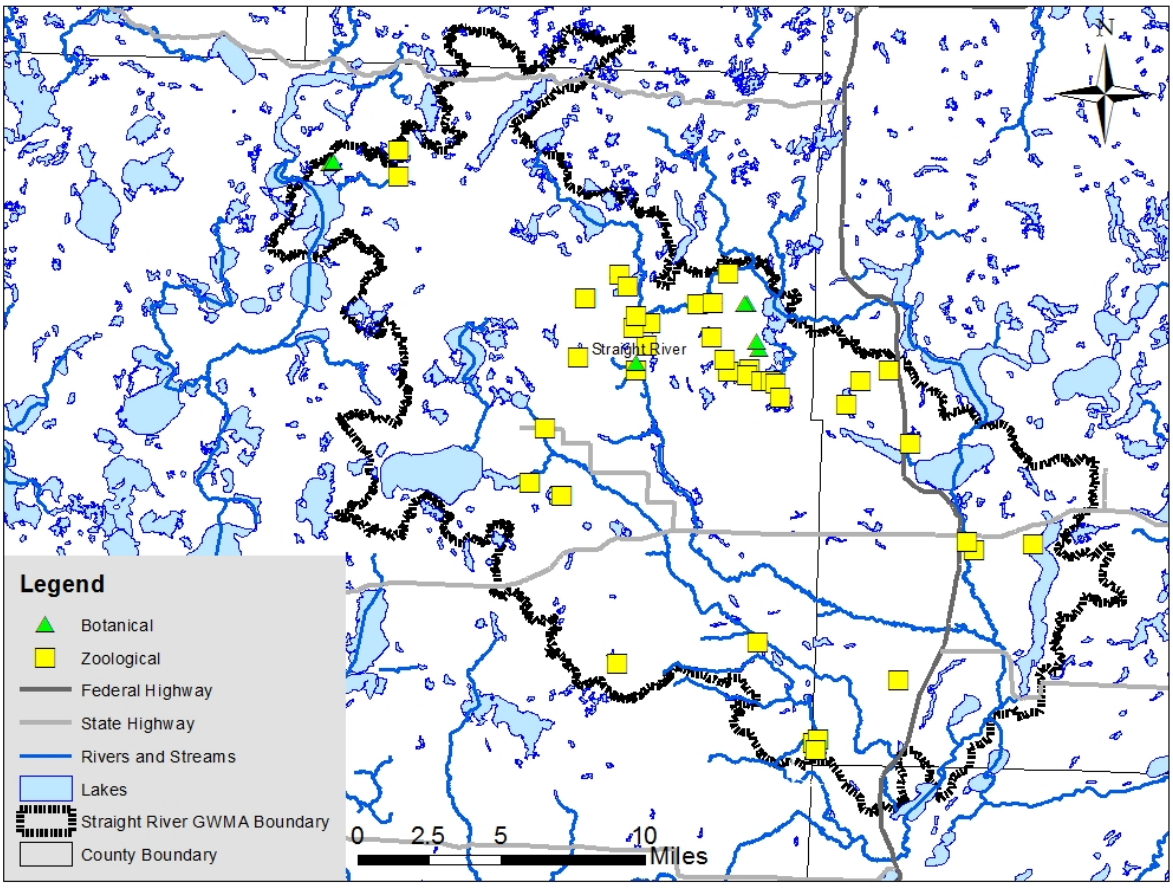

Figure 2-7 Straight River rare and natural features associated with groundwater

Fish Hook River

Along the Fish Hook and Straight Rivers in Hubbard County, there is another fairly large assemblage of rare species. These include the creek heelsplitter and black sandshell (both special concern mussels threatened by degradation of the stream habitat), the least darter (a special concern fish threatened by habitat loss and stream degradation), and a variety of birds, including the trumpeter swan, threatened by habitat degradation and loss.

Groundwater Associated Native Plant Communities of the Straight River Watershed

All of the following rare or vulnerable communities are directly dependent upon the water table for their health and stability. Thus they are highly susceptible to any disturbance to the groundwater system. As Figure 2-7 shows, they are all mapped associated with groundwater and seep areas. Associated with these areas are many additional examples of communities that were too small to have been mapped by the Minnesota Biological Survey.

The Spring Fen: this community is typically found in the vast peat bogs to the north, and is extremely rare this far south. It is only found where highly calcium-rich groundwater is discharged from underlying calcareous mineral soil and is forced up through artesian pressure. These communities are characterized by high pH (>7.0), high Ca++ concentrations, cold water temperatures, low dissolved oxygen content and high water levels. This combination of hydrologic conditions favors the development of specialized and

unique plants and plant communities and is very rare. This community is typically dominated by fine-leaved sedges and rushes with little or no shrub or tree cover.

Graminoid Rich Fen: this community is typically found in the vast peat bogs to the north, and is extremely rare this far south. It is only found in peatlands where there is significant lateral subsurface water flow. This lateral flowing groundwater is mineral-rich resulting in a surface water chemistry that is nutrient poor but with sufficient mineral concentration to maintain a pH >5.5. This mineral-rich groundwater typically emanates from areas of calcareous glacial till and flows beneath dense clayey sediments, until it reaches lenses of sand or coarse-textured material and percolates to the surface. This community is typically dominated by fine-leaved grasses and sedges with scattered, stunted, thick-leaved, shrubs.

White Cedar Forest: this community is typically found north and east of this region and is quite uncommon here. It is found where saturated soils are present throughout most of the growing season, typically in small closed depressions, along the borders of large wetlands, on gently sloping drains or at the toes of slopes in areas of groundwater discharge. This community is typically dominated by white cedar, with the understory relatively open.

Aspen-Birch-Fir Forest: this community is typically found north and east of this region and is generally not found this far south and west. It is found on the concave lower portion of slopes with a fine-textured calcareous till and locally high water table. The clayey soil tends to perch snow and rainwater creating a moist to very moist soil. The community is typically dominated by mesic to wet-mesic hardwood and hardwood-conifer forests, such as quaking aspen, balsam fir and paper birch.

White Cedar Swamp: this community is typically found NE of this area. It is found on wet peat in small basins associated with stream channels or near lakes. It grows where there is access to mineral-rich subsurface water flow. It has a varied micro-topography which contributes to structural complexity and relatively high species diversity. This community is typically dominated by white cedar.

No calcareous fens have been identified to date in the Straight River GWMA.

Table 2.1 Native plant communities closely associated with groundwater in the Straight River GWMA

Native Plant Community Code	NPC Name	Conservation Status Rank *	*Closely* Associated with groundwater/ seepage	*Often* Associated with groundwater/ seepage
FPn63b	White Cedar Swamp (N Central)	S3	X - not seepage	X
FPn73a	Alder - (Maple - loosestrife) Swamp	S5	X - not seepage	X
FPn82	White Cedar Swamp (N Central) Western Basin)		X - not seepage	
FPn82a	Rich Tamarack - (Alder) Swamp	S5	X - not seepage	
FPn82b	Extremely Rich Tamarack Swamp	S4	X - not seepage	
MHn44d	Aspen - Birch - Fir Forest	S3		X
OPn81a	Bog Birch - Alder Shore Fen	S5	X - seepage	
OPn92	Northern Rich Fen (Basin)		X - seepage	
OPn92a	Graminoid Rich Fen (Basin)	S4	X - seepage	
OPn92b	Graminoid - Sphagnum Rich Fen (Basin)	S4	X - seepage	
OPn93a	Spring Fen	S2	X - seepage	
WFn53b	Lowland White Cedar Forest (Northern)	S3	X - seepage	
WFn55	Northern Wet Ash Swamp		X - seepage	
WFn55c	Black Ash - Mountain Maple Swamp (Northern)	S4	X - seepage	
WFn64c	Northern Black Ash - Alder Swamp	S4	X - not seepage	
WMn82	Northern Wet Meadow/Carr			X
WMn82a	Willow - Dogwood Shrub Swamp	S5		X
WMn82b	Sedge Meadow	S4 S5		X

*S2 = State Imperiled; S3 = State Vulnerable to Extirpation; S4 = State Apparently Secure, Uncommon but Not Rare; S5 = State Secure, Common, Widespread, and Abundant

Table 2.2 Rare species closely associated with groundwater in the Straight River GWMA

Rare Plants				
Scientific name	**Common Name**	**State Ranking***	**General Habitat Type**	**Associated with Water**
Astragalus neglectus	Cooper's Milk-vetch	Watchlist	Woodland-prairie ecotone	
Carex hookerana	Hooker Sedge	SPC	Fire-dependent Forest	
Carex obtusata	Blunt Sedge	SPC	Upland Prairie; Savanna	
Cirsium pumilum var. hillii	Hill's Thistle	SPC	Upland Prairie; Savanna	
Cypripedium arietinum	Ram's-head Lady's-slipper	THR	Fire-dependent Forest and Forested Rich Peatland	X
Gymnocarpium robertianum	Limestone Oak Fern	SPC	Forested Rich Peatland	X
Malaxis monophyllos var. brachypoda	White Adder's-mouth	SPC	Forested Rich Peatland	X
Malaxis paludosa	Bog Adder's-mouth	END	Forested Rich Peatland	X
Najas gracillima	Thread-like Naiad	SPC	Aquatic- Lake	X
Scirpus pedicellatus	Woolgrass	Watchlist	Meadows, swamp openings	X
Sparganium glomeratum	Clustered Bur-reed	Watchlist	Marsh, Forested peatlands	X
Stuckenia vaginata	Sheathed Pondweed	END	Aquatic- Lake	X

Rare Animals				
Scientific name	**Common Name**	**State Ranking***	**General Habitat Type**	**Associated with Water**
Botaurus lentiginosus	American Bittern	Watchlist	Marsh; Lake Littoral Zone	X
Buteo lineatus	Red-shouldered Hawk	SPC	Mature deciduous forest	
Cygnus buccinator	Trumpeter Swan	SPC	Marsh; Lake Littoral Zone	X
Etheostoma microperca	Least Darter	SPC	Small Rivers/Streams; Lake Littoral Zone	X
Haliaeetus leucocephalus	Bald Eagle	Watchlist	Forested to wet areas; throughout	X
Lasmigona compressa	Creek Heelsplitter	SPC	Small Rivers/Streams	X
Ligumia recta	Black Sandshell	SPC	Medium/Large Rivers/Streams	X

* END = Endangered; THR = Threatened; SPC = Special Concern; Watchlist = Watchlist

Water Quality

Water quality affects the availability and cost of groundwater in the GWMA. Contaminated groundwater may not be available for use by individuals, industry or cities unless it undergoes treatment. Consumers may have to use deeper aquifers or rely on surface water sources. Contaminated groundwater also presents a risk to the connected ecosystems (lakes, streams and wetlands), impacting the species that live there and the people who use these water bodies to live, work, and recreate.

Minnesota Statute 103G.287 directs the DNR to consider the effects of water quality in water appropriations. Management activities in the Straight River GWMA will require continued coordination between the existing state agencies that are responsible for groundwater and surface water quality, including: Minnesota Department of Agriculture (MDA), the Minnesota Department of Health (MDH), the Minnesota Pollution Control Agency (MPCA), Board of Water and Soil Resources (BWSR) and the DNR.

Jurisdictions, Governance and Planning

Cities, counties, watershed districts and other local units of government play a critical role in planning and managing for long term water supply and water sustainability. Implementing practices to improve water quality and quantity relies heavily on local plans such as comprehensive local water management plans, watershed district plans, county comprehensive plans and city comprehensive plans. These plans are authorized by Minnesota Statute.

The Straight River GWMA encompasses parts of:

- 4 counties
- 15 townships
- 3 cities
- 2 Minnesota House of Representative Districts
- 1 Minnesota Senate Districts, and
- 3 Soil and Water Conservation Districts (Hubbard, Becker and a small part of Wadena Counties).

Local water governance in the Straight River GWMA is guided by the City of Park Rapids and the counties where the majority of the GWMA lays, i.e., Hubbard, Becker and Wadena Counties.

Comprehensive local water management is guided by local water management plans whose adoption and implementation are based on local priorities. As a general-purpose unit of government, counties, with their planning and land-use authorities, are uniquely positioned to link many land-use decisions with local goals for surface and groundwater protection and management. BWSR has oversight responsibilities to ensure that local water plans are prepared and coordinated with existing local and state efforts and that plans are implemented effectively. All parts of Minnesota have locally adopted and state-approved plans in place.

State of Minnesota jurisdiction for the Straight River GWMA is guided, in part, by Minnesota Statutes, section 103G.287, which states, “The commissioner may designate groundwater management areas and limit total annual water appropriations and uses within a designated area to ensure sustainable use of groundwater that protects ecosystems, water quality, and the ability of future generations to meet their own needs. Water appropriations and uses within a designated management area must be consistent with a plan approved by the commissioner that addresses water conservation requirements and water allocation priorities established in section 103G.261.”

3. The Goal and Objectives

Section 3 of the plan describes the goal and objectives for groundwater management, including supporting statutes and rules. The goal for the GWMA expresses a future desired condition for the area. The goal for the GWMA is:

> *In the Straight River Groundwater Management Area, the use of groundwater will be sustainable and therefore will not harm ecosystems, water quality, or the ability of present and future generations to meet their needs.*

The goal is drawn directly from the Minnesota Statutes for groundwater appropriations, Minn. Stat. sec. 103G.287, subd. 3, 4 and 5. These statutes describe protection of groundwater supplies, designation of groundwater management areas, and a standard of sustainability.

Groundwater use is defined as sustainable if that use:

- Does not harm aquifers and ecosystems
- Does not negatively impact surface waters
- Is reasonable, efficient and meets water conservation requirements
- Does not degrade water quality
- Does not create unresolved well interferences or water use conflicts

To attain the goal for the GWMA, this Plan sets five management objectives that define how these statutory requirements can be met. All of the management objectives must be achieved to ensure that use of groundwater is sustainable.

These objectives are:

I. *Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.*
II. *Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.*
III. *Groundwater use in the GWMA does not degrade water quality.*
IV. *Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.*
V. *All groundwater users in the GWMA have the necessary permits to use groundwater.*

The remainder of Section 3 describes each of the objectives in more detail.

Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.

Groundwater and surface waters together make up a connected hydrologic system that is affected by climate, geology and soils, land use and land cover, water use, and water quality changes. Therefore, impacts to aquifers, ecosystems, and surface waters resulting from water appropriations are related under this objective.

Aquifer Sustainability

The first part of this objective deals with preventing harm to aquifers. The purpose is to ensure that groundwater continues to be available for use in the future while protecting ecosystems and surface waters (described below). Groundwater use always reduces aquifer storage unless there is an equivalent increase in recharge through surface-water infiltration. Limits on appropriations can help ensure aquifer sustainability.

In Minnesota Rules, parts 6115.0630 and 6115.0670, the concept of *safe yield* is used as the measure of limits on allowable groundwater use. The concept looks at the impact that water withdrawals from an aquifer have on aquifer water quality levels, and pressure (sometimes referred to as 'heads'). It does not address potential impacts to other resources such as surface waters. Safe yield is defined separately for water-table aquifers and for artesian (confined) aquifers (see Section 7 for glossary of terms).

For confined aquifers, a water elevation level in an observation well (obwell) may be set as a threshold for aquifer protection that ensures compliance with safe yield (Figure 3-1). To protect the aquifer from being drawn down too far, 25 percent of the 'available' head (water height above the top of the aquifer, before pumping) must remain in an observation well. A warning threshold of 50 percent of the available head may be established to allow time for contingency plans to be put in effect if water levels decline.

