



ENVIRONMENTAL LAW & POLICY CENTER
Protecting the Midwest's Environment and Natural Heritage

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

February 27, 2018

RE: Line 3 Project Revised Final EIS Comments
Intervenor Friends of the Headwaters (FOH)
PUC Dockets 14-196, 15-137

Dear Mr. Ek:

Thank you for the opportunity to comment on the latest revisions to the final environmental impact statement (FEIS) for Enbridge's proposed Line 3 project. As requested, FOH is not reiterating its longstanding concerns with the environmental review of this Project in this comment letter. Instead, this letter focuses on two issues where the revisions to the FEIS attempt to respond directly to arguments FOH raised in the previous EIS adequacy proceedings and the PUC's previous inadequacy findings. In FOH's view, the revisions do not bring the FEIS up to the level of adequacy required by the Minnesota Environmental Policy Act.

1. *Karst topography*: DOC-EERA's new "Appendix U" does not adequately evaluate whether karst topography issues with the proposed SA-04 alternative could be avoided or minimized with route adjustments, and we still do not have a fair comparison between SA-04 and the proposed Project.
2. *New disclaimers*: DOC-EERA's insertion of new boilerplate disclaimers into the text of the FEIS, repeatedly stating that it is impossible to predict the environmental impacts of oil spills without knowing all the circumstances, and that the quantitative data included should be read with the text's qualitative discussion, does not somehow cure the absence of site-specific environmental impact analysis in the FEIS.¹

¹ There are two other important issues the PUC previously raised in its inadequacy order—the differences in incremental impact between new pipeline corridors and expansions in existing pipeline corridors, and the proper timing and consideration of the completed cultural and historic survey under section 106 of the National Historic Preservation Act. The DNR and the MPCA comments on November 22, 2017 emphasized how new corridors raise many significant environmental risks that are not encountered when expanding in an existing corridor. On the cultural survey, FOH agrees with the intervenor tribes that not including the completed cultural/historical information in the FEIS and proceeding to decisions on FEIS adequacy and Enbridge's CN and RP applications without that information violates the Minnesota Environmental Policy Act (MEPA) and the intent of section 106.

Karst topography

Minnesota's resource agencies and the DOC-EERA have all acknowledged that the so-called "system alternative 04" or "SA-04" would pose fewer environmental risks than Enbridge's proposed project, except for a concern about karst topography along the route. "SA-04" is a pipeline corridor currently occupied by the Alliance natural gas pipeline, co-owned by Enbridge, which carries natural gas from western Canada to terminals in Illinois, and Kinder Morgan's Cochin pipeline, which carries light condensate (diluent) north from Illinois to oil sands facilities in Canada. Unlike Enbridge's proposed Project, SA-04 would not require the opening of a new pipeline corridor through the pristine waters in central Minnesota's lake country, through areas with high groundwater contamination sensitivity, through areas with high retention of pre-settlement wetlands, and through areas with important habitat for fish, wildlife, and wild rice. SA-04 would largely travel through flat farmland and would deliver crude oil from the western Canada tar sands to the same oil terminals in Illinois where virtually all of the oil in a new Line 3 project would ultimately travel.

The draft and final environmental impact statements for this Project pointed out, however, that the "Alliance/Cochin" pipeline corridor travels through karst topography in southeastern Minnesota, northeastern Iowa, and northwestern Illinois. Karst topography is characterized by soluble bedrock, typically limestone, with sinkholes and caves that can exacerbate the effects of water contamination. Not all karst is the same, of course, with some exhibiting soluble bedrock features very near the surface, and others with layers of glacial sediment over the top.² Because oil spills in karst areas can be more problematic than oil spills elsewhere, it is better, all things being equal, to avoid or minimize the risk of oil spills in karst topography.

FOH criticized the discussion of karst issues in the DEIS and first FEIS for this Project on two principal grounds. Neither of those issues have yet to be successfully addressed.

First, the DEIS and FEIS and now the second FEIS all continue to insist that Enbridge's proposed Project does not travel in or near karst areas, implying that that gives the proposed Project a major advantage over SA-04 from an environmental perspective. That statement is (and always has been) at best highly misleading. The proposed Project may not run through karst topography *in Minnesota*, but the crude oil that would run through a new line 3 will not stop in Superior, Wisconsin. As Enbridge acknowledges, the oil in a new line 3 will then travel on other Enbridge pipelines, primarily Line 61 and any future "twin," through Enbridge's Mainline corridor south through Wisconsin into Illinois. In southern Wisconsin and northern

² The environmental impact statement for the Alliance pipeline emphasized that it would be running parallel to what was then the Dome Petroleum pipeline, now the Kinder Morgan Cochin pipeline, and that there had been no sinkhole issues along that route. <https://books.google.com/books?id=A601AQAAMAAJ&pg=SA5-PA2&lpg=SA5-PA2&dq=Iowa%2Bsinkhole%2Boil%2Bpipeline&source=bl&ots=49vfwisciG&sig=JeSNw-kyhvdFd0c9s319AEMx2ac&hl=en&sa=X&ved=0ahUKEWjXsNb83aPZAhWYhOAKHT8DBEMQ6AEIXjAI#v=onepage&q=Iowa%2Bsinkhole%2Boil%2Bpipeline&f=false>

Illinois, the Enbridge Mainline pipelines all travel through karst topography, and many of the karst features are less than 50 feet from the surface.

