Appendix C to Attachment C

To

Honor the Earth

Comments on Line 3 Replacement Project

DEIS

CN-14-916 and PPL-15-137

Appendix C
PCA Sandpiper Letters

January 23, 2015

The Honorable Eric Lipman
Minnesota Office of Administrative Hearings
600 North Robert Street
P.O. Box 64620
St. Paul, MN 55164-0620

RE: In the Matter of the Application of North Dakota Pipeline Company LLC for a Certificate of Need for the Sandpiper Pipeline Project in Minnesota
MPUC Docket No. PL6668/CN-13-473
OAH Docket No. 8-2500-31260

Dear Judge Lipman:

The Minnesota Pollution Control Agency (MPCA) submits the following comments for consideration by the Administrative Law Judge (Judge) in making recommendations to the Public Utilities Commission (Commission) in this matter. The MPCA's comments provide information addressing several of the criteria set forth in Minn. Rule 7853.0130 for making a determination on a certificate of need for the Sandpiper Pipeline Project (SA-Applicant) proposed by North Dakota Pipeline Company ("NDPC" or "Applicant"). The MPCA respectfully requests that if a determination of need is reached in this proceeding, the certificate of need be conditionally granted contingent upon suitable modification of SA-Applicant to protect and avoid high quality natural and environmental resources, and the inclusion in the Route Proceeding, Docket No. CN-13-474, of SA-03 and any other System Alternative that meets the identified need, pursuant to the Commission's authority under Minn. Rule 7853.0800. The MPCA will gladly provide additional information or comments that the Judge may find helpful in the course of this proceeding.

A. The MPCA's comments address four of the criteria required under Minn. Rule 7853.0130 for a determination on a certificate of need.

Minn. Rule 7853.0100 requires evaluation of all applicable and pertinent factors listed under each of the criteria set forth in Rule 7853.0130 and a specific written finding with respect to each of the criteria. Minn. Rule 7853.0130 states that a certificate of need shall be granted if all the listed determinations can be made. However, if one or more of those determinations cannot be met, a certificate of need may be denied, or conditionally granted subject to modification, under Minn. Rule 7853.0800.

The MPCA is providing comments that address the determinations required under Rule 7853.0130.B (2); 7835.0130.B (3); 7853.0130.C (2); and 7853.0130.C (3), which state:

- 7853.0130.B. 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, considering: . . .
  (2) the cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives;
  (3) the effect of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives; and . . . .

- 7853.0130.C. the consequences to society of granting the certificate of need are more favorable than the consequences of denying the certificate, considering: . . .
  (2) the effects of the proposed facility, or a suitable modification of it, upon the natural and socioeconomic environments compared to the effect of not building the facility;
  (3) the effects of the proposed facility or a suitable modification of it, in inducing future development.

The MPCA comments will address each of the criteria mentioned above and associated listed factors.

B. SA-03 is a reasonable and prudent alternative to the Applicant's facility (SA-Applicant), since the respective costs of SA-Applicant and SA-03 and of oil to be supplied by SA-Applicant and by SA-03 are not significantly different. Minn. Rule 7853.0130.B(2).

Financial impacts and comparative costs are among the factors to be evaluated in determining whether the criteria in Minn. Rule 7853.0130.B are met. Since MPCA submitted its comments dated August 21, 2014 to the Public Utilities Commission,[1] additional relevant testimony have been submitted in this docket. This included the direct testimony of economist Adam Heinen of the Department of Commerce (Doc. ID 201411-104761-03 ("Heinen Direct"). Mr. Heinen stated his expert opinion that System Alternative SA-03, as proposed by the MPCA, would meet the need of the project if as also proposed by MPCA, the Clearbrook terminal location was moved westward to the Crookston area or another location closer to the North Dakota border. (Heinen Direct, p. 75,) Mr. Heinen also indicated that moving the terminal location could increase the cost of constructing the pipeline, and discussed Applicant's estimate of the cost increase. (Heinen Direct, 75-76). Mr. Heinen then stated in his opinion that any apparent higher costs of SA-03 based on Applicant's analysis were insignificant and unlikely to impact retail prices and that the Applicant had not shown that SA-03 was an unreasonable alternative to meet the need of the proposed project. (Heinen Direct, pp. 77-78)

[1] See PUC Docket Filing 20148-102458-02 and 20148-102458-04

Mr. Heinen reinforced his direct testimony when he filed rebuttal testimony addressing SA-03. Mr. Heinen affirmed that SA-03 appeared to be a reasonable alternative to meet the need for this project. (Heinen Rebuttal, p. 7) (Doc. No. 20151-105968-01). This testimony supports the finding that under Minn. Rule 7853.0130.B(2), based on comparative cost, SA-03 is at least a reasonable and prudent alternative. However, comparative effects on natural environments, i.e., potential environmental and natural resource impacts as discussed in the following sections, appear to make SA-03 "a more reasonable and prudent alternative" under Minn. Rule 7853.0130.B(3).

In addition to direct costs of construction and operation, the costs considered under Rule 7853.0130.B(2) should include an evaluation of whether a system alternative such as SA-03 is a more reasonable alternative to SA-Applicant because of a reduced risk of a costly spill to a sensitive environmental area. An Alternative that avoids or impacts fewer sensitive ecosystems and water bodies than SA-Applicant will have a smaller likelihood of incurring significant response costs. As documented by the U.S. Environmental Agency (USEPA), it costs considerably more to restore or rehabilitate water quality than to protect it.[2] The areas of the state traversed by the SA-Applicant have waters and watersheds that are currently subject to protection in the state's "Watershed Restoration and Protection Strategy" program, [3] financed through the Clean Water Fund and aided by significant volunteer participation of Minnesota citizens. By keeping these waters as clean as possible before they become impaired, extensive costs of restoring waters to state standards can be avoided. Location of oil pipelines in these areas place their pristine waters at risk, and also place potentially millions of dollars in state and federal funds allocated for protection of these areas at risk.

When evaluating spill response costs, the following factors would make one corridor a better choice than another in minimizing the potential for costly spills or accidental discharges: fewer crossings of flowing water; fewer adjacent water bodies; quality of those waters; presence of especially sensitive areas or habitats or species or uses; better access to downstream oiled areas; tighter soils; and closer and more equipped and prepared responders. The MPCA applies these factors in comparing SA-Applicant with SA-03 and other alternatives in the next section of our comments.

C. SA-Applicant presents significantly greater risks of potential environmental impacts and encroaches on higher quality natural resources than SA- 03 and several other system alternatives. Minn. Rule 7853.0130.B(3). The effects of SA-Applicant on the natural environment support a determination in favor of other alternatives. Minn. Rule 7853.0130.C(2) and C(3).

[2] See http://water.epa.gov/polwaste/nps/watershed/upload/economic_benefits_factsheet3.pdf (incorporated by reference) .

[3] See (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html)

Environmental risks are posed by all aspects of pipeline construction and operation, including post-spill recovery and restoration activities. The primary and most significant risks are associated with the long-term effects upon environmental and natural features that will be permanently altered, eliminated, or otherwise impacted by the presence of a pipeline, as well as the potential impacts of the release of crude oil as the result of a spill event during the potential 40 years or more that the pipeline will be operational. Those risks include environmental damages such as loss of wildlife, contamination of drinking water, destruction of fisheries, loss of habitat, and alteration of ecological systems. (For a discussion of the behavior and cleanup of oil spilled to surface water, soil, and groundwater, see Appendix A to the MPCA's comments.)

During these proceedings, the MPCA has commented extensively on the environmental concerns regarding the route proposed by Applicant in comparison to alternative routes and system alternatives. MPCA's prior comments can be found in Document Nos. 20146-100780-01, 20148-102458-02 and 20148-102458-04, each incorporated by reference. These prior comments have addressed such specific items as access to potential release sites in surface waters, potential to impact ground water, wild rice, the state's highest-quality surface water systems, wildlife habitat, low income populations, watersheds currently being assessed for restoration and protection strategies, fisheries, economies, and numerous other parameters.

In these comments, the MPCA concluded that with respect to protection of the highest-quality natural resources in the state, the SA-Applicant route presents significantly greater risks of potential impacts to environment and natural resources than several of the system alternatives, including SA-03. Although all proposed routes and system alternatives have the potential to impact some natural resources, the Applicant's proposed route encroaches on higher quality resources, superior wildlife habitat, more vulnerable ground water, and more resources unique to the state of Minnesota than do many of the proposed system alternatives. Several examples of the greater potential for harmful environmental impacts of SA-Applicant compared to other alternatives are highlighted in the following pages.

The relevance of other system alternatives depends upon whether the need for the project is determined based upon a narrower and more localized view or upon a larger regional view. While SA-03 has been identified as a reasonable and prudent project alternative as a general matter, it serves as such an alternative from both a localized and regional view. However, if need is determined based on a larger regional view of need, several other system alternatives may also be reasonable and prudent alternatives to meet that regional need. Consequently, the MPCA also addresses the comparative impacts of other System Alternatives and SA-Applicant to inform a determination of need from a regional perspective.

The broader objective of the proposed project is transporting oil to markets in the Midwest and along the eastern and gulf coasts, not to transport oil through the state of Minnesota

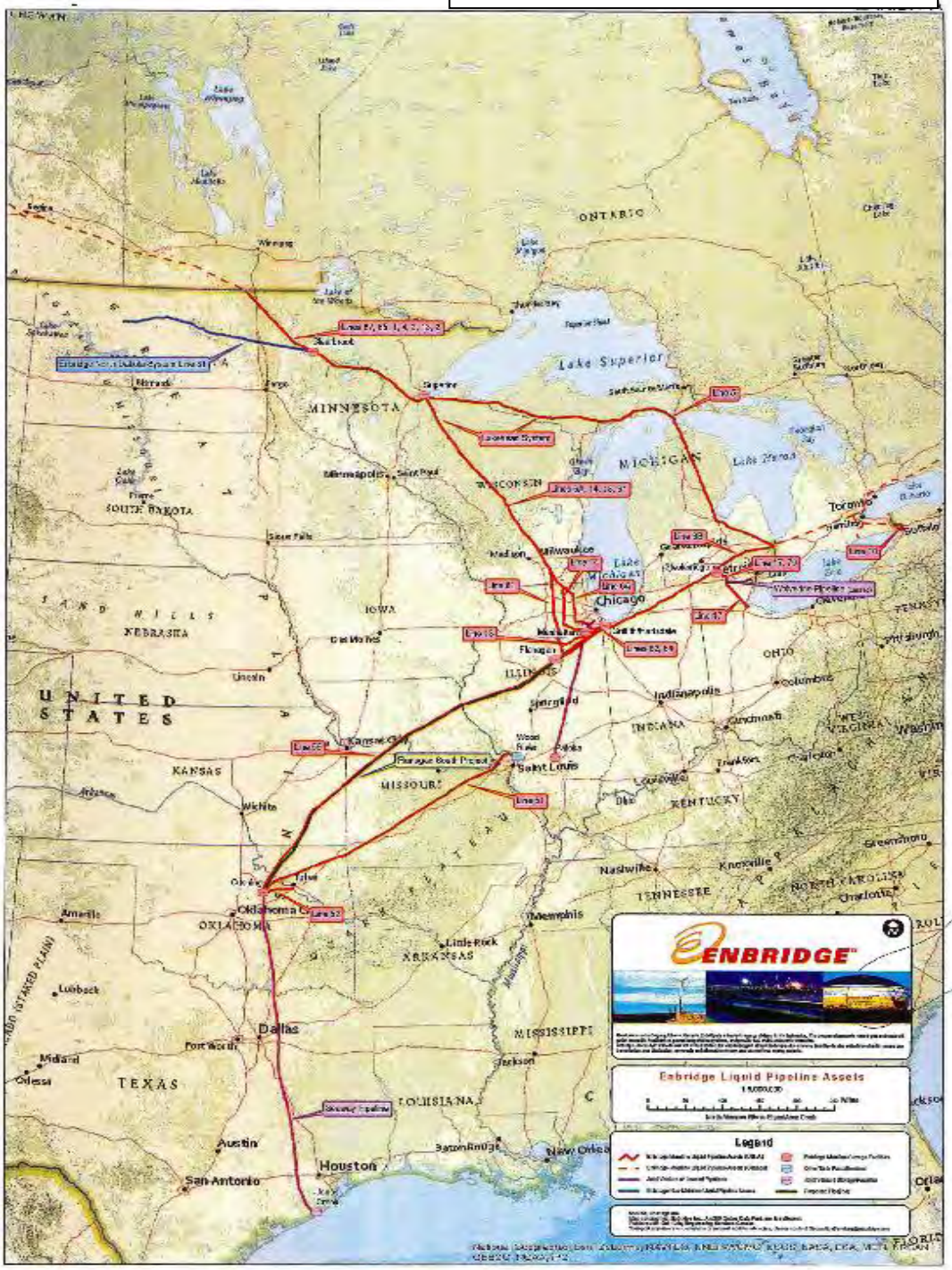
with termination in Superior Wisconsin. [4] Oil that is to be transported to Superior, Wisconsin through the proposed pipeline will continue through Wisconsin to Chicago (or Wisconsin and Michigan if routed to Sarnia, Ontario). Oil that would be transported via one of the southern system alternatives, such as SA-04, and on to the Chicago area would have to be transported through Iowa before reaching Illinois. In either case, Chicago appears to be a common destination for most if not all of the oil that is proposed to be moved through Minnesota.

Information regarding the existence of contractual agreements obtained when Applicant held an "open season" has been offered as the underlying basis for a determination of need.[5] The Applicant has suggested that the facility as proposed (SA-Applicant) is necessary in order to assure those contractual agreements are filled and that alternatives such as SA-03 would negatively affect the cost of fulfilling those agreements. This proceeding will determine whether the Applicant's open season agreements establish the need for siting a pipeline through Northern Minnesota instead of along a southern alternate route. If the underlying actual and predominate need of the project is to get Bakken oil to Midwest regional markets in Wisconsin, Michigan, or Illinois, that need can be achieved by several of the system alternatives. The foregoing is generally and specifically supported by the direct and rebuttal testimony of Applicant's witness Neil Earnest (Document ID Nos. 20148-102134-03, Earnest Direct Testimony, and 20151-105934-01, Earnest Rebuttal Testimony). See Figure 1, which is an overview of Applicant's regional infrastructure and corresponding destinations.

[4] Applicant testimony acknowledges that the project's intended destination is not Superior, Wisconsin but refineries in the Midwest. Applicant witness Earnest, in rebuttal, indicates that oil from this project is not only competing with alternative modes of transportation to refineries in Chicago, Patoka, and Cushing. The oil is also competing with all of the other crude oil choices available to the refineries in the Midwest. Enbridge rebuttal at pp 5-6. "Accordingly, all else equal, higher Sandpiper transportation costs to the Midwestern markets acts to decrease the volume of Bakken crude oil that can be expected to be processed in the Midwest, and to lower the utilization of the pipeline." (Earnest Rebuttal, 6) 20151-105934-01

[5] Heinen Direct, pp. 6-7. The nature and content of these open season transportation service agreements are confidential. The MPCA has not examined the nature or substance of these agreements or their duration. Mr. Heinen also indicates in his testimony that he does not know the ultimate destination of that oil.

Figure 1


ENBRIDGE
Enbridge Liquid Pipeline Assets
Legend
Lake Superior
MINNESOTA
WISCONSIN
MICHIGAN
Chicago
IOWA
NEBRASKA
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSOURI
KANSAS
OKLAHOMA
TEXAS
ARKANSAS
LOUISIANA
MISSISSIPPI
Dallas
Houston
San Antonio
Austin
Oklahoma City
Kansas City
Saint Louis
Memphis
Nashville
Indianapolis
Toronto
UNITED STATES

Comparative Evaluation of Environmental Effects

The comparative long term environmental and eco-system impacts and the potential impact of spills must be carefully evaluated for each system alternative in determining the need for a pipeline project. Permanent harm to sensitive eco-systems, habitats, and species may occur following construction of a new pipeline. In addition, long-term impacts from a spill can be much more damaging in areas containing features such as environmentally sensitive areas and those with limited access. As discussed below, these long-term environmental and eco-system impacts should be accorded great weight in the determination of need for a pipeline project. Further, in associated routing proceedings, these impacts must be subjected to even more rigorous and detailed environmental review when evaluating alternative routes. It is not sufficient under Rule 7853.0130 to determine that the location for the proposed project is suitable or reasonable. Rather, the location should be one that best minimizes the risk to human populations and environmental and natural resources.

1. Adverse Impacts to High Quality Surface waters are Greater under SA-Applicant.

SA-Applicant traverses a greater number of high quality water bodies than does SA-03 and presents higher risk of environmental impacts from a spill or release of crude oil along its route corridor. Based on watershed health scores as determined by the Minnesota Department of Natural Resources in its Watershed Health Assessment Framework, MPCA documented that the adverse impacts to overall water quality from construction and operation, as well as spill cleanup and response, of Applicant's Alternative were more harmful than alternatives including SA-03, SA-04, and SA-05. See MPCA Comment letter dated August 21, 2014 , Document ID Nos. 20148-102458-02 and 20148-102458-0420148-04, page 5).

The MPCA provides these additional comments to assist in proper interpretation of the information on surface waters in the Department of Commerce environmental analysis "Comparison of Environmental Effects of Reasonable Alternatives" (DOC study) submitted on December 19, 2014, (ID 201412-105567-01) and in evaluating the criteria and factors based on that information. For example, on its face, the DOC study may be misinterpreted as indicating that SA-03 is a worse alternative than SA-Applicant in affecting impaired waters. The DOC study concluded that there were 50 impaired waters crossed by the Sandpiper route, and 98 impaired waters crossed by SA-03 (DOC Study, 72, 90). Under the Clean Water Act ("CWA"), an impaired water is any water body (e.g., lakes, rivers, streams, wetlands) that is too polluted or otherwise degraded to meet the applicable water quality standards set by states, territories, or authorized tribes. Water quality and water quality standards will vary throughout the state depending on the region of the state in which the waters reside. "Impaired" waters are not the same across the state. For a water body to be deemed impaired in southern or western Minnesota (western corn belt plains or Red River valley ecoregions), it typically will have a greater degree of contamination or degradation than would be required for a water body in the central

hardwood forest ecoregion of Minnesota traversed by the applicant's preferred route (Sandpiper) to be deemed impaired. Thus, waters that are listed as impaired along the SA-Applicant route are likely to be higher quality (having a lower contamination level) than a water listed as impaired in the southern part of the state, and might not be listed as impaired at all along the SA-03 route. Waters in northern Minnesota are generally of better water quality or more pristine.

2. Significant Environmental Damage Would Occur From a Release at or near a Water Crossing Extending up to at least a Distance of 10 Miles from the Point of Release. SA-Applicant Has Many Areas of Limited Access, Increasing the Risk of Extended Impact to Surface Waters.

The most significant potential impact to a surface water from a crude oil pipeline crossing is the environmental destruction that would occur in the event of a release at or near the water crossing. According to a third party risk assessment document developed as part of the Keystone XL EIS[6], Exponent states: "A distance of at least 10 miles downstream from the proposed centerline of the pipeline should be used for the identification of sensitive areas and for identifying CPSs(contributory pipeline segments) during the final design phase of the Project." The 10 mile estimate is fair, given the potential for flowing water to carry a release of oil, especially in remote areas such as those found throughout the proposed Sandpiper route. Considering that the 2010 Enbridge spill into Talmadge Creek and the Kalamazoo River caused significant damage approximately 35 miles from the spill site, a ten mile estimate of damages is conservative and reasonable. See Stolen testimony, Document ID 201411-104748-02, page 24.

Damage to aquatic systems from an oil release can occur either as a result of physical effects such as smothering of organisms, or toxic contamination due to the chemical compositions of the oil. An oil spill in an aquatic ecosystem could cause, among numerous other impacts, death of waterfowl, other bird species, amphibians, reptiles, aquatic mammals, microorganisms, plankton, fish, pets and livestock living adjacent to waters, stunted growth of surviving species, loss of vegetation, destruction of soils, long-term reduction of dissolved oxygen, human health damage, damage to air quality, property value loss, and destruction of drinking water resources. This does not include damages that would occur during the cleanup process, especially in areas with limited, restricted or no access.

3. Potential Damages During Pipeline Construction and Testing Are Greater for SA-Applicant than other Alternatives.

Damages to surface waters as a result of construction activities can and do occur. Flowing water can also carry these effects a long distance from their origin, as noted above. MPCA has observed and documented significant sediment discharges to surface water on pipeline

[6] See http://keystonepipeline-xl.state.gov/documents/organization/221278.pdf, page XV, "Recommendations",

projects as a result of failing to install sufficient sediment and erosion controls on hillsides adjacent to surface waters. The failure to account for spring time subsidence of soils as a result of winter construction is common; frozen soils that are dug up and replaced into trenches thaw and subside in warmer spring temperatures, causing the soils to sink over the pipeline and form a ditch. These ditches act as conduits for melt water or rain water, and as they do not have sediment controls installed, tend to erode significantly as water runs through them. It is common for these subsidence ditches to terminate in water bodies, causing sedimentation and habitat damage (MPCA Comment Letter dated April 4, 2014, -Document ID 20144-98170-01, page 8).

Damage to surface water resources during hydrostatic testing discharges has occurred recently in the state. During these tests, segments of pipeline are filled with a significant volume of pressurized water, often millions of gallons, to test the integrity of the pipe. The water is then released in a manner that should minimize environmental impact. During the Alberta Clipper/Southern lights diluent project, Enbridge exceeded agreed-upon maximum discharge rates on 15 of its hydrostatic testing discharge operations. At two of these sites (adjacent to the Mississippi River and adjacent to the Clearwater River), the exceedances were enough to cause significant erosion and sediment discharge to surface waters. These cases were referred to the U.S. Environmental Protection Agency and eventually settled by the U.S. Department of Justice in 2013 with Enbridge paying a $425,000 penalty. During these hydrostatic testing operations, as much as 4,000 gallons of water per minute can be discharged from valves. This water is general required to be discharged to an upland area or a dewatering device, but when discharged rates are exceeded, or sometimes even when they are not, the pressurized water can erode soils and carry those eroded soils to surface waters, causing turbidity or smothering of aquatic habitat.

The placement of the new terminal construction west of the proposed Clearbrook location as suggested by MPCA in SA-03 will assure that future pipelines are located west and south of these pristine areas, thus avoiding the resources that the state is spending millions of dollars to protect. Meanwhile, the continued expansion of the Clearbrook facility that will coincide with construction in the SA-Applicant location will mean continued impact and potential impact to the highest value (pristine) waters in our state as a result of future pipeline construction.

4. Threats to Groundwater and Potential Drinking Water Supplies from SA-Applicant are Difficult to Assess, but Appear to Pose More Significant Risks than the System Alternatives, including SA-03.

Highly detailed topographical data for the state of Minnesota (called “LIDAR” data)) illustrates that the Sandpiper route (SA-Applicant) traverses territory with greater topographical contrast than does the SA-03 route. Much of the topography along the SA-Applicant route in Minnesota is the result of the deposit of glacial till from thousands of years ago. The composition of this till is often dependent on how the till was deposited. A

term used to describe these soils is “moraine,” or a mass of rocks and sediment carried down and deposited by a glacier, typically as ridges at its edges or extremity.

What is most important to understand about the soils along the SA-Applicant route is that the complexity of moraines in the area creates a significant degree of localized changes in groundwater movement that are very difficult to predict, as opposed to some of the flatter lands to the west and south, such as those traversed by SA-03, SA-04, or SA-05. Typically, ground water through this till along the SA-Applicant route will move laterally and toward a water body, so it is important that significantly more data is gathered from this route before the possible movement of oil in the event of a release can be predicted and response plans developed. It would be very difficult, if not impossible, to accurately assess the potential for ground water contamination based solely on the examination of GIS layers. However, it can be predicted that the damage to groundwater, potentially used as a source of drinking water, as well as the connected soils could take decades to repair, if the damage could be repaired at all. Additional impacts could include damage to agricultural areas (inability to grow crops) and damage to surface waters, wildlife and habitat from oil carried through underground conduits to those areas.

The LIDAR data strongly suggests an increased potential for impacts to drinking water from SA-Applicant than from SA-03 and some other system alternatives. However, more in-depth study will need to be done in the routing phase in order to make an informed comparison and either confirm or negate what the LIDAR data suggests as a factual conclusion.

5. SA-Applicant Threatens a Greater Percentage of Wild Rice and Native Forests than any of the Proposed Alternatives, including SA-03.

Wild rice, in addition to being an important economic consideration in Minnesota, is also an extremely important cultural resource, as well as an essential food source for humans and wildlife. It requires very specific conditions and good water quality, both of which are provided by north central Minnesota lakes. The Sandpiper pipeline would encroach on some of the richest wild rice territory in the state of Minnesota. Further, MPCA staff has identified 10 wild rice locations along the Sandpiper route for which there is no access from pipeline to the location of the wild rice. By comparison, SA-03 has two such areas. As shown in Figure 2, SA-Applicant (in green) would threaten significantly more of the state wild rice crop than any system alternative.

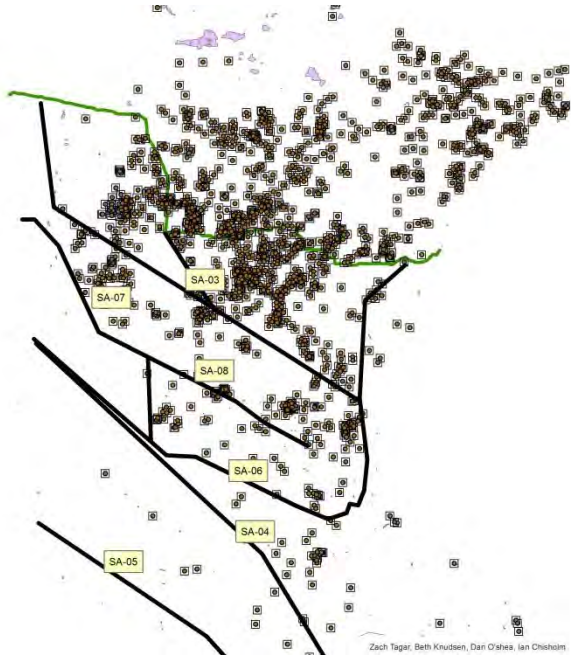


FIGURE 2 -- Wild Rice stands in Minnesota. The Sandpiper route (in green) would threaten more of the state's wild rice stands than any of the proposed system alternatives.

6. SA-Applicant Has a Greater Potential for Impact on Ecoregions than other Alternatives, including SA-03.

As accurately indicated in the DOC study, the majority of SA-03 crosses land that has been converted to agriculture or developed; this is true even when one considers only the portion of the system alternative within the state of Minnesota. Analysis of a GIS map of land cover in Minnesota (Figure 3 below) is helpful to indicate the land cover that would be crossed by SA-Applicant and the Alternatives. When the location of SA-Applicant, and other Alternatives are superimposed on Figure 3, it demonstrates that SA-03 skirts large areas of hay, grassland, pasture, and cultivated crop with infrequent passes through forested areas and wetland. By contrast, the SA-Applicant route crosses a significant amount of forested lands and wetlands, encroaching on significant agricultural land only west of Clearbrook and in the Park Rapids area. SA-Applicant can be seen to skirt far more forest and wetland areas than either system alternative SA-03, SA-04, or more southern alternatives.

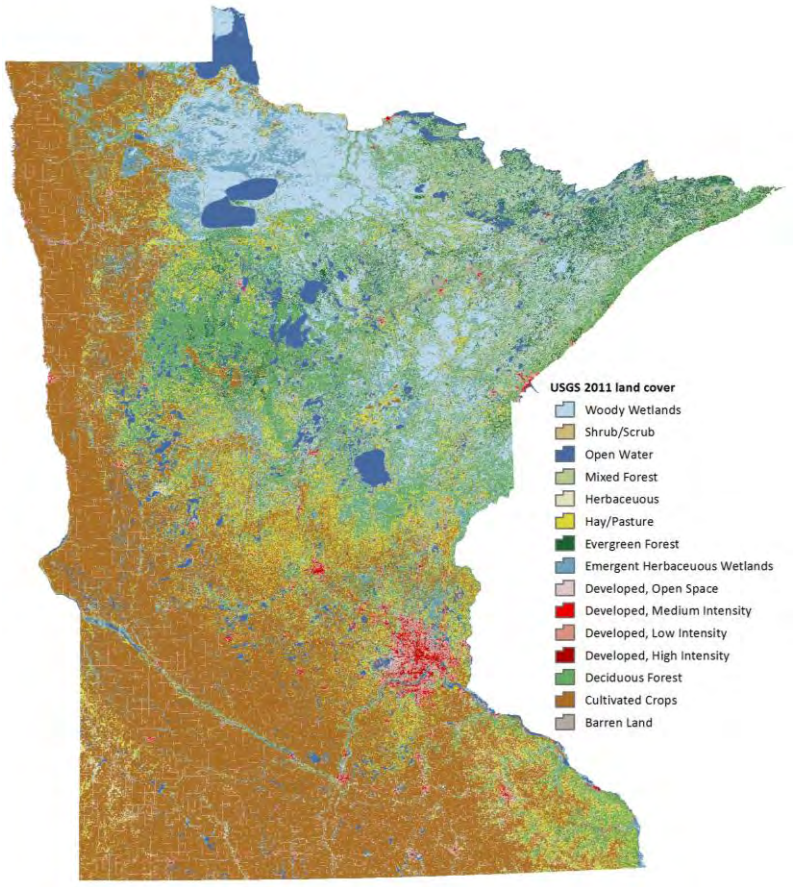


FIGURE 3-- The legend on the left indicates what land cover types are represented by what colors.