For water-table aquifers, safe yield is a total use rate that does not exceed the long-term average recharge rate (Minn. Rules 6115.0630). In short, output (pumping) for the aquifer does not exceed input (recharge) over the long term. Again, this does not account for impacts to surface waters, which are addressed in the next section. Pumping from confined aquifers typically causes water from the water table aquifer to flow down into the confined aquifers. Therefore, safe yield should be determined based on both direct and indirect withdrawals from water-table aquifers.

Water levels that have stabilized to a pattern of variations above the threshold indicate compliance with safe yield. Understanding pumping history and measured water levels is important when evaluating compliance with safe yield.

Declining water levels that remain above the threshold are expected in some situations, even while use remains within the safe yield. This occurs if pumping rates gradually increase over time, the system has not come into equilibrium with recent pumping rates, or natural fluctuations create a temporary downward trend.

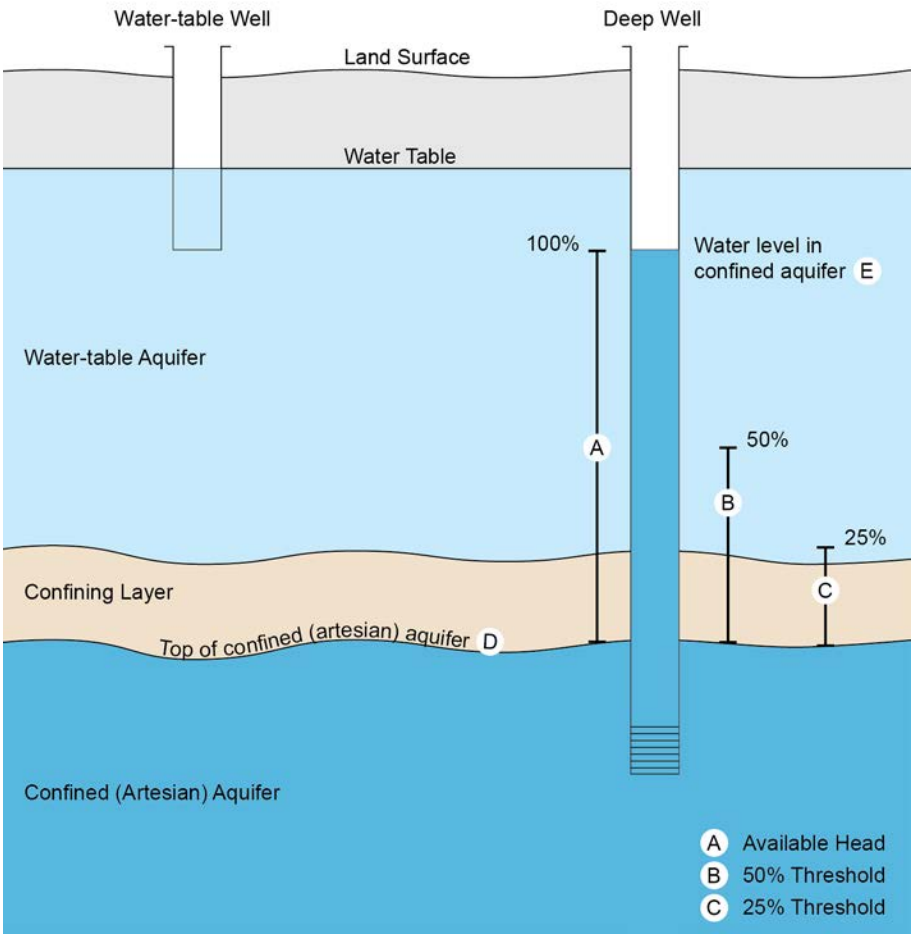

Figure 3-1 Safe yield thresholds

Schematic showing water-table and confined (artesian) aquifer conditions in relation to safe yield thresholds. The available head in the confined (artesian) aquifer is the distance (A) between the top of the confined aquifer (D) and the water level (E) in the deep well when not affected by pumping. The 50% threshold (B) is halfway between the top of the confined aquifer and the current water level in the deep well. The 25% threshold (C) is one-fourth of the way between the top of the confined aquifer and the current water level in deep well. Water levels in a confined aquifer must not stabilize below the 25% safe yield threshold.

Ecosystems and Surface Waters

The second part of Objective I deals with harm to ecosystems and negative impacts to surface waters when groundwater is overused. The groundwater system is part of the water cycle, eventually destined to discharge to surface waters such as rivers, lakes, wetlands, or springs. Taking groundwater from water table aquifers can divert water from streams, lakes, and wetlands. Overuse of groundwater can significantly alter surface water features and the biological communities, recreation, and other uses that those waters support.

Surface water appropriations are governed by Minn. Stat., sec. 103G.285. Groundwater appropriations are governed by Minn. Stat., sec. 103G.287. Groundwater appropriations may also be subject to additional limits based on their surface water impacts as follows (Minn. Stat, sec. 103G.287, subd. 2):

Groundwater appropriations that will have negative impacts to surface waters are subject to applicable provisions in section 103G.285.

Surface-water pumping (appropriation) has a direct and immediate effect on flow or water level in the surface water features from which the water is withdrawn. The same is not true for groundwater appropriations. Determining whether groundwater appropriations have negative impacts to surface waters is complex. Generally, the effect on connected surface water features is both delayed and spread out or 'flattened' in time and is typically distributed among multiple water features.

Several statutes frame the determination of negative impacts to surface waters:

1. Appropriations from lakes listed in Bulletin 25[1] are limited to a total annual volume of water amounting to 1/2 acre-foot per acre of water basin (6 inches over the surface area of the water body) (Minn. Stat., sec. 103G.285, subd. 3). Statute also calls for the setting of protective elevations that consider aquatic vegetation, fish and wildlife, recreation, existing uses, and slope of the littoral zone. Appropriations from small lakes (< 500 acres) must be discouraged because of their greater vulnerability (Minn. Stat., sec. 103G.261, item d).
2. Appropriations taken directly from surface water bodies are limited according to the requirements establishing and enforcing *protected flows* for streams and rivers or *protective elevations* for lakes and wetlands (Minn. Stat., sec. 103G.285). These are intended to accommodate the range of needs and uses of water bodies. For surface-water appropriations, consumptive appropriations may not be made from watercourses during periods of specified low flows (i.e. protected flows) or from lakes and wetlands when water levels are below the protective elevation (Minn. Stat., sec. 103G.285, subd. 2 and 3).
3. Minnesota Statutes protect trout streams from surface water appropriations (Minn. Stat., sec. 103G.285, subd. 5) because they are particularly dependent on steady flow, stable cold water temperatures, and sufficient oxygen levels. These conditions depend on a steady supply of groundwater from springs or diffuse seepage. The goal is to limit stream depletion due to groundwater pumping.
4. Public water wetlands may not be drained unless replaced (Minn. Stat., sec. 103G.221), and temporary drawdown is only allowed if certain conditions are met, including: improving navigation and recreational uses, improving fish or wildlife habitat, exposing sediments in order to remove nutrients or contaminants, to alleviating flooding of agricultural land or allowing mining of metals (Minn. Rules, part 6115.0270).
5. Public water wetlands may not be drained unless replaced (Minn. Stat., sec. 103G.221), and temporary drawdown is only allowed if certain conditions are met, including: improving navigation and recreational uses, improving fish or wildlife habitat, exposing sediments in order to remove nutrients or contaminants, to alleviating flooding of agricultural land or allowing mining of metals (Minn. Rules, part 6115.0270).

The 2015 Minnesota Legislature directed the DNR (Laws of Minnesota 2015, First Special Session, chapter 4, article 4, section 143), to take the following actions concerning sustainability thresholds: "the commissioner of natural resources shall consult with interested stakeholders and submit a report to the Legislative Water Commission and the chairs and ranking minority members of the house of representatives and senate committees and divisions with jurisdiction over the environment and natural

[1] DNR Staff, 1968. An Inventory of Minnesota Lakes. Division of Water, Soils and Minerals, Minnesota Conservation Department. Bulletin 25, 498 p.

resources policy and finance on recommendations for statutory or rule definitions and thresholds for negative impacts to surface waters as described in Minnesota Statutes, sections 103G.285 and 103G.287, subdivision 2. Stakeholders must include but are not limited to agricultural interests; environmental interests; businesses; community water suppliers; state, federal, and local agencies; universities; and other interested stakeholders.

In January 2016, the DNR submitted a report entitled: "Report to the Minnesota State Legislature: Definitions and Thresholds for Negative Impacts to Surface Waters." The DNR will use the approach described in this report to determine if negative impacts to streams, lakes, or wetlands are occurring due to groundwater appropriation within the GWMA. (The report is available on the DNR website. The executive summary of the report provides a succinct description of the approach, and it is included in this plan as Appendix D.)

Section 5 of the GWMA Plan provides a set of actions to meet Objective I.

Objective II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.

Water conservation is a key component of ensuring sustainability and an important objective within the GWMA. Efficient use increases the water available for current and future uses and can help reduce stress on the water resource. Explicit conditions may be placed on appropriation permits that require conservation practices appropriate to a specific use.

Conservation Requirements for Municipal Systems

Minnesota Statute, sec. 103G.291 requires public water suppliers serving more than 1,000 people to implement demand reduction measures by January 1, 2015. The City of Park Rapids is the only municipality within the GWMA that serves more than 1,000 people.

The measures must include a rate structure or outline a program that achieves demand reduction. Minnesota Statute, sec. 103G.291 also requires public water suppliers to adopt and enforce water-use restrictions when the governor declares a critical water deficiency. The restrictions must limit watering lawns, washing vehicles, irrigating golf courses and parks, and other nonessential uses.

Demand reduction measures reduce water use and must include a conservation rate structure or a conservation program. Demand reduction measures have been incorporated into the City of Park Rapids Water Supply Plan. The City of Park Rapids' new water supply plan is due in 2017.

Agricultural Irrigation

New water use permit applications for agricultural irrigation include a check box to indicate if a soil and water conservation plan has been approved by the local SWCD. Conservation conditions can also limit the amount of water reasonably needed for a particular agricultural situation (soil types, climate, and crop type).

Other Appropriation Categories

Although specific data are not tracked for other categories of water use, there are conservation-related conditions on some other permits. Conservation requirements have been developed for golf courses

and apply to newer permits or permit amendments. Typical permit language requires that the permitees shall, whenever practical and feasible, employ water conservation techniques and practices.

Non-permitted water users across the GWMA should also practice water conservation. The DNR supports conservation requirements for private and non-permitted use established through local jurisdictions such as watershed districts and municipal governments.

Section 5 of the GWMA Plan provides a set of actions to meet Objective II.

Objective III. Groundwater use in the GWMA does not degrade water quality.

Minnesota Statute 103G.287, directs the DNR to consider the effects of water quality in water appropriations. Management activities in the Straight River GWMA will require continued coordination between the existing state agencies that are responsible for groundwater and surface water quality, including: Minnesota Department of Agriculture (MDA), the Minnesota Department of Health (MDH), the Minnesota Pollution Control Agency (MPCA), Board of Water and Soil Resources (BWSR) and the DNR.

Pumping groundwater does not directly degrade the quality of the water in the aquifer in most circumstances, unless too much water is applied and nutrients are flushed out of the rooting zone. However, excessive pumping can cause water levels in wells to fall below the top of a buried aquifer, resulting in conversion to a water-table condition. In some circumstances this can lead to changes in water chemistry and degradation of water quality. Compliance with safe yield for buried aquifers prevents this situation from occurring as described under Objective I.

The effects of groundwater pumping on existing contamination must be considered when evaluating groundwater appropriation permits. Groundwater pumping can cause existing groundwater pollution to move or spread. Changes in groundwater levels and pressures can increase the movement of pollutants between aquifers or increase the spreading of pollutants within the same aquifer.

In some cases, pollution containment wells are used to limit movement of contaminated groundwater into less or uncontaminated areas of the aquifers. The MPCA, in cooperation with the responsible parties, determines duration and volume of pumping to contain pollution plumes and limit the movement or spreading of groundwater contamination.

Finally, water quality considerations in surface-water features must be incorporated into groundwater appropriation thresholds for surface-waters. Changes to the amount of groundwater flow into surface-water features can affect elements of water quality such as temperature, oxygen levels and contaminants.

Section 5 of the GWMA Plan provides a set of actions to meet Objective III.

Objective IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

The purpose of this objective is to manage water appropriations in accordance with the allocation priorities in Minn. Stat., sec. 103G.261. Domestic water use is the first priority for allocation of waters.

> (1) first priority, domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets the contingency planning provisions of section 103G.285, subdivision 6;
> (2) second priority, a use of water that involves consumption of less than 10,000 gallons of water per day;
> (3) third priority, agricultural irrigation, and processing of agricultural products involving consumption in excess of 10,000 gallons per day;
> (4) fourth priority, power production in excess of the use provided for in the contingency plan developed under section 103G.285, subdivision 6;
> (5) fifth priority, uses, other than agricultural irrigation, processing of agricultural products, and power production, involving consumption in excess of 10,000 gallons per day; and
> (6) sixth priority, nonessential uses.

A *well interference* problem occurs when groundwater appropriation causes the water level in public water supply well(s) or private, domestic well(s) to fall below the reach of those wells (Minn. Stat., sec. 103G.287 subd. 5 and Minn. Rules, part 6115.0730). According to Minn. Stat., sec. 103G.287, subd. 5, this applies to public water supply and private domestic wells constructed according to the state well code (Minn. Rules, part 4725). An interference complaint can only be valid for a domestic well if that well was constructed before appropriation permits allegedly causing the interference were issued and there are adequate water supplies available.

An interference problem may be resolved by modifying the affected well, replacing the well with a deeper well, replacing the well with an alternate water supply (e.g. connection to a public system), or modifying permitted pumping rates or schedules. Potential for well interference is considered when evaluating new water appropriation permits or amendment applications. The DNR follows procedures described in Minn. Rules, part 6115.0730 to mitigate potential interference that may be caused by new or increased appropriations and to respond to interference complaints.

Well interference is almost always a local issue. Groundwater information from the site of the well interference will continue to be needed, collected, and evaluated to weigh the risk for well interference due to new or amended appropriations. These evaluations will continue to require pumping tests and/or local aquifer monitoring.

A *water use conflict* occurs when water demands among existing and proposed users exceed the available waters. A water use conflict can only be resolved by limiting or restricting the rate, volume, and/or timing of water appropriations. The available waters must first be determined based on resource sustainability (Objectives I and II) before allocating the available waters among users. The DNR follows procedures described in Minn. Rules, part 6115.0740 to resolve water use conflicts. (See Appendix C.)

Section 5 of the GWMA Plan provides a set of actions to meet Objective IV.

Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.

Objectives I, II, III and IV (above) can only be tracked and achieved with an effective permitting system. Permits provide key data on groundwater use and the means to limit use if necessary to meet sustainability objectives. To be in compliance with current state requirements, individuals and organizations must, at a minimum, do the following if requesting 10,000 gallons of water per day or one million gallons of water per year:

- Obtain a water appropriation permit
- Pay annual fees
- Report annual water use according to permit conditions

Each groundwater appropriation permit holder is required to report the volume of water use on an annual basis. The reported volume must be accurate to within 10%. The use of water flow meters for reporting volumes is required. However, the commissioner may approve alternate methods of measuring water volume. As a result, the use of timing devices has become a method for reporting annual water use.

Permit holders must also comply with special conditions placed on their permits that are designed to ensure sustainability and/or monitor resource conditions. Some permits may include special conditions, such as groundwater-level monitoring from wells specifically constructed for that purpose.