The Minnesota DNR's groundwater specialists apparently had a limited opportunity to comment on the revisions to the FEIS, but one of their observations was that DOC-EERA's comparison between Enbridge proposed project and SA-04 has never been apples-to-apples. Exhibit A is a screen shot of the DNR comment at one of the places where DOC-EERA continues to insist that SA-04 is "longer" than the proposed Project:

The applicant's propose [sic] project route does not evaluate land requirements in Wisconsin and Illinois (or wherever it ends up). It only evaluates in Minnesota. However, there are impacts to land after it goes to the Superior terminal that are not evaluated. That is why the land requirements for SA04 are higher. It's not an "apples to apples" comparison.

Exhibit A (attached).³

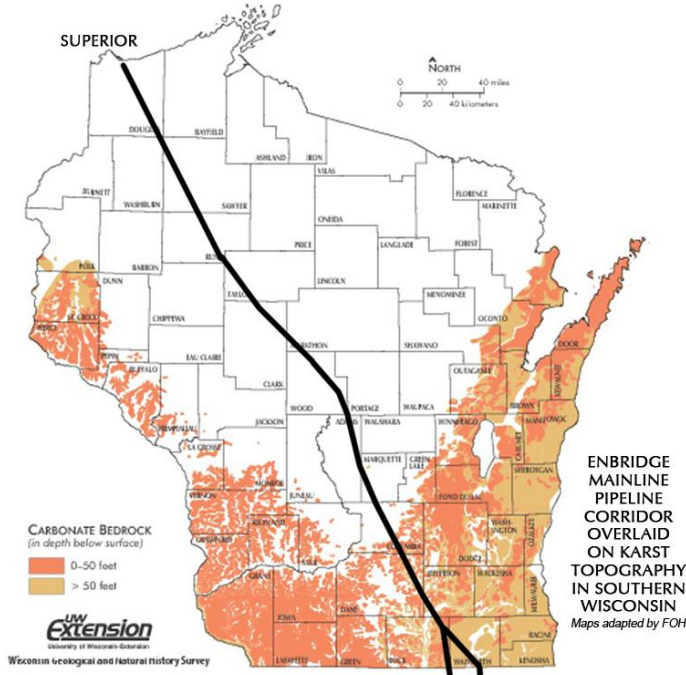
These maps show the areas where the Enbridge Mainline pipelines that will carry a new Line 3's crude oil in Wisconsin and Illinois cross karst topography.

³ FOH received DNR and MPCA comments on the revised FEIS through a specific request for this public data. As FOH has contended from the outset, the input of Minnesota's resource agencies into this process should be fully transparent, and the agreement among state agencies to keep this under wraps violates the Minnesota Environmental Policy Act (MEPA). No matter who the responsible government unit (RGU) is in any environmental review process, the comments of the resource agencies should be fully available to and usable by the public.

Karst and shallow carbonate bedrock in Wisconsin

Wisconsin Geological and Natural History Survey
 Factsheet 02 | 2009

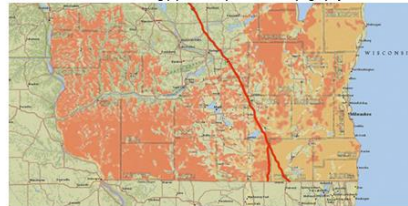
Areas with carbonate bedrock within 50 feet of the land surface are particularly vulnerable to groundwater contamination.



DOC EERA map portion, Appendix U, revised FEIS



Madison350.org pipeline map with karst topography



These maps illustrate the carbonate bedrock and karst topography in southern Wisconsin and northern Illinois through which the Enbridge Mainline System currently operates.

Sinkhole potential

In Wisconsin, sinkholes can form in areas where the bedrock is a type of rock called dolomite, which can be worn away in places by water to create the potential for the collapse of the soil above.



SOURCE: Wisconsin Geological and Natural History Survey
 State Journal

An additional 700,000+ barrels per day through the Wisconsin and Illinois karst sections on Enbridge's Mainline (or through Line 5) will increase the risk of a crude oil spill in karst topography substantially. We do not know how much exactly, because DOC-EERA has not done that analysis and the FEIS does not tell us. Nor do we know which karst topography is nearer the surface and therefore more vulnerable. Until we have that information, neither the

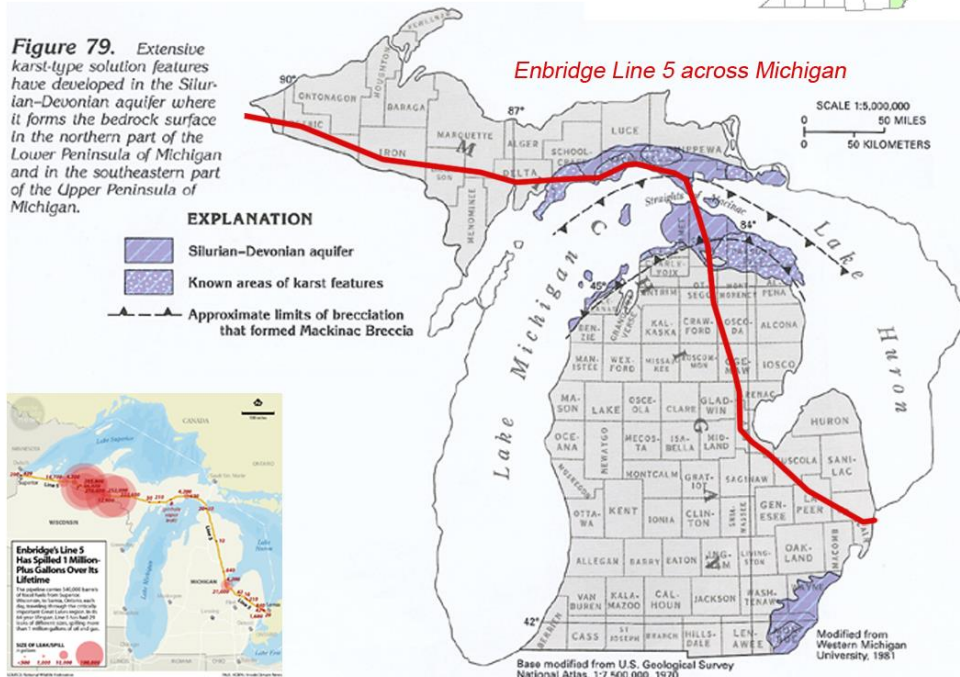
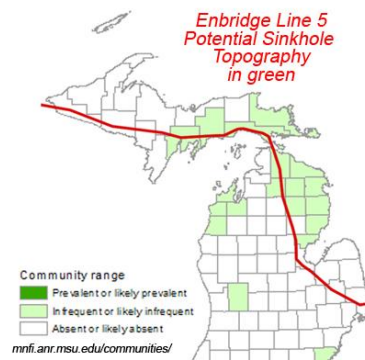
PUC nor the public can make any kind of fair comparison between the karst impacts of Enbridge’s proposed project and SA-04.