Forested areas, particularly larger, unfragmented expanses of forest, are necessary for a number of species of wildlife to survive. Many species of song birds, for example, need deep woods for nesting to avoid "edge species," or species that are more tolerant of human disturbance, because certain edge species such as cowbirds can parasitize their nests and cause mortality to their young. Other species, such as certain reptiles and amphibians, are very habitat specific and cannot easily disperse if that habitat is damaged, such as when a pipeline is placed through that habitat, altering vegetation, soils, and hydrology. Sensitive species of animals and plants require very specific, balanced conditions which can be permanently altered when a pipeline corridor is opened. Long term disturbance and fragmentation of these areas as a result of pipeline construction and siting will have negative impacts on these ecosystems and the wildlife dependent on these conditions.

In addition, an oil spill or release in these areas could result in toxic conditions in soils and vegetation which could kill wildlife. Vegetation would die off either as a result of direct exposure to oil, as a result of altering corridor topography or soil composition during construction activities or clean up after a spill. It is important to note that Enbridge has promised to separate topsoil only if asked to do so by landowners. It is equally important to separate and replace topsoil in forested, remote environments to maintain the integrity of those systems and mitigate some of the potential long-term impacts of pipeline construction.

Impacts to agriculture and pastureland can also occur, and have. However, farms typically do not provide habitat for large numbers of sensitive species or plants or animals that cannot exist elsewhere, and oil movement is likely to be reduced to some extent in flatter terrains with less water movement. Although financial impacts to the landowner and company responsible for the oil release may be greater than in some natural areas, actual environmental damage is apt to be less, and more easily mitigated.

7. SA-Applicant Has More Locations with Poor Access in the Event of a Release than SA-03 or other Alternatives.

As indicated in the June 24, 2014 letter by the MPCA (Document ID 20146-100780-01), access to potential leak sites in the State of Minnesota is of significantly greater concern along the SA-Applicant route than on any of the proposed system alternatives. MPCA staff identified 28 sites along the Sandpiper route for which access would be difficult or impossible within 250 feet of a 2000 foot downstream flow if oil were to be released in certain water bodies. By comparison, seven such areas were located on the SA-03 route, and none on SA-04.

A primary rule of thumb when planning for response to an oil leak is that a release in soil is better than a release in water, and a release in stagnant water is better than a release in flowing water. (For a more detailed discussion of the factors involved in oil spills and responses, see Appendix A to the MPCA comments.) In the Enbridge 2010 Kalamazoo River oil spill, oil caused environmental damage a reported 35 miles downstream from the original release site. The MPCA analysis was limited in scope and only took into account access within 2000 feet of a possible spill. The agency has not evaluated or assessed how much farther oil could travel in some of the identified locations along SA-Applicant's route before containment of a spill could be implemented if the leak were discovered in a timely manner. According to the aforementioned Exponent risk assessment for the Keystone XL pipeline, a small leak from a hole of 1/32 inch in diameter in a pipeline could remain undetected for several months, even with the most up-to-date leak detection technology in place. The same leak could release up to 28 barrels of oil per day, at 42 gallons per barrel. Thus, even a very small, virtually undetectable leak in a remote area, such as those located along much of the proposed Sandpiper route, could cause significant environmental damage such as that described under heading C.3 of this letter without being detected in remote areas, and limited access may also reduce the chance that a citizen may observe and report a leak too small for detection by technology.

The creation of access in remote locations where none exists can create its own problems, including damage to habitat, creation of a source of long-term erosion, fragmentation, aesthetic issues, alteration of hydrology, and other issues. The best way to avoid these concerns is to avoid or reduce the number of crossings of flowing water bodies, or those where access is limited.

From a perspective of minimizing risk of major environmental incidents due to inability to access potential leak sites in Minnesota, the proposed Sandpiper route fares more poorly than any of the proposed system alternatives.

8. SA-03 and Other System Alternatives Follow Existing Corridors to a Greater Extent than does SA-Applicant.

System Alternatives SA-03, SA-04, and SA-05 all follow specific, already existing pipeline corridors. Assuming that all have already passed at least some degree of environmental scrutiny and have been adjusted in critical areas to avoid key resources, a route in these corridors can also likely avoid critical areas and resources. It is important to consider that for these routes, there is no need to "estimate" possible impacts by using an inclusive buffer of a random width to determine quantities of resources that "might" be impacted if one imagines the width of the pipeline corridor to be several miles wide. Instead, one can make a fairly accurate determination of what the impacts or potential impacts of these routes would be based on a width of a few hundred feet. These proposed routes are not "crayon drawings" on a map, but represent actual in-the-ground infrastructure. Precise numbers of water body crossings, mineral extraction sites, forests, wetlands, population densities, cultural resources sites, access areas, and potential downstream carry of released oil all can be determined with relatively little effort by state agencies with access to the required location data. What cannot be determined without more detailed study because of limitations in ArcMap(GIS) capabilities is the quality of those resources. MPCA and Minnesota Department of Natural Resources (DNR) staff can provide general overviews of how the resources in those areas compare to the resources in the northern or forested parts of the state, but on the ground site-by-site analysis is required.

Some of the proposed system alternatives follow highway corridors to some extent, and thus specific placement of the lines is more difficult to guarantee and resource data would be difficult to assess at this stage without more specific information. However, a required consideration for pipeline routing as stated in MN. R. 7852.1900, subp. 3. F., is the use of existing rights-of-way and right-of-way sharing or paralleling. With that in mind, since SA-03, SA-04, and SA-05 all follow specific existing corridors, while SA-Applicant does not in its entirety, then all three system alternatives could be brought forward for further review if they are determined to meet the need for the project, provided that this criteria is considered worthy of sufficient weight in the process.

Conclusion.

SA-03 is a reasonable and prudent alternative to meet the need that may be demonstrated in this proceeding with fewer potential impacts to the highest quality surface waters and other natural resources in the state of Minnesota than SA-Applicant. Further, if the project need is to transport oil from the Bakken fields of North Dakota to markets in the Midwest, system alternatives SA-04 and SA-05 must also be considered as candidates to meet that

need, as they present fewer potential impacts to the natural environment of Minnesota and surrounding states than SA-Applicant.

If a determination of need is reached in this proceeding, the MPCA respectfully requests that the certificate of need be conditionally granted contingent upon suitable modification of SA-Applicant as necessary to protect and avoid high quality natural and environmental resource and the inclusion in the Route Proceeding, Docket No. CN-13-474, of SA-03 along with any other System Alternative that meets the identified need, pursuant to the Commission's authority under Minn. Rule 7853.0800.

Thank you for consideration of these comments.

Sincerely,

William Sierks
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APPENDIX A

BEHAVIOR AND CLEANUP OF OIL SPILLED TO SURFACE WATER, SOIL, AND GROUNDWATER

Presented below is general description of behavior and cleanup of oil spilled to surface water, soil, and groundwater.

Behavior of Oil in Surface Water

Many factors contribute to the spread and spill response efforts of an oil spill to surface waters, including weather, wave action and the chemical and physical properties of the oil. Oil that reaches surface water spreads on the surface of the water. If the water is flowing, the oil will be carried along. Additionally, wind will spread oil on water. By these forces thick layers of oil will spread and become thinner, more extensive layers. Oil spills may range from thickness measured in feet to a micron-thick rainbow of oil.

Some of the oil on water will evaporate. For example, Bakken oil is more volatile than many other crude oils. The evaporation of the "light end" portion of the oil increases the risk of ignition and exposure of responders to the toxic volatile components in the oil. Some of the oil on the water's surface will sink, especially as it mixes with sediment and as it loses the light ends through evaporation. Alberta oil sands crude is more prone to sinking than are many other crude oils. Sunken oil may move with water and/or may sink into bottom sediment. It may later release from bottom sediment if disturbed or with changes in temperature or current. Oil that sinks is especially challenging and tactics for finding and recovering sunken deposits of oil are not well developed. Removal of oiled sediment creates significant damage on its own. Some of the oil on water will dissolve into the water. Benzene, a toxic component of all crude oil, is among the most soluble components of crude and refined oils. Oil in moving waters will form emulsifications, called oil mousse, which is difficult to recover. Crude oils and refined oils will also have varying levels of hydrogen sulfide and other gases and constituents that are potentially toxic to humans and water life. In addition, oil spilled in surface water will coat and kill emergent vegetation, wildlife, shoreline, structures, and vessels.

Most aspects of response to an oil spill to surface water are made more difficult and less effective in winter ice and snow conditions. This is especially so if oil gets under ice, or if

the ice is not safe for holding up responders and equipment. Sometimes oil on frozen ground or oil on top of competent ice makes for easier oil recovery.

Often a point is reached where the environmental damage caused by attempting to recover spread out and dispersed oil outweighs the damage of the oil. Consequently, oil spill response strategy is to contain spilled oil before it gets away.

Spill Response to Protect Surface Water

Every oil spill recovery tactic requires speedy deployment of specialized equipment by specially trained responders. The tactics of recovery of oil from surface water include:

- Reaching the location of the spill, and reaching downstream oiled or potentially oiled locations. Access along a railroad track or pipeline right-of-way to the spill site sometimes is easy. But getting access to oil that has gotten away from the spill site down river or into fringing wetlands is often very difficult.
- Stopping the flow of oil from the land into the water. Each tactic requires access, and much equipment and specialized training.
- Capturing and containing oil downstream of the spill site. This is usually attempted with floating "containment booms" (floating 50 foot long plastic tubes chained together) to hold the oil. Placing containment booms require access and boats, booms and ropes, anchors, buoys, and specialized training. This equipment is seldom nearby. Containment booms are limited in the amount of oil they will hold back. Containment booms lose effectiveness in water with currents or shallow water. Containment also typically becomes less effective the further downstream oil travels and the more dispersed oil has become. Downstream capture and containment depends on the currents, weather, shoreline type, and access. The best-prepared companies have examined and prioritized potential down-stream containment sites in their response planning before the spill.
- Skimming, sorbing, or pumping oil from the water's surface. A skimmer is a vacuum or sorbing device that pulls the floating oil layer off of the water. Sorbents are natural or man-made materials that absorb oil but not water. The oiled sorbent must then be recovered from the water for disposal. Vacuum trucks can pump oil from oil pools or thick layers of oil on water. Skimming, sorbing, and pumping oil requires access to the oil location and equipment and tanks to store recovered oil for eventual disposal.
- Down-stream, ahead-of-oil protection of shorelines and sensitive features. Containment boom can be deployed at some sensitive locations before the oil arrives to deflect oil further down-stream. Protection measures require careful selection of sites to be protected, since equipment and time does not allow

protection of all areas. In the best of cases, sensitive areas have been examined and prioritized in response planning before the spill.

- Mopping up oil that has been stranded on shorelines, wetlands, marinas, structures, etc. This can be done with sorbents, power washers, oil-lifting chemicals, excavation, etc. This is very labor-intensive work requiring equipment, access, and specialized training. Some mopping-up methods can damage or destroy environmental features, for example excavating beaches, steam cleaning rocky shores, or moving people and boats through wetlands.
- Sampling water, sediment, shoreline, vegetation, etc. to assess where oil or oil components remain in the environment and whether additional recovery is possible and warranted.
- Recovering residual oil from sediments, shorelines, wetlands, and other places as possible.
- Monitoring the ongoing effects of residual oil and of recovery operations.

Even a very aggressive and effective spill response will not recover all spilled oil from a surface water.

Behavior of Oil on the Ground, And In Groundwater

As oil spilled onto the ground sinks into the ground, some oil will be retained by soil. So a small spill may be absorbed into soil and may never reach groundwater directly. But whether or not oil reaches groundwater, the oil retained on or in the soil will serve as a continuing source of groundwater contamination as infiltrating precipitation passes through it. Some soils such as clay have small or non-connected pore spaces such that oil will not readily pass through it, while soils like sands and gravels have large interconnected pore spaces through which oil will pass readily and quickly. The speed of travel is also dependent on the viscosity of the substance. Some oils are very "liquid," passing through soil quickly; other oils are thick, and those thick oils move through soil pores slowly.

"Groundwater" happens at the depth below the surface when the pore spaces between soil particles are filled with water instead of air. The depth of groundwater is highly variable in Minnesota from a few feet to one hundred or more feet. Groundwater moves, typically slowly, towards connections with surface water, wells, or other discharge points. Some fractured rock formations will allow oil plumes to move very quickly and very far.

When oil meets groundwater, the oil will mostly float near the surface of the groundwater, smearing the soils in that interface. The floating oil is termed "free product." It will spread out in a floating layer in the direction of groundwater flow. Some of this floating oil will

dissolve into groundwater forming a "plume." Some will evaporate and rise towards the surface. Some will remain sorbed onto soil.

Spill Response to Protect Groundwater

Once groundwater has become contaminated, the response strategies include understanding the direction, speed, and other characteristics of the groundwater. These response strategies use a variety of tools, including pre-existing information, soil borings, groundwater monitoring wells and geophysical methods. Classic physical strategies to protect groundwater from spills include:

- Pumping spilled oil from the ground's surface before it sinks into the soil;
- Digging oil-saturated soils so that the oil won't continue sinking into groundwater;
- Using high capacity blowers into the soil to suck the oil off the soil or groundwater as a vapor;
- Installing skimmers and pumps into the free product oil floating on the groundwater surface to pump out free product, and;
- Pumping groundwater to draw floating and dissolved oil to the surface for treatment.

Unfortunately, even a very aggressive and effective spill response will not recover all spilled oil from the ground. In those cases, if oil reaches groundwater, strategies for mitigating contaminated groundwater include:

- Ongoing groundwater pumping and treatment;
- Well replacement or treatment of a contaminated well;
- Adding restrictions on drilling new wells in the area;
- Adding oxygen and other materials to enhance natural degradation of oil;
- Ongoing monitoring to track contaminated groundwater behavior, and;
- Monitoring natural attenuation and biodegradation.

So, a spill of oil onto tight soils, with prompt recovery of oil from the ground's surface, and prompt excavation of contaminated soils is more effectively cleaned up and less damaging than is a spill of oil onto permeable soils, or areas with shallow groundwater. Especially concerning are spills of large volumes of oil on permeable soils near wellheads.

Biodegradation of Oil

It is well understood that oil that cannot be retrieved after a spill will eventually biodegrade over a period of years or decades. The rate at which biodegradation occurs in surface water, ground water, or soil is variable and contingent on many factors including oil concentration, soil types, temperatures, adequate oxygen and moisture. Oil-specific

chemical and physical properties influence biodegradation. Some refined oils have additives or other non-biodegradable components.

Dissolved oil at the front and side of the plume will typically be attacked by indigenous microbes. A steady-state will eventually be reached as the microbial biodegradation at the forward edge of the plume keeps up with the oncoming oil in the oncoming groundwater. As oil content of the plume is exhausted, this biodegradation consumes the most or all of the spilled oil and the plume shrinks. This process is called natural attenuation. Understanding natural attenuation is important in a spill response, but natural attenuation is never accepted as the sole response to any spill. Plumes of oil contamination in groundwater are typically measured in hundreds of feet or fractions of a mile from the spill. A plume's life may be only some years, or may be very long.

Synopsis of A Few Oil Pipeline Spills in Minnesota

The largest pipeline spill in Minnesota in recent decades was a 1.7 million gallon crude oil spill from Lakehead (now called Enbridge pipeline number 3 in Grand Rapids in March of 1991. Pumping and extensive excavations of wetland was done to recover most of the oil. About 300,000 gallons escaped to the Prairie River. Luckily, most of that oil flowed onto the river's ice surface, and was recovered by an aggressive and effective company response. If the spill had gone beneath the ice, or had it been in a different season, it would have been far more challenging to recover and would have caused much surface water and downstream damage.

In 2002, the Lakehead (now called Enbridge) pipeline number 3 leaked approximately 250,000 gallons of crude oil into wet land near Cohasset in 2002. An oil burn was done because of concern with impending rain pushing oil to the nearby Mississippi River. Remaining oil was pumped and excavated from the wet land and extensive land restoration done over several years.

In 2009 near Staples, Minnesota Pipe Line Company was reinforcing or replacing sections of pipe. A device placed on the line to temporarily reroute the line failed during the night, and approximately 210,000 gallons of crude oil was lost. It pooled at the surface and no surface water was nearby. An aggressive excavation was immediately begun. Many thousands of cubic yards of soil were removed and disposed off-site. A passive sump system was left in place for a few years at the deepest point of impact. The contamination did not migrate off site due to the significant excavation effort.

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January 23, 2015

The Honorable Eric Lipman
Minnesota Office of Administrative Hearings
600 North Robert Street
P.O. Box 64620
St. Paul, MN 55164-0620

RE: In the Matter of the Application of North Dakota Pipeline Company LLC for a Certificate of Need for the Sandpiper Pipeline Project in Minnesota
MPUC Docket No. PL6668/CN-13-473
OAH Docket No. 8-2500-31260

Dear Judge Lipman:

The Minnesota Pollution Control Agency (MPCA) submits the following comments for consideration by the Administrative Law Judge (Judge) in making recommendations to the Public Utilities Commission (Commission) in this matter. The MPCA's comments provide information addressing several of the criteria set forth in Minn. Rule 7853.0130 for making a determination on a certificate of need for the Sandpiper Pipeline Project (SA-Applicant) proposed by North Dakota Pipeline Company ("NDPC" or "Applicant"). The MPCA respectfully requests that if a determination of need is reached in this proceeding, the certificate of need be conditionally granted contingent upon suitable modification of SA-Applicant to protect and avoid high quality natural and environmental resources, and the inclusion in the Route Proceeding, Docket No. CN-13-474, of SA-03 and any other System Alternative that meets the identified need, pursuant to the Commission's authority under Minn. Rule 7853.0800. The MPCA will gladly provide additional information or comments that the Judge may find helpful in the course of this proceeding.

A. The MPCA's comments address four of the criteria required under Minn. Rule 7853.0130 for a determination on a certificate of need.

Minn. Rule 7853.0100 requires evaluation of all applicable and pertinent factors listed under each of the criteria set forth in Rule 7853.0130 and a specific written finding with respect to each of the criteria. Minn. Rule 7853.0130 states that a certificate of need shall be granted if all the listed determinations can be made. However, if one or more of those determinations cannot be met, a certificate of need may be denied, or conditionally granted subject to modification, under Minn. Rule 7853.0800.

The MPCA is providing comments that address the determinations required under Rule 7853.0130.B (2); 7835.0130.B (3); 7853.0130.C (2); and 7853.0130.C (3), which state:

- 7853.0130.B. 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, considering: . . .
  (2) the cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives;
  (3) the effect of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives; and . . . .

- 7853.0130.C. the consequences to society of granting the certificate of need are more favorable than the consequences of denying the certificate, considering: . . .
  (2) the effects of the proposed facility, or a suitable modification of it, upon the natural and socioeconomic environments compared to the effect of not building the facility;
  (3) the effects of the proposed facility or a suitable modification of it, in inducing future development.

The MPCA comments will address each of the criteria mentioned above and associated listed factors.

B. SA-03 is a reasonable and prudent alternative to the Applicant's facility (SA-Applicant), since the respective costs of SA-Applicant and SA-03 and of oil to be supplied by SA-Applicant and by SA-03 are not significantly different. Minn. Rule 7853.0130.B(2).

Financial impacts and comparative costs are among the factors to be evaluated in determining whether the criteria in Minn. Rule 7853.0130.B are met. Since MPCA submitted its comments dated August 21, 2014 to the Public Utilities Commission,[1] additional relevant testimony have been submitted in this docket. This included the direct testimony of economist Adam Heinen of the Department of Commerce (Doc. ID 201411-104761-03 ("Heinen Direct"). Mr. Heinen stated his expert opinion that System Alternative SA-03, as proposed by the MPCA, would meet the need of the project if as also proposed by MPCA, the Clearbrook terminal location was moved westward to the Crookston area or another location closer to the North Dakota border. (Heinen Direct, p. 75,) Mr. Heinen also indicated that moving the terminal location could increase the cost of constructing the pipeline, and discussed Applicant's estimate of the cost increase. (Heinen Direct, 75-76). Mr. Heinen then stated in his opinion that any apparent higher costs of SA-03 based on Applicant's analysis were insignificant and unlikely to impact retail prices and that the Applicant had not shown that SA-03 was an unreasonable alternative to meet the need of the proposed project. (Heinen Direct, pp. 77-78)

[1] See PUC Docket Filing 20148-102458-02 and 20148-102458-04

Mr. Heinen reinforced his direct testimony when he filed rebuttal testimony addressing SA-03. Mr. Heinen affirmed that SA-03 appeared to be a reasonable alternative to meet the need for this project. (Heinen Rebuttal, p. 7) (Doc. No. 20151-105968-01). This testimony supports the finding that under Minn. Rule 7853.0130.B(2), based on comparative cost, SA-03 is at least a reasonable and prudent alternative. However, comparative effects on natural environments, i.e., potential environmental and natural resource impacts as discussed in the following sections, appear to make SA-03 "a more reasonable and prudent alternative" under Minn. Rule 7853.0130.B(3).

In addition to direct costs of construction and operation, the costs considered under Rule 7853.0130.B(2) should include an evaluation of whether a system alternative such as SA-03 is a more reasonable alternative to SA-Applicant because of a reduced risk of a costly spill to a sensitive environmental area. An Alternative that avoids or impacts fewer sensitive ecosystems and water bodies than SA-Applicant will have a smaller likelihood of incurring significant response costs. As documented by the U.S. Environmental Agency (USEPA), it costs considerably more to restore or rehabilitate water quality than to protect it.[2] The areas of the state traversed by the SA-Applicant have waters and watersheds that are currently subject to protection in the state's "Watershed Restoration and Protection Strategy" program, [3] financed through the Clean Water Fund and aided by significant volunteer participation of Minnesota citizens. By keeping these waters as clean as possible before they become impaired, extensive costs of restoring waters to state standards can be avoided. Location of oil pipelines in these areas place their pristine waters at risk, and also place potentially millions of dollars in state and federal funds allocated for protection of these areas at risk.

When evaluating spill response costs, the following factors would make one corridor a better choice than another in minimizing the potential for costly spills or accidental discharges: fewer crossings of flowing water; fewer adjacent water bodies; quality of those waters; presence of especially sensitive areas or habitats or species or uses; better access to downstream oiled areas; tighter soils; and closer and more equipped and prepared responders. The MPCA applies these factors in comparing SA-Applicant with SA-03 and other alternatives in the next section of our comments.

C. SA-Applicant presents significantly greater risks of potential environmental impacts and encroaches on higher quality natural resources than SA- 03 and several other system alternatives. Minn. Rule 7853.0130.B(3). The effects of SA-Applicant on the natural environment support a determination in favor of other alternatives. Minn. Rule 7853.0130.C(2) and C(3).

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[2] See http://water.epa.gov/polwaste/nps/watershed/upload/economic_benefits_factsheet3.pdf (incorporated by reference) .

[3] See (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html)

Environmental risks are posed by all aspects of pipeline construction and operation, including post-spill recovery and restoration activities. The primary and most significant risks are associated with the long-term effects upon environmental and natural features that will be permanently altered, eliminated, or otherwise impacted by the presence of a pipeline, as well as the potential impacts of the release of crude oil as the result of a spill event during the potential 40 years or more that the pipeline will be operational. Those risks include environmental damages such as loss of wildlife, contamination of drinking water, destruction of fisheries, loss of habitat, and alteration of ecological systems. (For a discussion of the behavior and cleanup of oil spilled to surface water, soil, and groundwater, see Appendix A to the MPCA's comments.)

During these proceedings, the MPCA has commented extensively on the environmental concerns regarding the route proposed by Applicant in comparison to alternative routes and system alternatives. MPCA's prior comments can be found in Document Nos. 20146-100780-01, 20148-102458-02 and 20148-102458-04, each incorporated by reference. These prior comments have addressed such specific items as access to potential release sites in surface waters, potential to impact ground water, wild rice, the state's highest-quality surface water systems, wildlife habitat, low income populations, watersheds currently being assessed for restoration and protection strategies, fisheries, economies, and numerous other parameters.

In these comments, the MPCA concluded that with respect to protection of the highest-quality natural resources in the state, the SA-Applicant route presents significantly greater risks of potential impacts to environment and natural resources than several of the system alternatives, including SA-03. Although all proposed routes and system alternatives have the potential to impact some natural resources, the Applicant's proposed route encroaches on higher quality resources, superior wildlife habitat, more vulnerable ground water, and more resources unique to the state of Minnesota than do many of the proposed system alternatives. Several examples of the greater potential for harmful environmental impacts of SA-Applicant compared to other alternatives are highlighted in the following pages.

The relevance of other system alternatives depends upon whether the need for the project is determined based upon a narrower and more localized view or upon a larger regional view. While SA-03 has been identified as a reasonable and prudent project alternative as a general matter, it serves as such an alternative from both a localized and regional view. However, if need is determined based on a larger regional view of need, several other system alternatives may also be reasonable and prudent alternatives to meet that regional need. Consequently, the MPCA also addresses the comparative impacts of other System Alternatives and SA-Applicant to inform a determination of need from a regional perspective.

The broader objective of the proposed project is transporting oil to markets in the Midwest and along the eastern and gulf coasts, not to transport oil through the state of Minnesota

with termination in Superior Wisconsin. [4] Oil that is to be transported to Superior, Wisconsin through the proposed pipeline will continue through Wisconsin to Chicago (or Wisconsin and Michigan if routed to Sarnia, Ontario). Oil that would be transported via one of the southern system alternatives, such as SA-04, and on to the Chicago area would have to be transported through Iowa before reaching Illinois. In either case, Chicago appears to be a common destination for most if not all of the oil that is proposed to be moved through Minnesota.

Information regarding the existence of contractual agreements obtained when Applicant held an "open season" has been offered as the underlying basis for a determination of need.[5] The Applicant has suggested that the facility as proposed (SA-Applicant) is necessary in order to assure those contractual agreements are filled and that alternatives such as SA-03 would negatively affect the cost of fulfilling those agreements. This proceeding will determine whether the Applicant's open season agreements establish the need for siting a pipeline through Northern Minnesota instead of along a southern alternate route. If the underlying actual and predominate need of the project is to get Bakken oil to Midwest regional markets in Wisconsin, Michigan, or Illinois, that need can be achieved by several of the system alternatives. The foregoing is generally and specifically supported by the direct and rebuttal testimony of Applicant's witness Neil Earnest (Document ID Nos. 20148-102134-03, Earnest Direct Testimony, and 20151-105934-01, Earnest Rebuttal Testimony). See Figure 1, which is an overview of Applicant's regional infrastructure and corresponding destinations.

[4] Applicant testimony acknowledges that the project's intended destination is not Superior, Wisconsin but refineries in the Midwest. Applicant witness Earnest, in rebuttal, indicates that oil from this project is not only competing with alternative modes of transportation to refineries in Chicago, Patoka, and Cushing. The oil is also competing with all of the other crude oil choices available to the refineries in the Midwest. Enbridge rebuttal at pp 5-6. "Accordingly, all else equal, higher Sandpiper transportation costs to the Midwestern markets acts to decrease the volume of Bakken crude oil that can be expected to be processed in the Midwest, and to lower the utilization of the pipeline." (Earnest Rebuttal, 6) 20151-105934-01

[5] Heinen Direct, pp. 6-7. The nature and content of these open season transportation service agreements are confidential. The MPCA has not examined the nature or substance of these agreements or their duration. Mr. Heinen also indicates in his testimony that he does not know the ultimate destination of that oil.

Figure 1


ONTARIO
Lake Superior
MINNESOTA
WISCONSIN
MICHIGAN
Lake Michigan
Chicago
IOWA
NEBRASKA
UNITED STATES
ILLINOIS
INDIANA
OHIO
KENTUCKY
KANSAS
MISSOURI
Saint Louis
Nashville
TENNESSEE
Knoxville
Memphis
ARKANSAS
Little Rock
OKLAHOMA
Oklahoma City
Amarillo
Lubbock
Dallas
Waco
Austin
San Antonio
Houston
TEXAS
LOUISIANA
MISSISSIPPI
ENBRIDGE
Enbridge Liquid Pipeline Assets
Legend

Comparative Evaluation of Environmental Effects

The comparative long term environmental and eco-system impacts and the potential impact of spills must be carefully evaluated for each system alternative in determining the need for a pipeline project. Permanent harm to sensitive eco-systems, habitats, and species may occur following construction of a new pipeline. In addition, long-term impacts from a spill can be much more damaging in areas containing features such as environmentally sensitive areas and those with limited access. As discussed below, these long-term environmental and eco-system impacts should be accorded great weight in the determination of need for a pipeline project. Further, in associated routing proceedings, these impacts must be subjected to even more rigorous and detailed environmental review when evaluating alternative routes. It is not sufficient under Rule 7853.0130 to determine that the location for the proposed project is suitable or reasonable. Rather, the location should be one that best minimizes the risk to human populations and environmental and natural resources.

1. Adverse Impacts to High Quality Surface waters are Greater under SA-Applicant.

SA-Applicant traverses a greater number of high quality water bodies than does SA-03 and presents higher risk of environmental impacts from a spill or release of crude oil along its route corridor. Based on watershed health scores as determined by the Minnesota Department of Natural Resources in its Watershed Health Assessment Framework, MPCA documented that the adverse impacts to overall water quality from construction and operation, as well as spill cleanup and response, of Applicant's Alternative were more harmful than alternatives including SA-03, SA-04, and SA-05. See MPCA Comment letter dated August 21, 2014 , Document ID Nos. 20148-102458-02 and 20148-102458-0420148-04, page 5).