The DNR commissioner can modify water appropriation permits in a manner consistent with Minnesota statute and rule. These modifications can be in response to water use conflicts as noted above or, more broadly, to assure permitted water use is sustainable. For more information see Appendix B.

Objective V is meant to emphasize the importance of permitting and permit compliance to meet the sustainability goals of the Straight River GWMA.

Section 5 of the GWMA Plan provides a set of actions to meet Objective V.

4. Status of the GWMA in Terms of the Objectives

This section describes our current understanding of the status of the Straight River GWMA with respect to the five objectives described in Section 3. Based on the five objectives, the definition of sustainability with respect to groundwater is that use:

- Does not harm aquifers and ecosystems
- Does not negatively impact surface waters
- Is reasonable, efficient and meets water conservation requirements
- Does not degrade water quality
- Does not create unresolved well interferences or water use conflicts

All of the sustainability objectives must be achieved to attain overall sustainability of groundwater use in the GWMA.

Status of Objective I. Aquifers, Ecosystems and Surface Waters

Objective I: Groundwater use in the GWMA does not harm aquifers and ecosystems and does not negatively impact surface waters

Groundwater, surface waters and groundwater-dependent ecosystems are interrelated. Groundwater levels fluctuate in response to a number of influences including climate, land use, and groundwater use. Managing for sustainable use of groundwater requires quantitative knowledge of the influences on groundwater and its connection to surface water.

Two types of information are needed to make water-appropriation permitting decisions that protect aquifers, surface water resources, and associated biological communities. First, acceptable levels of hydrological impacts must be determined for each type of feature. General considerations are discussed in Section 3, but site specific thresholds may be needed for particular surface-water features. Second, an estimate of how and the degree to which existing or proposed water appropriations may change the hydrological regime must be made. The projected or interpreted impacts may then be compared to the specific thresholds.

Aquifers

Substantial growth (85%) in water demand in the Straight River GWMA has occurred in the last 25 years. Continued growth in groundwater demand is expected for parts of the GWMA. There is sufficient data available to evaluate compliance with safe yields in the GWMA. Although further work is needed to evaluate the risk of exceeding safe yield under potential future scenarios, practical assessments are achievable.

Observations reflect impacts of current and historical climate and land-use changes in addition to pumping history. Continued growth in groundwater demand is expected for parts of the GWMA

To determine safe yield and understand trends we need to review information on

- Climate data and trends (how much water is entering and exiting the system)
- Groundwater-level data and trends (to show relationship between use and natural climate fluctuations)
- Groundwater model results (to better understand the interrelated system)

Climate Data and Trends

The main driver of groundwater recharge is climate. The climate in the Straight River GWMA is characterized by variable weather. The 'normal' condition is for substantial ups and downs in precipitation, evaporation, and other climatic factors that affect hydrology.

Precipitation and other climatic factors affect groundwater recharge and groundwater levels. Relatively small changes in precipitation over large areas can have a significant effect on groundwater recharge and groundwater levels. The current climate monitoring network may be inadequate for determining this important part of the water balance in the GWMA. The network should be evaluated and expanded to fill data gaps.

In addition to changes in the amount of annual precipitation, the timing (e.g., wetter springs), nature (e.g., larger rain events over shorter periods), and distribution of precipitation also is important. Rainfall, temperature, relative humidity and other weather conditions are important for predicting the amount of water present in the Straight River GWMA.

Based on precipitation data from the Minnesota Climatology Working Group (State Climatology Office), the long term average annual precipitation in Park Rapids from 1885-2014 is 25.23 inches. The yearly precipitation data is shown in Figure 4-1.

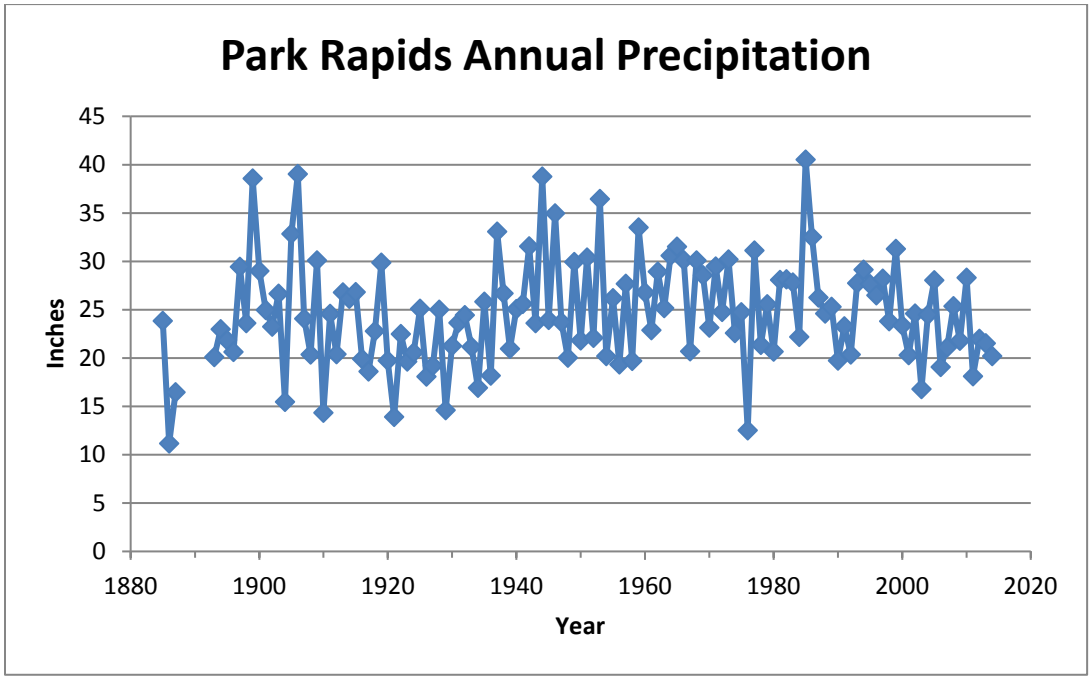

Figure 4-1 Historic precipitation patterns for Park Rapids, Minnesota

There are 5 locations where precipitation is recorded through DNR's MNGage system of volunteers, reported on a monthly basis, and coordinated by Soil and Water Conservation Districts. There is one automated station that provides real time climate data at the airport in Park Rapids. These can be a good source of a wider range of weather information in the Straight River. The Community Collaborative Rain, Hail and Snow Network, or CoCoRaHS, is a network of volunteer weather observers in the United States and Canada who take daily readings of precipitation and report them to a central

data store over the internet. There are no CoCoRaHS sites in the GWMA, but there is one located near the town of Menahga.

There is one cooperative DNR stream gaging station in this GWMA. In addition, DNR has installed 11 additional gaging sites. The cooperative site is fitted with real time weather data including precipitation, wind speed and relative humidity. The remaining 11 sites are manually downloaded. Figure 4-2 shows all the precipitation and gaging monitoring stations.

The University of Minnesota has developed a method of improving irrigation water management, resulting in more effective use of water in above ground irrigation systems using current weather conditions. This is known as the Checkbook Method. Increasing the number of sites within the Straight River GWMA at which detailed weather conditions are recorded and disseminated in real time would allow more accurate information upon which to base irrigation efficiency decisions.

Four new weather stations were installed for the Todd, Wadena and Hubbard Irrigation Scheduler Program and the information is available on the program's website (http://www.hubbardswcd.org/). The program just completed its third year (2015) and covers parts of the Straight River GWMA. Through the process of irrigation water scheduling, an irrigation technician is able to help producers determine how much water is needed to keep their crop healthy throughout the growing season by calculating the evapotranspiration rates for each of the major crops grown in the area. Each weather station contains information such as high and low temperatures, growing degree days, and evapotranspiration. There is a gap in precipitation monitoring in the Becker county portion of the GWMA.

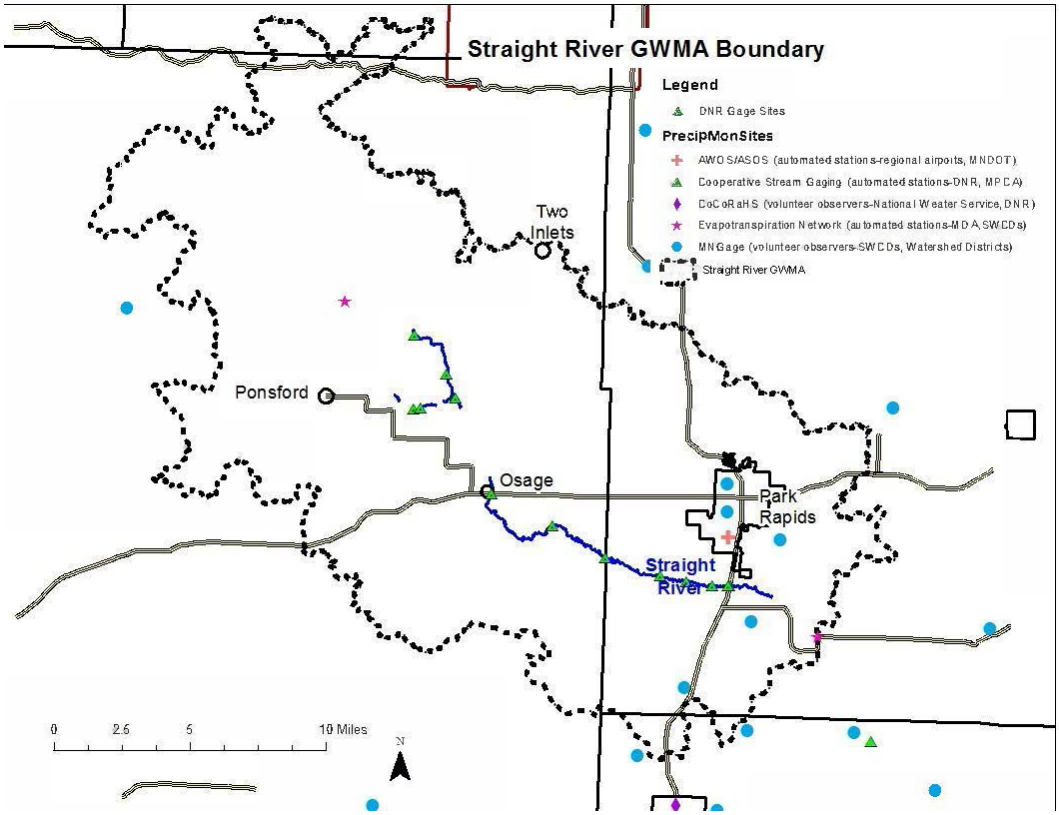

Figure 4-2 Precipitation and gaging sites in and around the GWMA

Groundwater Recharge

Aquifers are recharged by water from precipitation moving downward through the soil. The amount of groundwater recharge is affected by:

- the amount of precipitation
- the amount of precipitation that runs off the soil and into streams, lakes or wetlands
- the amount of precipitation that evaporates directly from the soil or is taken up by plants and transpired

The United States Geological Survey reports groundwater recharge for Straight River GWMA ranges between 5.15 and 6 inches. The majority of the sand and gravel aquifer is reported to have a recharge rate of 5.34 inches per year.

Groundwater-Level Data

Monitoring

Monitoring groundwater levels is an important element of groundwater management and ensuring compliance with safe yield. Monitored groundwater levels must be viewed in the context of natural climate fluctuations and groundwater pumping history.

Since 1944, DNR has managed a statewide network of water-level observation wells. Water-level readings are available via the DNR web page (http://www.dnr.state.mn.us/waters/cgm/index.html). There are 56 actively measured DNR observation wells within the GWMA boundary area.

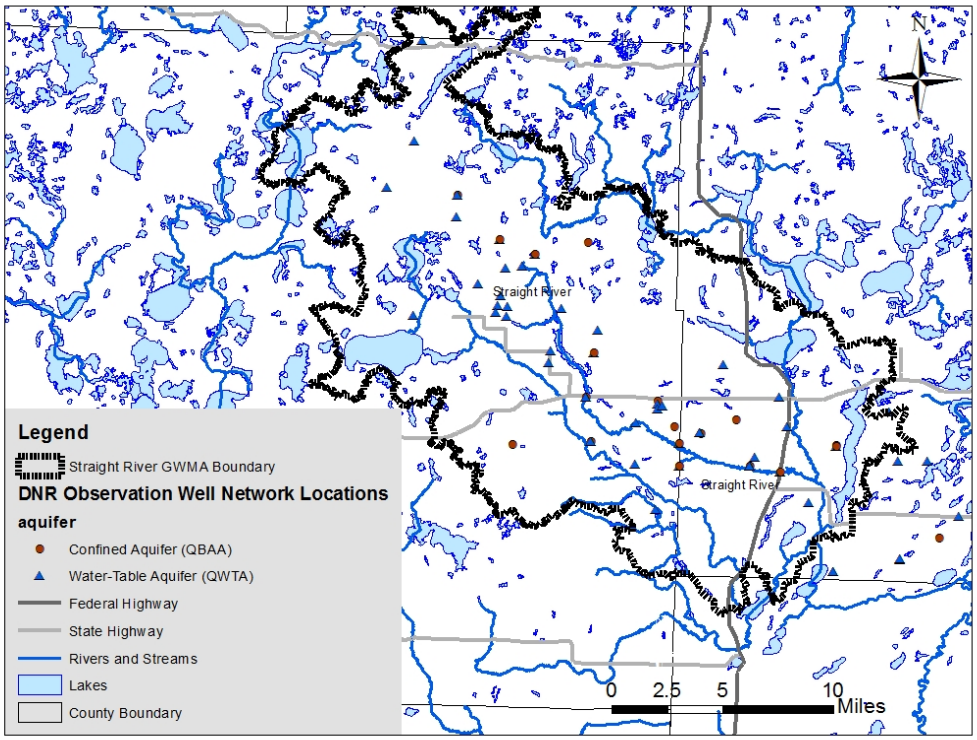

Figure 4-3 DNR observation wells in the Straight River GWMA

Figure 4-3 shows the location of the DNR instrumented observation wells within the GWMA boundary area. Forty one wells are constructed in the water table aquifer and fifteen are constructed into buried artesian aquifers.