To the extent any of the crude oil—presumably light crude--shipped through a new Line 3 ends going to Line 5, the karst issue is exacerbated even more. Line 5 runs across northern Wisconsin and the upper peninsula of Michigan, then under the Straits of Mackinac, south through the lower peninsula, across Lake St. Clair, to arrive at the oil refineries in Sarnia, Ontario. Line 5 crosses through considerable karst topography, as these maps show:

These maps illustrate the carbonate bedrock and karst topography in the Upper Peninsula, Mackinac Straits and central Michigan regions through which the Enbridge Mainline System currently operates.



DOC EERA map portion, Appendix U, revised FEIS
Dark brown carbonate bedrock close to surface



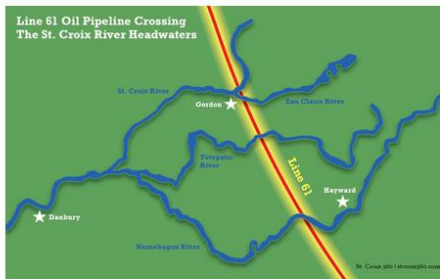
Some maps adapted by FOH

Of course, the impacts of additional utilization of the Enbridge Mainline corridor through Wisconsin poses environmental risks beyond potential karst impacts: additional river, stream and wetlands crossings, more impact on areas with higher groundwater contamination susceptibility, more potential wild rice habitat impacts, more effects on hunting, fishing and gathering rights in ceded territories.

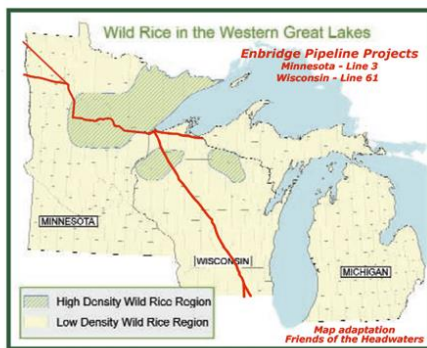
Besides Wisconsin's vulnerable karst topography a realistic "apples to apples" analysis should include Wisconsin's other natural resources at risk from the Enbridge pipeline system since most of the crude oil departing Superior is destined for Illinois refineries and beyond.

The environmental review for Enbridge's Line 61 stated the line would make 262 water crossings and 75 wetlands crossings.

An important water crossing is the headwaters of the St. Croix/Namekagon National and Wild Scenic River, one of the original eight wild and scenic rivers.

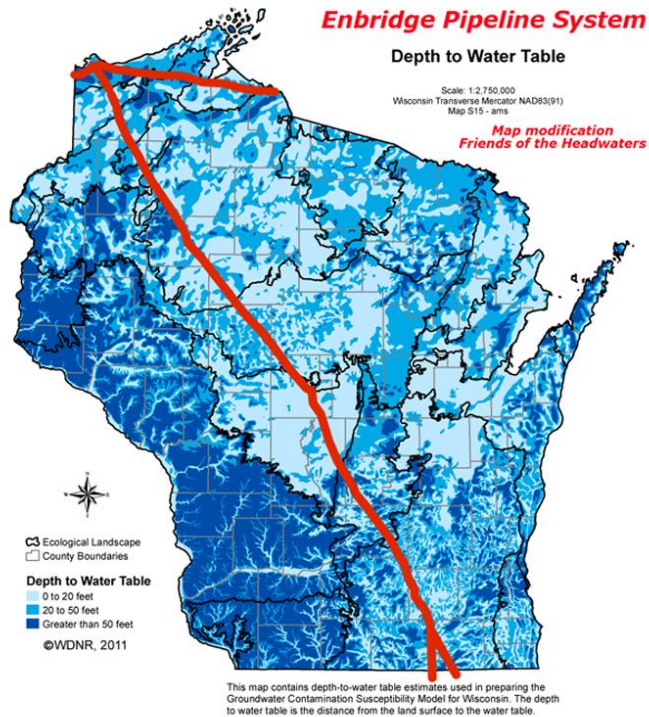


Wetlands are associated with wild rice, as important to Wisconsin's indigenous tribes as wild rice is to the tribes in Minnesota.