The MPCA provides these additional comments to assist in proper interpretation of the information on surface waters in the Department of Commerce environmental analysis "Comparison of Environmental Effects of Reasonable Alternatives" (DOC study) submitted on December 19, 2014, (ID 201412-105567-01) and in evaluating the criteria and factors based on that information. For example, on its face, the DOC study may be misinterpreted as indicating that SA-03 is a worse alternative than SA-Applicant in affecting impaired waters. The DOC study concluded that there were 50 impaired waters crossed by the Sandpiper route, and 98 impaired waters crossed by SA-03 (DOC Study, 72, 90). Under the Clean Water Act ("CWA"), an impaired water is any water body (e.g., lakes, rivers, streams, wetlands) that is too polluted or otherwise degraded to meet the applicable water quality standards set by states, territories, or authorized tribes. Water quality and water quality standards will vary throughout the state depending on the region of the state in which the waters reside. "Impaired" waters are not the same across the state. For a water body to be deemed impaired in southern or western Minnesota (western corn belt plains or Red River valley ecoregions), it typically will have a greater degree of contamination or degradation than would be required for a water body in the central

hardwood forest ecoregion of Minnesota traversed by the applicant's preferred route (Sandpiper) to be deemed impaired. Thus, waters that are listed as impaired along the SA-Applicant route are likely to be higher quality (having a lower contamination level) than a water listed as impaired in the southern part of the state, and might not be listed as impaired at all along the SA-03 route. Waters in northern Minnesota are generally of better water quality or more pristine.

2. Significant Environmental Damage Would Occur From a Release at or near a Water Crossing Extending up to at least a Distance of 10 Miles from the Point of Release. SA-Applicant Has Many Areas of Limited Access, Increasing the Risk of Extended Impact to Surface Waters.

The most significant potential impact to a surface water from a crude oil pipeline crossing is the environmental destruction that would occur in the event of a release at or near the water crossing. According to a third party risk assessment document developed as part of the Keystone XL EIS[6], Exponent states: "A distance of at least 10 miles downstream from the proposed centerline of the pipeline should be used for the identification of sensitive areas and for identifying CPSs(contributory pipeline segments) during the final design phase of the Project." The 10 mile estimate is fair, given the potential for flowing water to carry a release of oil, especially in remote areas such as those found throughout the proposed Sandpiper route. Considering that the 2010 Enbridge spill into Talmadge Creek and the Kalamazoo River caused significant damage approximately 35 miles from the spill site, a ten mile estimate of damages is conservative and reasonable. See Stolen testimony, Document ID 201411-104748-02, page 24.

Damage to aquatic systems from an oil release can occur either as a result of physical effects such as smothering of organisms, or toxic contamination due to the chemical compositions of the oil. An oil spill in an aquatic ecosystem could cause, among numerous other impacts, death of waterfowl, other bird species, amphibians, reptiles, aquatic mammals, microorganisms, plankton, fish, pets and livestock living adjacent to waters, stunted growth of surviving species, loss of vegetation, destruction of soils, long-term reduction of dissolved oxygen, human health damage, damage to air quality, property value loss, and destruction of drinking water resources. This does not include damages that would occur during the cleanup process, especially in areas with limited, restricted or no access.

3. Potential Damages During Pipeline Construction and Testing Are Greater for SA-Applicant than other Alternatives.

Damages to surface waters as a result of construction activities can and do occur. Flowing water can also carry these effects a long distance from their origin, as noted above. MPCA has observed and documented significant sediment discharges to surface water on pipeline

[6] See http://keystonepipeline-xl.state.gov/documents/organization/221278.pdf, page XV, "Recommendations",

projects as a result of failing to install sufficient sediment and erosion controls on hillsides adjacent to surface waters. The failure to account for spring time subsidence of soils as a result of winter construction is common; frozen soils that are dug up and replaced into trenches thaw and subside in warmer spring temperatures, causing the soils to sink over the pipeline and form a ditch. These ditches act as conduits for melt water or rain water, and as they do not have sediment controls installed, tend to erode significantly as water runs through them. It is common for these subsidence ditches to terminate in water bodies, causing sedimentation and habitat damage (MPCA Comment Letter dated April 4, 2014, -Document ID 20144-98170-01, page 8).

Damage to surface water resources during hydrostatic testing discharges has occurred recently in the state. During these tests, segments of pipeline are filled with a significant volume of pressurized water, often millions of gallons, to test the integrity of the pipe. The water is then released in a manner that should minimize environmental impact. During the Alberta Clipper/Southern lights diluent project, Enbridge exceeded agreed-upon maximum discharge rates on 15 of its hydrostatic testing discharge operations. At two of these sites (adjacent to the Mississippi River and adjacent to the Clearwater River), the exceedances were enough to cause significant erosion and sediment discharge to surface waters. These cases were referred to the U.S. Environmental Protection Agency and eventually settled by the U.S. Department of Justice in 2013 with Enbridge paying a $425,000 penalty. During these hydrostatic testing operations, as much as 4,000 gallons of water per minute can be discharged from valves. This water is general required to be discharged to an upland area or a dewatering device, but when discharged rates are exceeded, or sometimes even when they are not, the pressurized water can erode soils and carry those eroded soils to surface waters, causing turbidity or smothering of aquatic habitat.

The placement of the new terminal construction west of the proposed Clearbrook location as suggested by MPCA in SA-03 will assure that future pipelines are located west and south of these pristine areas, thus avoiding the resources that the state is spending millions of dollars to protect. Meanwhile, the continued expansion of the Clearbrook facility that will coincide with construction in the SA-Applicant location will mean continued impact and potential impact to the highest value (pristine) waters in our state as a result of future pipeline construction.

4. **Threats to Groundwater and Potential Drinking Water Supplies from SA-Applicant are Difficult to Assess, but Appear to Pose More Significant Risks than the System Alternatives, including SA-03.**

Highly detailed topographical data for the state of Minnesota (called "LIDAR" data)) illustrates that the Sandpiper route (SA-Applicant) traverses territory with greater topographical contrast than does the SA-03 route. Much of the topography along the SA-Applicant route in Minnesota is the result of the deposit of glacial till from thousands of years ago. The composition of this till is often dependent on how the till was deposited. A

term used to describe these soils is "moraine," or a mass of rocks and sediment carried down and deposited by a glacier, typically as ridges at its edges or extremity.

What is most important to understand about the soils along the SA-Applicant route is that the complexity of moraines in the area creates a significant degree of localized changes in groundwater movement that are very difficult to predict, as opposed to some of the flatter lands to the west and south, such as those traversed by SA-03, SA-04, or SA-05. Typically, ground water through this till along the SA-Applicant route will move laterally and toward a water body, so it is important that significantly more data is gathered from this route before the possible movement of oil in the event of a release can be predicted and response plans developed. It would be very difficult, if not impossible, to accurately assess the potential for ground water contamination based solely on the examination of GIS layers. However, it can be predicted that the damage to groundwater, potentially used as a source of drinking water, as well as the connected soils could take decades to repair, if the damage could be repaired at all. Additional impacts could include damage to agricultural areas (inability to grow crops) and damage to surface waters, wildlife and habitat from oil carried through underground conduits to those areas.

The LIDAR data strongly suggests an increased potential for impacts to drinking water from SA-Applicant than from SA-03 and some other system alternatives. However, more in-depth study will need to be done in the routing phase in order to make an informed comparison and either confirm or negate what the LIDAR data suggests as a factual conclusion.

5. SA-Applicant Threatens a Greater Percentage of Wild Rice and Native Forests than any of the Proposed Alternatives, including SA-03.

Wild rice, in addition to being an important economic consideration in Minnesota, is also an extremely important cultural resource, as well as an essential food source for humans and wildlife. It requires very specific conditions and good water quality, both of which are provided by north central Minnesota lakes. The Sandpiper pipeline would encroach on some of the richest wild rice territory in the state of Minnesota. Further, MPCA staff has identified 10 wild rice locations along the Sandpiper route for which there is no access from pipeline to the location of the wild rice. By comparison, SA-03 has two such areas. As shown in Figure 2, SA-Applicant (in green) would threaten significantly more of the state wild rice crop than any system alternative.

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April 4, 2014

Mr. Larry B. Hartman
Environmental Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul, MN 55101-2198

RE: Enbridge Sandpiper Pipeline Project - North Dakota Pipeline Company LLC
Pipeline Routing Permit Application, MPUC Docket No. PL-6668/PPL-13-474

Dear Mr. Hartman:

Thank you for the opportunity to review and comment on the Pipeline Routing Permit Application (Application) for the proposed Sandpiper Pipeline Project (the Project), prepared by Enbridge, doing business as Enbridge Pipelines (North Dakota) LLC (EPND). The Minnesota Pollution Control Agency (MPCA) has significant concerns regarding the lack of information for the proposed Project route. The supporting documentation for the preferred route does not adequately demonstrate avoidance and minimization of environmental impacts in areas where the existing conditions or resources may be vulnerable to disturbance and degradation (e.g., high quality waters and impaired waters, wetland crossings with limited access, slopes greater than five percent, areas of erodible soils and accessibility). We do note that the route avoids a calcareous fen present in the northern route; however, other sensitive areas including habitats, drinking water intakes and well head protection areas have not been identified. Additional information is needed to adequately consider alternative routes and the potential environmental effects associated with the preferred route.

Concerns also arise based on MPCA's experience with regard to pipeline construction, spills and remediation efforts, as well as Enbridge's apparent disregard of much of the information needed during the review and approval of the Alberta Clipper Crude Oil and Southern Lights Diluent Pipeline project in 2009-2010 (Alberta Clipper). The MPCA expects to receive the same level of information about this Project to enable the analysis of potential environmental impacts and the development of protective conditions in any issued permits. Due to the lack of detail provided regarding existing environmental conditions along the preferred route, MPCA cannot conclude or support the presumption that EPND has chosen the least environmentally impacting route or that the proposed actions are adequate to minimize environmental impacts that will result from the project.

MPCA's initial concerns and comments on the Application and Project include the following topics: future access to potential release sites; construction and operation of the break-out tanks; cumulative impacts from construction of additional pipelines and infrastructure in the area; emergency responsiveness and spill prevention; inspections and monitoring conducted during construction; proposed water body crossing methods and time frames; wastewater issues; and water quality, watershed and wetland issues.

ACCESS TO THE PROJECT

Obtaining access to a remote area of the Project in the event of a release to the environment is of significant concern. Numerous segments of the proposed Project route extend through large expanses of bog or open water wetland that have limited or no access under seasonal conditions. When vehicles cannot access a potential leak location under seasonal conditions, the risk of large-scale environmental damage and costly clean-up increases.

The LaSalle Creek crossing is a good example of an area in which it would be extremely difficult, if not impossible, to access downstream impacts and deploy equipment necessary to contain and clean up a spill. Large expanses of bog and some forest are located between the proposed crossing of La Salle Creek and Big La Salle Lake; consequently, there are no existing locations to access the water that could potentially be carrying leaked oil until after it has entered Big La Salle Lake. The environmental damage that would occur as a result of a leak at this location could be massive, and the obstacles to containing the leak or performing clean-up activities could be insurmountable. The MPCA strongly recommends that alternate routes around the LaSalle Creek and LaSalle Lake areas be considered. A suggested route could include constructing the Project parallel to Highway 108 located west of LaSalle Lake, extending southward along Highway 200 until Highway 200 intersects with 400th Street. At 400th Street, the Project would extend eastward until it rejoins with the proposed route.

BREAK-OUT TANKS

As you aware, the MPCA is a potential responsible governmental unit for the environmental review of projects involving the construction of hazardous material storage capacity (ref. Minn. R. 4410.4300, subp. 10(B)). Further, it is understood that the break-out tanks proposed to be constructed in Clearbrook will be addressed in the Comparative Environmental Analysis (CEA) prepared by the Department of Commerce. The assessment of impacts related to the tanks should, therefore, be evaluated to ensure adequate prevention and containment measures are incorporated into the Project design and operations, in order to prevent future releases and remediation. A secondary permeability assessment should be included in the CEA and construction and operation of the Project and break-out tanks should be completed in compliance with the Minnesota Office of Pipeline Safety and in accordance with Minnesota secondary containment standards.

CUMULATIVE IMPACTS

In addition to the Project proposal, a second effort has been proposed to upgrade Enbridge's Line 3 from Neche, North Dakota, to Superior, Wisconsin. The Great Northern Transmission power line, which will transport energy from Manitoba to Grand Rapids, is also in the planning process. These three projects, and any additional future energy infrastructure in the area, will have the potential to fragment and impact ecosystems. Under these circumstances, serious consideration should be given to an evaluation of the potential cumulative effects of past, present and future projects with respect to the disruption of the habitat and the continuity of natural, relatively undisturbed landscapes that remain in Minnesota. This could include planning of common corridors, considering risk assessment, access and the minimization of impacts while meeting the needs of electrical, natural gas and oil transmission. Past pipeline routes have followed corridors that were created when a power transmission line was put in place. While there are benefits to following an existing corridor, power lines and pipelines are different types of projects that present different potential impacts. There are points on the Project route, such as the LaSalle Creek area, where a power line crossing has a relatively low risk of harming natural resources in the event of an accident. However, a pipeline accident, such as a large drilling mud release (frac-out) or an oil leak in the same location would be devastating to the pristine natural areas downstream from the crossing site.

EMERGENCY RESPONSE/SPILL PREVENTION/REMEDIATION

The CEA should identify the locations of the shut off valves for the Project's new line and describe how these will be installed strategically to prevent and/or minimize flow or backflow of the line contents into sensitive areas in the event of a line break. Procedures and time frames for activating shut off valves should be described. The CEA should also identify the worst-case discharge for the response zones of the Project per Section 194.105 of the Department of Transportation Pipeline and Hazardous Materials Safety Administration regulations, including the worst-case volume, maximum release time in hours, shutdown response time and line drainage volume.

If EPND's contractor generates a hazardous waste from materials brought on-site (e.g., paint clean-up solvents, waste paints, etc.), then the contractor is responsible for proper waste collection, storage and disposal in accordance with all applicable regulations. Any release of the hazardous waste as a result of the improper handling, storage or disposal by the contractor in this instance is the responsibility of the contractor to rectify to the satisfaction of EPND and all applicable regulatory agencies. The CEA should address how EPND will ensure that proper responsibility is taken for hazardous waste generated.

Additionally, EPND's contractor is to report spills to the Minnesota State Duty Officer and appropriate federal, state and local agencies as soon as possible. A listing of federal, state and local agencies including reporting thresholds and timeframes is provided in Appendix G of the Application. The contractor, in coordination with EPND and the appropriate federal, state and local agencies will ensure that additional parties or agencies are properly notified and that all cleanup activities are satisfactorily completed and documented. Again, the CEA should address how EPND will ensure that this occurs.

INSPECTION AND MONITORING

EPND must ensure that workings are well-inspected for compliance and should describe how this will occur. Eventually, EPND must provide assurances that inspections will occur. The MPCA believes that construction should not take place without a third-party inspector present and on-site, and that a minimum of one third-party inspector will be required for every "spread" of construction (the spread distance will be determined in the Clean Water Act Section 401 Certification for the U.S. Army Corps of Engineers Permit). Additional spreads must be authorized in advance with additional third-party inspectors. The MPCA seeks a significant commitment to third-party inspectors from EPND and with MPCA oversight to ensure compliance with all permit conditions.

Some hydrostatic test discharges associated with Enbridge's Alberta Clipper project exceeded permitted discharge rates and caused damage to the environment, MPCA will be requiring additional, concrete assurances that discharge rates are complied with, including round-the-clock inspectors to monitor the discharges and/or additional Best Management Practices (BMPs). This may be addressed in MPCA permits for the Project which will be in development during the environmental review of the Project.

PROPOSED WATER BODY CROSSING METHODS AND TIME FRAMES

All waters of the state that may be impacted by the proposed Project need to be identified in relevant plans, as was required during construction of the Alberta Clipper project. The Application and related documents prepared for this Project (e.g., the Environmental Protection Plan dated October 13, 2013) do not contain this information, and will need to be revised accordingly.

Further, EPND is proposing to use an "open cut" method for installing the pipeline in the majority of streams and water bodies. This method was determined to be unacceptable for the previous project.

Consequently, the CEA should clearly identify that water bodies with stable banks in mineral soil and with any noticeable flow at the time of construction will be crossed using a Dry Crossing Construction method, including horizontal directional drilling (HDD), guided bore, dam and pump, or flume. Only water bodies that are dry during construction and selected water bodies, such as ditches in peat lands with no banks or impoundments, can be allowed to be crossed using an open cut and/or push pull methods.

In addition to the identification of waters (both impaired and unimpaired) that are being crossed by the proposed Project, waters downstream (and upstream in lentic waters) of the crossing points must also be identified. Identification includes the name and type of the water body, its impairment status, and the distance from the crossing point. It is imperative to MPCA's review and permitting that these features are clearly identified on maps to ensure adequate mitigation measures are in place to protect water bodies during the construction of the Project. Map features required for MPCA's review are included in Appendix A.

Many of the crossing points of the proposed Project are upstream from very high quality surface waters which must be protected or impaired waters which must be improved in order to meet water quality standards. Examples of this include the La Salle Creek crossing (less than 1,000 yards upstream of Big LaSalle Lake and also upstream from the La Salle Lake Aquatic Management Area), or Jail Lake in Crow Wing County, a lake impaired by excess nutrients. The potential impacts from an oil leak may go far beyond the water body being crossed. In many cases the proposed route threatens not only one but several lakes or rivers downstream from the proposed route.

The Twin Lakes, east of a line between Park Rapids and Hubbard, are listed as impaired by excess nutrients and mercury in fish tissue. The Twin Lakes contain significant wild rice beds and both basins are identified as wild rice lakes by the Department of Natural Resources (DNR). In addition to this, the area between the lakes and the proposed Project crossing is inaccessible by any type of equipment that would be needed for clean-up efforts and is buffered by hundreds of acres of several types of wetlands. To further compound the environmental risk of this location, the Twin Lakes empty to the Shell River, a tributary of the Crow Wing River. The MPCA strongly recommends that alternate routes around the Twin Lakes area be considered. A suggested route could include constructing the Project eastward along Highway 14 (located west of Hubbard); Highway 14 then junctions with Highway 87. Before Highway 87 junctions with Highway 6, there is a transmission line easement that runs southward, somewhat parallel to Highway 87/6. The Project could be constructed along the transmission line southward where it intersects Arbor Road, heading eastward to where it intersects Highway 6. Here, the Project could parallel Highway 6 south until it intersects the current proposed route.

In any instance where pipelines cross sensitive aquatic environments, such as those described above, an assessment of the risk of doing so, relative to other available routes, needs to be provided. Such an assessment is needed in order to understand potential impacts that may result from a leak, including costly and environmentally destructive cleanups. The connectivity of water bodies, soil types, access to potential spill sites and the potential of destruction of other critical habitat downstream of a crossing location must be the subject of more risk assessment prior to approving a proposed route. Cost or time factors to the proposer should be subordinate to the prevention of environmental destruction and the proper assessment of the risks to humans and the natural environment.

WASTEWATER, STORMWATER AND HYDROSTATIC TESTING

The CEA should clearly address the management methods and BMP's needed to ensure compliance by EPND's contractors and employees as these relate to: hydrostatic testing (especially allowable discharge exceedance/dispersal methods/discharge rates); erosion control; sediment transportation control; and, scouring control at sites/results from hydrostatic/trench dewatering discharges activities.

For handling erosion and sediment, stabilization of a spread should be conducted within two days. Additionally, the CEA should clearly describe the roles for EPND and its contractors so that it is clearly understood who has the responsibility for what permit requirements out in the field.

Hydrostatic testing needs to be conducted after the pipeline is moved and in place in the trench. It may be necessary to construct temporary sediment basins to reduce flows prior to discharging hydrostatic test water into wetlands or lakes. During the Alberta Clipper project, flows directed overland near steep slopes, even when the straw bale dewatering device was in use, occasionally caused serious erosion, particularly when the sites had steep slopes nearby or significant disturbed soils.

The appropriation of large amounts of water from under the ice of smaller lakes can be dangerous. Appropriation of several million gallons of water from a small lake can drop water levels below the ice by an inch or more, thus creating conditions that may be unsafe for human activity. Hydrostatic testing of pipes, when appropriating from smaller lakes, should be done in ice-out conditions if possible.

WATER QUALITY, WETLANDS, AND WATERSHEDS

Controlling potential environmental issues in or near wetlands and in water bodies is another important area. Additional precautions may need to be taken in these areas. The Project will need various water permits from the MPCA. Impacts authorized under a U.S. Army Corps of Engineers Section 404 permit will need a Section 401 Certification from the MPCA. An Individual NPDES Construction Stormwater (CSW) permit will also be needed. To facilitate the MPCA's review and development of these certifications and permits, the CEA will need to provide certain information as described below.

Frac-Out Consideration, Discharges and Spill Control

Areas where soils covering pipelines are largely peat or silt are much more likely to experience frac-outs during HDD activities, or allow oil discharges from leaks to reach the surface and spread. If an oil release were to occur, clean-up would be extremely challenging (if not impossible). This may result in "in situ" burning, as was conducted near Cohasset, Minnesota in 2002. Burning, of course, may entail significant environmental impacts of its own.

The CEA should provide any available information about soil types and the history of past frac-outs along the route, as frac-outs are likely to re-occur. This information will allow the MPCA to determine if there are areas along the route that are of high concern for frac-outs, requiring the certification to restrict or eliminate the use of drilling mud additives where frac-out contamination of the water body is more likely.

The CEA should describe how initial containment of frac-outs will be conducted, for instance, by having containment booms on site that are easily accessible and located in close proximity to water bodies. In addition, it should describe the actions to be taken to safely navigate the water in difficult locations, such as a peat bog, where access to parts of the water body is not available.

On past pipeline projects, workers have endangered themselves attempting to wade out into peat bogs or very silty wetlands to isolate frac-outs in the water body. Effective and safe ways of traversing the system, such as a barge, need to be in place.

It should also be described in the CEA how EPND plans to minimize the potential for frac-outs discharging drilling mud into sensitive resource areas, such as water bodies crossed via the HDD construction methods, and areas immediately adjacent to wetlands and water bodies. In past projects, specific conditions to prevent these discharges have included:

- A Drilling Mud Containment, Response and Notification Plan. EPND should describe the site-specific locations relative to the water bodies that will be crossed, where all equipment and supplies (e.g., silt/turbidity curtains, boats, etc.) will be stored and ready for immediate deployment prior to commencing any HDD activities. At a minimum, the plan must contain: I) maps showing the specific locations with sufficient access to each water body; 2) supporting text detailing how EPND will transport equipment, supplies and adequate staff to each location prior to starting the HDD crossing; and, 3) a Flocculent Use Contingency Plan, which identifies specific products and the methodology to be used, if necessary, to contain a drilling mud release.
- Requirements that if containment and cleanup equipment is deployed, sediment and/or bentonite collected by the silt/turbidity curtains shall be carefully removed and disposed of in an upland disposal location in compliance with all applicable rules and regulations.
- Each spread team is trained in spill response, containment and clean-up, and the required response equipment will be available at the location of the HDD with the spread team on-site.
- Other requirements for containment and recovery measures include adjusting drill pressures, pump volume rates and drill profiles to minimize the release, and suspending drilling operations if containment measures do not effectively control the release.

Certain specific conditions will likely need to be developed for spills that occur near or into a wetland or water body. EPND needs to provide information as to how they can ensure that wetlands and water bodies are protected in the case of spill. Example conditions include:

- If a spill occurs during refueling operations, the operation needs to be stopped until the spill can be controlled and the situation corrected.
- Use of sorbent booms and pads to contain and recover released materials in standing water.
- If necessary, for large spills in water bodies, the use of an Emergency Response Contractor to further contain and clean up the spill will be required.
- Excavation of contaminated soils in wetlands may be necessary, depending on the severity of the release. Excavated soils will need to be placed temporarily on plastic sheeting in a bermed area and covered with plastic sheeting, and secured. This should be conducted a minimum distance of 100 feet away from the wetland.

It should be explained in the CEA how EPND should meet these conditions or other effective procedures that would be used in these situations. Procedures for evaluating and consulting on options for wetland and water body spill response should be described.

Concrete wash water, grindings and slurry, must not be discharged to wetlands, water bodies, and storm sewer systems or allowed to drain onto adjacent properties. Methods should be described by which EPND will ensure that there is no discharge of these materials.

This could include limiting disposal to a defined area of the site within a lined containment area sufficient to contain the wash water and residual cement, and ensuring that contractors hired to provide concrete products will provide equipment capable of reclaiming wash water during wash out. Concrete slurry must be contained in a lined pit, washout container or other device.

Stabilization and Erosion Control

The CEA should also discuss the measures that will be taken to protect soil and soil erosion, including how EPND will prevent unforeseen weather events from possibly causing significant erosion and potential discharges to water bodies. This could include performing the authorized work in spreads, and limiting the amount of excavated open trench within a spread to no more than two days of anticipated welding production. EPND will also need to describe how each spread will be restored (backfilled and BMPs in place) as the leading edge of the spread is opened and the work progresses.

Other measures to protect soil and soil erosion that should be discussed in the CEA include how EPND will segregate topsoil from subsoil in a manner that will prevent mixing when:

- constructing the Project in cropland, hay fields, pasture, residential areas and other areas as requested by the landowner where soil productivity is an important consideration;
- to the extent practicable in forested areas, standing water wetlands, and non-agricultural open areas with steep slopes adjacent to wetlands and water bodies; and,
- in wetland areas without standing water.

The CEA should also address how the soil and reserved topsoil will be replaced to the trench during backfilling.

The CEA also needs to describe how EPND will address areas of unusually steep slopes along the Project's proposed construction route that are adjacent to waters of the state, and measures that will be used to prevent topsoil erosion and loss after construction. Measures should include those taken when cutting into parent material (as defined in Figures 1, 2, 3 in the Environmental Protection Plan) for trenching, construction of the level work area or any other such cutting on the hillsides, and during backfilling. Options include removing the topsoil and storing it separately from the underlying subsoil and then replacing it in the trench in the opposite order removed. Measures should also be included for areas where there is not sufficient top soil separation for vegetation to be re-established, such as supplying suitable topsoil to ensure rapid re-vegetation and slope stabilization occurs in these sensitive areas.

The CEA should describe how EPND will implement and ensure compliance with intended requirements in the Individual NPDES CSW permit. This would include, but not be limited to:

- As a general rule, use of straw bales for sediment control should only be used in mucky, wetland soils. When used in upland situations, straw bales are as likely to increase soil erosion and transport, by increasing flow velocities in gaps between or outside of the bales as they are to decrease it.
- Remedying sediment-buried silt fences; removal of sediment from silt fences will not suffice. Once the silt fence has been plugged with excess sediment, it will no longer function properly and should be replaced with a new layer of silt fence.
- Stabilization procedures within 24 hours of ceasing construction in an area if the earth moving activity is expected to cease for at least 14 days. On a pipeline project, this should be easy to predict and stabilization procedures should begin almost immediately after the pipeline trench has been backfilled.

- On steep slopes, or slopes draining to surface waters (ditches, wetlands, streams, lakes), ditch checks should be installed over backfilled pipe trenches that were opened and closed during frozen soil conditions, as subsidence of thawing soils (frozen soils backfill in chunks) will create stormwater and snowmelt conveyances that could impact surface waters. Preparation for this phenomenon would include treating those backfilled trenches as ditches before they become ditches.
- Mulch or other erosion control will be required on all exposed upland soils, regardless of slope. Seeding in and of itself is not considered stabilization. Hydromulch with liquid tackifier or hydraulic soil stabilizers are preferred to standard mulch on steeper slopes or prior to snowfall, as mulch will not be effective throughout the winter in most conditions.
- Straw bales should not be used as slope breakers or as sediment control on upland slopes. Straw mulch should be applied at a minimum rate of two tons per acre, but ground coverage for straw mulch to be effective should be at least 90 percent, not 75 percent. Stabilized earthen berms have worked well in the past, although biologs or wattles may be effective in some areas. Gaps between spoil piles must be stabilized with blankets or other effective erosion control.
- Additional information is required as to the composition and manufacturer's recommendation on the foam pillows.
- Clean construction mats that are used by heavy equipment to enter streams are unlikely to remain clean for long. If mats or temporary bridges are used, it will be necessary to install some type of sediment control, such as triangular silt dikes, along each edge of the bridge or mat to ensure that sediment stays on the bridge or mat until the work is complete. At that time, the sediment may be removed by whatever means are necessary to keep it out of the receiving waters.
- Vegetation used to restore stream banks should be similar in species composition to the vegetation growing on the site prior to disturbance.

Subsidence of Soils Due to Winter Construction

A considerable amount of the excavation work that EPND will perform will occur during frozen soil conditions. When these frozen chunks of soil are excavated and then replaced over the trench, large gaps of air are included with the soils. During spring thaw, the ice in these soils melt and "subsidence" occurs; the soils sinks over the trench area, often forming what is essentially a ditch. On slopes that drain to surface water, these ditches act as conveyances which accelerate movement of water and sediment transport toward the water bodies. To prevent this, all trenches that are excavated during frozen soil conditions, and that drain toward surface waters (wetlands, streams, lakes, ditches), must have ditch checks installed as the trenches are buried. These can be in the form of triangular silt dikes, biorolls, silt fence, rock checks, or subterranean rocks, but some type of ditch checks must be installed, with spacing dependent on the degree of slope, in anticipation of subsidence in the spring.

Wetland Mitigation

The CEA should describe the compensatory mitigation that EPND will provide for the permanent loss of waters and wetlands.

CONCLUSION

The MPCA is aware that Enbridge has not fully complied with applicable water quality rules and regulations when constructing or expanding pipelines. The Alberta Clipper project brought about enforcement action to settle federal allegations that the project resulted in fifteen instances of illegal discharges into Minnesota wetlands and rivers while testing two of the newly constructed pipelines. The discharge of test water from a 36-inch pipeline at a site just north of Bemidji eroded a hillside and created a gully 50 to 60 feet long, 15 feet wide and 10 feet deep, leaving up to a foot of sediment in a wetland and sending rust-colored water into the Mississippi River. In view of this history, it will be necessary to provide additional assurances to the MPCA concerning the additional efforts and resources which will be employed to ensure this Project will not result in similar non-compliance.