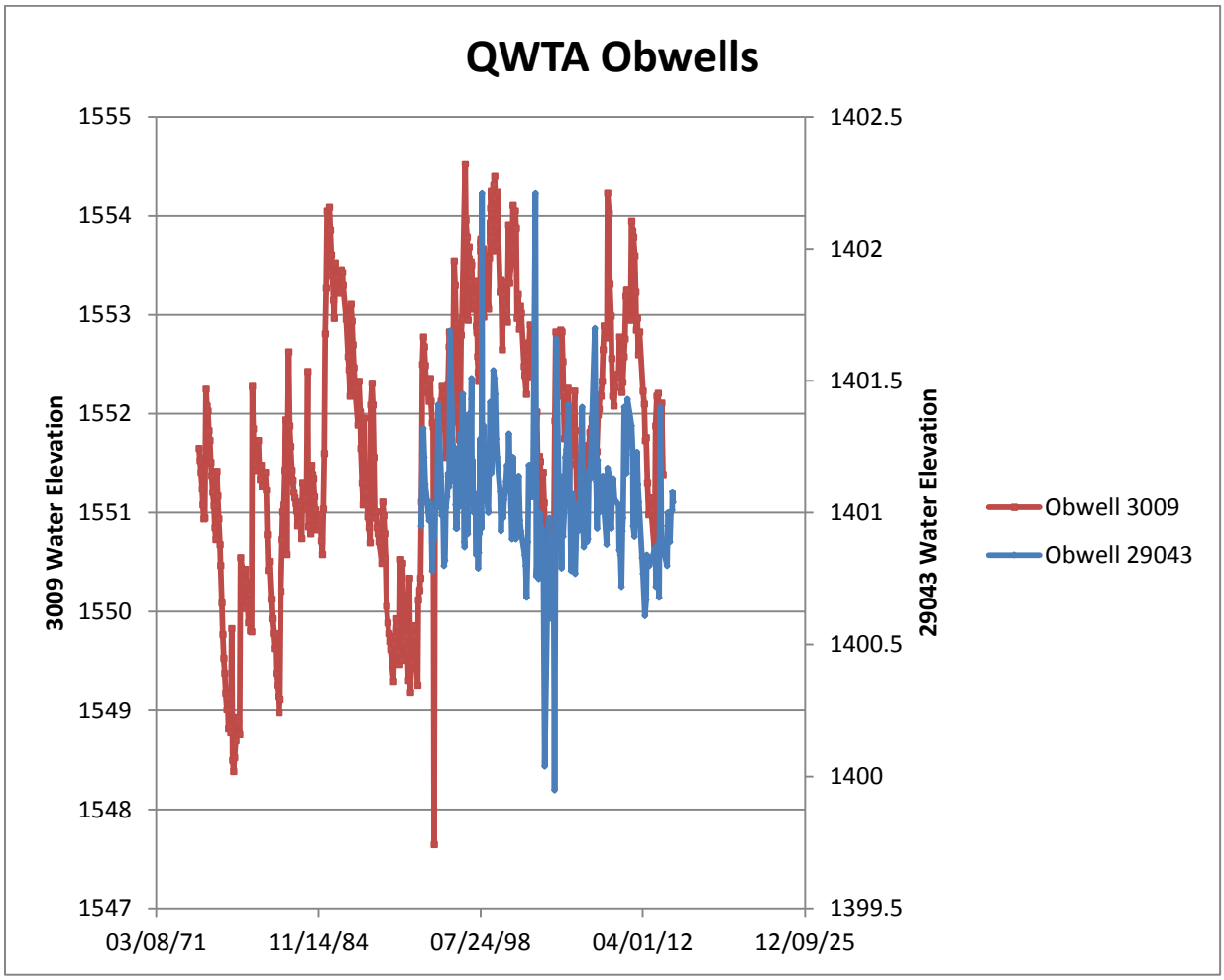

Figure 4-4 Observation well hydrographs water table aquifer (obwells 3009 and 29043)

The water elevation histories shown on Figure 4-4 are from two water table aquifer wells and demonstrate the range of historic water level highs and lows. Observation well 3009 is located nineteen miles northwest of observation well 29043. The location of these wells is highlighted in Figure 4-3. The water levels are shown as water elevation or feet above sea level datum. The difference in level elevation (approximately 150 ft.) gives an indication of the horizontal groundwater gradient between the locations.

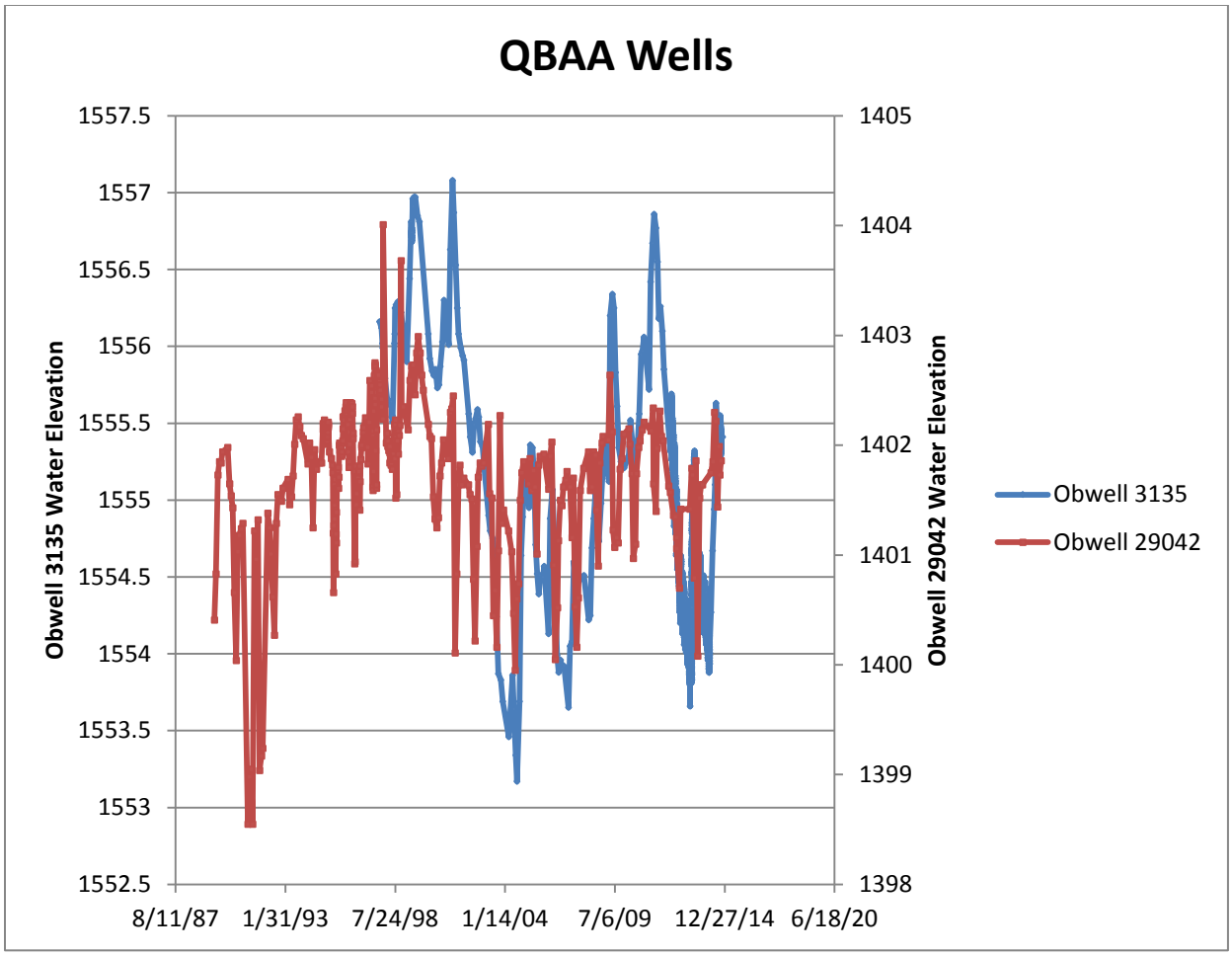

Figure 4-5 Observation well hydrographs buried drift artesian aquifer (obwells 3135 and 29042)

The water level hydrograph in Figure 4-5 shows the water elevation history for two DNR observation wells that are constructed into buried drift artesian aquifers. Observation well 3135 is located nineteen miles northwest of observation well 29042. The location of these wells is highlighted in Figure 4-3. The water levels are shown as water elevation or feet above sea level datum. The difference in level elevation (approximately 150 ft.) gives an indication of the horizontal groundwater gradient between the two locations. Multiple water level decline events demonstrate that water level declines are caused by water use. A similar relationship exists for the water-table aquifer, where groundwater levels will fluctuate in response to seasonal groundwater pumping.

Using data for groundwater models

Groundwater levels are measured in groundwater level obwells. Observation well data is necessary to calibrate computer models that can be used to predict water levels in areas where no groundwater measurements exist. The more observation well data that can be applied to the computer model, the more accurate the model becomes.

A groundwater model was developed by the consulting firm Camp Dresser and McKee during the late 1980s. The results can be reviewed in their December 1999 report, "Development of a Modflow Model of the Straight River Basin". Since this model was completed, both the number of wells and annual

pumping volumes have increased beyond the modeled estimates. Computer groundwater model technology, capabilities and the understanding of the input variables have also changed. Portions of this model may serve as a useful framework or starting point for a new and updated groundwater model. An assessment of what may be required to update the model is needed.

Groundwater Recharge

Recharge cannot be directly measured, but recharge can be estimated using climate, soils, and groundwater data.

A particular area of high uncertainty is evaporation. Monitoring data gaps exist for evaporation and groundwater recharge. Only two evaporation network sites are sited within the GWMA (Figure 4-6). Additional sites would be needed to evaluate the entire GWMA.

Surface Waters

Evaluating groundwater-surface water interactions is more complex than evaluating aquifer levels. Determining thresholds of negative impact on surface waters from groundwater pumping is also complex. Therefore, the DNR proposes establishing specific thresholds for specific watercourses, water basins, watersheds, or hydrologic areas in those parts of the state where water use is at risk of causing negative impacts. (Please read Appendix D for more information on negative thresholds for surface waters.)

Monitoring data are the foundation for impact assessment. There is a relatively dense network of precipitation gauges, observation wells, lake gauges, in the Straight River GWMA. There are five stream gauges; however, only the downstream gauge by Hwy. 71 has a long period of record (about 30 years). Monitoring gaps are likely to be identified, as improved impacts assessment methods are implemented.

Several previous studies have documented impacts to the Straight River that were attributed to groundwater appropriations.

A study by the United States Geological Survey (USGS) in 1988-1990 concluded that groundwater appropriations may impact the Straight River by reducing flows up to 34 percent during the irrigation season, and stream temperature may be affected by 0.5^{o} C to 1.5^{o} C if groundwater appropriation rates continued at the levels observed during that particularly hot, dry summer of 1988 (Stark et. al., 1994).

A study by MN DNR, Division of Waters in 1996-1998 documented an atypical increase in winter stream flow along the river reach between Becker CR 125 and Hubbard CR 115 and concluded that stream flow is likely impacted from water appropriations by at least 2 cfs to 4 cfs within that reach, or approximately 4% to 8% of the average July – August stream flow. Additional flow losses occur naturally in the river between CR 115 and TH 71. These natural losses are exacerbated by groundwater appropriations during extremely low flows as documented in 1988-89. The study also used modeling to evaluate the effects of groundwater appropriations on stream water temperatures by assuming that all groundwater appropriations affect the stream flow equally, which is a simplification of the real variability of impact. If all groundwater appropriations were added to the stream flow, then the resultant flows would increase from 5% to 50% above the existing modeled conditions, and the exceedance value of the lethal limit temperature for brown trout (25^{o} C) was lowered a maximum of 10% and averaged 2% less when compared to existing conditions. The river reach between CR 115 and TH 71 had the most consistent

reductions in temperatures using this simplified analysis (approximately 1.0° C). These reductions were significant when compared to the associated modeling errors (MNDNR Waters, 2002). This suggests that reductions in water use through improved efficiency and other conservation practices may provide benefits to the stream environment and water temperature-dependent aquatic organisms that reside in the Straight River.

Annual stream water temperature monitoring from June through September by MN DNR Fisheries has documented significant increasing trends. Average daily stream temperatures at Becker CR 125 increased 1.01° C during the ten year period from 2003 to 2013. Nearby air temperatures also increased, but at a lower rate. Average daily air temperatures increased 0.61° C during that same period. Maximum daily stream temperatures increased 1.42° C, while maximum daily air temperatures increased only 1.01° C. Minimum daily stream temperatures increased 1.01° C, but minimum daily air temperatures increased only 0.001° C.

Limited dissolved oxygen within the Straight River from Straight Lake to the confluence with the Fish Hook River was the listed stressor for the river's various life forms as determined by the MPCA in its 2010 listing of impaired Minnesota waters. Since 2002, water-quality sample results indicate that low dissolved oxygen levels in the Straight River have persisted to the detriment of stream life. The Crow Wing River Watershed Total Maximum Daily Load (TMDL) report that was prepared to address the impairment listing described water temperature as the primary stressor to low dissolved oxygen levels in the Straight River. Additional data collected by MPCA as part of the Crow Wing River Watershed Monitoring and Assessment in 2010-2011 confirmed the 2010 impairment listing. The Monitoring and Assessment Report stated: "This portion of the Straight River flows through an agricultural area with high groundwater withdrawals. Further investigation is needed to determine if groundwater withdrawals are influencing the dissolved oxygen levels within the Straight River." A Watershed Restoration and Protection Strategy report was prepared by MPCA in 2015 as the final phase of the Crow Wing River watershed assessment process. The report notes that "changes in the groundwater and surface water interactions in the streams, particularly near Park Rapids, are resulting in altered stream hydrology that is stressing fish communities."

Straight River, Upper Straight Creek and Straight Lake Creek support naturally reproducing populations of trout. Straight Lake Creek was stocked with Brook Trout from 1946-1978 and with Brown Trout in 1961, 1985 and 1986. Both species are now naturally reproducing in this stream. Upper Straight Creek was stocked with Brown Trout from 1948-1966 and with Brook Trout since 1967. Enough natural reproduction has occurred since switching to the Minnesota Wild strain of Brook Trout in 2010 that stocking may be discontinued in Upper Straight Creek. A 1930 fishing contest in the Park Rapids area recorded both Brook and Brown Trout, while an earlier contest registered only Brook Trout. During the first fisheries survey of the Straight River in 1947, both Brook and Brown Trout were sampled. The first record of Brown Trout stocking was in 1947 but since they are not native, they were obviously introduced prior to that. The second fisheries survey in 1961 recorded both Brown Trout and Rainbow Trout, which were also stocked periodically between 1955 and 1978. Only Brown Trout were sampled in 1976 and 1981 fisheries surveys and in annual sampling since 1986 on the Straight River. No Brook Trout have been sampled in any fisheries survey since 1947 on the Straight River. The disappearance of Brook Trout from the Straight River is likely due to warmer temperatures. Although exact causes are unknown, it is likely that land use changes from predominately forest to agriculture and poor road crossings have contributed to the warmer temperatures and the shift from Brook Trout to Brown Trout. Brown Trout stocking continued through 1990, when they were discontinued, because natural reproduction was sufficient to maintain a high quality trout fishery.

Ideally, stream flow impacts should be re-evaluated with existing appropriation amounts and the longer period of record for stream flow data. Stream flow impacts should be re-evaluated (compared) using re-created natural flow conditions. Temperature impacts and resulting dissolved oxygen level impacts as a result of appropriations need to be evaluated further.

Status of Objective II. Water Conservation

Objective II. Groundwater use in the GWMA is reasonable, efficient and complies with water conservation requirements.

Municipal Water Supply and Water Conservation

Public water supply systems serving more than 1,000 people must also have a water supply plan approved by the DNR. In the Straight River GWMA, the city of Park Rapids serves over 1,000 people and must have a water supply plan (Minn. Stat., sec. 473.859). The plan lays out future challenges and options for a community's water supply and the community commits to certain water use and conservation goals. Through its ongoing replacement of leaking water lines, audits, implementation of a conservation rate structure and other measures, the City of Park Rapids continues to reduce per capita water demand.

Agricultural Irrigation and Water Conservation

Permits for agricultural irrigation may include "conditions" that become part of the permit, such as a requirement that the permitee develop a conservation plan with help from the Soil and Water Conservation District. These conservation plans may include irrigation water conservation, as well as following Best Management Practices for nitrogen management.

Status of Objective III. Water Quality

Objective III. Groundwater use in the GWMA does not degrade water quality

The quality of groundwater in the Straight River GWMA is very important. Nitrates and other chemicals have been found in groundwater in the Straight River GWMA. In some areas, nitrate levels exceed health risk limits. Poor groundwater quality may limit the use of groundwater. In public meetings and in written comments submitted to the DNR, people have expressed concern about how land-use practices and extensive groundwater pumping for agricultural irrigation may affect both the availability of water to support the ecosystem and the quality of drinking water, particularly for private wells located within the Straight River GWMA.