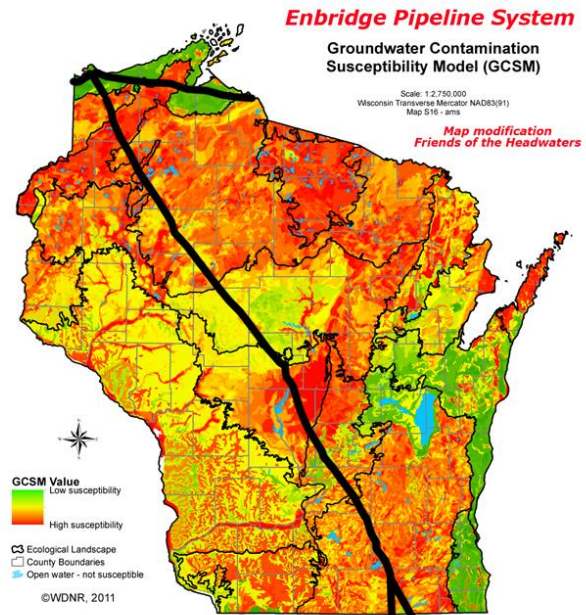


The PUC has expressed concern for the safety of groundwater with the proposed Line 3 route as well as the alternates routes.

The two larger Wisconsin maps feature the "depth to the water table" and "groundwater contamination susceptibility."



This map contains depth-to-water table estimates used in preparing the Groundwater Contamination Susceptibility Model for Wisconsin. The depth to water table is the distance from the land surface to the water table.



The Groundwater Contamination Susceptibility Model (GCSM) for Wisconsin estimates the susceptibility of the state's groundwater to contamination from surface activities. The GCSM was developed by the DNR, the US Geological Survey (USGS), the Wisconsin Geological & Natural History Survey (WGNHS), and the University of Wisconsin - Madison in the mid-1990s. The results of the GCSM are illustrated in a map published in 1987 at a scale of 1:1,000,000 (available from the Wisconsin Geological & Natural History Survey: <http://www.uwex.edu/wgnhs/maps.htm>).

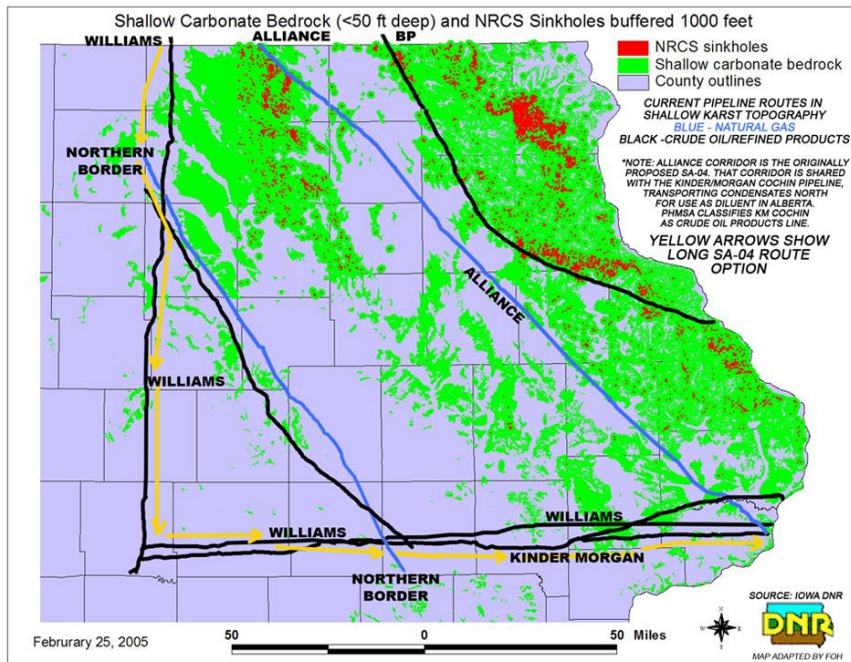
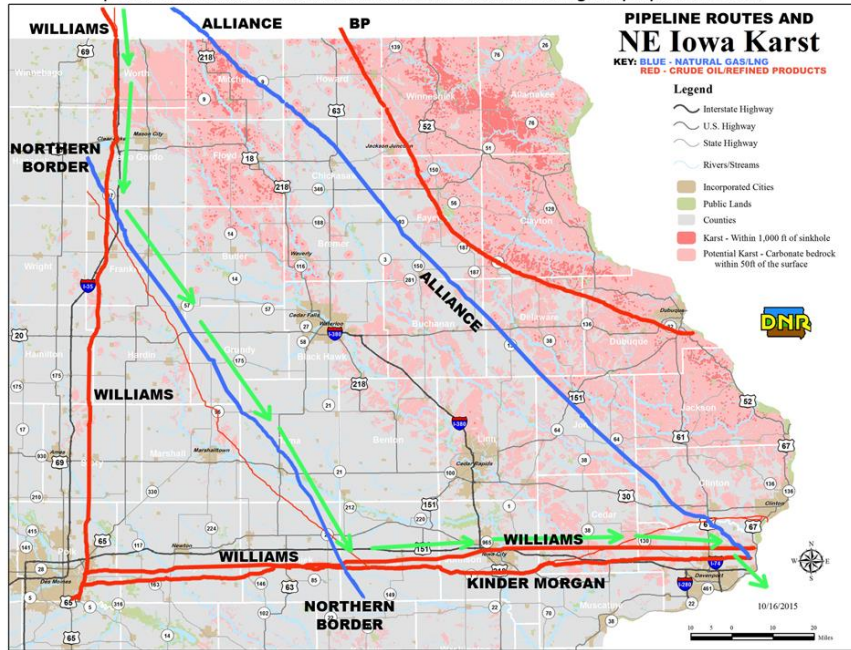
The FEIS, even with the new revisions, still pretends that the oil through a new line 3 will stop in Superior, or that impacts beyond Superior are immaterial for a new Line 3, while, at the same time, it still insists on including Iowa and Illinois impacts in its assessment of SA-04. Until that problem is fixed, the PUC and the public do not have an adequate basis for making the SA-04 vs. Applicant's Proposed Route (APR) comparison with respect to karst impacts.