We anticipate additional comments as the development of future project-related documents, such as the Draft CEA, unfolds. Comments provided in this letter are intended to be addressed and incorporated into the Draft CEA.

We 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 favorable determination on the required MPCA authorizations is needed to commence construction. Ultimately, it is the responsibility of EPND 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,

Chuck Peterson

Patrice Jensen
Planner Principal
Environmental Review

PJ:ld

cc: Jamie Schrenzel, DNR
Desiree Morningstar, U.S. Army Corps of Engineers
Reed Larson, MPCA
Bill Sierks, MPCA
Steve Lee, MPCA
Catherine Neuschler, MPCA
Craig Affeldt, MPCA

APPENDIX A
MAP REQUIREMENTS
Enbridge Sandpiper Pipeline Project - North Dakota Pipeline Company LLC
Pipeline Routing Permit Application, MPUC Docket No. PL-6668/PPL-13-474

MPCA is requesting that an aerial map book of the Project in Minnesota be prepared that contains the following features:

- locations of all water bodies (including wetlands) proposed to be crossed by the Project
- identification of all delineated wetland types and locations at or near the Project route
- precise mile post locations of all water body crossings by the Project
- Department of Natural Resources public water status of water bodies crossed by the Project
- proposed crossing methods of all water bodies, with alternative proposed crossing methods by the Project
- date restrictions when construction will not allowed
- depiction and identification of environmentally sensitive areas crossed by the Project
- depiction of all existing access roads and proposed to be constructed access roads in the Project area
- width and bank height of streams or rivers being crossed by the Project
- water bodies within 1 mile downstream of the proposed stream/river/wetland crossings of the Project and the distances to these waters
- impairment status of water bodies downstream of the Project crossings
- Special Waters (ORVW) within 1 mile downstream of the Project crossings
- soil erodibility along the Project route weighted by slope

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May 12, 2015

Mr. Scott Ek
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

Re: In the Matter of the Application of Enbridge Energy, Limited Partnership for a Certificate of Need and a Pipeline Routing Permit for the Line 3 Pipeline Replacement Project in Minnesota
PUC Docket No. PL-9/CN-14-916 (Certificate of Need)
PL-9/PPL-15-137 (Pipeline Routing Permit)

Dear Mr. Ek:

The Minnesota Pollution Control Agency (MPCA) offers these comments on the Certificate of Need (CON) application and the Pipeline Routing Permit application filed by the Enbridge Energy, Limited Partnership (Enbridge) in these dockets ("Line 3 Replacement" project).

The Minnesota Public Utilities Commission (PUC) has requested comments on three topics concerning the completeness of the Enbridge Line 3 Replacement applications:

1. Does the CON application contain the information required under Minn. R. 7853.0220 to 7853.0260 and Minn. R. 7853.0500 to 7853.0640?
2. Does the pipeline route permit application contain the information required under Minn. R. 7852.2100 to 7852.3100?
3. Are there any contested issues of fact with respect to the representations made in the applications?

The MPCA understands that Enbridge's preferred route is proposed to co-locate the Line 3 Replacement on the same route as its proposed Sandpiper pipeline project. Although the MPCA's environmental concerns with the Sandpiper project are known, it must be noted here that the discussion of alternatives in the Line 3 Replacement applications does not address those concerns or consider any system or route alternatives that were brought forward in the Sandpiper proceedings. Nor do the applications appear to provide adequate basis for selection of a southern route alternative over a northern route alternative, such as rebuilding of the Line 3 Replacement in its current location.

The MPCA contests both the adequacy of the environmental analysis and the lack of consideration of reasonable alternatives in the applications. [1]

Failure to address alternatives and evaluate environmental impacts. Enbridge intends to locate the Line 3 Replacement pipeline adjacent to the Sandpiper pipeline between Clearbrook and Superior. The MPCA has filed comments raising environmental concerns with this route in the Sandpiper dockets (see Dockets 13-473 and 13-474). Since the Line 3 Replacement project follows the same proposed route, it raises substantially the same concerns that the MPCA expressed in Sandpiper, but the applications do not address those concerns.

It does not appear that Enbridge evaluated any system alternatives or route alternatives that have been included in the Sandpiper docket. Sandpiper System Alternative 3 and System Alternative 3 Modified (a route alternative included by the Commission in the Sandpiper route proceeding) are given minimal to no consideration.[2] Despite Enbridge's awareness of the significant environmental concerns expressed by state agencies and interested parties in the Sandpiper proceedings, and the alternatives offered in those dockets, the Line 3 Replacement applications do not address these alternatives.

The applications discuss three options, the preferred route and two alternatives involving replacement along or parallel to the existing Line 3, i.e., rebuilding Line 3 in place. However, the applications do not adequately discuss the alternatives for rebuilding Line 3 in place or the resulting impacts to environmental values of all three options. The applications also do not provide sufficient information for comparison and informed consideration of the options.

Need for comprehensive environmental analysis of cumulative environmental effects. The proposal to place Line 3 next to Sandpiper increases the potential to impact some of Minnesota's most pristine natural resources. The Commission has authority and responsibility under the Minnesota Environmental Policy Act, Minn. Stat. ch. 116D, to make a detailed evaluation of the potentially significant environmental effects, including cumulative potential effects, alternatives, and measures that would avoid or mitigate the potential environmental harm from this project. The possibility of simultaneous construction is not addressed, nor is the effect of continuous construction of two pipelines over extended construction seasons.

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[1] The MPCA comments are generally directed to: the adequacy of Enbridge's CON application under Minn. R. 7853.0250.A (relating to the socially beneficial uses of the output of the project, including "its uses to protect or enhance environmental quality"); Rule 7853.0540 Alternatives; Rule 7853.0600 Information Required (environmental data); Rule 7853.0630, subp. 3 and 4 (safeguards); Rule 7852.2600, (route alternatives and description of environment); Rule 7852.2700 (environmental impact of preferred route); Rule 7852.3100 (consideration of alternative routes); and the sufficiency of the application for purposes of a detailed evaluation of the potentially significant environmental effects under the Minnesota Environmental Policy Act, Minn. Stat. Ch. 116D.

[2] The MPCA and MDNR have provided extensive environmental information on SA-3M as an alternative to the Applicant's route. (See MPCA's Oct. 29, 2014 comment identifying a specific route for SA-3M, and MDNR's Jan. 23, 2014 comment letter).

Section 7.1.3 of the route application (Impact Calculations) states that calculations are based on an assumption that the Sandpiper pipeline will be constructed first. Timing of the construction of both projects is important. Construction of both lines could begin in 2016, yet the possibility and consequences of simultaneous construction are not addressed. Construction of the two projects in the same corridor may well result in greater impacts to surrounding terrain and water bodies than would occur if one project were built after another, because staging, spoils placement, and work space could not fully use the corridor. The discussion of project impacts should address the potential of concurrent construction impacts and the effects of extended construction of two projects in the same corridor on human, natural and environmental resources. The absence of that analysis in this section contributes to an inadequate analysis of likely site conditions and of the anticipated construction activity sequence.

Response on spill analysis. The applications do not have a sufficiently detailed analysis of the effects of a potentially catastrophic failure. In the introduction to section 7.0 of the route application, addressing the environmental impact of the preferred route, Enbridge makes the following statement:

> The Minnesota Pollution Control Agency (MPCA) and Minnesota Department of Natural Resources (MNDNR) have expressed concern with regard to the potential impacts of a catastrophic oil spill from the Project on environmental resources. An overall incident frequency was developed for the Keystone XL Project[3], which is also designed of x70 steel pipe. Based on these statistics, it is highly unlikely that a spill or leak will occur along any given small section of the pipeline. Therefore potential impacts from a theoretical oil release are not identified in Section 7.0 due to the extremely low frequency and many assumptions that would first be necessary to adequately quantify how a leak would affect the environment. Enbridge will continue to work with the applicable agencies regarding leak prevention measures and emergency response.

While the MPCA agrees that it may be unlikely for a spill to occur at "any given small section of the pipeline," the applications do not adequately discuss potential environmental impacts such as what would occur to surface water, drinking water, human health, terrestrial wildlife, aquatic wildlife, vegetation, soils, and other resources in the event of a spill, as required by Rule 7852.2700. It is reasonable to anticipate that a leak or spill will occur at some point during the operational life of the pipeline. The applications should address the potential impacts that a significant spill would have on the various types of terrain and aquatic resources along the project route.

To summarize, the MPCA believes that information minimally necessary for any meaningful assessment and comparison of potential environmental impacts under the criteria of PUC rules and MEPA are missing from Enbridge's current applications.

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[3] The MPCA notes that the Executive Summary of the Final Supplemental Environmental Impact Statement for the Keystone XL project (Page 30), states that the risk of spills and leaks represents the "greatest potential threat to water and aquatic resources."

Thank you for consideration of these comments.

Sincerely,

William Sierks, Manager
Environment & Energy Section
Resource Management & Assistance Division

WS:bt

Minnesota Pollution Control Agency
520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300
800-657-3864 | 651-282-5332 TTY | www.pca.state.mn.us | Equal Opportunity Employer

June 24, 2014

Mr. Larry B. Hartman
Environmental Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul, MN 55101-2198

RE: Enbridge Sandpiper Pipeline Project - North Dakota Pipeline Company LLC
Pipeline Routing Permit Application, MPUC Docket No. PL-6668/PPL-13-474
Replacement May 30, 2014 Letter with Maps

Dear Mr. Hartman:

On April 14, 2014, the Minnesota Public Utilities Commission (PUC) extended the comment period in the matter of the Application of North Dakota Pipeline Company LLC for a Pipeline Routing Permit for the Sandpiper Pipeline Project (Sandpiper) in Minnesota. This letter appends the Minnesota Pollution Control Agency (MPCA) letter on this subject, which was submitted to you on April 4, 2014.

We understand the topics open for comment include alternate routes, human and environmental impacts to be studied in the Comparative Environmental Analysis (CEA), and whether any specific methods or mitigation exist to address these impacts that should be studied in the CEA. MPCA's additional comments on these topics include:

- Inspection and monitoring
- Additional items for evaluation in the CEA
- Watershed Restoration and Protection Strategy
- Carbon footprint
- Environmental justice
- Alternate route analysis
- Cumulative impacts

Inspection and Monitoring

On April 16, 2014, Enbridge, doing business as North Dakota Pipeline Company LLC, submitted a proposal to the MPCA regarding independent/third-party environmental monitors for the proposed Sandpiper project. MPCA does not agree that Enbridge should be hiring and directing these inspectors/monitors, but rather that they report directly to a state agency with jurisdiction over the project. The MPCA requests that the PUC require that another agency directly hire independent inspection and monitoring contractors and/or temporary staff to conduct this work under MPCA oversight to be funded by Enbridge.

The structure, work plan, and cost of a monitoring and inspection plan should be determined while the CEA is being prepared. The MPCA and Minnesota Department of Natural Resources (MDNR) staff, who have been working collaboratively on the Sandpiper project, are willing to participate with Enbridge and

participating agencies to develop the appropriate information and mechanism. The mechanisms for this would be worked out among the parties. The payment of the state's reasonable costs should be a provision of the PUC's route permit issued to Enbridge.

Additional Items for Evaluation in the CEA

The MPCA requests that Enbridge complete a Phase I Environmental Assessment (Phase I) of the selected pipeline construction corridor in accordance with the All Appropriate Inquiry (AAI) standard as per the National Environmental Policy Act (NEPA), Title 40, Code of Federal Regulations Part 312. The Phase I is conducted to research and review potential locations of existing/historic dumps, hazardous waste sites, and other environmental concerns. If areas of environmental concern are identified in association with construction of the pipeline, Enbridge should be required to prepare work plans to describe how solid/hazardous waste/contaminated soil and groundwater will be investigated prior to construction, and how impacted areas will be dealt with in accordance with state and local regulations.

MPCA requests that the CEA include a detailed risk assessment regarding the potential for leaks to occur, how much oil might be released, and how this could affect groundwater, surface water, aquatic life, and others. The hydrogeology of the pipeline corridor area should be studied to determine potential fate and transport of a release, and potential vapor intrusion issues if a release occurs in close proximity to human habitation.

Watershed Restoration and Protection Strategy

In 2006, the Minnesota Legislature passed the Clean Water Legacy Act, which required the MPCA to develop an approach to comprehensively monitor and assess the waters of the state every 10 years, and provided one-time funding for that effort. In order to provide long term, consistent funding for Minnesota's clean water efforts, on November 4, 2008, Minnesota's voters passed the Clean Water Land and Legacy Amendment (Legacy Amendment) to the Minnesota Constitution to, in part, protect and restore lakes, rivers, streams, and groundwater. The Amendment imposed three-eighths of one percent sales tax to fund the effort for 25 years. Subsequently, in 2013, the Clean Water Accountability Act was passed by the Minnesota Legislature. This new law requires the MPCA to develop watershed restoration and protection strategies (WRAPS) for each of the state's 81 major watershed units, which correspond to the 8-digit hydrologic unit codes (HUCs). WRAPS include the monitoring and assessment information, as well as land use-based models that demonstrate the source of the highest contributors of pollutants in each watershed. This information is then used to develop strategies to either protect waters that meet water quality standards or restore waters that do not meet standards.

The WRAPS is a collaborative effort that involves the MPCA, the MDNR, the Board of Water and Soil Resources, the Department of Health, the Department of Agriculture, local soil and water conservation districts, watershed districts, the University of Minnesota, industry and business organizations, and the private citizens of Minnesota. WRAPS components are: monitoring and assessment of hydrology and the chemical and biological constituents of water quality, a stressor identification process, total maximum daily loads (TMDLs) and restoration plans for impaired waters, protection strategies for waters that currently meet standards, and a civic engagement process to assist stakeholders with implementing protection and restoration strategies.

While not yet completed, WRAPS are in process in the following major watersheds that the Sandpiper proposal will cross, also identified by the corresponding eight-digit HUCs:

- Grand Marais Creek HUC 09020306
- Red Lake River HUC 09020303
- Clearwater River HUC 09020305
- Mississippi – Headwaters HUC 07010101
- Crow Wing River HUC 07010106
- Pine River HUC 07010105
- Mississippi – Grand Rapids HUC 07010103
- Kettle River HUC 07030003
- St. Louis River HUC 04010201
- Nemadji River HUC 04010301

One of the first tenets of any protection strategy is to avoid impacts where possible. The Sandpiper proposal is not consistent with the protection strategies that are currently in development for these WRAPS, due to the large number of high quality surface waters that lie along the path of the proposed route. Enbridge should participate in stakeholder groups for these WRAPS. Stakeholder groups provide a forum for engaged citizens and interested groups to develop implementation strategies to restore and protect each watershed. The CEA should review and consider how to integrate the strategies into the proposal, or find alternate routes that have less potential for impacting surface and groundwater.

Carbon Footprint – Greenhouse Gas Emissions

The MPCA is concerned about the carbon footprint of a project. The Minnesota Legislature established greenhouse gas (GHG) reduction goals in the Next Generation Energy Act (Minn. Stat. 216H.02). The goals of the Next Generation Energy Act are to reduce greenhouse gas emissions by 15 percent below 2005 levels by 2015, and 80 percent by 2050. Greenhouse gases, upon release to the atmosphere, warm the atmosphere and surface of the planet, and lead to alterations in the earth's climate. The GHG emissions measured and reported in Minnesota include carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), and two classes of compounds known collectively as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). These GHG emissions result from fuel combustion, the calcination of limestone, the degradation of organic (peats) and mineral soils, permanent land clearing and forest harvesting, and a variety of other sources. Pertaining to this project, source types include stationary and mobile source combustion from construction equipment, emissions from venting, and wetland and forest disruptions.

To track progress with the Next Generation Energy Act reduction goals, the CEA should evaluate the GHG emissions from the project and the impact these emissions may have on the attainment of the state's GHG reduction goals. Alternatives and options to reduce GHG emissions or to offset/mitigate GHG emissions should also be identified in the CEA. In addition, the CEA should evaluate the GHG impacts if this project is not built – specifically, if oil is transported by rail or truck instead of by pipeline.

Environmental Justice

The MPCA works to incorporate environmental justice principles into its projects. Environmental Justice (EJ) involves assuring the fair treatment and meaningful involvement of all persons, regardless of race or income when making environmental decisions. Fair treatment means that no group of people should

bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means: people have an opportunity to participate in decisions about activities that may affect their health and the environment in which they live; the public's contribution can influence the regulatory agency's decision; their concerns will be considered in the decision making process; and, decision makers seek out and facilitate the involvement of those potentially affected.

The proposed route of the Sandpiper Pipeline and other alternate routes may directly affect low income and minority populations. If a pipeline leak or break occurs, adverse impacts could occur in both surface and subsurface drinking water supplies, areas with stands of wild rice important to local Tribes and tribal members, cropland areas, impaired waters, and wildlife management areas among other types of environmental, social and economic impacts. If the Northern route or other alternate routes are chosen, the Sandpiper Pipeline may affect tribal lands.

The CEA should include consideration of EJ issues. The CEA should look at how pipeline construction and operation, and potential problems during each of these phases, may cause disproportionate impacts on low-income or minority populations. In addition, local, state, and federal agencies should engage residents to assure that they are aware of opportunities to participate in the process and understand how their comments and concerns are incorporated into the final draft CEA.

Alternate Route Analysis

The MPCA staff's analysis of the proposed Sandpiper route shows many water body crossings for which there would be very difficult or no access downstream of the crossing to clean up spills in the event of a crude oil release. The lack of possible access to these areas by people and equipment necessary to clean up spills increases the likelihood that an incident could result in significant long-term environmental damage. A failure to account for these possibilities is considered to be a substantial flaw with the currently proposed Sandpiper route.

There are many variables that could be examined when considering the potential for environmental damage in the event of a release. These include: soil types, wetland types, sensitive or endangered species, proximity to aquifers, hydrology, forest types, state park boundaries, proximity to human populations, proximity to areas with stands of wild rice, connectivity of surface waters, and others. However, for purposes of providing a simpler and effective comparison between alternative route proposals that is both visual and quantifiable (within certain limitations that will be discussed in this letter), MPCA staff has elected to compare the routes based on access to potential leak sites for purposes of containment of spills and possible clean up.

To minimize variables and subjectivity for this analysis, MPCA staff opted to identify, using ArcGIS technology, water body crossings that had neither road or traversable upland features within 250 feet of flowages of water (heavily forested areas are not considered for this purpose to be traversable, as trees would have to be removed before equipment could be brought in), or portions of larger wetland complexes that fell within a 2,000 foot buffer of the point where the proposed pipeline route was to cross a stream, lake, or wetland. The 250-foot distance from access point to flowage is somewhat arbitrary. MPCA staff conferred with contractors and engineers who specialize in road construction, and most felt that in a best-case scenario, with aggregate and equipment available, a 250-foot road into a bog or wetland would be constructed within 24 hours. Thus, for purposes of this analysis ,MPCA staff

assumed that it is possible to build an access road to reach areas where containment of a spill might be accomplished before the spilled product covers an area large enough that cleanup would be highly destructive to a sensitive environment, or impossible. Similarly, there is no regulatory basis for choosing the 2,000 foot buffer distance, other than it is a significant distance for oil impacts to occur over any surface water and easy to apply consistently statewide. It is a distance that for most people would be easy to visualize, yet small enough to create a fair comparison between routes. These numbers provide a basis for comparisons between routes and have little significance beyond that. However, if these criteria are used consistently for all proposed routes, it does provide a basis to compare the potential for each route to cause considerable environmental damage in the event of a release.

There are some factors to consider that fall beyond the scope of this comparison. For example, the water crossings proposed for the Sandpiper route are frequently streams or flowages with connectivity to other water bodies downstream. By contrast, water body crossings on the Northern route frequently involve very large wetland complexes rather than smaller, faster moving flowages. The area needed to access might be much greater, but the oil may move more slowly in such areas. Counting becomes a bit more difficult here as well, because it is difficult to establish criteria for counting "crossings" that is comparable to the different features observed in the Sandpiper route. In most cases, MDNR catchment flow lines were used to distinguish one crossing point from another.

In any case, the method used as a basis for comparison by MPCA staff does provide quantifiable data to analyze the proposed routes from a meaningful perspective: Which route proposals pose the greatest risk to create destructive and expensive containment and cleanup operations in the event of a spill?

MPCA staff compared four proposed routes in their entirety (see Figure A below). The four proposed routes that were compared were (1) The currently proposed Sandpiper route; (2) The "Northern" route, used by Enbridge for previous projects and which has been suggested as an alternative by other entities; (3) The "Alternative 3" route which was identified as a possible alternative by MPCA staff; and (4) The southern "Alternative 4" route which exits the state at the Iowa border and would be required to tie into the Enbridge infrastructure either in another state, or to circle around outside of Minnesota to end at the Superior Terminal. The fourth route was suggested as an alternative by a citizen group.

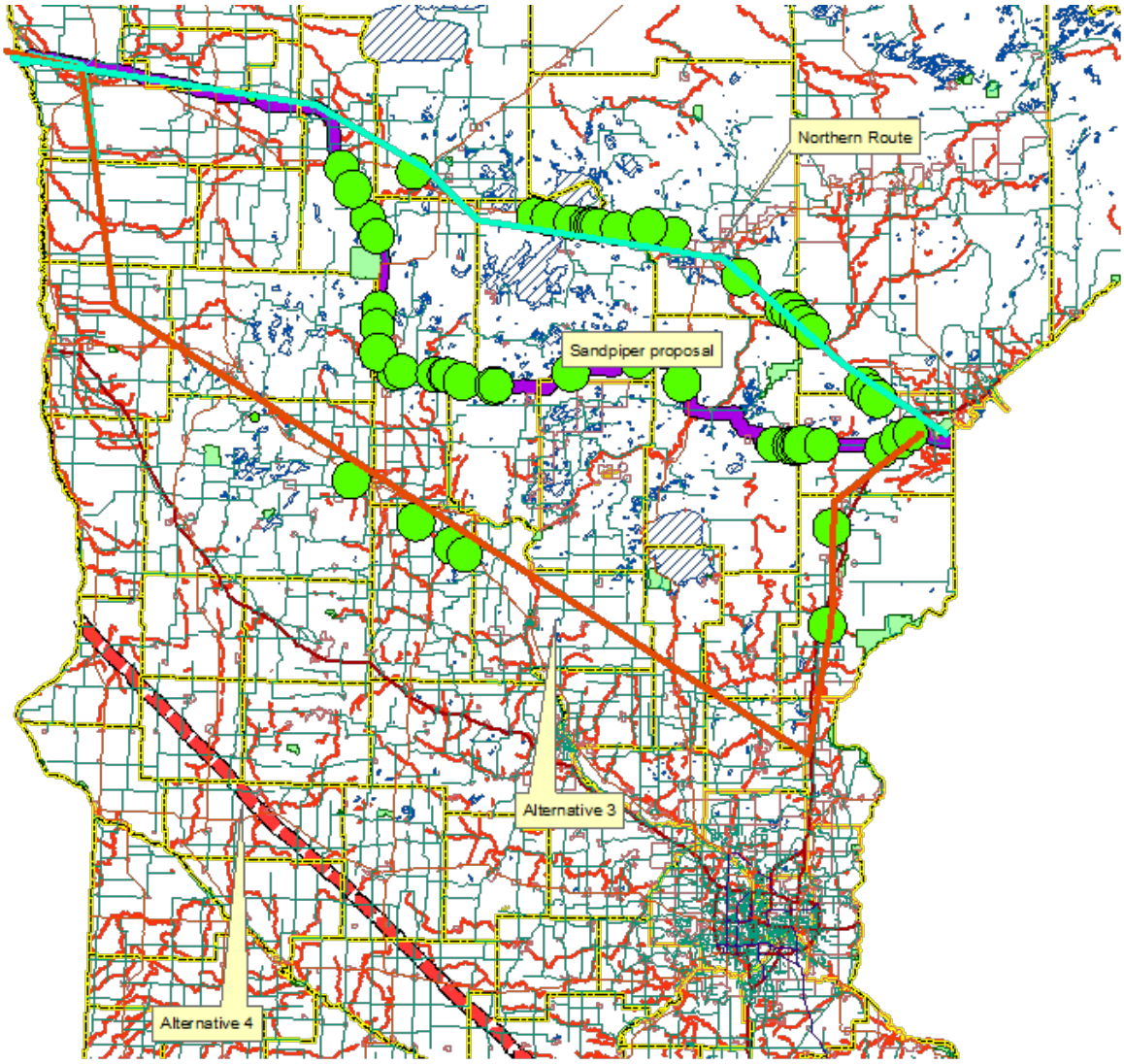

Figure A-The green circles mark points where MPCA staff have identified access concerns. Approximate locations of the four primarily examined proposals are also identified.

Any water body crossing, especially streams, rivers, or flowages of any kind that can carry oil downstream, pose the risk of creating large scale environmental damage in the event of a release. If possible, it is best to avoid crossing surface waters altogether with oil pipelines in order to minimize this risk. However, if a water body, bog or otherwise sensitive area is to be crossed, then serious consideration should be given to whether the site can be accessed quickly in the event of a release to contain the product, minimize migration of product into surface waters, soils and groundwater, and perform clean-up operations. In situations where roads have to be constructed to access a spill, the act of constructing the road, excavating and clearing vegetation can all exacerbate the damage that the spill itself created. Additionally, placement of flow control valves in strategic locations along/near sensitive areas may help to minimize backflow of product out of a fractured line into those areas.