Nitrate

Nitrate in drinking water is a public health concern. The health risk limit is set by the Minnesota Department of Health (MDH) and is 10 mg/l in drinking water. Within the Straight River GWMA, this concentration has been exceeded in some private domestic wells and municipal wells in the water-table aquifer (QWTA). Nitrate in groundwater can occur naturally in low concentrations, and in some areas, concentrations can increase due to land use practices. Nitrogen is an essential plant nutrient critical for crop production. Nitrate-nitrogen is a constituent in some fertilizers, can be derived from other forms of

nitrogen fertilizer, or is produced in the soil by microorganisms from organic and inorganic nitrogen sources.

In the Straight River GWMA, municipal drinking water sources that take water from shallow unconfined aquifers show nitrate-nitrogen contamination that in places exceed the health risk limit set by MDH. Confined aquifers in the GWMA generally have lower levels of nitrate-nitrogen contamination. The presence of nitrate-nitrogen can also be an indicator of other water contaminants. Nitrate-related issues in the GWMA require further study.

Water temperature is a measure of water quality, particularly for cold-water streams like the Straight River and its tributaries. Water temperatures in the Straight River have sometimes exceeded lethal thresholds for Brown Trout. Water temperature is the primary stressor for low dissolved oxygen levels that led to an impairment listing for the Straight River in 2010.

Status of Objective IV. Well Interferences and Water-Use Conflicts

Objective IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

Well Interferences

There have been no formal well interference complaints in the Straight River GWMA. DNR considers potential for well interference when evaluating new water-appropriation permit or amendment applications.

Water-Use Conflicts

There are no standing water-use conflicts in the Straight River GWMA. It is possible that water-use conflicts could arise from cumulative impacts of multiple users. Improved methods for evaluating surface-water impacts could reveal water-use conflicts not previously identified.

Status of Objective V. Permits

Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.

Compliance

There are no identified groundwater users in the GWMA operating without a required permit. It is possible, however, that there are unidentified groundwater uses that require a permit. A thorough audit of water wells has not been conducted for the GWMA. Beginning in July 2013, new wells requiring a water-appropriation permit must receive preliminary approval from the DNR prior to construction. This will help the DNR monitor compliance.

DNR staff obtains compliance reports from the Minnesota Permitting and Reporting System (MPARS) electronic permits database. When pumping volume exceeds the appropriation permit amount (overuse), the DNR investigates and takes appropriate action. In general, compliance with permitted volumes is high in the Straight River GWMA. Special circumstances may lead to actual use exceeding permitted volume in a given year, such as waterline breaks, other system problems, or one-time uses. In addition to the limits on annual volume and maximum pumping rate, some permits may include special conditions, such as groundwater-level monitoring. DNR will follow the established statute and

rule processes for permit changes. For further information on water appropriation permit modifications, please see Appendix B.

5. DNR Actions

Prior sections of the Straight River GWMA Plan have described the area; introduced the sustainability goals, objectives and aquifer sustainability thresholds for the area; and presented the DNR's current understanding of natural resources and appropriations with respect to the sustainability thresholds. Section 4 described some of the information and data gaps that need to be addressed to continue to manage groundwater sustainably. This section restates the sustainability goal for the GWMA, and introduces the specific actions by each objective that DNR plans to take to meet the sustainability goal.

The GWMA GOAL:

In the Straight River Groundwater Management Area (GWMA), the use of groundwater will be sustainable, and therefore, will not harm ecosystems, water quality, or the ability of present and future generations to meet their needs.

Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.

1. The DNR will improve monitoring of groundwater levels, basin water levels, stream flows, climate, groundwater-associated biological communities and water use within the GWMA to inform DNR permit decisions.
   a. The DNR will continue to build a comprehensive hydrological and climate monitoring system for the GWMA. DNR will coordinate with federal, state, and local agencies in these efforts. The following are some initial efforts that may be adjusted over time:
      i. Stream flow monitoring - Re-establish 2 Straight River stream-flow monitoring sites at former sites on County Roads 125 and 115.
      ii. Wetland Monitoring - Install 2 gages per basin at wetland basins (public water basins 29-0550, 03-01400, and 03-0700).
      iii. Lake Level Monitoring - Install at least 2 additional lake (possibly Long and Straight Lakes) gages to the existing gages.
      iv. Groundwater level Monitoring - Install 4 new monitoring wells in addition to the existing 30 wells in close proximity to the Straight River stream gage sites to determine pumping impacts on surface and groundwater.
      v. Investigate whether there are opportunities to coordinate monitoring wells to be used by multiple permitees.
      vi. Identify additional climate monitoring requirements for more precise evapotranspiration estimates.
      vii. Increase the amount of citizen precipitation and weather reporting through recruitment to the Minnesota Volunteer Precipitation Observing Program and the Community Collaborative Rain, Hail & Snow Network (real-time).
   b. The DNR will continue to enhance water use information within the GWMA.
      i. Partner with LGUs and Con Agra Foods/Lamb Weston/RDO Frozen Foods and other businesses in the use of Supervisory Control and Data Acquisition (SCADA) or similar technologies for data collection and communication.
   c. DNR will develop and use the most appropriate groundwater models and methods to predict volumes, rates and water level impacts from groundwater appropriations, as well as describe the current groundwater conditions and characterize the nature and extent of the primary aquifers and the relationship of surface water and groundwater.

d. Develop additional information on groundwater associated biological communities to inform water appropriation decisions.
e. Conduct a baseline inventory of existing water use practices within the GWMA.

2. The DNR will develop and apply sustainability thresholds for aquifers, ecosystems and surface waters in the GWMA[2].
   a. The DNR will use safe yield for aquifers to determine limits to appropriation permits in the GWMA[3].
   b. The 2015 Minnesota Legislature directed the DNR (Laws of Minnesota 2015, First Special Session, chapter 4, article 4, section 143), to take the following actions concerning sustainability thresholds: "the commissioner of natural resources shall consult with interested stakeholders and submit a report to the Legislative Water Commission and the chairs and ranking minority members of the house of representatives and senate committees and divisions with jurisdiction over the environment and natural resources policy and finance on recommendations for statutory or rule definitions and thresholds for negative impacts to surface waters as described in Minnesota Statutes, sections 103G.285 and 103G.287, subdivision 2. Stakeholders must include but are not limited to agricultural interests; environmental interests; businesses; community water suppliers; state, federal, and local agencies; universities; and other interested stakeholders." In January 2016, the DNR submitted a report entitled: "Report to the Minnesota State Legislature: Definitions and Thresholds for Negative Impacts to Surface Waters." The DNR will use the approach described in this report to determine if negative impacts to streams, lakes, or wetlands are occurring due to groundwater appropriation within the GWMA. (The report is available on the DNR website. The executive summary of the report provides a succinct description of the approach, and it is included in this plan as Appendix D.)

3. The DNR groundwater appropriation permits will integrate sustainability limits, individual and cumulative permit analysis, and will include evaluation of existing permits within the GWMA.
   a. The DNR will evaluate each new permit application individually, as well as in conjunction with other permits in the related aquifer systems to address issues associated with the cumulative impacts of appropriations across the aquifer.
   b. The DNR will complete a review of all existing permits in the GWMA within 5 years, and if necessary, adjust permits to achieve sustainable groundwater use (DNR will follow the established statute and rule processes for permit changes – see Appendix B). [4]
   c. Where needed and in accordance with statutory requirements, DNR will limit current and future appropriations.

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[2] Sustainability means that groundwater and surface water levels, water quality, and ecosystems are not harmed and that present and future generations will be able to meet their need for water.

[3] Safe yield for artesian conditions means the amount of groundwater that can be withdrawn without degrading water quality or causing a continual decline in groundwater levels that results in a change from artesian to water table condition. Safe yield for water table conditions means the amount of water that can be withdrawn without degrading the quality of the water in the aquifer and without allowing the long term average withdrawal to exceed the available long term average recharge to the aquifer system based on representative climatic conditions.

[4] The DNR has not determined the detailed steps and timeline for how we will evaluate and implement any necessary changes to existing permits. However, we recognize that this is a vital component of GWMA planning, and we are committed to working with permitees as we develop that process.

   d. Improve communication tools that will allow the public to more clearly understand the permitting process including modifying the language in the preliminary well notification letter.

4. DNR will improve communication on the status of Objective 1 (aquifers, ecosystems, surface waters) in the GWMA.
   a. The DNR will create a new GWMA reporting system that will be understandable by the public, and it will include results of data collection and analysis in the GWMA.
   b. The DNR will hold at least two GWMA Advisory Team meetings per year. They will be open to the public.
   c. The DNR will increase education and outreach to the public about sustainable use of groundwater in the GWMA.

5. The DNR will improve access to data collected and analyzed by other organizations in the GWMA.
   a. The DNR will actively support and participate in the development of a more comprehensive and accessible data management system within the GWMA, including website improvements.
   b. The DNR will work with Minnesota Pollution Control Agency (MPCA), Minnesota Department of Agriculture (MDA), Minnesota Department of Health (MDH), Con Agra/Lamb/Weston/RDO, etc., to improve access to data collected and analyzed by other organizations in the GWMA.

6. The DNR will ensure that the City of Park Rapid's Water Supply Plan includes actions that must be taken if cumulative aquifer withdrawals exceed thresholds or if negative impacts on surface waters are occurring due to groundwater withdrawals in the GWMA.

7. The DNR will promote groundwater recharge in the GWMA, consistent with sound water quality management.
   a. The DNR will work with other organizations and agencies including watershed districts, counties and local units of government to identify important groundwater recharge areas and opportunities to enhance recharge.
   b. The DNR will support local government efforts to protect important groundwater recharge areas through zoning and land use planning.
   c. The DNR will update the groundwater sensitivity maps for the GWMA within 5 years.

Objective II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.

1. The DNR will ensure that groundwater users are complying with water conservation requirements in their water supply plans and permits.
   a. The DNR will include water conservation requirements in appropriate permits as framed by statute, rule and public water supply plans.
   b. The DNR will evaluate compliance with water conservation requirements on permits that include them. (DNR will be in contact with permit holders, as we do these reviews.)
   c. When considering a permit transfer request or amendment request to increase appropriations in this GWMA, DNR will evaluate a permit holder's performance in meeting conservation requirements in their permit and the conservation goals contained in applicable water supply plans.
   d. The DNR will partner with local units of government, such as Soil and Water Conservation Districts (SWCDs), to assist in developing and complying with conservation requirements in water appropriation permits.

e. The DNR will update the information it uses to develop water conservation requirements specific to each water use category.

2. The DNR will improve communication about and promote the values of water conservation in the GWMA.
   a. DNR will promote lessons learned about water conservation from working farms, municipalities, industries, and other water users in the GWMA.
   b. DNR will include descriptions and evaluations of water conservation practices in the GWMA in the new GWMA reporting system.
   c. DNR will update its website to include links to organizations with water conservation information (e.g., SWCDs, United States Department of Agriculture, and University of Minnesota Technical Assistance Program).

3. The DNR will work with other organizations to promote appropriate water storage and aquifer recharge in the GWMA.

4. The DNR will promote the use of water conservation strategies, such as re-use of water in the City of Park Rapids community water supply planning, in the GWMA.

Objective III. Groundwater use in the GWMA does not degrade water quality.

1. The DNR will include compliance with local, state, and federal water quality regulations as permit conditions.
   a. The DNR will coordinate with local, state, and federal agencies to identify water quality regulations that apply to groundwater use and clarify how best to assure compliance.

2. The DNR will ensure that permitted appropriations do not degrade water quality by moving known contaminants.
   a. The DNR will work with PCA, MDH and MDA to determine the most suitable methods to evaluate the risk of moving known contaminants for new and existing permits.[5]

3. The DNR will ensure that the City of Park Rapids Water Supply Plan takes into account contaminant management.

4. The DNR will improve communication about known contaminants and pollution management in the GWMA.
   a. The DNR will use a new reporting system to describe and evaluate status of contamination and pollution plume management in the GWMA.
   b. The DNR will work with MDA, MDH, MPCA and others to share data about water quality among agencies.
   c. The DNR will work with MDA, MDH, MPCA and others to better interpret water quality data.

[5] The DNR has not determined the detailed steps and timeline for how we will evaluate and implement any necessary changes to existing permits. However, we recognize that this is a vital component of GWMA planning, and we are committed to working with permitees as we develop that process. We also recognize that water conservation can be an important tool to reduce contaminant movement.

5. The DNR will ensure the permitted appropriations do not increase known water quality contamination of a surface water feature.

Objective IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

1. The DNR will continue to review permit applications to identify and reduce the likelihood of well interferences and water use conflicts.

2. The DNR will resolve well interferences and water use conflicts applying the framework outlined in statute and rule.

3. The DNR will improve information on aquifer characteristics in the GWMA to improve its ability to identify and reduce the likelihood of interferences and conflicts prior to permit approval.

4. The DNR will increase education and awareness about resolving well interferences and water use conflicts.

Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.

1. The DNR will improve its capacity to detect unpermitted groundwater use.
   a. The DNR will complete periodic analyses to identify potential unpermitted groundwater use in the GWMA and take appropriate action.
   b. The DNR will conduct follow-up reviews of preliminary well approval actions to determine compliance with permit requirements.
   c. The DNR will provide updated information to well drillers and consultants on existing laws and the water appropriation permit application process.
   d. The DNR will facilitate the public's ability to identify and report unpermitted use.

2. The DNR will ensure that permitted volumes reflect actual use and that actual use does not exceed permitted volumes.
   a. The DNR will evaluate water use reports and will contact permit holders whose reports indicate inaccuracies.
   b. The DNR will monitor water use and bring permitees into compliance whose reported use is higher than permitted.
   c. The DNR will help permit holders adjust permitted volume to better match actual use and need, consistent with other plan objectives.

3. The DNR will ensure that water users comply with conditions on appropriation permits.
   a. The DNR will help bring permit holders into compliance with their permit conditions.
   b. The DNR will focus on permits that have been reviewed to address challenges of cumulative impacts and sustainability thresholds (Objective 1, action 3).