Second, the new "Appendix U" in the revised FEIS does not accurately describe the extent to which route adjustments to SA-04 could avoid or minimize karst issues. Appendix U just dismisses more substantial reroutes out of hand, which would move the oil well west of the karst regions in and near the four-state driftless area.⁴ FOH provided DOC-EERA with information on a number of existing pipeline corridors through which the oil could run that would avoid karst regions entirely,⁵ but there is no attempt in the revisions to analyze those alternatives at all, apparently because they would be "longer." These maps show where those alternatives are:

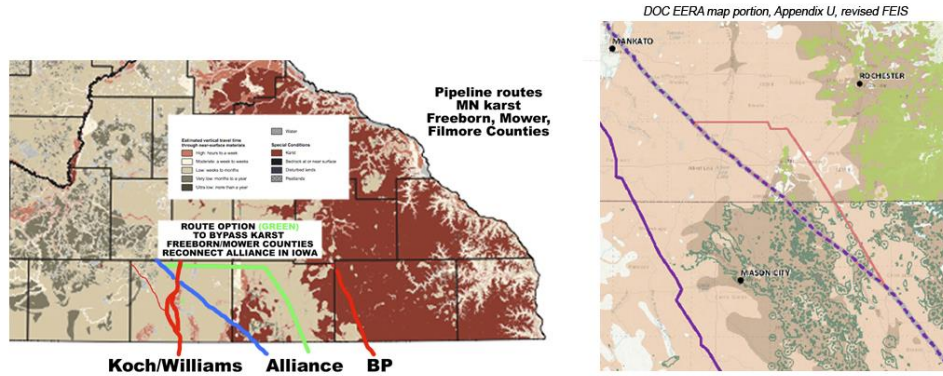
⁴ An annotated version of Appendix U, containing the DNR and MPCA comments, is attached as Exhibit B, with the electronic "cover letters" included at the beginning.

⁵ The DNR commented: "Why wasn't a route straight down through Eastern SD or SW MN considered instead of going through Mankata? If the line were cut down through Des Moines, then over through Peoria and then co-locate with existing Enbridge Lines to Joliet. Avoids a lot of karst." Exh. B [comment MW8].

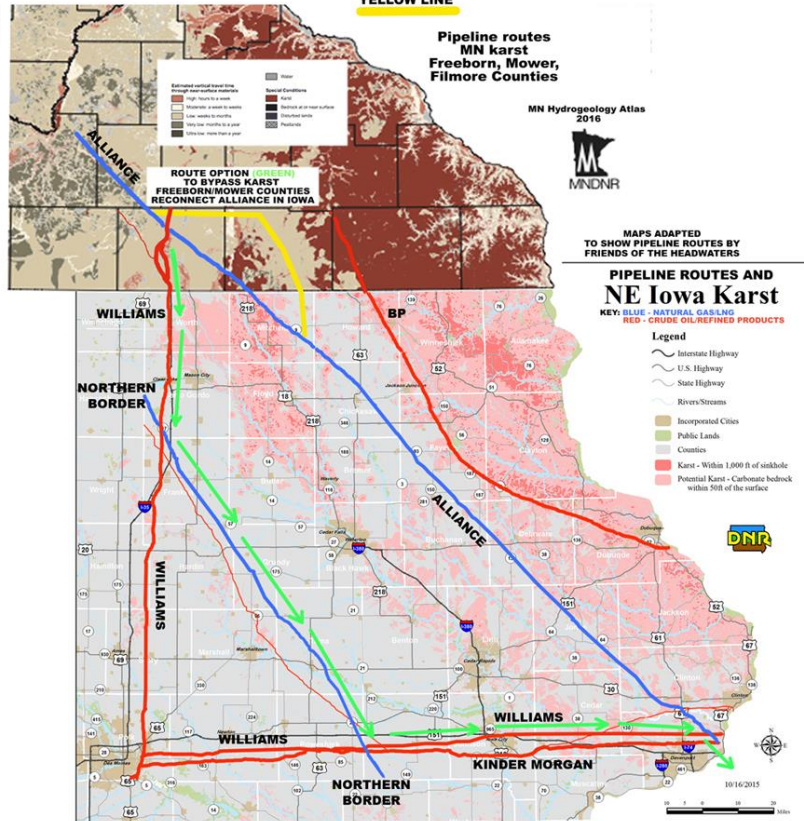
These maps illustrate two suggested SA-04 long alternate routes to bypass the Iowa karst. Both routes primarily use existing pipeline corridors. Green and yellow arrows indicate the potential alternative corridors. The Alliance corridor is original proposed SA-04.



Friends of the Headwaters also proposed an SA-04 short route to bypass the karst topography in Freeborn and Mower Counties as well as adjacent Iowa counties. This route alternate was proposed in a FOH brief filed on 12/19/17. DOC EERA adopted FOH's short SA-04 route proposal with some minor modifications as noted in the portion of their map from Appendix U in revised FEIS. The larger map at bottom illustrates the region's major pipeline corridors with FOH's SA-04 alternates in yellow or green.