A difficulty with aerial photograph analysis as opposed to field surveying of water crossings is that it is difficult to determine whether a stream or wetland is permanently, seasonally, or intermittently flooded. MPCA staff relied on National Wetland Inventory maps to identify wetland types, which will to

some extent help to determine the likelihood of the wetland having open water at the time of a leak, which would allow transport of released oil to occur more quickly, or merely be in a state of saturated soil, which would result in easier and faster containment and cleanup of a spill. The results of the MPCA staff analysis are as follows:

Sandpiper Route

The proposed Sandpiper route crosses 28 water bodies for which there is no access for possible containment within 2,000 linear feet downstream of the proposed pipe crossing. Of these 28 water body crossings, one is a stream to lake system, 12 are wetland complexes, 10 are streams that flow to wetland systems, and five are streams that flow to areas with stands of wild rice. Below is a list of the water body crossings for this route option, followed by example Figures B and C:

NAME of ROUTE	TOWNSHIP NAME	LOCATION (TWP/RNG/SEC)	LOCATION of AREA
Sandpiper Route	Mahtowa	T47 R18W S8	Moose Horn River
Sandpiper Route	Salo	T47 R22W S1	Headwaters Sandy River
Sandpiper Route	Salo	T47 R22W S2	Headwaters Sandy River
Sandpiper Route	Automba	T47 R21W S6	West Branch River
Sandpiper Route	Salo	T47 R22W S6	Headwaters Sandy River
Sandpiper Route	Automba	T47 R21W S6	West Branch River
Sandpiper Route	Automba	T47 R21W S1	Heikkila Creek-Kettle River
Sandpiper Route	Atkinson	T48 R18W S36	Blackhoof River
Sandpiper Route	Copley	T147 R37W S34	Walker Brook
Sandpiper Route	Moose Creek	T146 R36W S29	Upper Rice Lake-Wild Rice River
Sandpiper Route	Bull Moose	T138 R31W S12	Headwaters South Fork Pine River
Sandpiper Route	Bull Moose	T138 R31W S11	Headwaters South Fork Pine River
Sandpiper Route	Bull Moose	T138 R31W S11	Headwaters South Fork Pine River
Sandpiper Route	Arago	T141 R35W S17	Hay Creek
Sandpiper Route	Northwest Aitkin	T50 R26W S22	White Elk Creek
Sandpiper Route	McKinley	T138 R32W S3	Goose Lake-Big Swamp Creek
Sandpiper Route	McKinley	T138 R32W S4	Goose Lake-Big Swamp Creek
Sandpiper Route	Crow Wing Lake	T139 R33W S36	Burgen Lake
Sandpiper Route	Crow Wing Lake	T139 R33W S36	Burgen Lake
Sandpiper Route	Crow Wing Lake	T139 R33W S33	Town of Huntersville-Crow Wing River
Sandpiper Route	Straight River	T139 R35W S36	Blueberry Lake-Shell River
Sandpiper Route	Blind Lake	T139 R28W S26	Arrowhead Lake
Sandpiper Route	Hubbard	T139 R34W S31	Shell River
Sandpiper Route	Beulah	T139 R25W S9	Moose River
Sandpiper Route	Straight River	T139 R35W S6	Straight River
Sandpiper Route	Bear Creek	T145 R36W S35	Gill Lake-Mississippi River
Sandpiper Route	Todd	T140 R35W S6	Fishhook Lake
Sandpiper Route	Lake Hattie	T144 R35W S19	LaSalle Lake-Mississippi River

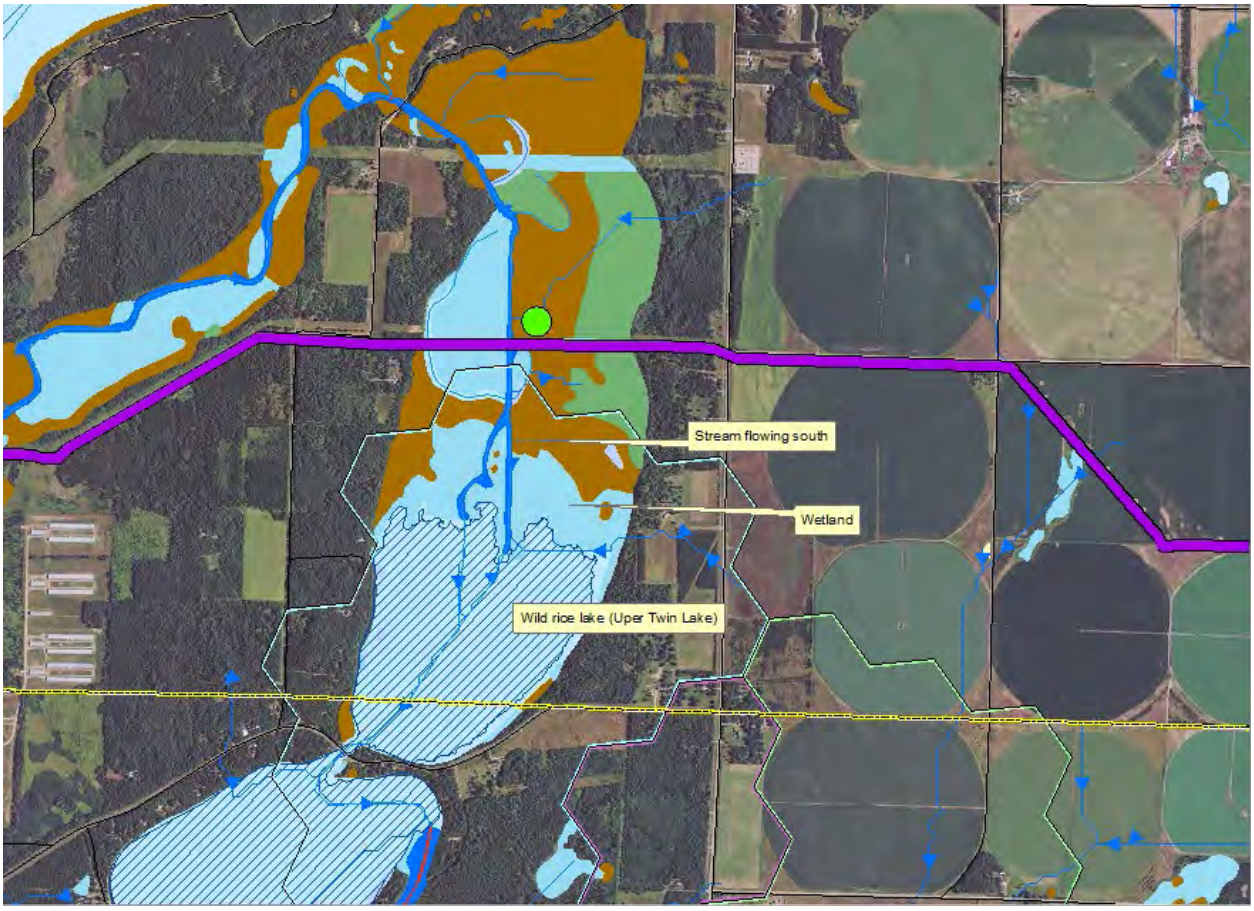

Figure B - This shows an example of a proposed crossing point over surface water that flows south (see arrows on dark blue flowage line) through a wetland complex and into a wild rice lake (the Twin Lakes near Menahga and Park Rapids, MN). However, to determine accessibility, the wetland identification layer must be turned off so that land features can be examined as in Figure C below. The purple line is the proposed Sandpiper route. (Scale 1:24,001)

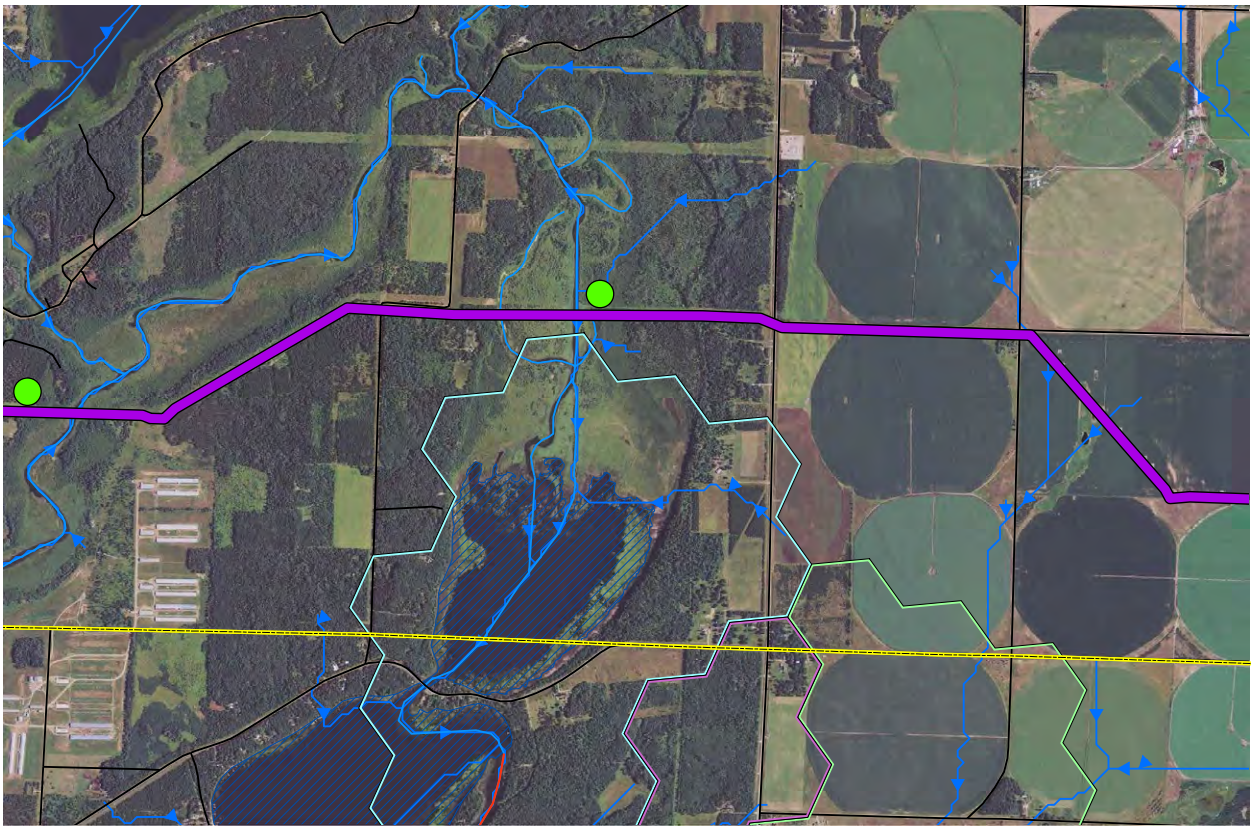

Figure C-Here, the wetland layer is turned off so that the landscape can be examined for accessibility. In this instance, there are no roads or open farmland to bring containment or clean-up equipment within 1,500 feet of the flowage that would potentially deliver leaked crude oil into the upper most of the Twin Lakes. The curvy black line between the lakes is a road, and the first good point of access. This road is 6,700 feet from the pipeline crossing, although it is possible that boats or barges could access the lake from the farm fields to the right (east) or the road (black line) to the left and contain a spill within the lake. (Scale 1:24,001)

Hill Route

The "Hill route alternative," suggested by the MDNR as a way to avoid features of concern, would not differ from the proposed Sandpiper route based on the criteria discussed here.

Northern Route

The Northern route, which parallels the path of the Alberta Clipper project, crosses 20 water bodies for which there is no access within 2,000 feet downstream of the location where crossings would occur if the route were followed. Along the Northern route, water bodies without access to potential leak sites within 2,000 feet include one stream that flows to a lake, 14 wetland complexes, five stream/wetland systems, and two streams or wetlands that flow to areas with stands of wild rice or wetlands. Below is a list of the water body crossings for this route option, followed by example Figures D and E:

NAME of ROUTE	TOWNSHIP NAME	LOCATION (TWP/RNG/SEC)	LOCATION of AREA
Northern Route	Pot Shot Lake	T52 R21W S8	Floodwood River
Northern Route	Northeast Aitkin	T52 R22W S1	West Branch Floodwood River
Northern Route	Wawina	T53 R22W S27	West Branch Floodwood River
Northern Route	Deer Lake	T56 R26W S29	Mississippi River
Northern Route	Bowstring Lake	T144 R26W S3	Little Winnibigoshish Lake-Miss. River
Northern Route	Morse	T145 R25W S35	White Oak Lake-Mississippi River
Northern Route	North Cass	T145 R27W S35	Sixmile Brook
Northern Route	North Cass	T145 R27W S34	Sixmile Brook
Northern Route	North Cass	T145 R27W S34	Sixmile Brook
Northern Route	North Cass	T145 R27W S33	Sixmile Brook
Northern Route	North Cass	T145 R28W S26	Sixmile Brook
Northern Route	Wawina	T53 R22W S28	West Branch Floodwood River
Northern Route	Blackberry	T54 R24W S13	Blueberry Lake-Mississippi River
Northern Route	North Cass	T145 R29W S24	Portage Creek
Northern Route	North Cass	T145 R29W S20	Portage Creek
Northern Route	Wilton	T147 R34W S34	Grant Creek
Northern Route	Pot Shot Lake	T52 R21W S22	Floodwood River
Northern Route	Perch Lake	T49 R18W S7	Perch Lake
Northern Route	North Carlton	T49 R19W S1	Stoney Brook
Northern Route	Arrowhead	T50 R19W S27	Bog Lake

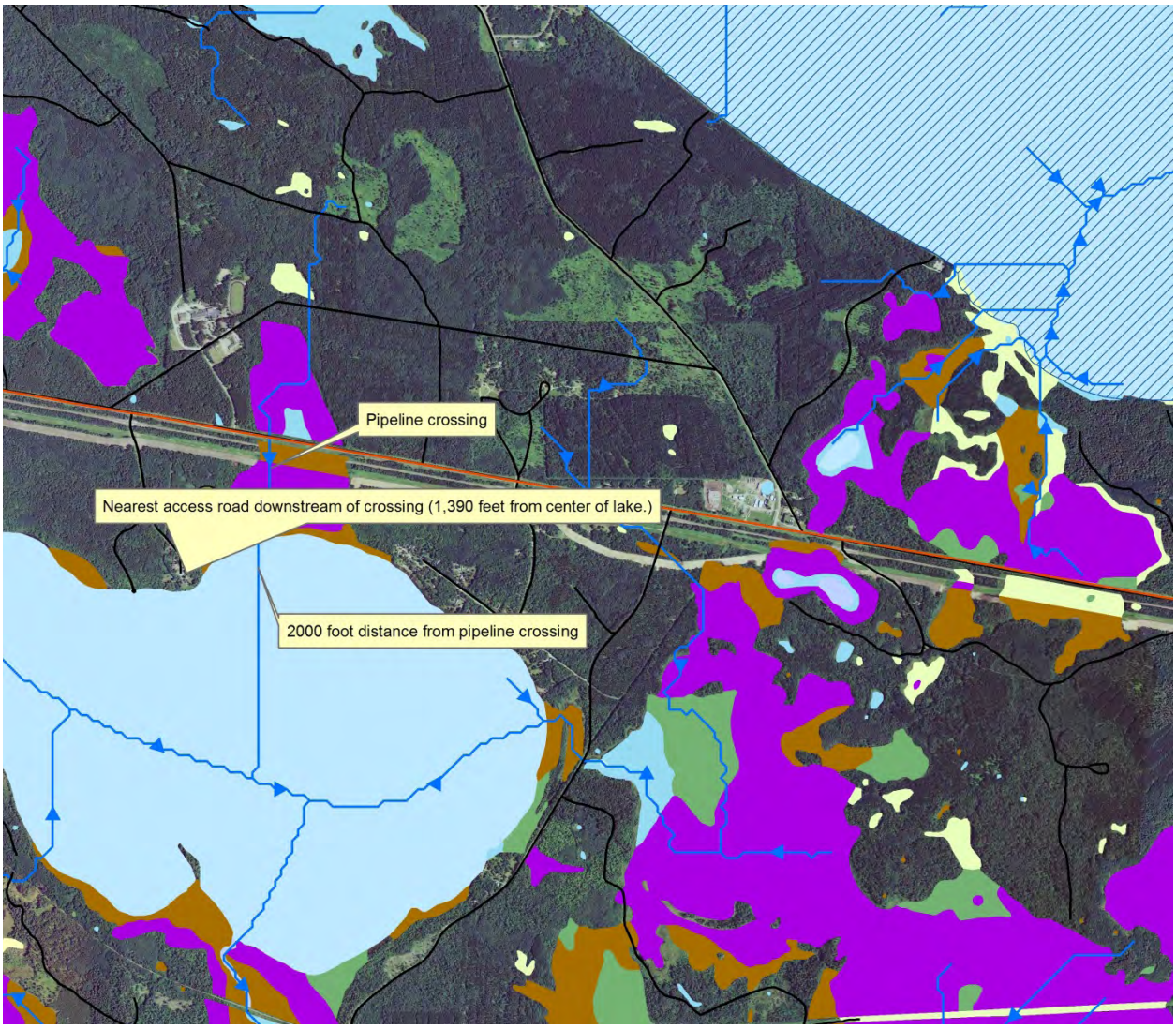

Figure D-With NWI wetland layer turned on, one can see wetland extending well beyond the 2,000 foot buffer at this crossing along the "Northern" route. The purple is bog, the green is forested wetland. In Figure E below the wetland layer is turned off so that accessibility to a potential leak here can be determined. (Scale 1:24,001)

Figure E- With the wetland identifying layers turned off, one can see that there are no roads or upland areas from which to access potential leak sites at this crossing. There is a possible access point identified to the southwest of the pipeline crossing, but containment equipment would have to be strung across over 3,000 feet of wetland as it flows into the lake to contain all of a release as it flows to the south. (Scale 1:24,001)

Alternative 3 Route

The Alternative 3 route corridor, which was referenced earlier in the letter, begins at the same western point that both the Sandpiper and Northern routes do; however, roughly 20 miles west of the North Dakota border it veers south and follows an existing (possibly abandoned) pipeline south and then southwest to roughly five miles west of North Branch, Minnesota, where it then follows another corridor in a northerly direction, where it eventually intersects with the proposed Sandpiper route just west of Superior, Wisconsin. This route has 7water body crossings with no access within 2,000 feet downstream of the pipe crossing; however, these water bodies are often smaller wetland complexes than are seen on either the Sandpiper route or the Northern route. These crossings without access within 2,000 feet

include two wetland complexes, four stream/wetland systems, and one area with stands of wild rice. Below is a list of the water body crossings for this route option, followed by example Figures F and G:

NAME of ROUTE	TOWNSHIP NAME	LOCATION (TWP/RNG/SEC)	LOCATION of AREA
Alternate Route 3	Mission Creek	T40 R21W S12	Mission Creek
Alternate Route 3	Fawn Lake	T132 R32W S34	Lower Turtle Creek
Alternate Route 3	Fawn Lake	T132 R32W S19	Fish Trap Creek
Alternate Route 3	Kettle River	T44 R20W S8	City of Willow River-Kettle River
Alternate Route 3	Bartlett	T133 R34W S23	Moran Creek
Alternate Route 3	Compton	T134 R36W S5	Deer Creek-Leaf River
Alternate Route 3	Twin Lakes	T48 R17W S21	Blackhoof River

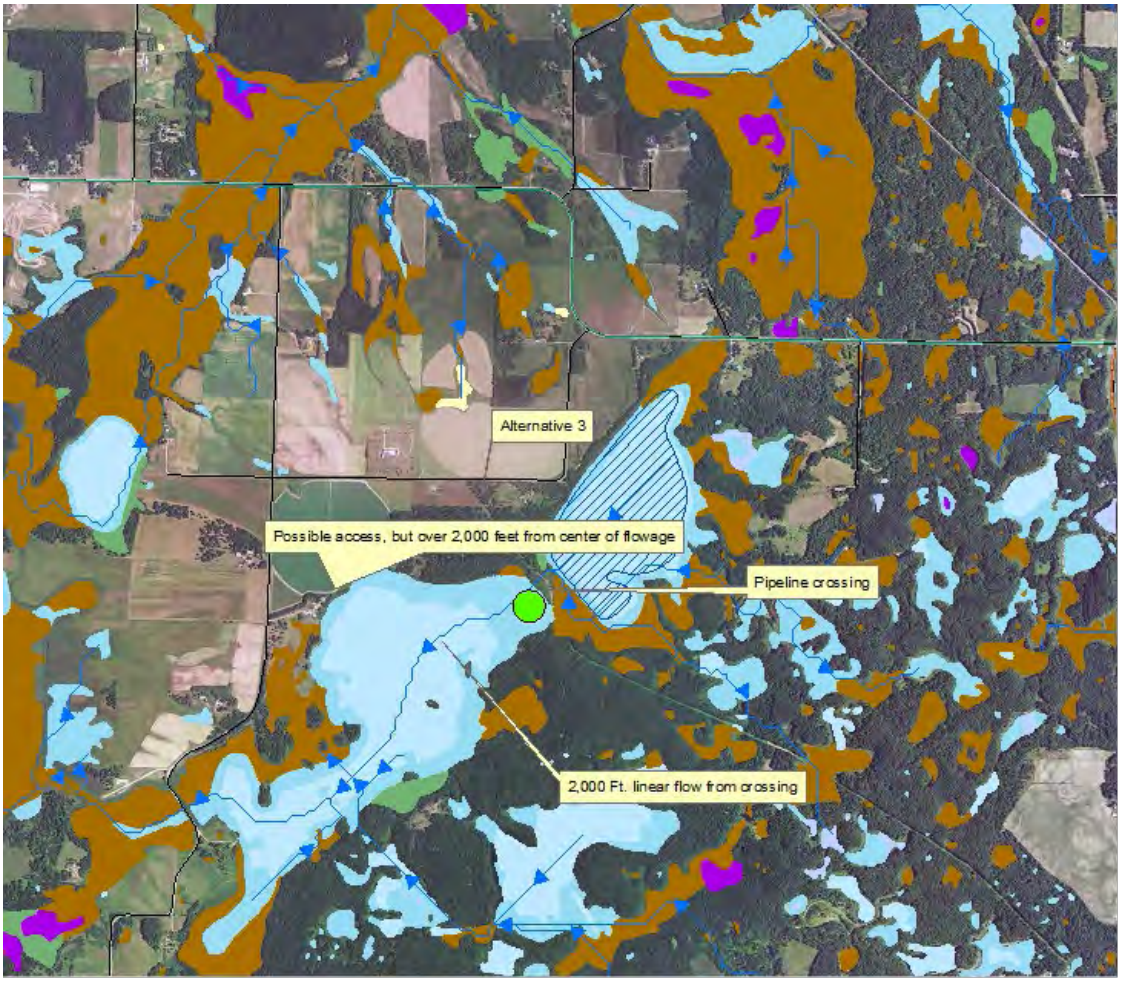

Figure F - Wetland layer identifies an open water wetland south of the pipe crossing that would likely receive oil from a leak. Wetland layer turned off in Figure G below. (Scale 1:24,001)

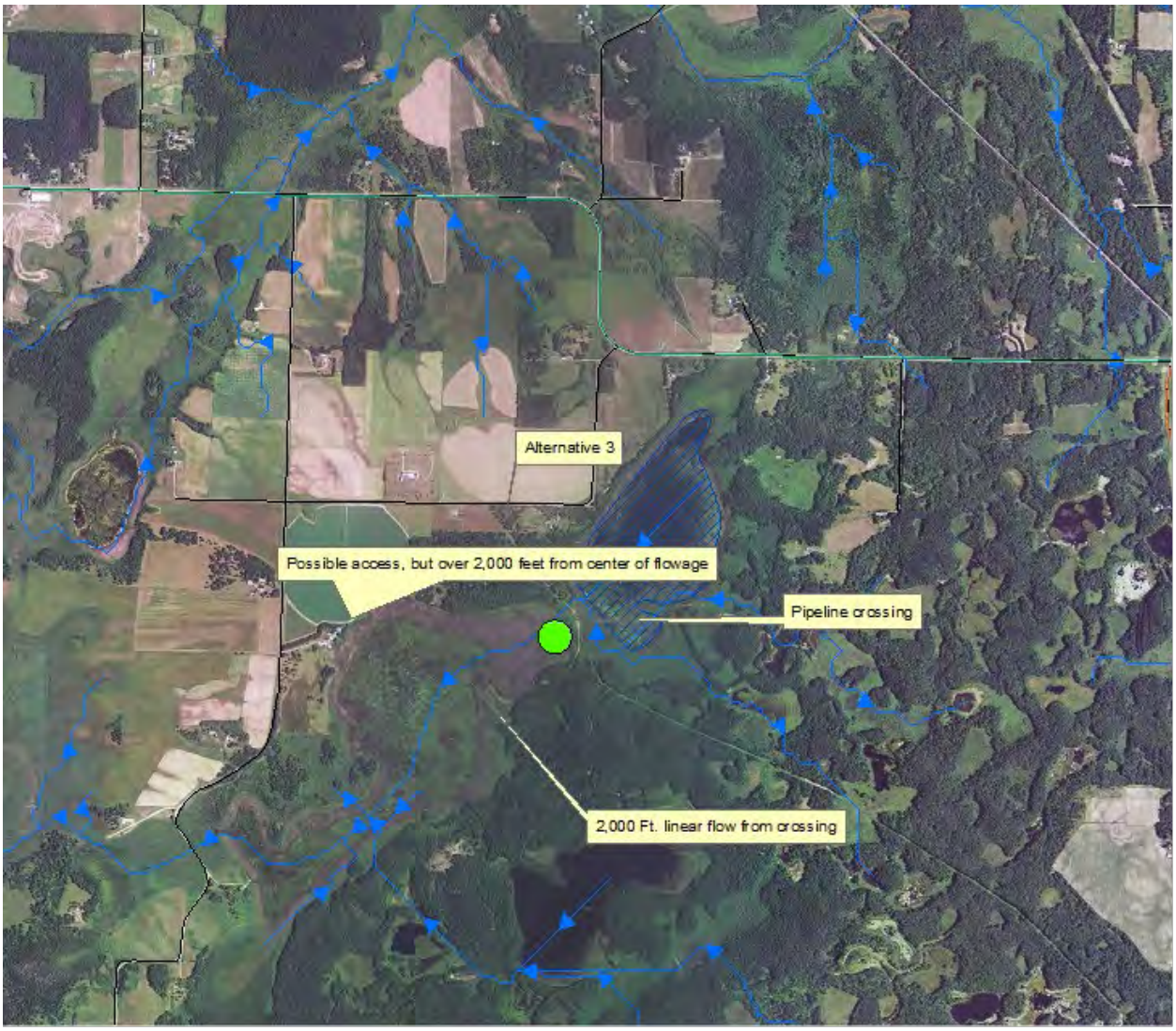

Figure G-With wetland layer turned off, one can see that the nearest access to the main stem of the flowage is roughly 2,000 feet to the west. If the wetland is traversable by boat or barge, which is possible given the wetland type (Type 3/5 shallow marsh and open water) then it is possible that access to material could be gained within the 2,000 foot buffer here. (Scale 1:24,001)

Alternative 4 Route

The Alternative 4 corridor enters the state in Traverse County just west of Wheaton, Minnesota, and runs to a southeast bearing until it exits the state south of Austin, Minnesota. A pipeline along this route would cross no water bodies lacking access within 2,000 feet of a potential leak site in surface water. There are very few water bodies crossed by this route in general over the proposed route.

National Hydrography Dataset

Even if access issues are taken out of the equation, the proposed Sandpiper route does not fare well in comparisons with alternative proposals based on examination of the National Hydrography Dataset

(NHD) layer. Using the NHD layer, the proposed Sandpiper route would cross 20 water bodies, the Northern route would cross 10, the Alternative 3 route would cross 12, and the Alternative 4 route would cross 1 water body within the state of Minnesota. The NHD layer obviously does not identify all water bodies that are being crossed; however, it does identify water bodies that are part of a connected network of surface waters which may also be a good gauge of potential environmental impact if an incident were to occur.

Notably, the two routes in this analysis that crossed the fewest water bodies and put water resources at the lowest risk for environmental damage both aligned away from the Clearbrook terminal. Perhaps the most problematic aspect of the design of this proposed route is the continued expansion of terminal capacity at the Clearbrook location. Any pipelines that are built to transport material out of the Clearbrook terminal are forced to enter the largest concentration of lakes, streams, and open-water wetlands in the state. Any route proposed out of Clearbrook, either south or east will cross dense expanses of open waters. A northern to eastern route from Clearbrook would cross massive wetland complexes and areas with stands of wild rice. If future, new terminals, were to be constructed in western Polk (could collect from Canada or North Dakota), Kittson (could collect from Canada or North Dakota) or even Clay counties (North Dakota) the creation a route proposal that avoids the greatest concentration of surface waters becomes feasible.

Summary of Route Analysis

There are numerous pipeline corridors that currently exist in Minnesota. Of those, there are several that cross far fewer water bodies and have better potential for access in the event of a release than the current Sandpiper proposal. MPCA staff examined three existing corridors in addition to the proposed Sandpiper route. While performing risk assessment, the current use of the corridors in question should also be considered, as much of the proposed Sandpiper route follows a corridor in which three other oil pipelines currently exist. Thus, not just one pipeline would be crossing sensitive water bodies with limited access, but four. The likelihood of an incident in which crude oil product is released is thus greater than what a single pipeline would entail. This is also true of the Northern route, in which numerous pipelines carrying crude oil exist. What has happened in the past with regard to location of pipeline routes is from this perspective unfortunate; MPCA staff believes that past routes have crossed too many water bodies in inaccessible areas, and the risk of large-scale impact as a result of a release incident is significant and ongoing. As this analysis shows, options posing a lesser risk to surface waters may be available.

Of the four possible routes that MPCA staff has examined, the proposed Sandpiper route and the previously followed Northern route show a significantly higher potential for environmental damage than either the Alternative 3 or Alternative 4 routes. It is also possible that an as-yet unexplored route could also score well relative to the Sandpiper proposal. The analysis of the Alternative 4 route is incomplete in that possible impacts outside of the Minnesota state boundaries were not looked at, so the surface waters avoided or protected by this route are only located in Minnesota per this analysis. It is also acknowledged that the MPCA staff analysis focused on the potential water quality and natural resource aspects of the project and not on other types of resources or land uses.

Nevertheless, the criteria adopted for this analysis show a clear difference in potential risk to surface waters between the Sandpiper proposal and other possible routes, and that in the event of a significant

oil release, the Sandpiper route proposal has a significantly greater potential for large-scale environmental damage than other route proposals.

It is important to note that the construction of accesses through sensitive "no access" areas as a preventative measure can also create environmental hazards and damages and cannot be assumed to be an acceptable remedy. Rather, route proposals put forth now and in the future should take these factors into consideration and avoid continuing to cross surface waters at these locations. The minimization of surface water crossings in any location should become a priority for consideration when planning a route to construct a pipeline.

Cumulative Impacts

The NEPA, Title 40, C.F.R. 1508.7, defines cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

The cumulative impacts review in the CEA should include current and proposed transmission line corridors, highway construction, water delivery systems, landfills, railroads, power generations plants, feedlots, and mine and mineral extraction sites which have the potential to interact with the proposed project. The CEA should also review the potential for significant cumulative effects related to past, present and future projects in the Duluth/Superior area involving increased transmission, storage, processing or refining activities, including the expansion of the Calumet Superior Refining facility in Superior, Wisconsin, or transportation of oil, fuels or products refined or manufactured from oil. Areas in which such impacts could occur include air quality in Duluth and the surrounding area in Minnesota, water quality as related to new or increased discharges or shipping activities, and transportation whether by truck, rail or ships.

The CEA should identify the impacts of past incidents associated with pipeline construction and operation, past incidents involving two or more associated utility lines, accidents or emergencies which may arise due to an unforeseen chain of events during the operational life of the pipeline, and effects within the project limits, and local and regional effects. Cumulative impacts may occur to:

- Human activities, such as recreation, agriculture and loss of prime farmland
- Wildlife including migratory birds and aquatic species
- Habitat and alterations to terrestrial vegetation
- Endangered species
- Air quality, including dust (particulate matter) and visual impacts
- Land values
- Watersheds
- Local and state socioeconomics

According to data provided by the Pipeline and Hazardous Materials Safety Administration (PHMSA), to date, there are 2,408 miles of crude oil pipeline in the state of Minnesota. More are planned within the next few years. Much of this infrastructure exists in corridors shared by several other pipelines carrying liquefied petroleum gas, natural gas, diluent for tar sands oil, refined petroleum product and other

hazardous materials. In total, there are 10,475 miles of pipeline through the state. According to PHMSA, over the last 20 years, there has been an average of 14 spills from pipelines per year in Minnesota, an average of 1,812 barrels of hazardous liquids spilled per year in Minnesota, an average of 1,093 net barrels lost per year in Minnesota, and an average of $3,135,572 of property damage annually in Minnesota. Five lives have been lost as a result of pipeline incidents.

The MPCA has numerous concerns about the number of pipelines planned to use the same corridors. With each water body crossed by a pipeline carrying crude oil, the risk of a major incident increases. A cursory review of the PHMSA web site identifies apparent causes of pipeline failure to include: incorrect operation, equipment failure, internal and external corrosion, third party damage (excavation), construction damage, material failure (pipe, fitting, weld), weld leak, and other unknown causes. For example, at the site of the Enbridge pipeline release in Marshall, Michigan, the National Transportation Safety Board found "that deficiencies in Enbridge's integrity management (IM) program contributed to the release of hazardous liquid…" (Federal Register, Volume 79, No. 87, Tuesday, May 6, 2014 (25990 – 25994). See also Enbridge Incorporated Hazardous Liquid Pipeline Rupture and Release, Marshall, Michigan, July 25, 2010 (NTSB/PAR-12/01, PB2012-916501). Ultimately, the perspective should not be if a pipeline fails, but how will a release be mitigated when a failure occurs and at any given location (and the environmental susceptibility of that area to a release).