6. Implementation Schedule

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.					
I.1	DNR will improve monitoring of groundwater levels, basin water levels, stream flows, climate and water use within the GWMA to inform DNR permit decisions.				
I.1.a.	DNR will continue to build a comprehensive hydrological and climate monitoring system for the GWMA. DNR will coordinate with federal, state, and local agencies in these efforts. The following are some initial efforts that may be adjusted over time:				
I.1.a.i.	Stream flow monitoring - By 2018, reestablish 2 Straight River stream-flow monitoring sites at former sites on County Roads 115 and 125.	**DNR Ecological and Water Resources (EWR) Water Monitoring and Surveys Unit**, EWR Regional Appropriations staff	New	1	
I.1.a.ii.	Wetland Monitoring - By 2018, install 2 gages per basin at wetland basins (public water basins 29-0550, 03-01400, and 03-0700).	**EWR Water Monitoring and Surveys Unit** with input from EWR Hydrogeology and Groundwater Unit.	Existing but enhance	1	
I.1.a.iii.	Lake Level Monitoring - By 2018, install at least 2 additional lake (possibly Long and Straight Lakes) gages to the existing gages.	**EWR Water Monitoring and Surveys Unit** with input from EWR Hydrogeology and Groundwater Unit. Coordinate with DNR Fish and Wildlife (FAW).	Existing but enhance	1	
I.1.a.iv.	Groundwater level Monitoring - Install 4 new monitoring wells in addition to the existing 30 wells in close proximity to the Straight River stream gage sites to determine pumping impacts on surface and groundwater.	**EWR Water Monitoring and Surveys Unit** with input from EWR Hydrogeology and Groundwater Unit	Existing but enhanced	1-2	

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
I.1.a.v.	Investigate whether there are opportunities to coordinate monitoring wells to be used by multiple permitees.	**EWR Hydrogeology and Groundwater Unit** with input from EWR Water Monitoring and Surveys Unit, EWR Regional Appropriations staff, and EWR Water Regulations Unit	New	1-2	
I.1.a.vi.	Identify additional climate monitoring requirements and wind speed for more precise evapotranspiration estimates.	**EWR Water Monitoring and Surveys Unit - State Climatology Office** with input from EWR Hydrogeology and Groundwater Unit	New	3-4	
I.1.a.vii.	Increase the amount of citizen precipitation and weather reporting through recruitment to the Minnesota Volunteer Precipitation Observing Program and the Community Collaborative Rain, Hail & Snow Network (real-time).	**EWR Water Monitoring and Surveys Unit, State Climatology Office, and University of Minnesota** with input from EWR Hydrogeology and Groundwater Unit	Existing but enhance	3-4	
I.1.b.	DNR will continue to enhance water use information within the GWMA.	**EWR Hydrogeology and Groundwater Unit,** EWR Regional Appropriations staff	Existing but enhance	2-3	
I.1.c.	DNR will develop and use standard groundwater models and methods to predict volumes, rates and water level impacts from groundwater appropriations.	**EWR Hydrogeology and Groundwater Unit,** EWR Regional Appropriations staff	New	1-2	
I.1.d.	Develop additional information on groundwater associated biological communities to inform water appropriation decisions.	**EWR Regional Plant Ecologist**	New	2-3	

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
I.1.e.	Conduct a baseline inventory of existing water use practices within the GWMA.	**EWR Hydrogeology and Groundwater Unit,** EWR Regional Appropriations staff	New	1-2	
I.2	DNR will develop and apply sustainability thresholds for aquifers, ecosystems and surface waters in the GWMA[i].				
I.2.a.	DNR will use safe yield for aquifers to determine limits to appropriation permits in the GWMA[ii].	**EWR Regional Appropriations staff**, EWR Hydrogeology and Groundwater Unit	New	1	
I.2.b.	The DNR will determine negative impacts to surface water features (streams, lakes, wetlands) using the approach that is described in the 2016 "Report to the Minnesota State Legislature: Definitions and Thresholds for Negative Impacts to Surface Waters."	**EWR Regional Appropriations staff,** EWR Information, Monitoring and Assessment section, EWR Conservation Assistance and Regulation Section	New	1-3	
I.3	DNR groundwater appropriation permits will integrate sustainability limits, individual and cumulative use analysis, and will include evaluation of existing permits within the GWMA.				
I.3.a.	DNR will evaluate each new permit application individually and in conjunction with other appropriation permits in the related aquifer systems to address issues associated with the cumulative impact of appropriations across the aquifer.	**EWR Regional Appropriations staff**, EWR Hydrogeology and Groundwater Unit, EWR Water Monitoring and Surveys Unit	Existing but enhance	3	I.1.c
I.3.b.	DNR will review all existing permits in the GWMA within 5 years, and if necessary, adjust permits to achieve sustainable groundwater use. [iii]	**EWR Regional Appropriations staff**, EWR Hydrogeology and Groundwater Unit	New	1-5	I.1.c I.2.a.b.c
I.3.c.	DNR will limit current and future appropriations where needed and in accordance with statutory procedural requirements."	**EWR Regional Appropriations staff**, EWR Hydrogeology and Groundwater Unit, EWR Water Monitoring and Surveys Unit	Existing but enhance	1-5	I.2.a.b.c

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
I.3.d.	Improve communication tools that will allow the public to more clearly understand the permitting process (e.g. press releases, daily notices during drought periods, etc.).	**EWR Water Regulations Unit,** EWR Comm. and Planning Unit	Existing but enhance	2	
I.4	DNR will improve communication on the status of Objective 1- aquifers, ecosystems and surface waters in the GWMA.				
I.4.a.	DNR will create a new GWMA reporting system that is understandable by the public and will include results of data collection and analysis within the GWMA.	**EWR Comm. and Planning Unit,** EWR Regional Appropriations staff	New	1-3	
I.4.b.	DNR will hold two Straight River GWMA Advisory Team meetings per year that are open to the public.	**EWR Regional Appropriations staff**, EWR Hydrogeology and Groundwater Unit, EWR Water Monitoring and Surveys Unit	Existing but enhance	1-5	
I.4.c.	DNR will increase education and outreach to the public about sustainable use of groundwater in the GWMA.	**EWR Water Regulations Unit,** EWR Comm. and Planning Unit	Existing but enhance	1-2	
I.5	DNR will improve access to data collected and analyzed by other organizations in the GWMA.				
I.5.a.	DNR will actively support and participate in the development of a more comprehensive and accessible data management system within the GWMA, including website improvements.	**EWR Comm. And Planning Unit,** EWR Regional Appropriations staff	New	2-3	
I.5.b.	DNR will work with Minnesota Pollution Control Agency (MPCA), Minnesota Department of Agriculture (MDA), Minnesota Department of Health (MDH), Con Agra/Lamb/Weston/RDO, etc., to improve access to data collected and analyzed by other organizations in the GWMA.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	2-3	

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
I.6	DNR will ensure that the City of Park Rapids Water Supply Plan includes actions that must be taken if cumulative aquifer withdrawals exceed limits or results in negative impacts to surface waters.				
I.7	DNR will promote groundwater recharge in the GWMA, consistent with sound water quality management.				
I.7.a.	DNR will work with other organizations and agencies including watershed districts, counties, and other local units of government to identify groundwater recharge areas and opportunities to enhance groundwater recharge.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	2-3	
I.7.b.	DNR will support local government efforts to protect important groundwater recharge areas through zoning and land use planning.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	2-3	
I.7.c.	DNR will update the groundwater sensitivity map for the GWMA within 5 years.	**EWR Regional Appropriations staff**, EWR Hydrogeology and Groundwater Unit, EWR Water Monitoring and Surveys Unit	Existing but enhance	3	
Objective II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.					
II.1	DNR will ensure that groundwater users are complying with water conservation requirements in their water supply plan and permits.				
II.1.a.	DNR will include water conservation requirements in all appropriate permits as framed by statute, rule and public water supply plans.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	Existing but enhance	1-3	
II.1.b.	DNR will evaluate compliance with water conservation requirements for all permits that include them (DNR will be in contact with permit holders as we do these reviews).	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	Existing but enhance	1-2	

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
II.1.c.	When considering permit transfer requests or amendment requests to increase appropriations in the GWMA, DNR will evaluate permit holders' performance in meeting conservation requirements in their permit and the conservation goals contained in applicable water supply plans.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	1-2	
II.1.d.	DNR will partner with local units of government such as Soil and Water Districts (SWCDs) to assist in developing and complying with conservation requirements in water appropriation permits.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	1-2	
II.1.e.	DNR will update the information it uses to develop water conservation requirements by water use category.	**EWR Water Regulations Unit,** EWR Regional Appropriations staff	Existing but enhance	2-3	
II.2	DNR will improve communication about and promote the values of water conservation in the GWMA.				
II.2.a.	DNR will promote lessons learned about water conservation by municipalities, industries, and other water users in the GWMA.	**EWR Hydrogeology and Groundwater Unit,** EWR Regional Appropriations staff	New	1-2	
II.2.b.	DNR will include descriptions and evaluations of water conservation practices in the GWMA in a new GWMA reporting system.	**EWR Comm. And Planning Unit,** EWR Regional Appropriations staff	New	3-4	I.4.a
II.2.c.	DNR will update its website to include links to organizations with water conservation information (e.g., SWCD's, United States Department of Agriculture, University of Minnesota Technical Assistance Program, etc.).	**EWR Comm. And Planning Unit,** EWR Regional Appropriations staff	New	1-2	
II.3	DNR will work with other organizations to promote appropriate water storage and aquifer recharge in the GWMA.				
II.4	DNR will promote the use of water conservation strategies in the City of Park Rapids water supply planning in the GWMA..				
Objective III. Groundwater use in the GWMA does not degrade water quality.					

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
III.1	DNR will include compliance with local, state, and federal water quality regulations as permit conditions.				
III.1.a.	DNR will coordinate with local, state, and federal agencies to identify water quality regulations that apply to groundwater use and clarify how best to assure compliance.	**EWR Regional Appropriations staff,** EWR Water Regulations Unit	New	2-3	
III.2	DNR will ensure that permitted appropriations do not degrade water quality by moving known contaminants.				
III.2.a.	DNR will evaluate all new permits to address their role in the moving known contaminants.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	Existing	1-2	
III.2.b.	DNR will evaluate all existing permits in the GWMA for their role in moving known contaminants. [iv]	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	3-4	
III.3	DNR will ensure that the City of Park Rapids Water Supply Plan takes into account contaminant management.				
III.4	DNR will improve communication about known contaminants and pollution management in the GWMA.				
III.4.a.	DNR will create and use a new reporting system to describe and evaluate status of contamination and pollution plume management in the GWMA.	**EWR Regional Appropriations staff,** EWR Comm. And Planning Unit	New	2-3	
Objective IV. Groundwater use in the GWMA does not create well interferences or water use conflicts.					
IV.1	DNR will continue to review permit applications to identify and reduce the likelihood of well interferences and water use conflicts.				
IV.2	DNR will resolve well interferences and water use conflicts applying the framework outlined in statute and rule.				
IV.3	DNR will improve information on aquifer characteristics in the GWMA to improve its ability to identify and reduce the likelihood of potential interferences and conflicts prior to permit approval.				
IV.4	DNR will increase education and awareness about resolving well interferences and water use conflicts.				

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.					
V.1	DNR will improve its capacity to detect unpermitted groundwater use.				
V.1.a.	DNR will complete an annual analysis to identify potential unpermitted groundwater use in the GWMA and take appropriate action.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	1-5	
V.1.b.	DNR will conduct follow-up reviews of preliminary well approval actions to determine compliance with permit requirements.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	2-3	
V.1.c.	DNR will provide information to well drillers and consultants on existing laws and the water appropriation permit application process.	**EWR Regional Appropriations staff,** EWR Hydrogeology and Groundwater Unit	New	1-5	
V.1.d.	DNR will facilitate the publics' ability to identify and report unpermitted use.	**EWR – Water Regulations Unit,** EWR Regional Appropriations staff.	New	1-5	
V.2	DNR will ensure that permitted volumes reflect actual use and that actual use does not exceed permitted volumes based on established limits.				
V.2.a.	DNR will evaluate water use reports and will contact permit holders whose reports indicate inaccuracies.	**EWR Water Regulations Unit,** EWR Regional Appropriations staff	Existing but enhance	1-2	
V.2.b.	DNR will monitor permitted versus reported use and bring permitees whose reported use is higher than permitted use into compliance.	**EWR Regional Appropriations staff,** EWR Water Regulations Unit	Existing	1-3	
V.2.c.	DNR will work with permit holders to adjust permitted volume to better match actual use and need, consistent with other plan objectives.	**EWR Regional Appropriations staff**	Exisiting	1-3	
V.3	DNR will ensure that water users comply with conditions on appropriation permits.				

Action ID	Action	Responsible Organization, DNR Unit or Individual (Primary in Bold)	Existing or New	Plan Year	Notes
V.3.a.	DNR will work with permit holders to bring them into compliance with their permit conditions.	**EWR Regional Appropriations staff**	Existing but enhance	1-5	
V.3.b.	DNR will focus on permits that have been reviewed to address challenges of cumulative impacts and sustainability thresholds (Objective 1, action 3).	**EWR Regional Appropriations staff**	New	3-5	

7. Glossary

Aquifer – any water-bearing bed or stratum of earth or rock capable of yielding groundwater in sufficient quantities that can be extracted (Minn. Rule, part 6115.0630, subp. 2)

Appropriating – withdrawal, removal, or transfer of water from its source regardless of how the water is used (M.S. 103G.001, Subd.4)

Artesian aquifer or confined aquifer – a water body or aquifer overlain by a layer of material of less permeability than the aquifer. The water is under sufficient pressure so that when it is penetrated by a well, the water will rise above the top of the aquifer. A flowing artesian condition exists when the water flow is at or above the land surface (Minn. Rule, part 6115.0630, subp. 4).

Basin – a depression capable of containing water which may be filled or partly filled with waters of the state. It may be a natural, altered, or artificial depression (Minn. Rule, part 6115.0630, subp. 5)

Buried artesian – an aquifer composed of glacially associated sands and/or gravels, over which a confining layer of clay or till was deposited

Conservation rate – a water fee (rate) structure that encourages conservation and may include increasing block fees, seasonal rates, time of use rates, individualized goal rates, or excess use rates (Minn. Stat., sec. 103G.291, subd. 4(a))

Demand reduction measures – actions that reduce water demand, water losses, peak water demands, and nonessential water uses. Demand reduction measures must include a conservation rate structure, or a uniform rate structure with a conservation program that achieves demand reduction (Minn. Stat., sec. 103G.291, Subd. 4(a)).

Evapotranspiration – the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

Groundwater – subsurface water in the saturated zone. The saturated zone may contain water under atmospheric pressure (water table condition), or greater than atmospheric pressure (artesian condition) (Minn. Rule, part 6115.0630, subp. 11)

Native plant community – a group of plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms

Negative Impact – refers to the relationship of groundwater use to surface waters. See Minn. Stat., section 103G.287, subd. 2 which states "Groundwater appropriations that will have negative impacts to surface waters are subject to applicable provisions in section 103G.285" (this affects altered and natural watercourses, which includes trout streams and basins).

Nested Obwells – Two or more adjacent water-level observation wells completed in different aquifers, or different depths within the same aquifer. Used to determine vertical differences in groundwater levels or heads.

Normal (climate) – the average of a climate variable such as precipitation or temperature over a standard 30-year period (e.g. 1981–2010)

Obwell – a water-level observation well in the DNR network

Potential evaporation or free water surface evaporation – evaporation from a thin film of water having no appreciable heat storage (Farnsworth et al., 1982).

Protected flow – the amount of water required in the watercourse to accommodate instream needs such as water-based recreation, navigation, aesthetics, fish and wildlife habitat, water quality, and needs by downstream higher priority users located in reasonable proximity to the site of appropriation (Minn. Rule, part 6115.0630, subp. 12)

Protective elevation – the water level of the basin necessary to maintain fish and wildlife habitat, existing uses of the surface of the basin by the public and riparian landowners, and other values which must be preserved in the public interest (Minn. Rule, part 6115.0630, subp. 13)

Recharge – the addition of water to the groundwater system

Safe yield – *water table condition:* the amount of groundwater that can be withdrawn from an aquifer system without degrading the quality of water in the aquifer and without allowing the long term average withdrawal to exceed the available long term average recharge to the aquifer system based on representative climatic conditions (Minn. Rule, part 6115.0630, subp. 15)

artesian condition: the amount of groundwater that can be withdrawn from an aquifer system without degrading the quality of water in the aquifer and without the progressive decline in water pressures and levels to a degree that will result in a change from artesian condition to water table condition (Minn. Rule, part 6115.0630, subp. 15)

Transpiration – the process of transport of water from plant roots to above ground parts where it is released to the atmosphere as vapor

Water table aquifer or unconfined aquifer – an aquifer where groundwater is under atmospheric pressure (Minn. Rule, part 6115.0630, subp. 17)

Water-use conflict – A situation where the available supply of waters of the state in a given area is limited to the extent that there are competing demands among existing and proposed users which exceed the reasonably available waters (Minn. Rule, part 6115.0740. subp. 1).