PIPELINE CORRIDORS IN 3 SOUTHERN MINNESOTA COUNTIES AND NORTHEASTERN IOWA
POTENTIAL RE-ROUTE OF SYSTEM ALTERNATIVE SA-04 (ALLIANCE NG LINE) TO AVOID KARST TOPOGRAPHY USING WILLIAMS CORRIDOR TO NORTHERN BORDER TO WILLIAMS OR KINDER-MORGAN
OR 2ND OPTION OF BENDING SA-04 OVER THE KARST IN FREEBORN/MOWER COUNTIES
GREEN ARROWS
YELLOW LINE



DOC-EERA did evaluate a shorter route adjustment to SA-04 to go around a small karst area near Mason City, Iowa. Contrary to the statement in Appendix U, the route they analyzed is

not the same as the route FOH suggested, but the analysis does indicate that a minor re-route would minimize, if not completely eliminate, potential karst areas.

The bottom line appears to be that potential karst impacts from an SA-04 can be minimized with a minor re-route, and almost entirely eliminated with a more substantial reroute along existing pipeline corridors to the west. Either option would mean that SA-04 would travel through considerably less karst topography on its way from Canada to Illinois (or Sarnia, Ontario) than a new Line 3 and its necessary connections to the Enbridge Mainline through Wisconsin or Line 5 through Michigan.

The FEIS cannot provide either the PUC or the public with enough information to make that comparison until it assesses the potential karst impacts between Superior and the actual destinations of the new line 3 crude oil. That can include miles and acreage, but it also must include an analysis of how vulnerable to contamination the different karst areas might be, that is, how close to the surface the soluble bedrock is in different places.

In its earlier briefing on the adequacy of the first FEIS, FOH also was highly critical of the assumption that SA-04 would pose a greater threat to drinking water supplies than the APR because it would travel closer to population centers like Mankato, St. Peter, and LeSueur. The PUC asked DOC-EERA to revise the FEIS to provide that analysis, but it does not appear that has happened. The series of tables with columns of figures in the second half of “Appendix U” do not provide that information, at least not in a form the public can understand.

Moreover, it appears that those tables are fraught with errors and inconsistencies. The annotated comments of Minnesota’s resource agencies, attached as Exhibit B, point out at least a few of these problems, and perhaps those agencies will file additional comments to make DOC-EERA and the PUC aware of more of those issues going forward. For example, in some places, the tables indicate potential karst impacts of zero, when the earlier text insists that potential karst impacts cannot be eliminated. So again, neither the PUC nor the public can know anything more from these revisions as to whether SA-04, which runs by population centers who use deep wells and not surface water or shallow aquifers for drinking water, or the APR, which runs through unusually sensitive groundwater areas in central Minnesota, poses a greater threat to drinking water resources.

New disclaimers.

Throughout the environmental review process, DOC-EERA has protested that it cannot predict the environmental impacts of a construction accident or an oil spill along any of the possible routes, because those impacts would depend on “all the circumstances.” The logic goes, apparently, that since they cannot know what “all the circumstances” will be, it is not “reasonably possible” for them to do site-specific spill impact assessments, and therefore they do not have to attempt to do them. DOC-EERA has also declined to make any qualitative assessments of the natural resources at stake with any of the proposed pipeline routes, and has

therefore relied on numbers of acres, numbers of crossings, and so on to complete their environmental impact analysis.

The revisions to the FEIS do nothing to change any of that. The only addition to the text that seems to address that issue are a series of new disclaimers that say that they cannot answer the basic question of what would the environmental impacts of an oil spill at any particular location be. They urge readers to look at the likely directions an oil spill might take, check to see what natural resources might be in that area, consult the generic discussion about what impacts oil spills can have, and draw their own conclusions. There are more words now, but the DOC-EERA position on site-specific impacts is the same.

In any environmental review process, there is of course incomplete or unavailable information. The courts have long recognized, however, that agencies cannot get away with just throwing up their hands in the face of incomplete information and avoiding their statutory obligation to analyze potential environmental impacts.

The Environmental Quality Board's (EQB) environmental review rules, Minn. R. 4410.2500, lay out the framework for what responsible government units (RGUs) must do when they do not have all the information that would be relevant to an environmental impact assessment:

If information about potentially significant environmental effects is essential to a reasoned choice among alternatives and is not known and the cost of obtaining it is excessive, the information cannot be obtained within the time periods specified in part 4410.2800, subpart 3, or the means to obtain the information are beyond the state of the art, the RGU shall include the following information in the EIS:

- A. a statement that the information is incomplete or unavailable and a brief explanation of why it is lacking;
- B. an explanation of the relevance of the lacking information to evaluation of potentially significant environmental impacts and their mitigation and to a reasoned choice among alternatives;
- C. a brief summary of existing credible scientific evidence that is relevant to evaluating the potential significant environmental impacts; and
- D. the RGU's evaluation of such impacts from the project and its alternatives based upon theoretical approaches or research methods generally accepted in the scientific community.⁶

⁶ This EQB rule tracks the federal Council on Environmental Quality (CEQ) rule on this subject nearly verbatim. 40 C.F.R. § 1502.22. The federal rule does explicitly clarify that this framework applies to low-probability, high-consequence events like oil spills, specifically “impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.” *Id.*

DOC-EERA has still not met that burden. And there are and have always been “theoretical approaches or research methods generally accepted in the scientific community” available to DOC-EERA to do this work. Risk assessment methodologies for low probability/high consequence events like oil spills are not in their infancy. Throughout this process, FOH has urged DOC-EERA and the PUC to use the Risk Assessment Information System (RAIS) developed at the Oak Ridge National Laboratory (ORNL) and FOH has also referred to the Exponent risk assessment report prepared for the KeystoneXL pipeline project. <https://2012-keystonepipeline-xl.state.gov/documents/organization/221278.pdf>. What those resources demonstrate is that risk assessments for incident like oil spills cannot stop at estimating the potential transport of an oil spill, offering generic observations about potential effects of oil contamination on natural resources, and then asking member of the public to make their own judgments. Contrary to what DOC-EERA (and occasionally the PUC itself) likes to say, it is “reasonably possible” to make the kind of site-specific oil spill risk assessments that are still missing from the FEIS. More disclaimer language does not cure that fundamental defect.