As explained above, MPCA examination of the proposed Sandpiper route and the previously used Northern route (Alberta Clipper) shows that significantly more open water bodies are crossed by the pipelines in these corridors than alternative routes. Far more of these crossings have no available access within a 2,000 foot buffer, meaning that release incidents are more likely to impact surface waters within that 2,000 buffer. Both the Sandpiper and Alberta Clipper routes are corridors for numerous crude oil pipelines; consequently, these routes are more vulnerable and less able to properly mitigate damage to aquatic environments. Whereas oil does travel through soils and overland, it travels significantly farther in aquatic environments.

Pipeline construction will involve soil excavation, vegetation removal, the crossing of water bodies, and the alteration or loss of wildlife habitat. These activities and the creation of new corridors can result in forest fragmentation affecting numerous species of wildlife that require expanses of undisturbed forest. Wetland perches may be broken causing alteration of natural hydrology in wetland areas, and stream geomorphology can be altered by damaging banks or stirring up stream bottoms. Herbicides used to control vegetation in pipeline corridors may adversely affect pollinators, particularly honeybees, resulting in hidden impacts that are difficult to trace, but nonetheless exist.

The construction, operation, maintenance, incidents and repairs associated with crude oil pipelines have been accompanied by significant environmental impacts. With more proposals in the works, more cumulative impacts can be expected to occur. Therefore, concerted effort is needed to take a close look at and carefully analyze the creation of common routes and corridors for pipeline projects where the risks of impacts to the environmental and human health can be minimized. The routes that have been used in the past pose substantial risks as noted above. Continuing to open more corridors will increase these risks and impacts. The MPCA would support and participate in a joint effort by state agencies to begin examining the feasibility of such a corridor, both for the purpose of expediting approval of future proposals and minimizing the potential for environmental impacts. A fresh look at the routing of energy transportation projects from a larger and more comprehensive perspective has the potential to make a

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
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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

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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.

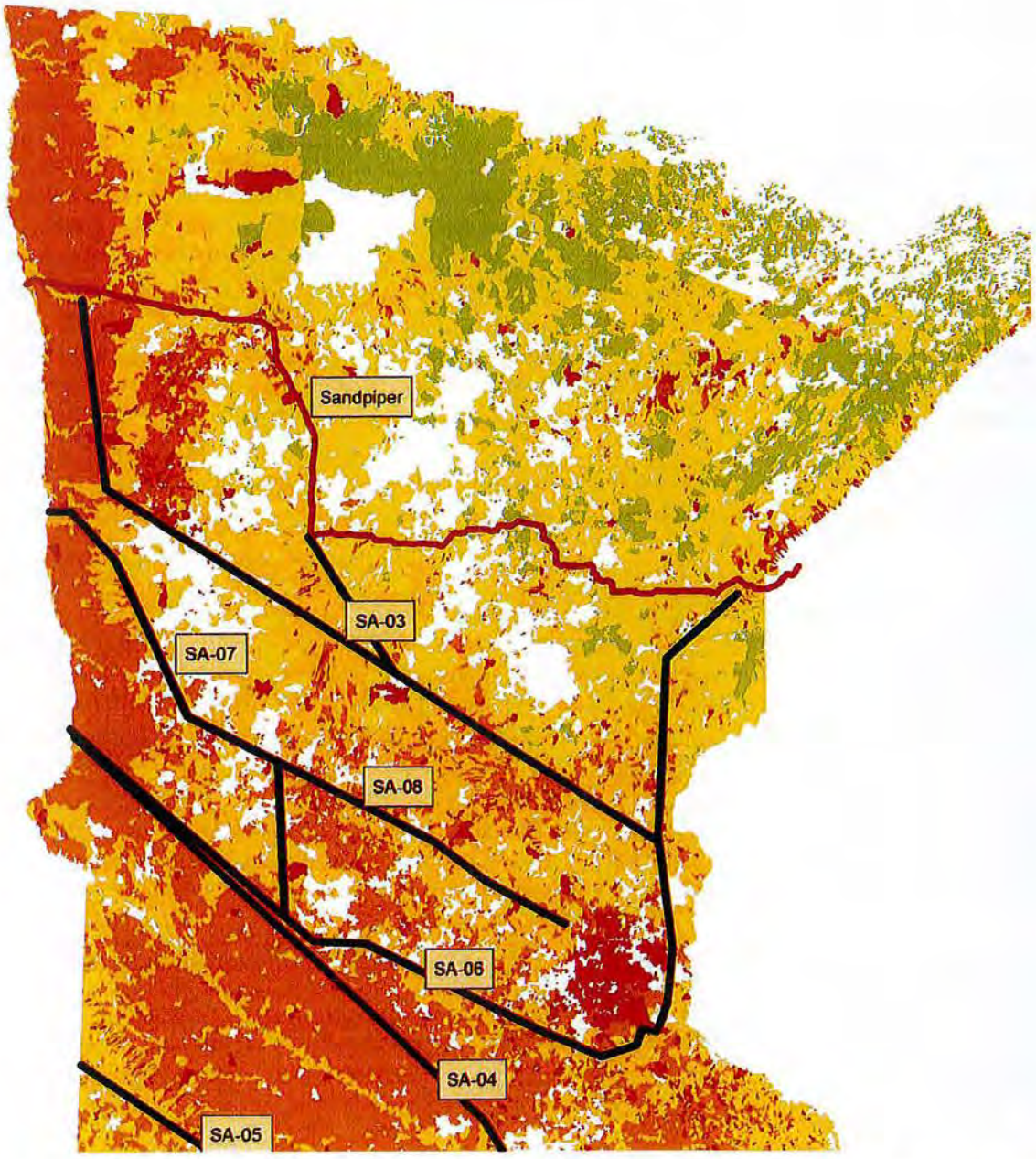
The MPCA's comments are intended to demonstrate the importance and the utility of the Commission developing an environmental effects analysis of the various system alternatives in the Certificate of Need part of this combined proceeding.

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

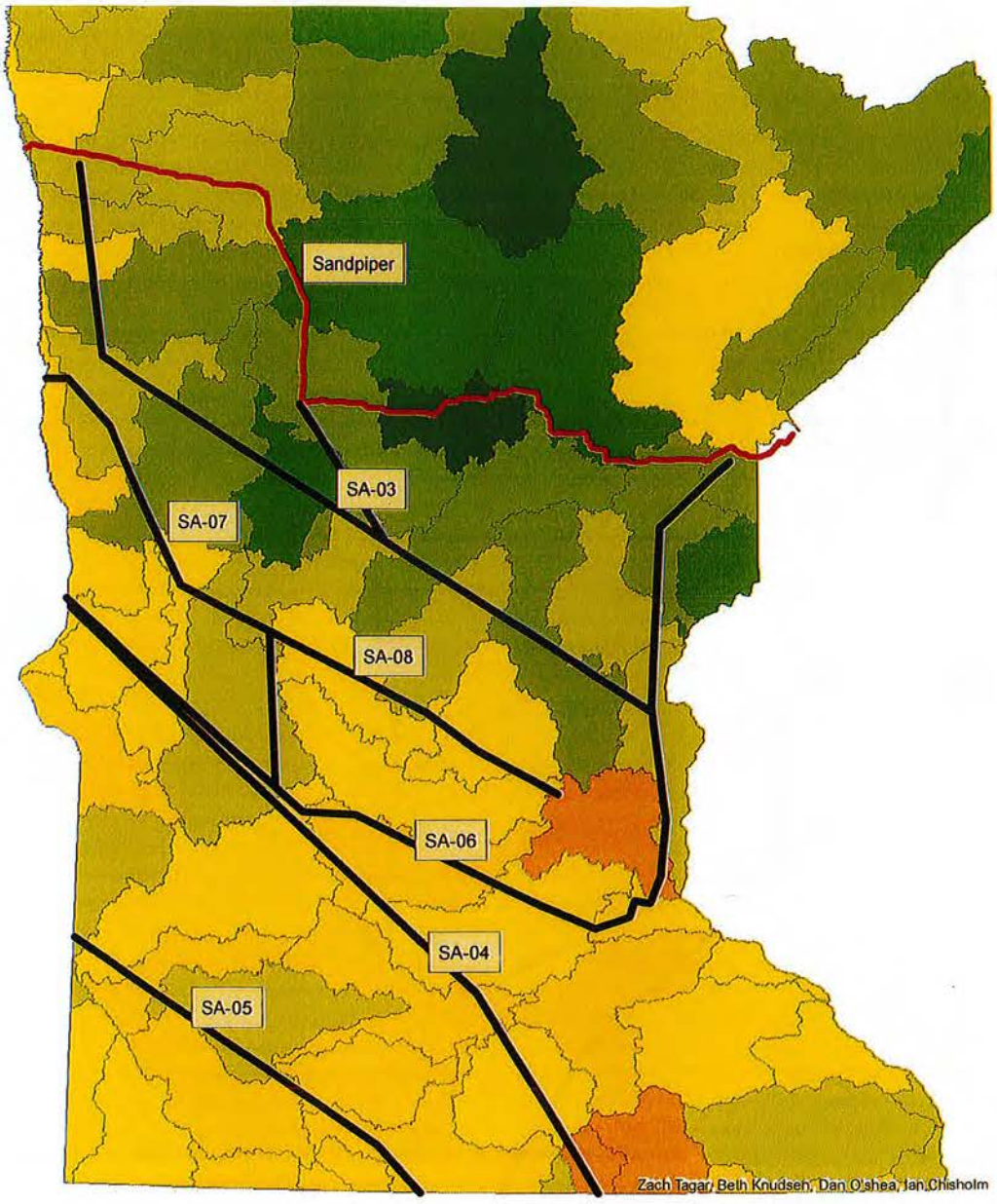
MPCA has considered the criteria in Minnesota Rule 7852.1900 Subp. 3 to compare the proposed system alternatives and the Sandpiper route by identifying corresponding Geographic Information System (GIS) layers to these criteria, and then visually examining the resulting maps. Without having access to 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.

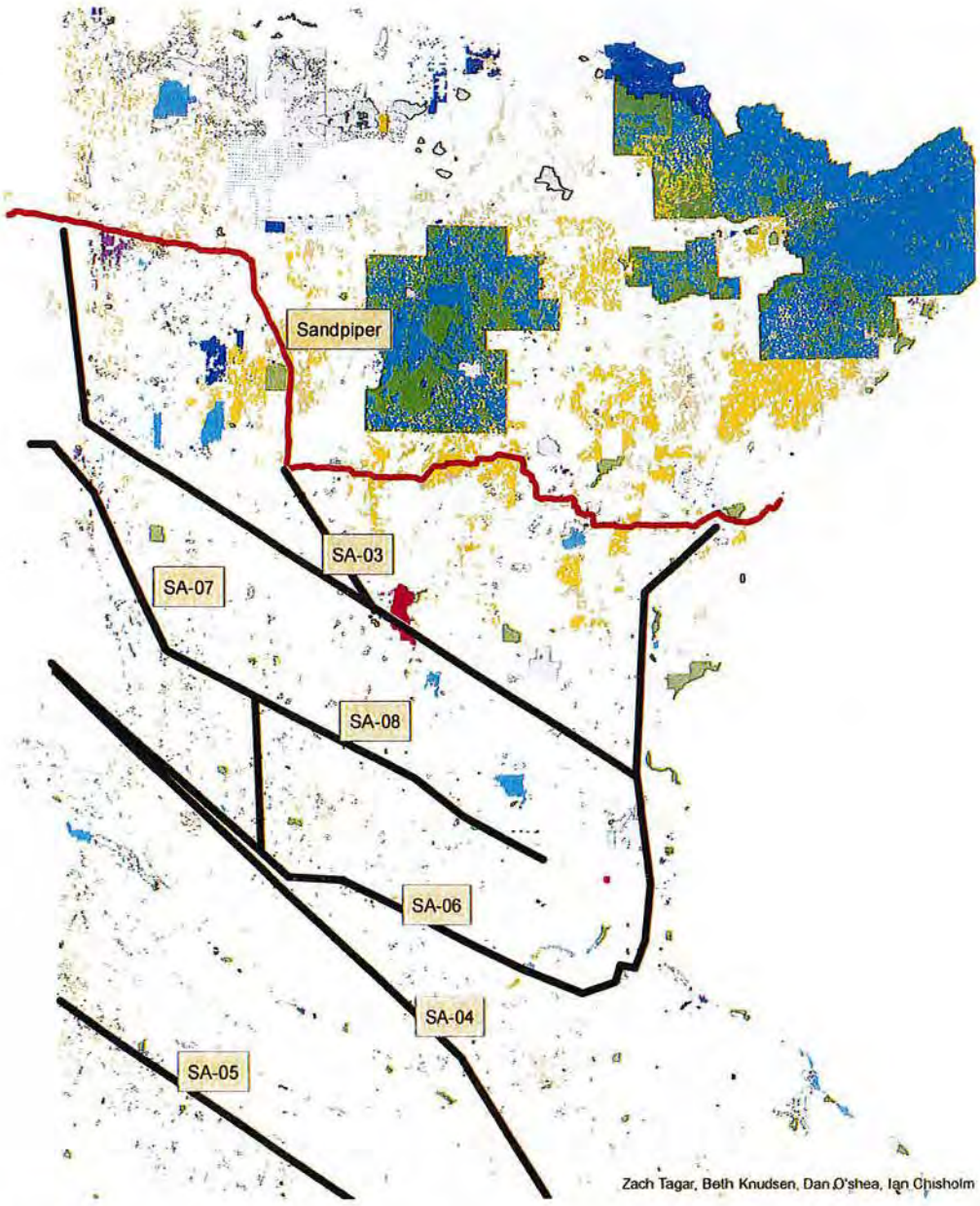
Several layers were used to depict these criteria, including Cumulative Disturbance Index (a score showing how human activity has affected the environment which could be used as an indicator of the quality of wildlife habitat), a map showing Water Quality mean score (the score for overall water quality 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.

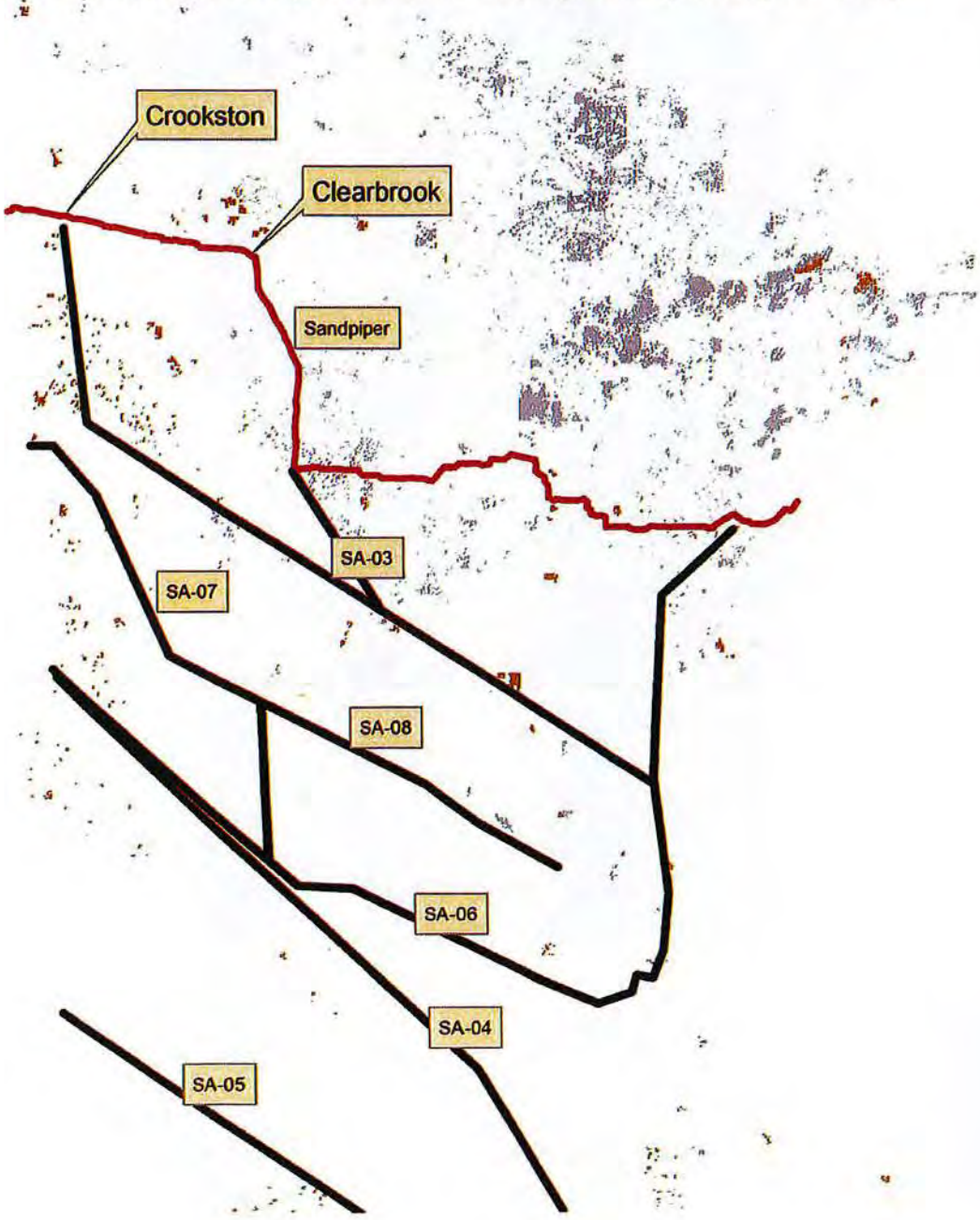
Environmental and natural resource protection and the prevention of impacts tend to be less costly and more effective than restoration; therefore, scoring in this instance is based on preventing impacts to higher quality areas. Scoring of the proposed system alternatives based on criteria in Minnestoa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

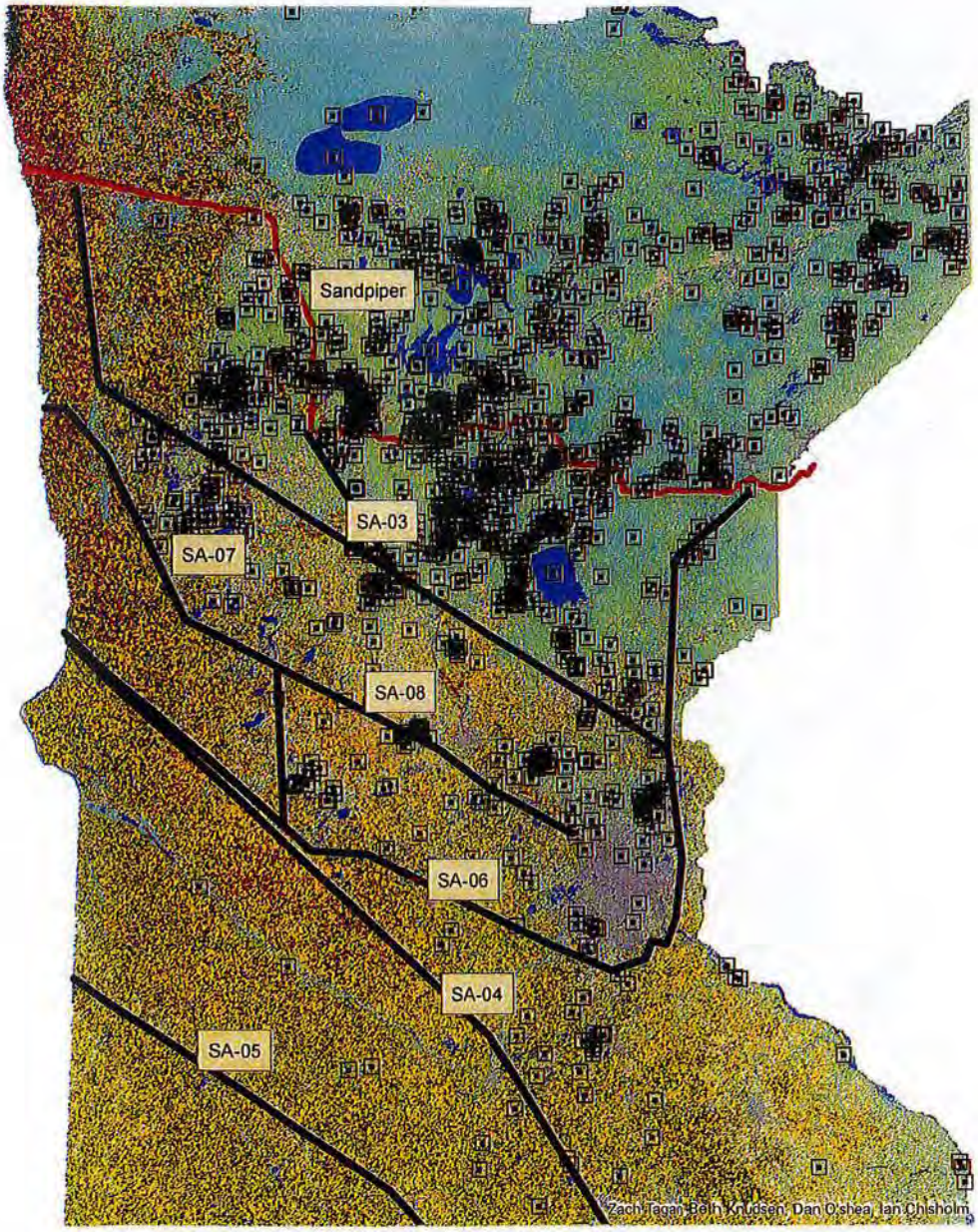
Minnesota Rule 7852.1900 Subp. 3.D. Economies within the route, including agricultural, commercial or industrial, forestry, recreational, and mining operations.

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.



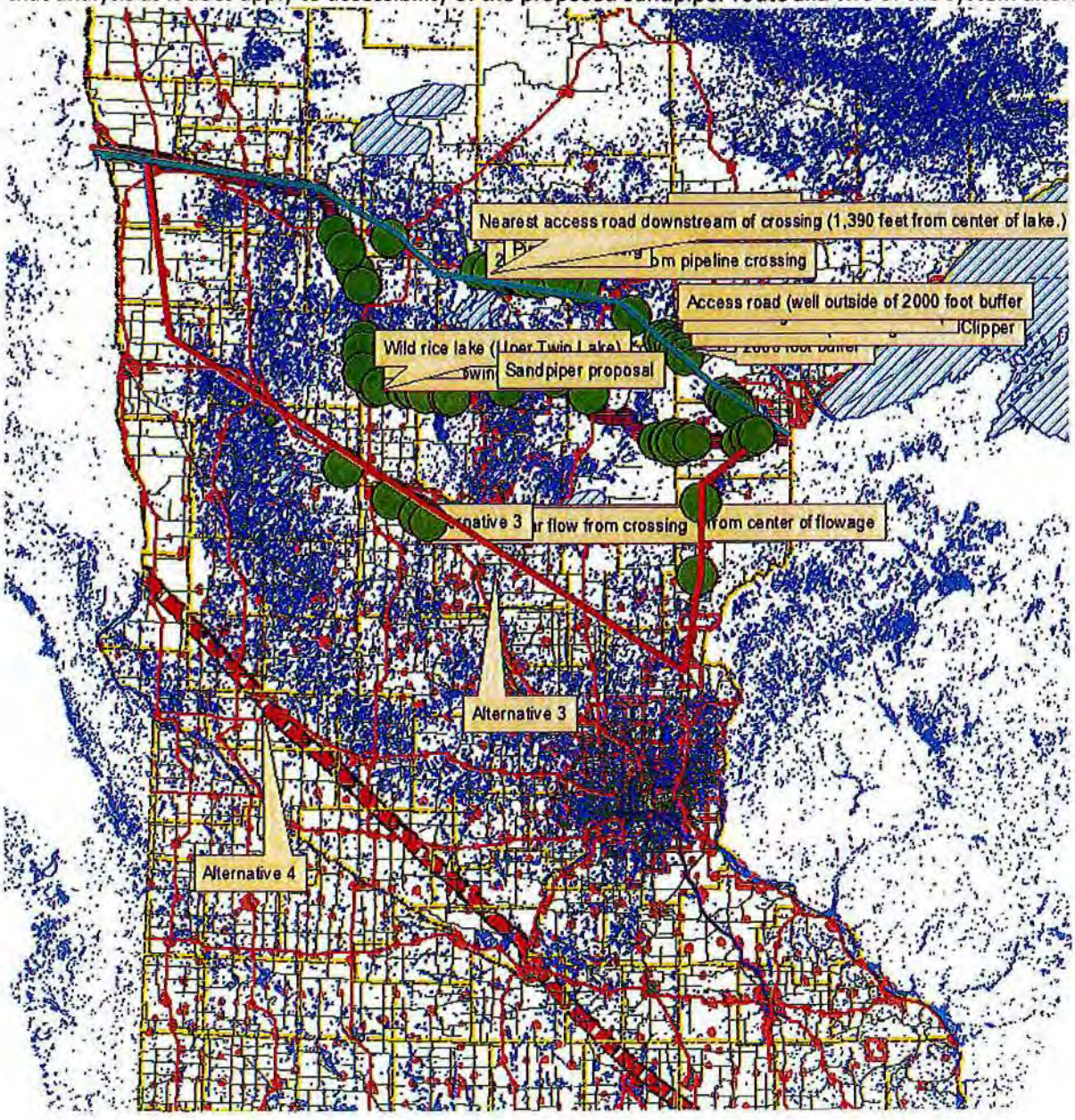
This map identifies cropland in Minnesota, and also stands of wild rice (black squares with black dots). The yellow or dark green areas are corn and soybeans, while the lighter green and blue-green are forested areas. The state appears fairly evenly divided between forest land above SA-03, and heavily 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.