Well interference – A situation where an appropriation reduces water levels beyond the reach of public water supply and private domestic wells constructed according to Minn. Rules, part 4725 (Minn. Stat., sec. 103G.287, subd. 5; Minn. Rules, part 6115.0730).

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9. Appendix A

Minnesota Executive Agency Commitments to the Straight River GWMA Plan

Minnesota Department of Agriculture

The Minnesota Department of Agriculture (MDA) supports the Minnesota Department of Natural Resources (MDNR) led approach to managing groundwater through the development of Groundwater Management Areas (GWMA). The MDNR is the lead agency for managing groundwater appropriations consistent with statutory requirements for sustainability including providing for ecosystem needs. The MDA has statutory responsibilities and expertise in addressing agricultural contributions to water quality concerns. The MDA will provide support in our areas of responsibility and expertise to the MDNR and local communities in GWMAs.

Overview of the MDA Role

The MDA is the lead state agency for addressing pesticides and nitrate from fertilizer in groundwater. MDA also has related regulatory and non-regulatory responsibilities for pesticide and fertilizer management including storage, handling and cleanup of contaminated facilities. The primary statutory authority for these activities comes from the Groundwater Protection Act [MN Statutes (MS) Chapter 103H], the Pesticide Control Law (MS 18B), and the Fertilizer, Soil Amendment, and Plant Amendment Law (MS 18C). The MDA coordinates with University of Minnesota Extension, soil and water conservation districts, farmers, agronomists and other interested parties to promote and support the most current science based best management practices to reduce potential agricultural contaminants in groundwater and for irrigation management.

The MDA has developed a Pesticide Management Plan (PMP) and a Nitrogen Fertilizer Management Plan (NFMP) which outline a formal approach to addressing pesticide and nitrate contamination in groundwater. The MDA will provide assistance to the MDNR within GWMAs primarily through the implementation of the NFMP and the PMP. The MDA will provide technical support for evaluating levels of pesticide and nitrate contamination, identifying potential sources and protective actions for nitrate and pesticides in groundwater, and other related work within a GWMA. The MDA approach emphasizes review of existing data on local agricultural practices and identifying appropriate voluntary best management practices (BMPs) to ensure that the best available science is used for addressing local problems, and on working closely with local farmers, crop advisors, local government, other agencies, and other interested parties to address nitrate or pesticide issues.

Nitrogen Fertilizer

The Nitrogen Fertilizer Management Plan (NFMP) is the state's blueprint for prevention, evaluation and mitigation of the impacts of nitrogen fertilizer on groundwater. Within GWMAs, MDA will participate in issues related to nitrate in groundwater using the processes identified in the NFMP. This includes monitoring and assessment, development and implementation of BMPs, and other prevention and mitigation activities. Some specific activities are provided below.

Where nitrates in groundwater may be of concern within GWMAs, MDA assistance will be guided by the NFMP and could include:

- Conduct monitoring and assessment of groundwater for nitrates;
- Evaluate nitrate data;
- Engage with the agricultural community, U of M Extension and other local stakeholders to provide information and solicit feedback;
- Provide advice on appropriate nitrogen fertilizer BMPs and other practices;
- Survey of current adoption of BMPs and agricultural practices;
- Assist agricultural community through information and education activities such as farmer meetings, on farm demonstration, technical assistance on nitrogen management practices;
- Follow-up evaluation to determine BMP effectiveness and adoption; and,
- Evaluation of other practices that should be considered.

Pesticides

The Pesticide Management Plan (PMP) is the state's blueprint for prevention, evaluation and mitigation of occurrences of pesticides or pesticide breakdown products in groundwater and surface waters of the state. The PMP includes components promoting prevention, developing appropriate responses to the detection of pesticides or pesticide breakdown products in groundwater and surface waters, and providing responses to reduce or eliminate continued pesticide movement to groundwater and surface water.

If pesticides in groundwater are a concern within GWMAs, the MDA will provide assistance using the processes identified in the PMP. This assistance may include:

- Collection and analysis of data on the presence of pesticides and pesticide degradates in groundwater;
- Evaluation of monitoring data for common detection determinations in groundwater;
- Evaluation of BMPs;
- Engaging the agricultural community, U of M Extension and other stakeholders in evaluating and implementing BMPs;
- Evaluating actions to mitigate the effects of specific pesticides in common detection for groundwater;
- Development of voluntary pesticide-specific BMPs; and,
- Evaluation of BMP use and effectiveness.

MDA Point Source Authority

In addition to non-point source activities shown above, MDA has responsibilities and regulatory authority for overseeing agriculture chemicals from point sources as directed in MS 18C (fertilizer storage, handling, distribution, use and disposal), MS 18D (agricultural chemical liability) and MS 18E (agricultural chemical response and reimbursement). As provided in these statutes, MDA will exercise these authorities as needed to address potential point sources of contamination such as releases from bulk storage facilities within GWMAs.

Irrigation

MDA, in cooperation with the University of Minnesota Extension, will provide technical support for irrigation water management to reduce the potential for impacts from nitrogen fertilizer and pesticides to groundwater. MDA will promote current irrigation practices that use the best available science. This

could include practices such as increasing water use efficiency, irrigation scheduling, fertigation, and other irrigation management practices.

Variation based on unique circumstances for each GWMA:
The above outlines the general approach of MDA involvement within GWMAs. This approach will be modified as appropriate to address the unique circumstances of each GWMA.

Minnesota Department of Health

Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.

1. MDH will act to implement the federal Safe Drinking Water Act by focusing on a 'source to tap' strategy of multiple protections to ensure the delivery of safe drinking water to all Minnesotans connected to a public water system.
2. MDH will enforce the Minnesota Well Code to ensure wells meet current construction and maintenance standards.
3. MDH will focus Wellhead Protection plan development and implementation efforts that protect drinking water resources and public health.
4. MDH will coordinate with state agency efforts to evaluate and improve local (e.g., LUGs, NGOs) capacity to manage groundwater and drinking water issues.
5. MDH will support and prioritize activities that protect both public and private groundwater resources that are used as a source of drinking water.

Objective II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.

1. MDH will focus Wellhead Protection plan development and implementation efforts to encourage sustainable land and water uses.
2. MDH will assist public water systems in identifying conservation activities when developing wellhead protection plans, especially activities that align with regional efforts within groundwater management areas.
3. MDH will continue to advise on storm-water infiltration practices in vulnerable wellhead protection areas.
4. Subject to legislative funding, MDH will conduct a thorough review of state rules, regulations, and policies relative to water reuse.
5. MDH will evaluate and encourage the adoption of conservation practices where multiple benefits can be achieved that conserve groundwater resources and improve the quality of drinking water in GWMAs.

Objective III. Groundwater use in the GWMA does not degrade water quality.

1. MDH will coordinate with state agency efforts to evaluate and improve local (e.g., LUGs, NGOs) capacity to manage groundwater and drinking water resources.

2. MDH will focus Wellhead Protection plan development and implementation efforts that encourage sustainable land uses and the adoption of conservation practices that result in reduced nutrient loss and other anthropogenic impacts that degrade drinking water quality and may impact human health.
3. MDH will assist public water systems in developing water monitoring networks, especially unconfined aquifer settings where drinking water sources are vulnerable.
4. MDH will promote the use of groundwater and land use modeling to demonstrate both the costs and benefits associated with changes in land use on both water quantity and quality.
5. MDH will coordinate with DNR, MPCA, MDA, USGS and others on monitoring, regulation, and prevention efforts for contaminants of emerging concern, including the development of health-based guidance, if appropriate.
6. MDH will coordinate with DNR and others to examine if regional aquifer management approaches might be of value to public water systems, local units of government, and other stakeholders concerned with drinking water protection.

Objective IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

1. MDH will share with DNR staff the data and groundwater models developed for wellhead protection purposes. These may assist in evaluation of hydraulic impacts of potential new high capacity wells that are located in close proximity to drinking water supply management areas.

Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.

1. MDH will assist the DNR technical staff with the coordination and evaluation of compliance issues/impacts on the public water systems.
2. MDH will coordinate with DNR on data exchange for new potential high-capacity wells in groundwater management areas.

Minnesota Pollution Control Agency

The Minnesota Pollution Control Agency has reviewed the Straight River Groundwater Management Area Plan and determined that the agency can support the DNR's goals for the GWMA through the following actions organized by Plan objectives:

Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.

A. MPCA - Monitor the waters of the state within the GWMA to assess their quality, using a systematic intensive watershed approach to determine physical, chemical and biological integrity.
B. MPCA - Identify and investigate groundwater – surface water interactions
C. Work with local government units to promote and implement best management practices to protect surface and groundwater quality
D. MPCA – Support development of shared data system with DNR, MDH, MDA and other organizations

Objective II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.

A. MPCA - Identify and investigate groundwater – surface water interactions with in the GWMA
B. MPCA - Pollution Prevention and MnTAP consultations for water conservation
C. MPCA - Participate with other agencies to encourage water re-use where appropriate
D. MPCA – participate in development of new groundwater models to better understand flows, recharge rates and water balances within the GWMA.

Objective III. Groundwater use in the GWMA does not degrade water quality.

A. MPCA - Monitor the waters of the state to assess their quality, using a systematic intensive watershed approach to determine physical, chemical and biological integrity.
B. MPCA – continue to monitor statewide ambient well network as an early warning system identifying contaminant threats to shallow and vulnerable aquifers in GWMAs and elsewhere. MPCA will make data/results available to interested parties via EQuIS or MPCA website. MPCA will consider installing additional wells if in GWMAs if needed, in conjunction with partner agencies who oversee groundwater monitoring (MDA, MDNR, and MDH).
C. MPCA - Minimize and regulate, with local partners pollutant discharges via permits, technical/financial assistance, and enforcement. E.g. septic systems, feedlots, spray irrigation permits, landfills.
D. MPCA (w/MDH, MDA, USGS) –adapt monitoring, prevention, regulation and remediation efforts for contaminants of new/emerging concern
E. MPCA - Work with local government units to promote and implement best management practices to protect surface and groundwater quality, including storm-water management

Objective IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

A. MPCA - Identify and investigate groundwater – surface water interactions

B. MPCA – help develop new groundwater models to better understand flows, recharge rates and water balances

Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.

A. MPCA – Support DNR efforts to identify all appropriate permit conditions related to MPCA regulatory authority.

Board of Water and Soil Resources

The Minnesota Board of Water and Soil Resources has reviewed the Straight River Groundwater Management Area Plan and determined that the agency can support the DNR's goals for the GWMA through the following actions, organized by Plan objectives:

DNR Objective I. Groundwater use in the GWMA does not harm aquifers and ecosystems, and does not negatively impact surface waters.

A. *BWSR will encourage local government units (Counties, Soil and Water Conservation Districts and others) to consult with the DNR to obtain groundwater management information relevant to their plan updates.*
B. *BWSR will support local governments' efforts to incorporate groundwater management objectives in their plans and to incorporate groundwater protection provisions in their regulatory programs. BWSR will develop guidance to help these local governments to adopt plans, policies and actions that are consistent with DNR objectives for management and protection of groundwater resources.*
C. *BWSR will encourage the participation of Soil and Water Conservation Districts in the DNR Observation Well program.*
D. *Consistent with BWSR's responsibility to administer the Wetland Conservation Act (WCA), BWSR will:*
    a. *support DNR's effort to develop tools to better estimate the effects of groundwater withdrawals on the quantity, quality and biological diversity of wetlands, and*
    b. *as requested, on a case-by-case basis, review and comment on applications for groundwater withdrawals that have the potential to affect wetlands.*
E. *BWSR will attend future GWMA Advisory Team meetings to maintain communication with DNR and provide a link to LGUs*.

DNR Objective II. Groundwater use in the GWMA is reasonable, efficient, and complies with water conservation requirements.

A. *BWSR will continue to encourage the development of groundwater management activities (e.g., irrigation scheduling program and pivot uniformity tests) within their existing and future grant programs.*
B. *BWSR will support local units of government in their development of local plans to address groundwater protections.*

DNR Objective III. Groundwater use in the GWMA does not degrade water quality.

A. *BWSR will support local governments' efforts to incorporate groundwater management objectives in their plans and to incorporate groundwater protection provisions in their regulatory programs.*
B. *BWSR will encourage local governments to consult with the DNR to obtain groundwater management information relevant to their plan updates.*

DNR Objective IV. Groundwater use in the GWMA does not create unresolved well interferences or water use conflicts.

This objective does not relate to BWSR programs and responsibilities.

DNR Objective V. All groundwater users in the GWMA have the necessary permits to use groundwater.

This objective does not relate to BWSR programs and responsibilities.

Appendix B

Process Summary: Preliminary Well Construction, Water Appropriation Permitting and Permitting for Municipal Water Supply Plan

Well Construction – Preliminary Assessment

The following provides a high-level summary of steps for a water appropriations permit applicant and the DNR will take to obtain a preliminary assessment of proposed well.

1. Applicant logs into MPARS to obtain approval for a new well.
2. The Appropriation Hydrologist reviews the approval request.
3. The approval request may be sent to the Groundwater Specialist for review.
4. The approval request may be sent to management for review in very complex cases.
5. A letter is sent to the applicant that may describe the resources of concern in the area (if any) and whether the anticipated appropriation is likely to meet the applicable requirements for obtaining a permit to pump water.
6. The applicant may be informed of the need to gather additional information, conduct aquifer tests, or install observation wells before applying for a DNR Water Appropriation Permit.
7. The DNR may follow up to ascertain if the applicant constructed of the well.

Appropriation Permit Actions

The following provides a high-level summary of steps to obtain a water appropriations permit.

1. Applicant completes the preliminary assessment for well construction.
2. Applicant logs into MPARS to request a DNR Water Appropriation Permit or to amend an existing Water Appropriation Permit.
3. The DNR Appropriation Hydrologist reviews the request and may send the initial request to the Groundwater Specialist for review at this point.
4. Additional information may be requested from the applicant to form a complete application, or to provide enough information with which to make a sound decision. The applicant may be informed of the need to conduct an aquifer test.
5. Meetings may be held with the applicant.
6. The Appropriation Hydrologist will generate the invoice for the permit application fee, or amendment application fee and it will be sent to the applicant using MPARS.
7. The applicant uses MPARS to pay the invoice.
8. When the application is complete and the fee is paid the application is forwarded to the County, SWCD, Watershed District, other relevant parties and other DNR staff for review. They are allowed 30 days to review the proposal and submit comments to the DNR.
9. If concerns exist, the applicant will be notified of the concerns and allowed to address those concerns. DNR staff is available for discussion regarding any issues related to the permit application or natural resource concerns. Additional actions may need to be taken by the applicant to address the concerns. An aquifer test may need to be conducted by the applicant.
10. If the issues are addressed, the Appropriation Hydrologist will draft the Permit in MPARS. The appropriate conditions will be added to the permit to address the need for water level monitoring, or other actions, by the applicant.
11. A DNR representative will issue the DNR Appropriation Permit using MPARS.

High-Level Process for Community Public Water Supplies

The following provides a high-level summary of steps for a municipal water appropriations permit applicant and the DNR will take to obtain a high capacity well permit within the scope of an approved water supply plan.