For the reasons stated above and in its previous comments, Friends of the Headwaters (FOH) respectfully requests that the Public Utilities Commission find the revised FEIS to be inadequate, remand it back to DOC-EERA and Minnesota’s natural resources agencies to complete the work, and suspend proceedings on Enbridge’s application for a certificate of need and a route permit until that additional work is completed, the public has had a chance to weigh in, and the commission has made a determination that the FEIS with those additional revisions meets the statutory standard of adequacy.

Sincerely,



Richard Smith
President, Friends of the Headwaters



Scott Strand
Attorney for Friends of the Headwaters

PAGE 12

Michele Walker Feb 2, 8:52 AM

Need to a short explanation of why the underestimation. Was it because the construction dimensions are underestimated? It's not really clear here how these percentage were arrived at.

Reply Delete

PAGE 13

Michele Walker Feb 2, 8:50 AM

The applicant's propose project route does not evaluate land requirements in Wisconsin and Illinois (or wherever it ends up). It only evaluates it in Minnesota. However, there are impacts to land after it goes to the superior terminal that are not evaluated. That is why the land requirements for SA04 are higher. It's not a "apples to apples" comparison.

Show more

Reply Delete

Louise Miltich Dec 28, 6:54 PM

Added: As noted above

Accept Reject

Louise Miltich Jan 27, 12:27 PM

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Chapter 5 Introduction

Existing Conditions, Impacts, and Mitigation – Certificate of Need

relationship between the Applicant's proposed project and CN Alternatives, as the land requirements for construction and operation along the SA-04 alternative are over twice the amount for the Applicant's proposed project; both the Applicant's proposed project and SA04 would require acreage for construction an order of magnitude greater than for construction of the rail or truck facilities (see Sections 2.4 and 4.2).

In addition to incomplete information on the extent of upland impacts for SA-04, the primary shortcoming of the above approach for the environmental analysis is associated with Enbridge's proposal to reduce the width of the construction work area for the Applicant's proposed project in some wetlands and waterbodies (from 120 feet to 95 feet) based on site-specific field investigations and engineering. These refinements have not been incorporated into the general approach for the SA-04 footprint. For wetlands, this discrepancy is addressed in the wetlands resource section. For the analysis of surface water, the issue is recognized but is less integral, as the impact assessment for surface waters is not driven by the acreage of waterbody crossings as much as the resulting impact on water quality, aquatic habitat, and fisheries, and the measures to minimize those impacts. As noted above, if SA-04 is approved, it is expected that field surveys and engineering would result in refinements to the route, the width of the construction footprint, and construction methods to further avoid and minimize impacts to wetlands and waterbodies.

PAGE 12

Michele Walker

Feb 2, 8:52 AM

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[Reply](#) [Delete](#)

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[Show more](#)

[Reply](#) [Delete](#)

Louise Miltich

Dec 28, 6:54 PM

Added: As noted above

[✓ Accent](#) [✗ Reject](#)

To allow for a more direct comparison between the Applicant's proposed project and the CN Alternatives, the impacts for both the Applicant's proposed project and SA-04 in the summary subsection are calculated based on Enbridge's refined construction work area (typically 120 feet wide) and 50-foot-wide permanent right-of way. This approach results in underestimating impacts for both alternatives by approximately 3 percent (operations) to 20 percent (construction). As discussed in Section 5.1.3, it is expected that the majority of the acreage of aboveground facilities, access roads, ATWS, and yards for the SA-04 alternative would be located in upland open lands. From an overall acreage perspective, the 3- to 20-percent underestimate does not substantially alter the general

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Chapter 5 Introduction

Existing Conditions, Impacts, and Mitigation – Certificate of Need

relationship between the Applicant's proposed project and CN Alternatives, as the land requirements for construction and operation along the SA-04 alternative are over twice the amount for the Applicant's proposed project; both the Applicant's proposed project and SA04 would require acreage for construction an order of magnitude greater than for construction of the rail or truck facilities (see Sections 2.4 and 4.2).

In addition to incomplete information on the extent of upland impacts for SA-04, the primary shortcoming of the above approach for the environmental analysis is associated with Enbridge's proposal to reduce the width of the construction work area for the Applicant's proposed project in some wetlands

EXHIBIT B

From: [Beeman, Michelle \(MPCA\)](#)
To: [Grant, Bill \(COMM\)](#); [Wachtler, John \(COMM\)](#)
Cc: [Naramore, Barb \(DNR\)](#); [Doneen, Randall \(DNR\)](#); [Sierks, Bill \(MPCA\)](#)
Subject: MPCA Comments on Line 3 FEIS revisions
Date: Tuesday, February 06, 2018 9:22:09 AM

Bill and John,

Below are the comments from MPCA summarized from our staff review. In similar fashion to DNR's comments, the following should be understood in the context of our limited role in developing and reviewing the proposed revisions. Specifically, MPCA's involvement in these revisions included one project management meeting to discuss potential approaches, one technical meeting to discuss the SA-04 re-route to avoid Karst, and 2 business days to review the re-route appendix and changes to FEIS Chapters 5 and 6. Your request was for feedback only on the specific language Commerce chose to add or change in the document. From that limited perspective, we provide the following for your consideration.