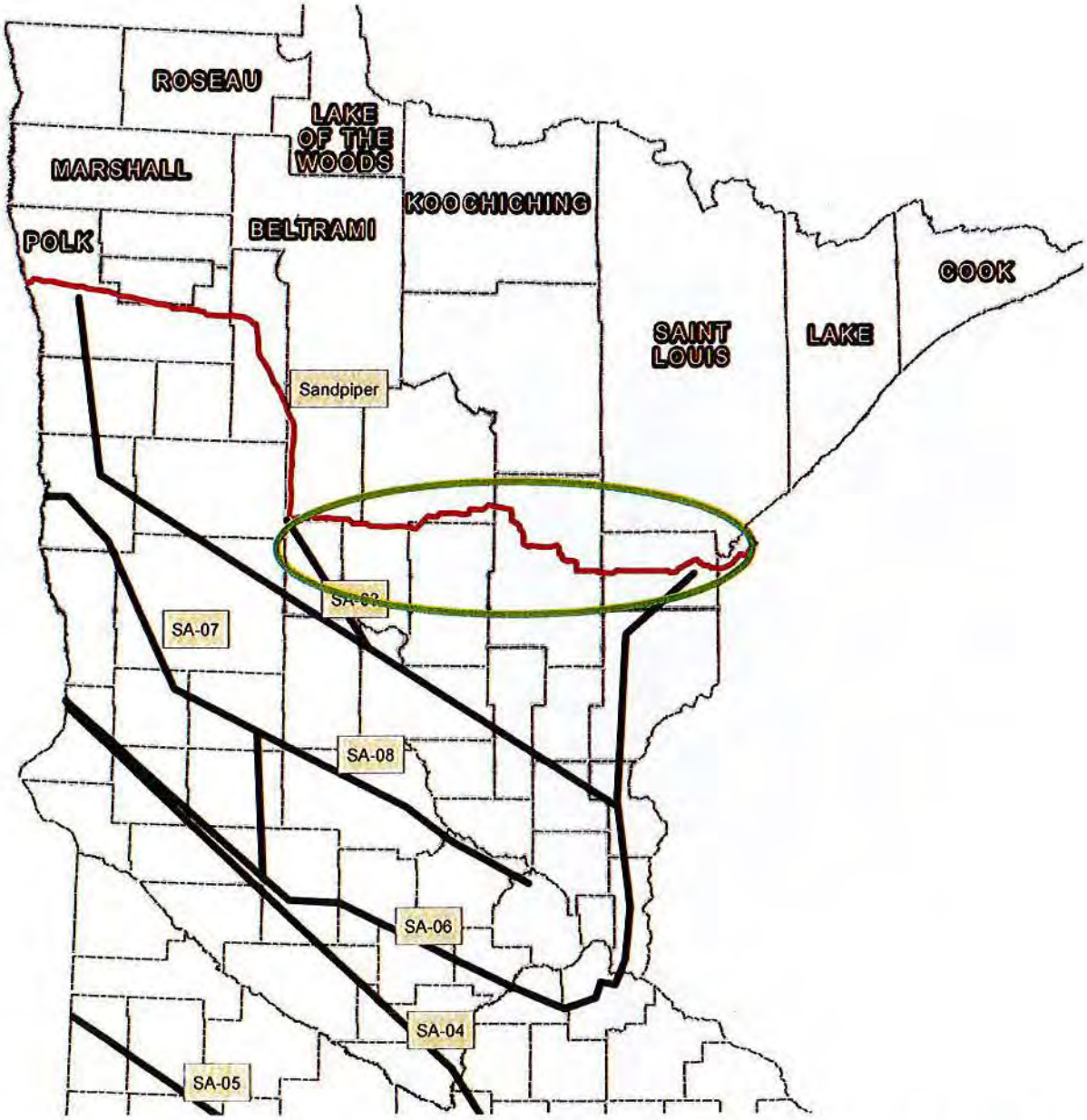


As described in the MPCA's June 24, 2014 letter, the MPCA studied the Sandpiper route proposal, SA-03, and SA-04 for accessibility downstream of water crossings. The criteria set for this study involved road access to water crossing areas within 250 feet of the center of a flowage or water body for a 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:

- S 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

Minnesota 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:

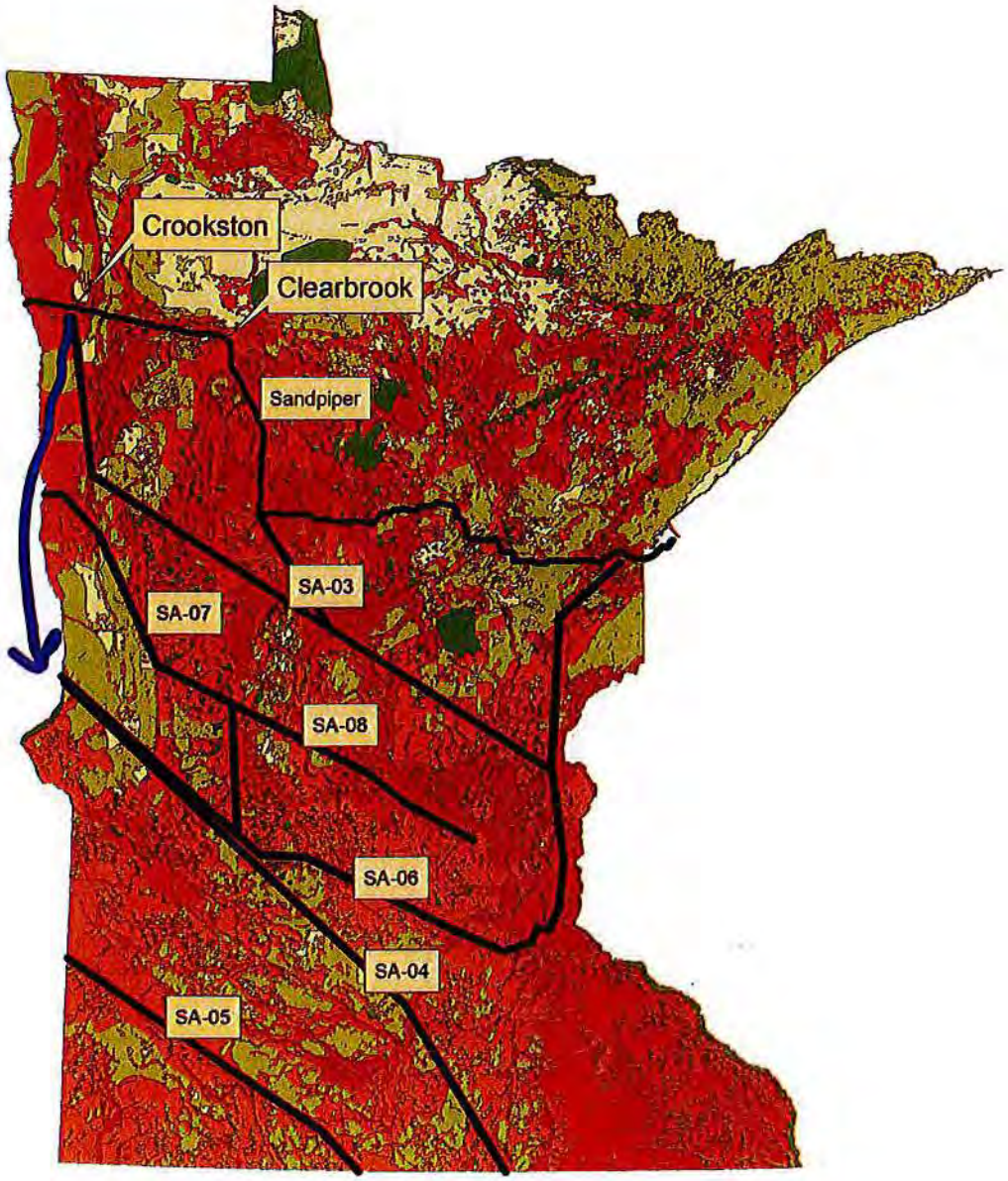


Through much of Aitkin County, and small areas of Carlton County, the Sandpiper proposal does not appear to follow any existing corridors at all. Thus, based on these criteria, the Sandpiper route and system alternatives would score as follows:

- 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

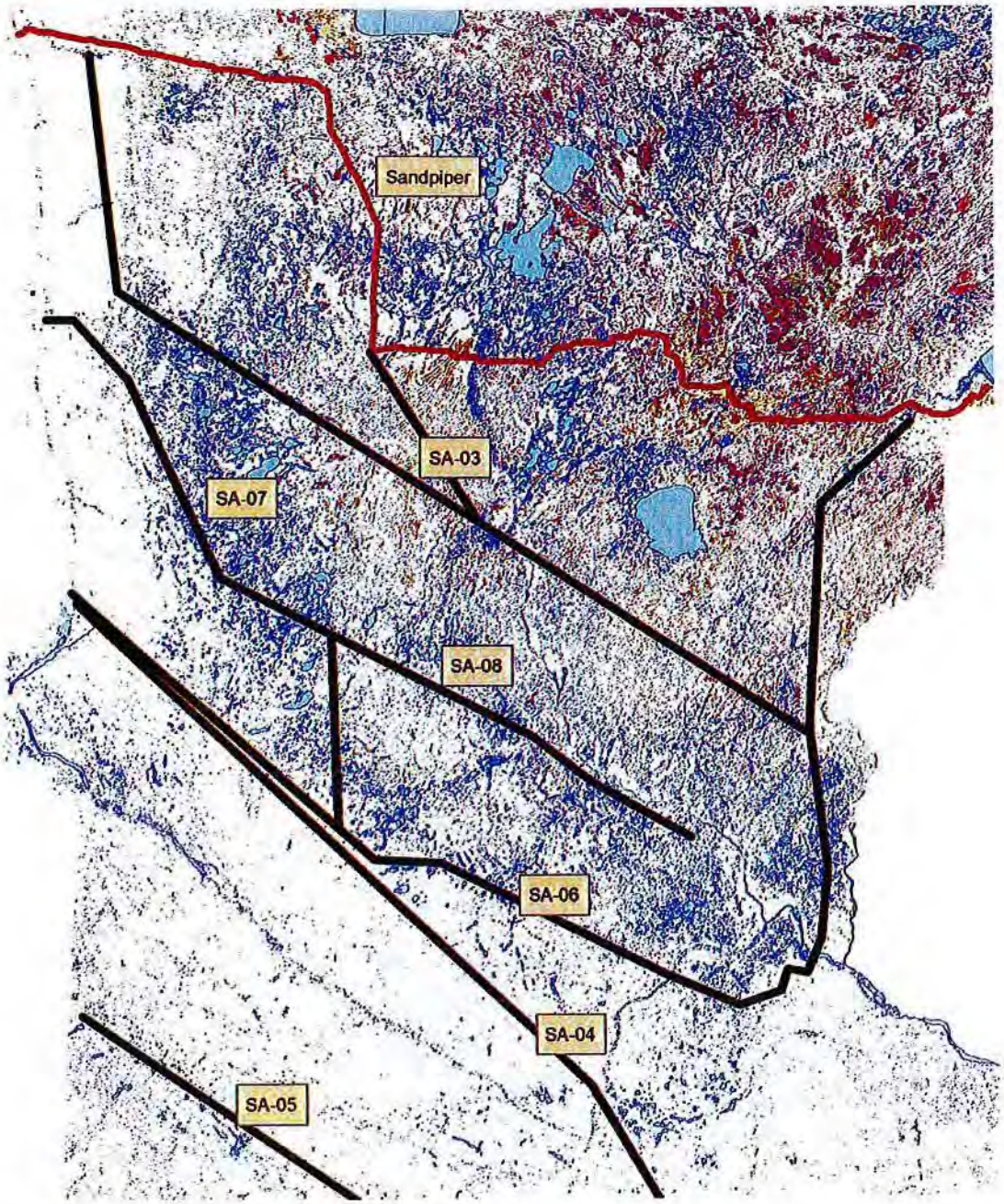
Minnesota Rule 7852.1900 Subp. 3.G. Natural resources and features.

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:

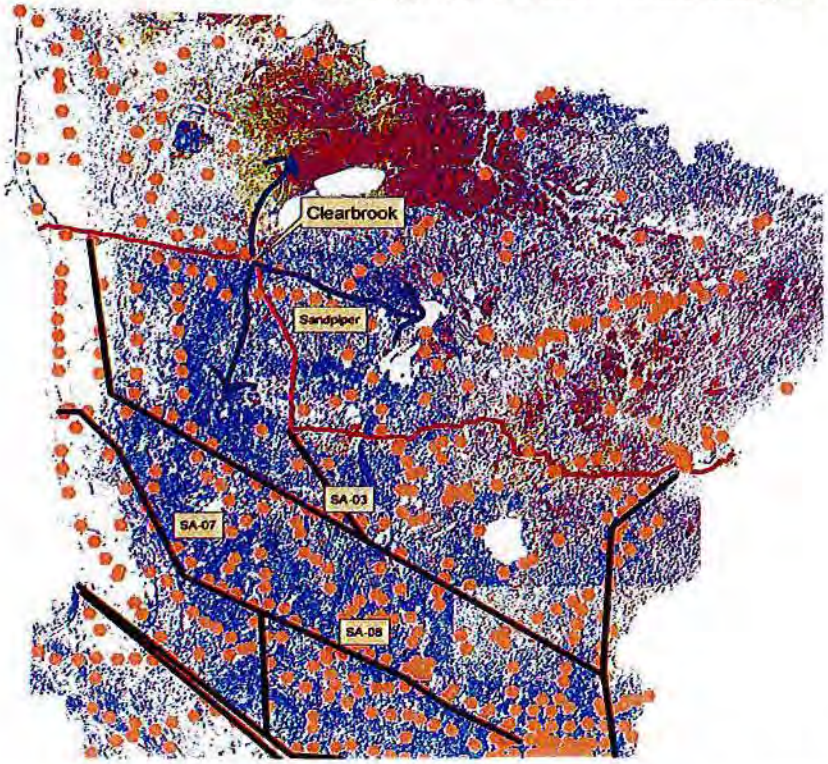
- 5 points (small potential impact to criteria) SA-04, SA-05
- 3 points- (moderate potential impact to criteria) SA-03, SA-06, SA-07, SA-08
- 1 point (stronger potential to impact criteria) Sandpiper

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.

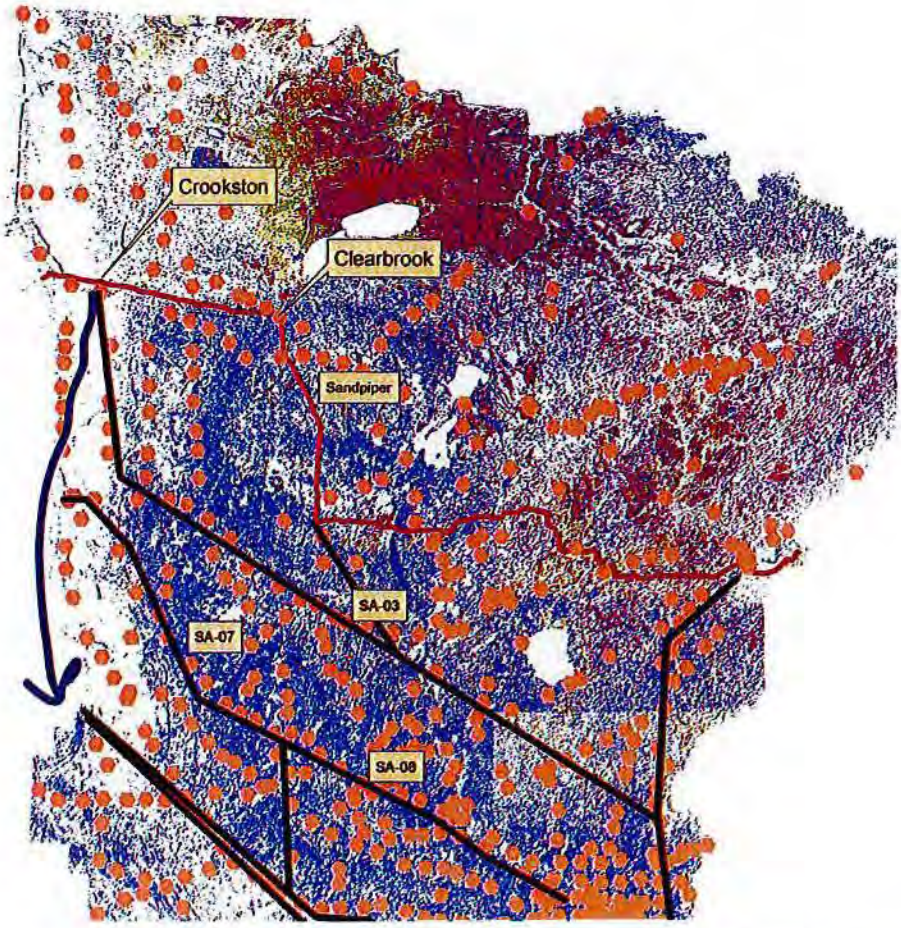
Minnesota Rule 7852.1900 Subp. 3.I. Cumulative potential effects of related or anticipated future pipeline construction.

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
800-657-3864 | 651-282-5332 TTY | www.pca.state.mn.us | Equal Opportunity Employer

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 to Attachment C

To

Honor the Earth

Comments on Line 3 Replacement Project

DEIS

CN-14-916 and PPL-15-137

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).

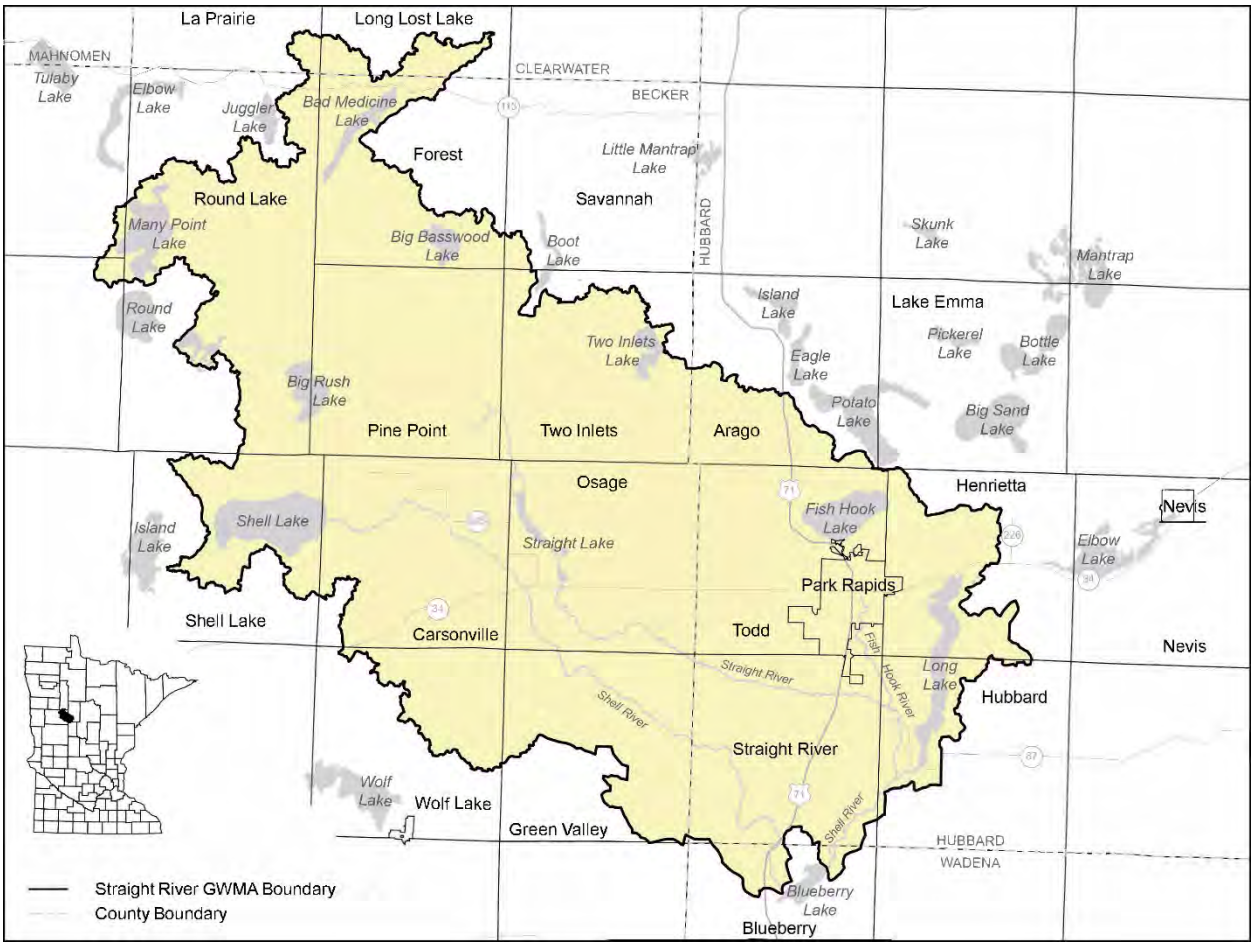

Figure 2-1 Boundary of the Straight River GWMA

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.

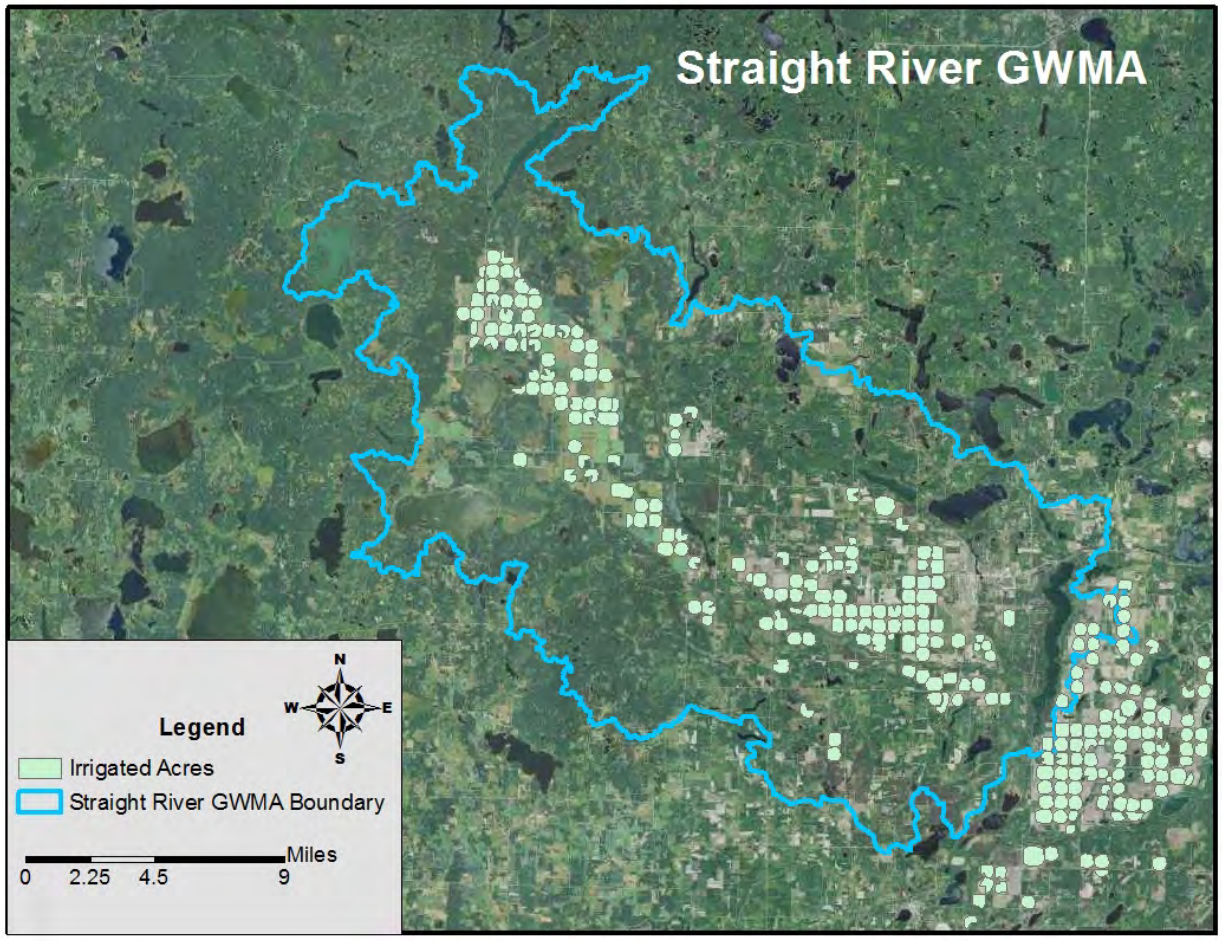

Figure 2-2 2014 Irrigated acreage in the Straight River GWMA

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).

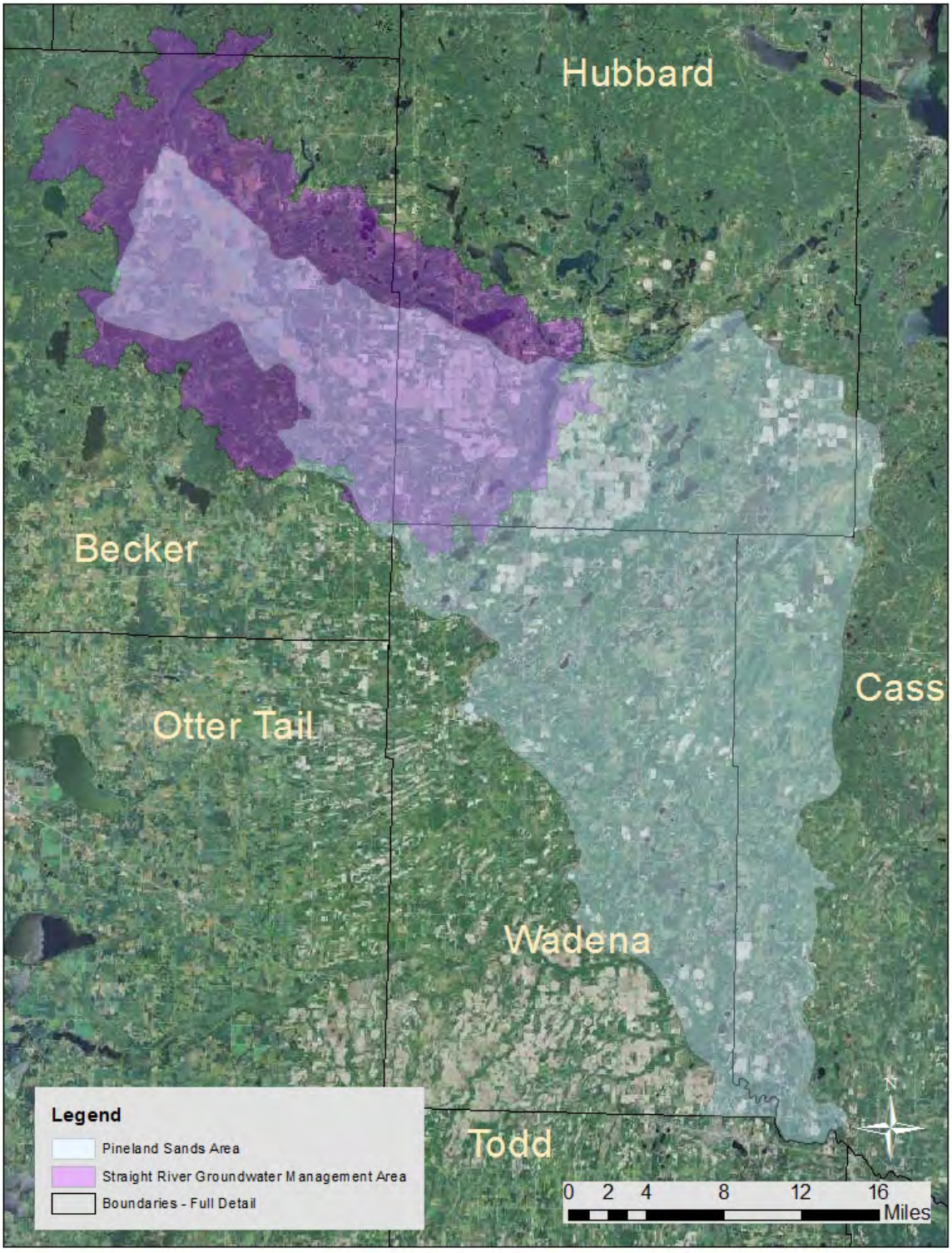

Figure 2-3 Straight River GWMA within context of the Pineland Sands

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%.

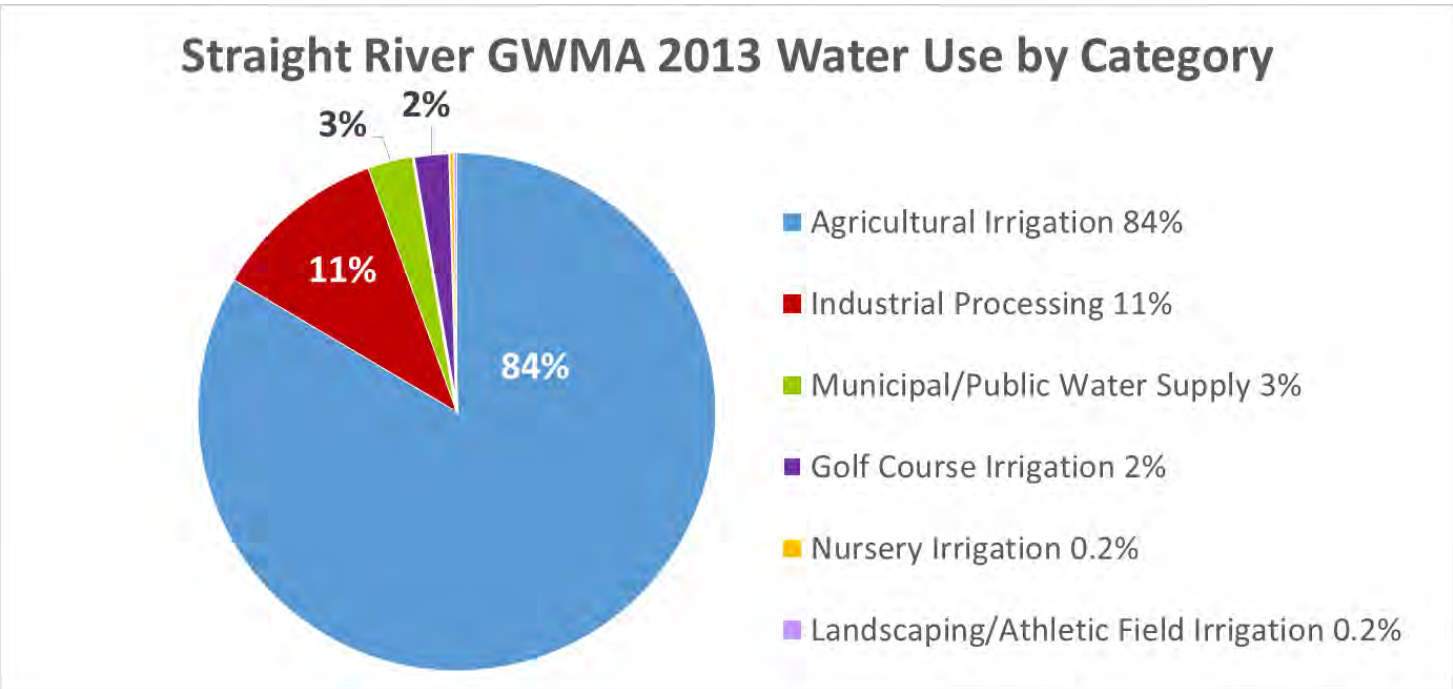

Figure 2-4 - Water use in the Straight River GWMA in 2013 by category

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.