1. City develops local Water Supply Plan, receives DNR approval & city adopts (approved WSP identifies future water needs & source water(s))
2. City submits Well Construction Preliminary Assessment to DNR prior to drilling well
3. DNR provides site-specific WCPA information to city
4. City drills well (MDH notification)
5. City submits permit amendment or application
6. DNR & city coordinate with other agencies (MDH, MPCA, Met Council, watershed districts, counties) and engage in comment period
7. DNR determines if aquifer testing is needed; if so,
    a. City prepares and submits aquifer test plan; DNR must approve
    b. City conducts aquifer tests with monitoring (input from DNR)
    c. DNR reviews aquifer test results
8. DNR makes permit decision
9. Issued permits have applicable permit conditions

Water Appropriation Permit Modifications

Consistent with Minnesota Statute and Rule, the DNR Commissioner can modify water appropriation permits. However, statute and rule also protect the permit holder.

For instance, water appropriation permit holders are afforded due process through Minnesota Statute and Rule. If the permit holder does not agree with a permit decision, they may request a contested case hearing.

Contested case hearings are used in many states. They are informal court proceedings governed by state law that can be used to protect rights, duties and privileges of the affected parties. The purpose of contested case hearings is to provide decision makers with the highest quality information available to render permit decisions, and to provide third party review of an appeal made to a state agency decision.

Modifications to water appropriation permits are described very specifically by Minnesota Statute and Rule:

- The DNR is prohibited from modifying or restricting the authorized amount of groundwater that is used for agricultural irrigation between May 1 and September 30, unless the DNR determines that the authorized amount of appropriation endangers a domestic water supply. [1] This is designed to provide some assurance of a water source to bring the crop through to harvest.
- Whenever a permit is proposed to be modified, there is an opportunity for the permit holder to demand a contested case hearing.
- From the initial decision whether to issue or deny a permit, to the proposed modification of an existing permit due to the establishment of a protected flow or protected elevation in a nearby surface water feature, the applicant or permit holder has the opportunity to a public hearing.[2]

[2] Minn. Rules, 6115.0670, Subp. 3.

- If there is a water use conflict, where there is limited water availability, resulting in the commissioner proposing adjustments to permits in an area that are competing for the same inadequate water source, the action is taken by the DNR only after the permit holders or applicants are notified and given the opportunity for a hearing.[3]
- Most terminations are subject to advanced notice and opportunity for a hearing. An exception would be, for example, when a permittee requests termination.[4]
- The public hearings that can be requested are conducted as contested case hearings under Minn. Stat. Chapter 14, and are conducted by the Office of Administrative Hearings.[5]
- Permits that authorize appropriation from surface water sources may be temporarily suspended as a result of periods of extremely low rainfall. This is defined as when the flows measured in their watersheds fall below a certain point, typically the Q90 flow. Applicants for surface water appropriations are required to have a feasible contingency plan for these situations or agree to withstand the results of not being able to appropriate water (after suspension).[6]

It should be extremely rare for a permit holder to face a permit modification without significant advance warning. However, if a permit modification is necessary and the permit holder or applicant disagrees with the permit decision, Minnesota Statute and Rules provide for a hearing.

If the DNR found the existing authorized water use in an area to be unsustainable, DNR would provide advanced notice and involve permit holders in finding a solution.

[3] Minn. Rules, 6115.0740, Subp. 3.
[4] Minn. Rules, 6115.0750, Subp. 8.
[5] Minn. Stat., 103G.311
[6] Minn. Stat., 103G.285, Subd. 6.

Appendix C
Minnesota Rule Guiding Water Use Conflicts

MINNESOTA RULE 6115.0740 WATER USE CONFLICTS (www.revisor.leg.state.mn.us)

Subpart 1. **Conflict defined**.
For the purpose of these rules a conflict occurs where the available supply of waters of the state in a given area is limited to the extent that there are competing demands among existing and proposed users which exceed the reasonably available waters. Existing and proposed appropriations could in this situation endanger the supply of waters of the state so that the public health, safety, and welfare would be impaired.

Subp. 2. **Procedure**.
Whenever the total withdrawals and uses of ground or surface waters would exceed the available supply based on established resource protection limits, including protection elevations and protected flows for surface water and safe yields for groundwater, resulting in a conflict among proposed users and existing legal users the following shall apply:

A. In no case shall a permitees be considered to have established a right of use or appropriation by obtaining a permit.

B. The commissioner shall analyze and evaluate the following:

(1) the reasonableness for use of water by the proposed and existing users;

(2) the water use practices by the proposed and existing users to determine if the proposed and existing users are or would be using water in the most efficient manner in order to reduce the amount of water required;

(3) the possible alternative sources of water supply available to determine if there are feasible and practical means to provide water to satisfy the reasonable needs of proposed and existing users.

C. If conflicts can be resolved by modifying the appropriation of the proposed and existing users, the commissioner shall do so.

D. If conflicts cannot be resolved through modification of proposed and existing permits the commissioner shall base the decision regarding issuance of new applications and retention, modification, or termination of existing permits on the basis of existing priorities of use established by the legislature as follows:

(1) If the unresolved conflict involves users who are or would be in the same priority class, the commissioner shall require the proposed users and existing permitted users to develop and submit a plan which will provide for proportionate distribution of the limited water available among all users in the same priority class. The commissioner shall withhold consideration of new applications and shall, if the existing permitted appropriations endanger the supply of waters of the state, suspend or limit existing permits until a plan is approved by the commissioner.

The plan must include proposals for allocating the water which address the following: possible reduction in the amounts of appropriation so that each user would receive a proportionate amount of water for use; and possible restrictions in the timing of withdrawals so that each user would be allowed to withdraw a proportionate share of water for use over certain periods of time.

If the commissioner approves the proposed plan, new permits will be issued and existing permits will be amended in accordance with that plan.

If the commissioner determines that the proposed plan is not practical or reasonable, the commissioner shall develop a new plan or modify the proposed plan to provide proportionate share of water among the users involved. The commissioner shall issue new permits and amend existing permits based on that plan.

(2) If the unresolved conflict involves users who are or would be in a different priority class the available water supply shall be allocated to existing and proposed users based on the relative priority of use. Highest priority users shall be satisfied first. Any remaining available water supply shall be allocated to the next succeeding priority users, until no further water is available. Users in the same priority class shall be offered the same options as provided in subitem (1).

Subp. 3. **Notice and hearing**.

All actions by the commissioner shall be made after notice and opportunity for public hearing.

Statutory Authority: MS s 103G.315; 105.415

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Appendix D

Executive Summary of the Report to the Minnesota State Legislature: Definitions and Thresholds for Negative Impacts to Surface Waters

Background and purpose

This report was prepared in response to Laws 2015, chapter 4, article 4, which directed the Department of Natural Resources (DNR) to consult with interested stakeholders and develop recommendations for statutory or rule definitions and thresholds for negative impacts to surface waters.

The DNR is charged with *managing* water resources to assure an adequate and sustainable supply for multiple uses. Minnesota has a modified riparian water law system, in which landowners have the right to make reasonable use of the abutting surface waters or the groundwater beneath their land, as defined and regulated by the water appropriation permitting program. The water itself is a public trust resource, and the state grants the right to water beyond personal use – above 10,000 gallons per day or one million gallons per year – through water appropriation permits. In recent years, it has become increasingly clear that Minnesota's water resources, while abundant in many areas, are not unlimited. In some areas, increasing water withdrawals are using more groundwater than is naturally being recharged. In other areas, groundwater supplies are limited due to the underlying geology. Groundwater contamination is also a limiting factor in many areas.

The variability of Minnesota's climate and geography mean that rainfall is not always available in the quantities we need at the times when it is most needed. Increasing demands on both surface water and groundwater supplies can cause negative impacts to the ecosystems and riparian uses of streams, lakes, and wetlands. While water levels fluctuate naturally throughout the year and across multiple years, water appropriations can push low levels lower, significantly reducing stream flows and more frequently putting fish, wildlife, plant communities and riparian uses at risk.

This report examines the effects of groundwater use on rivers and streams, lakes, and wetlands. DNR's analysis and recommendations are based on the fact that surface water bodies go through seasonal and multi-year cycles of high and low water levels. The seasonal patterns, known as the seasonal hydrograph, are primary drivers in creating and maintaining the unique ecology and associated aquatic and riparian habitats of each water body. To preserve the seasonal hydrograph, protected flows must be established for streams, and protection elevations for lakes and some wetlands. These protection levels can then be translated into a quantity of water that can be sustainably withdrawn. Multi-year dry cycles and extreme droughts also serve important ecological functions, but may require a different approach to determining sustainable water use—e.g., water use that is ecologically sustainable under the normal seasonal hydrograph may need to be reduced during extreme drought.

This report was prepared with input from a broad range of stakeholders, as described in the Introduction and Appendix A. This report also incorporates and summarizes scientific studies, including an examination of approaches used in other states and countries. The recommendations in this report represent the DNR's suggestions to further define and describe methods of determining protected flows and protection elevations. These recommendations are based on the DNR's assessment of available information, analytical tools and the practicality of applying them in Minnesota.

Recommendations

The recommendations in this report fall into three categories: 1) definitions to be added in statute; 2) integration of statutory provisions dealing with surface water and groundwater; and 3) approaches to determining the thresholds for streams, lakes, and wetlands.

Definitions

The following definitions are recommended to be added in statute:

- Negative impact to surface waters – in relation to water appropriations, a change in hydrology sufficient to cause ecosystem harm or alter riparian uses long-term.
- Ecosystem harm – in relation to water appropriations, to change the biological community and ecology in a manner that results in a less desirable and degraded condition.
- Sustainable diversion limit – in relation to water appropriations, a maximum amount of water that can be removed directly or indirectly from a surface water body in a defined geographic area on an annual basis without causing a negative impact to the surface water body.

Statutory changes

The DNR also recommends combining many of the provisions in section 103G.285, which deals with surface water appropriations, and 103G.287, which deals with groundwater, into a single "Water Appropriations" section. This revision would recognize the interconnected and interdependent nature of surface and groundwater resources while removing the circular references between the two sections of statute that make it difficult to identify and assess 'negative impacts.'

Approach to determining thresholds

A "threshold" is essentially the point at which negative impacts occur. Thresholds can be estimated based on data and scientific literature. Calculating thresholds at a statewide scale is not appropriate or practical, however, given the number of variables involved – e.g., which species or which riparian uses are negatively impacted. The diversity of Minnesota's surface water and groundwater resources, land use, and climatic factors would make a single number misleading and inappropriate for many locations and conditions. The precautionary principle would require that any such statewide threshold be set to be protective of the most vulnerable resource, thereby unnecessarily restricting water use in many areas. Therefore, the DNR proposes establishing specific thresholds for specific watercourses, water basins, watersheds, or hydrologic areas in those parts of the state where water use is at risk of causing negative impacts.

Streams: The DNR's research and a review of scientific literature indicate that a 20% change in hydrologic regime (relative to the August median base flow) will negatively affect the ecosystem, while a change less than 10% is not likely to be detectable. Setting a diversion limit of no more than 10% of the August median base flow will preserve the seasonal variability of the natural hydrology under all but the most extreme drought conditions. A 15% diversion limit would preserve much of the seasonal variability, but is not adequate to protect ecosystems during periods of drought. We recommend a 10% limit in most circumstances, but recognize a diversion limit of up to 15% may be appropriate in some areas where water uses are less dependent on a consistent supply.

Lakes: The DNR recommends an approach that establishes sustainable diversion limits for two categories of lakes.

Lakes connected to stream systems that outflow most of the time. For these lakes, the outflowing stream's diversion limit would be applied to the lake and a separate protection elevation for the lake would not be necessary.

Lakes with infrequent surface outflow. For these lakes, protection elevations specific to the lake could be established based on key considerations related to hydrology, ecology, and riparian uses. Water levels at and above the protection elevation are expected to maintain the characteristic hydrology, ecology, and riparian uses of the lake most of the time. Water levels below the protection elevation put one or more of the water body's resources or uses at risk. The protection elevation is used to establish the sustainable diversion limit.

Wetlands: Different types of wetlands have distinct and characteristic seasonal water levels that maintain their characteristic plant and animal communities. Most wetland types in Minnesota depend to some extent on groundwater for at least some part of the growing season. Some wetland types, such as fens, are highly connected to and dependent on groundwater, while others, such as floodplain forests, are more directly influenced by surface-water. However, as yet there is no systematic method for evaluating potential negative impacts on wetlands due to groundwater appropriations, due to limited wetland-related hydrologic data.

The DNR is proposing to establish a comprehensive wetland hydrology characterization and monitoring program statewide. An initial step in this process is to begin testing the feasibility of establishing target hydrographs for the various wetland types, with a particular focus on areas of the state experiencing a heavy demand for groundwater appropriation. A target hydrograph is a range of acceptable water levels throughout the year for each various wetland types, extending from "normal" levels to infrequent or rare low levels that stress the characteristic plant and animal communities. The target hydrograph would be used as a guide for developing allowable diversion limits throughout the growing season to maintain the characteristic hydrologic regime.

Impacts to wetlands are also regulated under other authorities, primarily the Minnesota Wetland Conservation Act and the Public Waters Permit Program. The DNR's goal under this approach would be to avoid wetland drainage that would trigger regulation under those programs.

Methodology

The DNR would focus its efforts to set thresholds for negative impacts primarily in those areas of the state where the intensity of groundwater use and/or scarcity of groundwater supplies is causing concern, such as the groundwater management areas or individual water bodies known to be negatively affected by groundwater use. In these areas, the DNR will implement the following steps:

1) establish negative impact thresholds for surface water bodies;
2) establish sustainable diversion limits that will maintain protected flows and protection elevations of those water bodies;
3) conduct groundwater modeling to determine the effects of groundwater withdrawals on the surface water bodies; and
4) assess to what degree individual groundwater withdrawals may need to be adjusted.

Applying this approach to water use permitting

Water users, whether they are public suppliers, agricultural irrigators, industry, businesses or golf courses, need reliability and predictability. Establishing negative impact thresholds and sustainable

diversion limits should ultimately improve the predictability and consistency of water appropriation decisions. It should also reduce the need to modify permits during drought and thus allow water users to rely on a fixed quantity in most years, although extreme drought conditions extending over multiple years may still call for emergency water use restrictions.

Establishing negative impact thresholds and sustainable diversion limits is the first step in the process of allocating water resources among individual appropriators. Further discussion is needed as to how best to engage current and prospective water users in allocation decisions once we have determined the amount of available water in a given hydrologic area.

Minnesota's water appropriation statutes were formulated in an era when groundwater resources were viewed as essentially unlimited. Allocating water resources in an environment where those resources may in fact be limited calls for additional research and discussion. Our statutes and rules may need to be revised to provide better guidance. The DNR is currently researching potential models of water allocation systems used in other states and regions as part of this larger discussion.

Local governments also play a significant role in the water allocation process through their planning and land use controls, which help to determine the number and nature of residential, commercial, and industrial water users in a given community. In planning for future development, local governments should carefully consider the sustainability of their water supplies and the extent to which new water-intensive uses should be allowed or encouraged. A planning process that considers the needs of all water users, future needs, and opportunities for water conservation can help to sustainably manage existing and proposed water use.

Conclusions

- **Minnesota is in the "urgency room," not the "emergency room," in terms of water use management.**
- **The state's water management policies, statutes, and rules are strong and conceptually sound. However, the state's water management statutes could be improved by clarifying terminology and better recognizing the interconnected nature of surface water and groundwater.**
- **There is a strong scientific basis for maintaining the natural dynamic patterns of surface water bodies by establishing protected flows for individual streams, protection elevations for individual basins, and target hydrographs for wetlands.**
- **Over the next five years, the DNR intends to set protected flows, protection elevations, and target hydrographs for water bodies in places where demand for water may be exceeding sustainable supplies. The changes to statute recommended in this report would help support that work.**