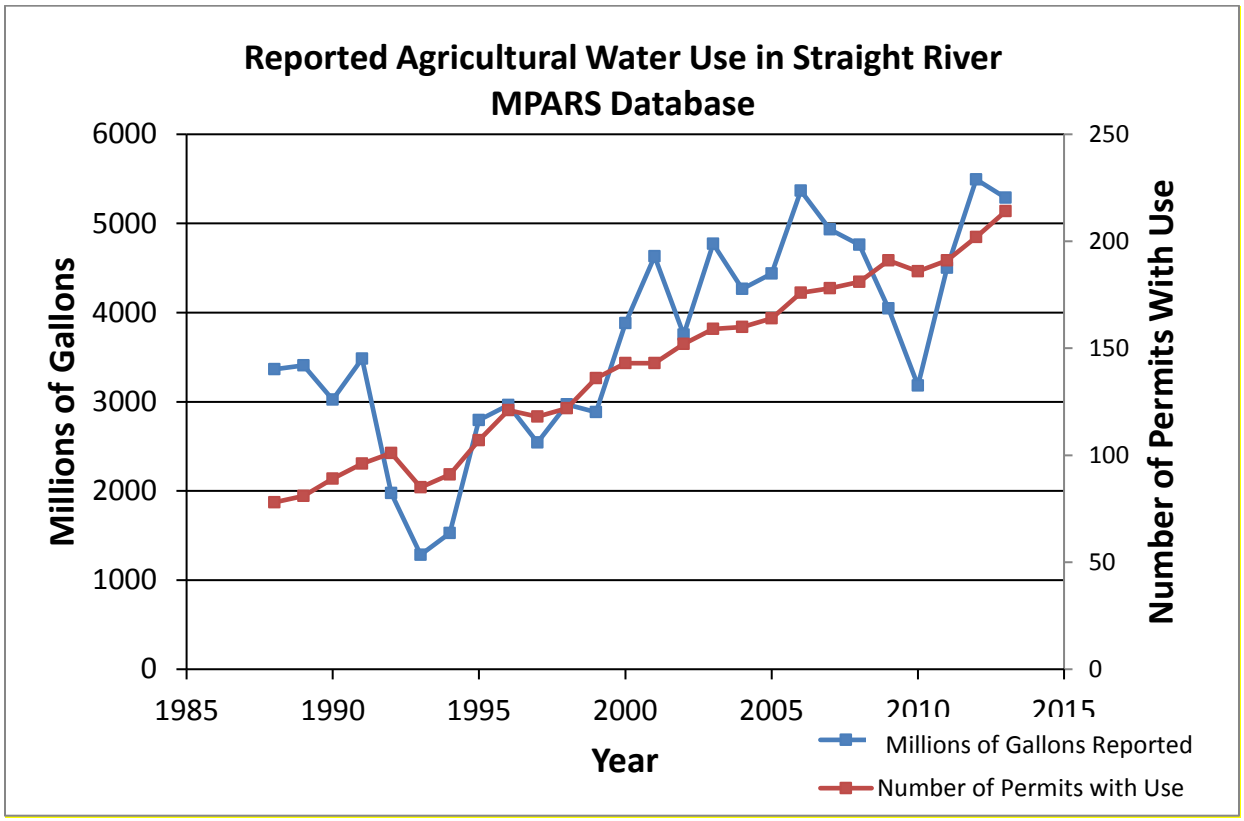

Figure 2-5 Agricultural groundwater use (1998 to 2013)

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.

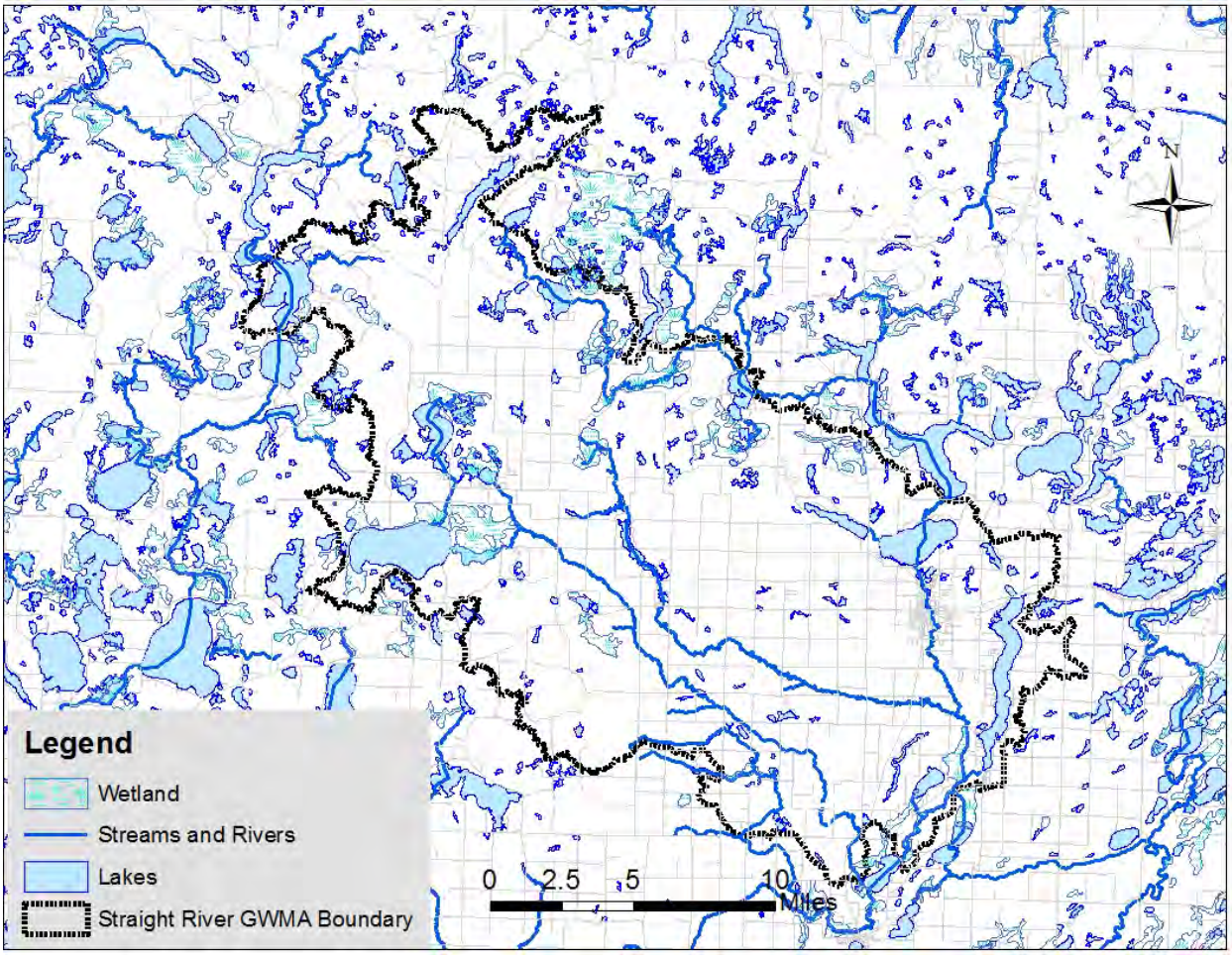

Figure 2-6 Surface water features within and around the Straight River GWMA

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.

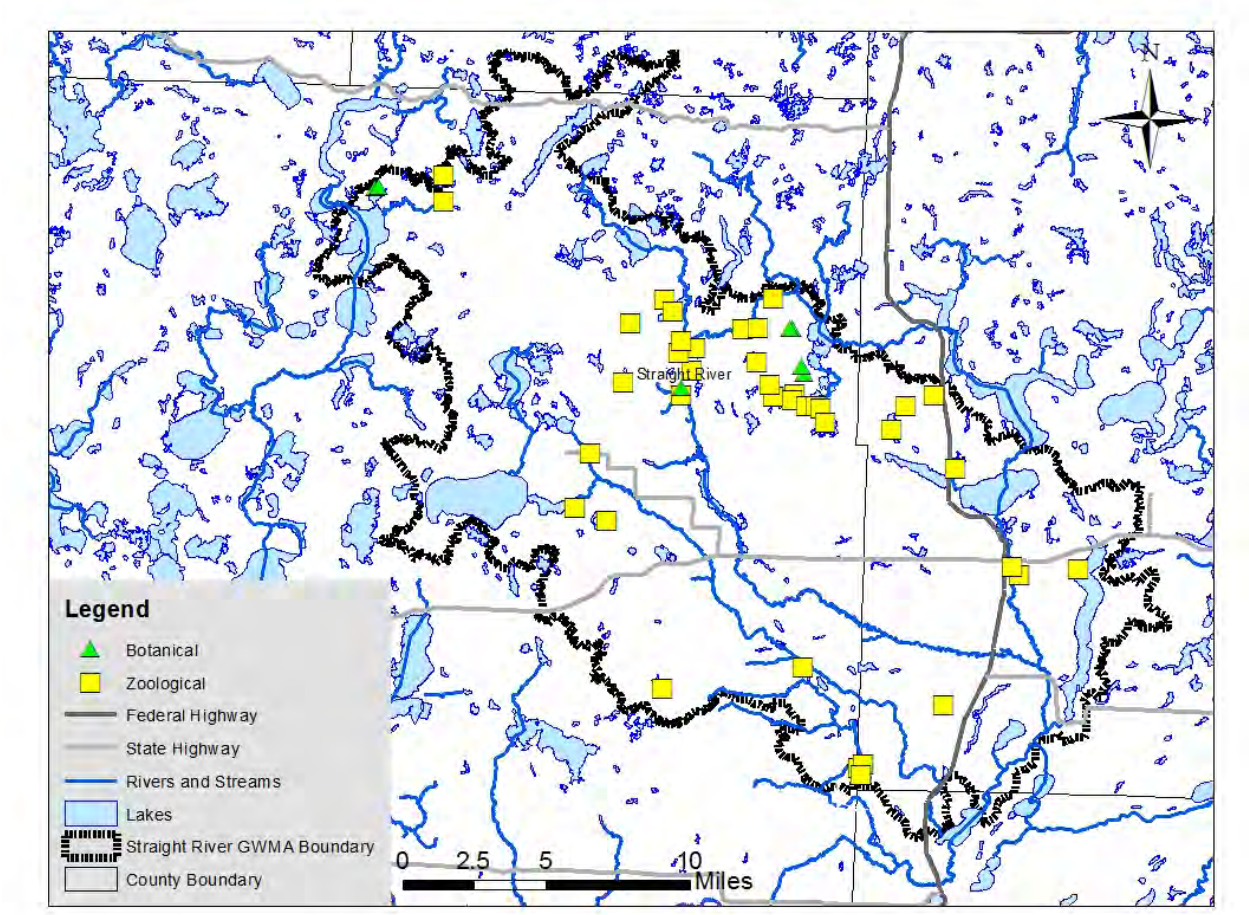

Figure 2-7 Straight River rare and natural features associated with groundwater

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.

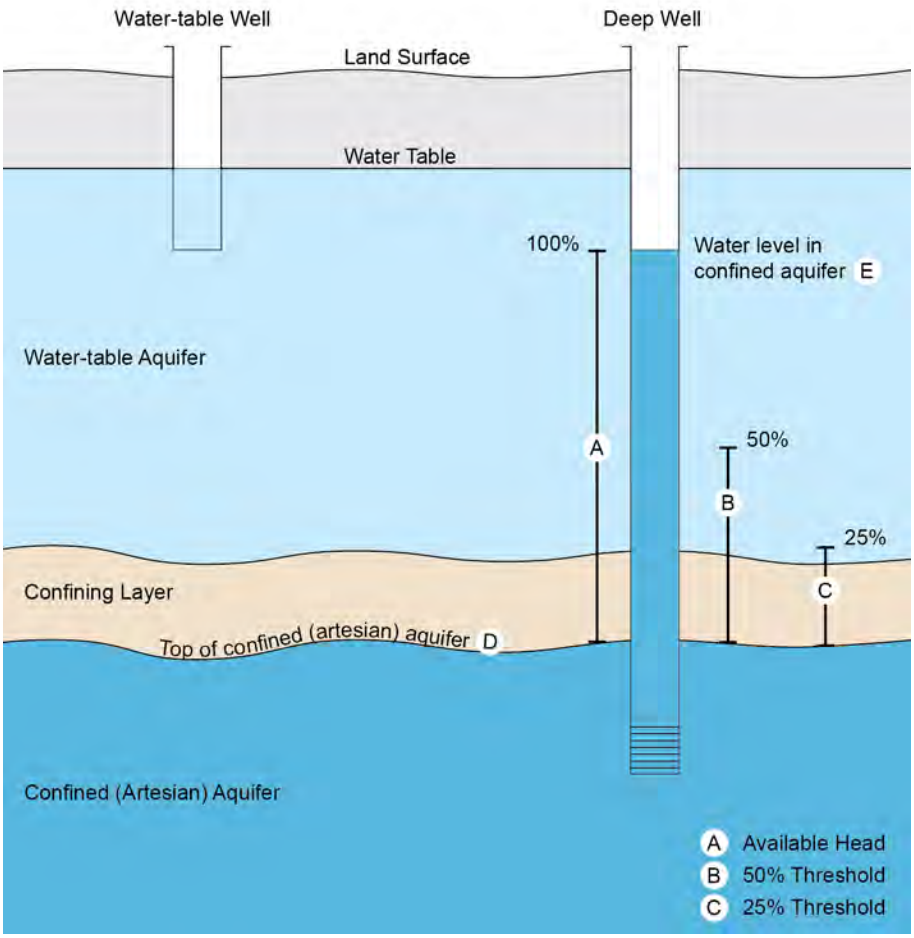

Figure 3-1 Safe yield thresholds

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.

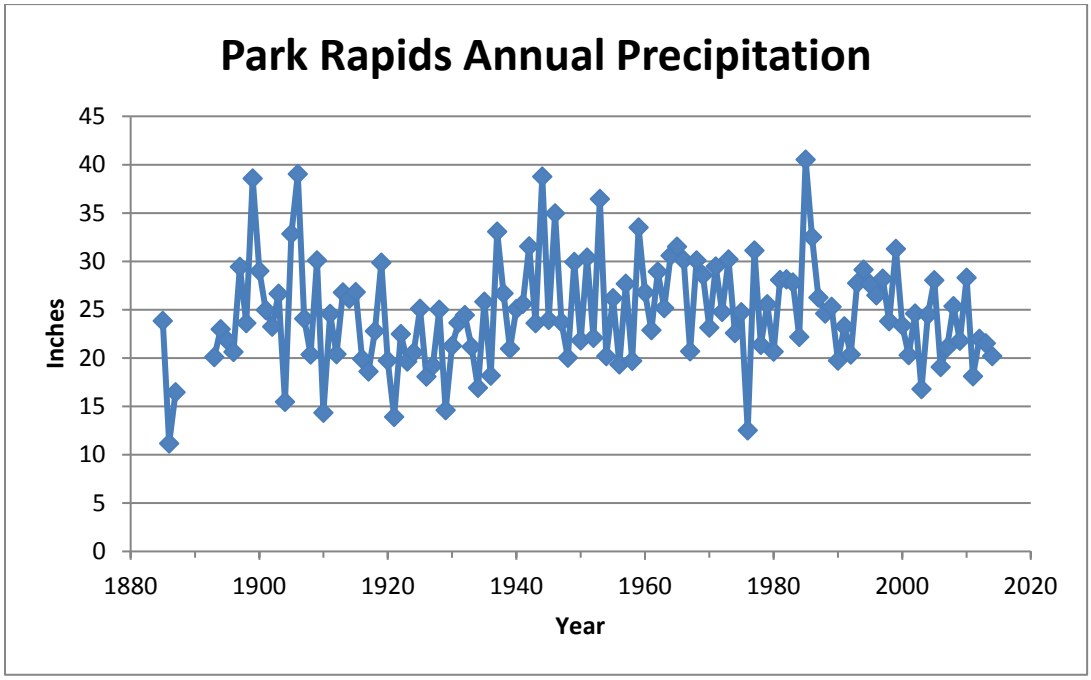

Figure 4-1 Historic precipitation patterns for Park Rapids, Minnesota

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.

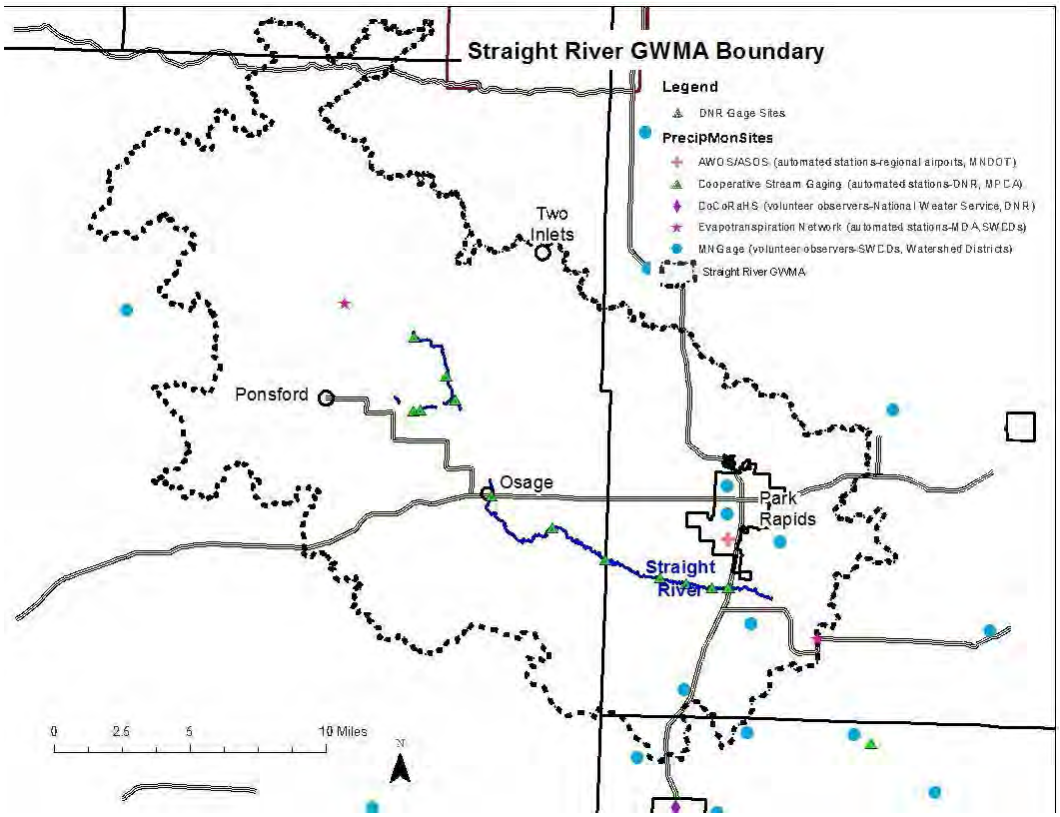

Figure 4-2 Precipitation and gaging sites in and around the GWMA

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.

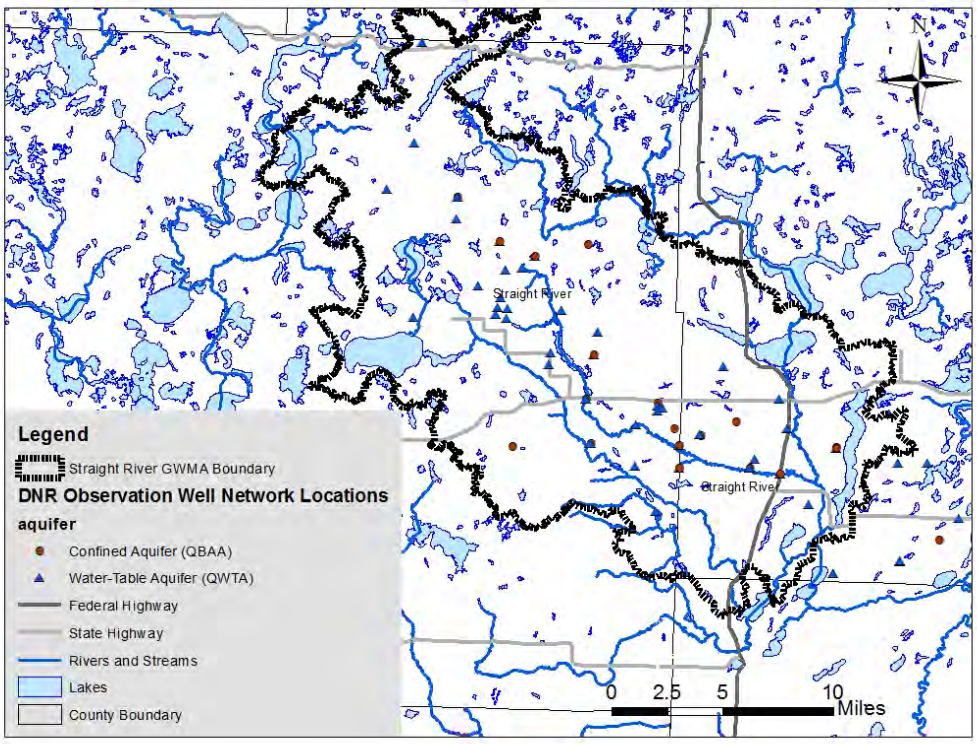

Figure 4-3 DNR observation wells in the Straight River GWMA

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.

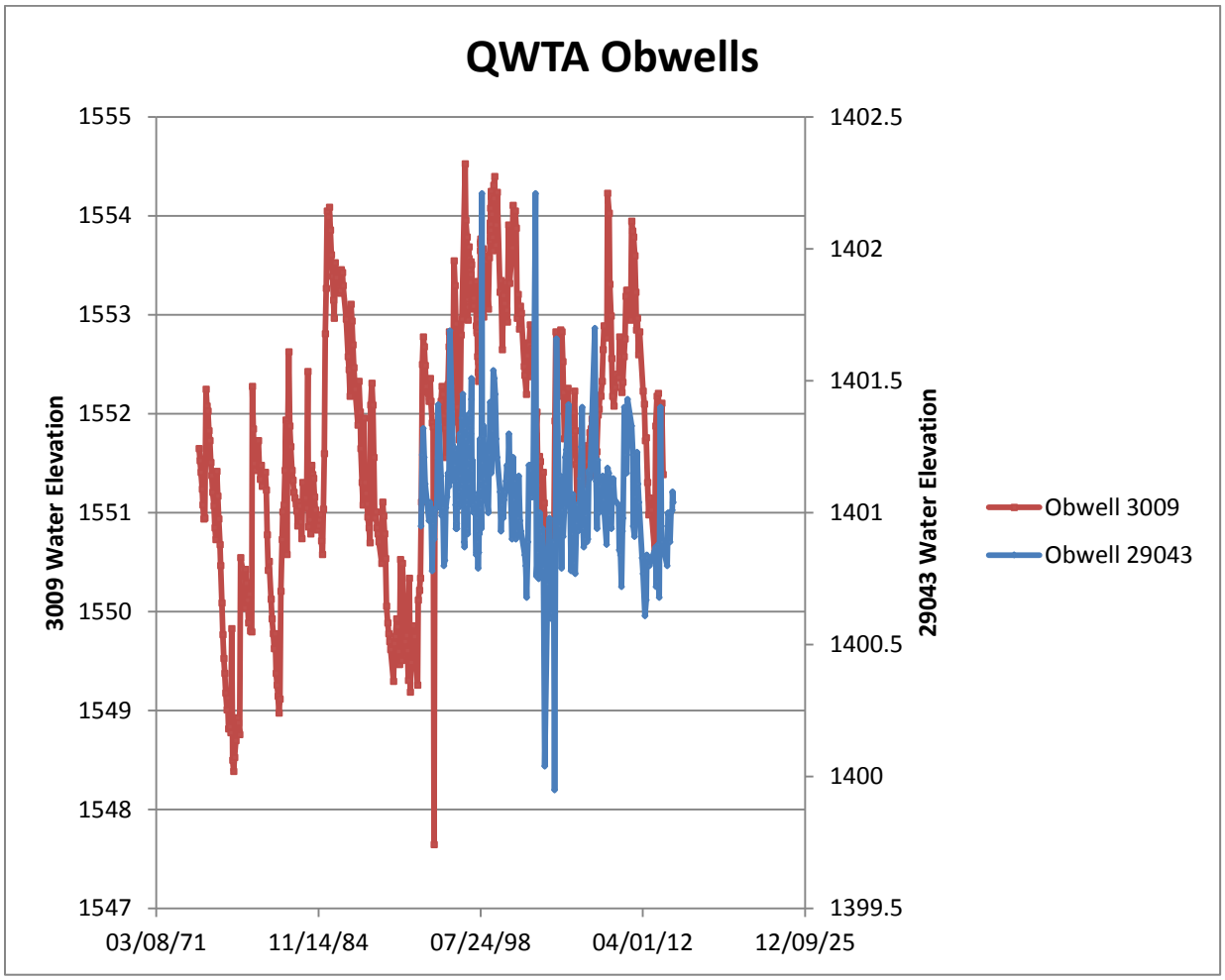

Figure 4-4 Observation well hydrographs water table aquifer (obwells 3009 and 29043)

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.

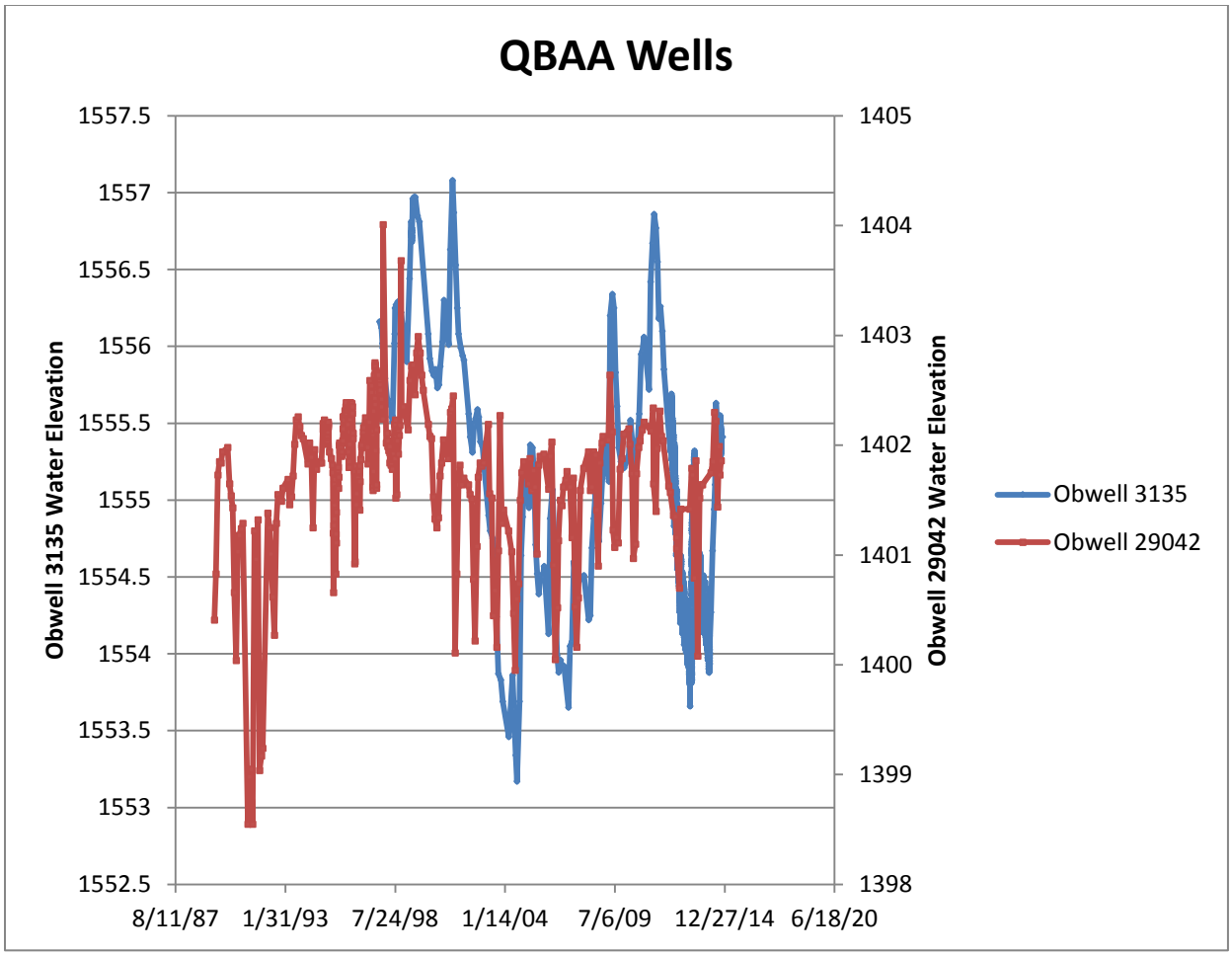

Figure 4-5 Observation well hydrographs buried drift artesian aquifer (obwells 3135 and 29042)

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).

8. References

Helgesen, John O. 1977. Ground water appraisal of the Pineland Sands Area, Central Minnesota: U.S. Geological Survey Open-File Report 77-102.

Kruse, G, R Merritt, J. Frischman, 2002. Surface Water and Groundwater Interaction and Thermal Changes in the Straight River in North Central Minnesota. MN Department of Natural Resources, July 2002.

LaBaugh, J.W., G.E. Groschen, and T.C. Winter. 1981. Limnological and Geochemical Survey of Williams Lake, Hubbard County, Minnesota. U.S. Geological Survey Water-Resources Investigations Report 81-41.

Liesch & Associates, Hydrogeologic Investigation for an Alternative Water Supply, Lamb-Weston Midwest, Inc./RDO Frozen Park Rapids, MN. July 1995.

Lorenz, D.L., and Delin, G.N., 2007, A regression model to estimate regional ground-water recharge in Minnesota: Ground Water, v. 45, no. 2, 10.1111/ j.1745-6584.2006.00273.x.

Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Robertson, 2014: Ch. 18: Midwest. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 418-440. doi:10.7930/J0J1012N.

Ruhl, James F. 1995. Presence, Distribution, and Potential Sources of Nitrate and Selected Pesticides in the Surficial Aquifer along the Straight River in North-Central Minnesota, 1992-93. U.S. Geological Survey Water-Resources Investigations Report 95-4151.

Siegel, D.I. and T.C. Winter. 1980. Hydrologic setting of Williams Lake, Hubbard County, Minnesota. U.S. Geological Survey Open-File Report 80-403.

Stark, J.R., D. S. Armstrong, D.R. Zwilling. 1994. Stream-Aquifer Interactions in the Straight River Area, Becker and Hubbard Counties, Minnesota. USGS WRIR 94-4009.

University of Minnesota Extension. 2008. Bulletin WW-06946
http://www.extension.umn.edu/distribution/naturalresources/components/dd6946r.html

USDA Natural Resources Conservation Service, Soil Data Mart. Available at:
http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Walker, Michele, Kirk English, Jeanette Leete, Robert Bezek. Peysenske Lake Water Level Evaluation. MN DNR Internal Report. 2009.

Walsh, James, MDH. Wellhead Protection Plan, Part 1, for the city of Park Rapids. October 2002

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.**