Commission order item (a): *the EIS needs to (i) indicate how far and where SA-04 would need to be moved to avoid the karst topography it would otherwise traverse and (ii) provide a revised environmental-impact analysis of SA-04 specifically to reflect the resulting relocation of that alternative.*

1. In Appendix U, Fig. 2, Why not also show a Green arrow/line from SA-04 to the WI mainline; why only extend from the APR/RA-03? Since the Commission asked how SA4 should be modified to avoid karst, it would seem that drawing another "conceptual route" green line from SA-04, not just from RA-3, would be helpful.
2. Appendix U – We recommend connecting to the IL refinery that can actually refine this oil, since that change also avoids karst. That realignment is responsive to the Commission's question, while not relying on a technical distinction about moving the end point that the Commission didn't specifically address.
3. Beyond that, MPCA concurs with DNR comments and did not have any specific additional observations on Appendix U.

Commission order item (b): *the EIS needs to clarify that quantitative representations of route and system alternatives do not necessarily reflect the actual qualitative impacts of those alternatives. For example, the acreage of HCA drinking water sources impacted by SA-04 may be less than the same acreage of HCA drinking water sources impacted by other routes based on the nature of those water sources.*

4. Commerce's approach to add "cautionary notes" about not relying on a single data set, and adding to the summary tables some language that data sets must be read together, is a helpful start. However, since the summary tables themselves aren't changed, and they still make little to no distinction of quantitative v. qualitative in comparing alternatives, we aren't sure how helpful this will actually be for the Commissioner to digest the information. For example, our November comment letter points out that many SA4 waters are impaired or compromised, while the APR is impacting pristine waters. This type of distinction is not

reflected in the summary tables despite the cautionary footnotes.


Commission order item (c): *The EIS needs to clearly identify the extent to which resource impacts of route alternatives in the existing Line 3 corridor are or are not additive—i.e., the extent to which that route alternative would introduce new or additional impacts beyond the impacts of the existing pipelines in that corridor.*

5. We have a similar observation, as with item (b). Commerce's additional notes clarifying where the impacts described for alternatives already reflect the current impacts, and where there are incremental impacts, are a reasonable step. However, the summary tables were not changed and do not seem to reflect that the existing Line 3 corridor already has impacts that will continue whether or not the new project happens, while the other alternatives are creating new impacts in new corridors.

Our staff did review Chapter 10 in its entirety, and had gone ahead and compiled some suggested comments and edits throughout, since they had not seen the chapter in final status before you submitted it to the Commission. However, these comments go beyond what was newly added language by Commerce in response to the Commission's inquiry, so I do not believe they are likely useful for you at this point in time. If you would like me to share them, please let me know.

Michelle

Michelle Beeman
Deputy Commissioner
Minnesota Pollution Control Agency
651-757-2013

From: Naramore, Barb (DNR) barb.naramore@state.mn.us 

Subject: DNR Comments and Line 3 FEIS Revisions

Date: February 5, 2018 at 10:39 PM

To: Grant, Bill (COMM) bill.grant@state.mn.us, Wachtler, John (COMM) john.wachtler@state.mn.us

Cc: Doneen, Randall (DNR) randall.doneen@state.mn.us, Beeman, Michelle (MPCA) michelle.beeman@state.mn.us, Sierks, Bill (MPCA) bill.sierks@state.mn.us

BN

Bill and John:

Please see email below from Randall Doneen and attached files. Together, they constitute DNR's comments on the draft Line 3 FEIS revisions that Commerce provided to us.

Barb

Barb Naramore

Assistant Commissioner

Minnesota Department of Natural Resources

500 Lafayette Road

St. Paul, MN 55155

Phone: 651-259-5033

Cell: 651-341-5490

Email: barb.naramore@state.mn.us

mndnr.gov



John:

The DNR has reviewed the FEIS revisions that Department of Commerce has made to:

1. re-route SA-04 to avoid Karst,
2. clarify that quantitative data in tables needs to be considered with respect to qualitative information to more completely understand the potential environmental effect, and
3. clarify which potential environmental effects take into account corridor sharing of the routes.

DNR's comments should be understood in the context of our limited role in developing and reviewing the proposed revisions. Specifically, DNR's involvement in these revisions included one project management meeting to discuss potential approaches, one technical meeting to discuss the SA-04 re-route to avoid Karst, and 2 business days to review the re-route appendix and changes to FEIS Chapters 5 and 6. DNR's objective, as it has been throughout the EIS process, has been to provide the best support possible as an assisting agency to Commerce.

The attached documents have comments and track changes that were provided from the DNR team. Below are itemized comments that capture some of the larger themes in our comments. In some cases, these itemized comments may be captured in DNR's comments in that attached files; and in other cases, they are stand alone. Commerce should look at the itemized comments and the detailed comments, and make changes as appropriate throughout the entire document.

- Appendix U needs to clarify what portions of the route actually received a re-route. The text talks about MN, IA, and IL, but then all the data only addresses MN and IA. Presumably this is because the 2 re-routes were fully contained in MN and IA; however, the bridge between the text and data tables is lacking.
- Data table in Appendix U. This table will likely create confusion. It appears to be developed from the previous Chapter 5 and 6 (and Ch. 10) that were focused on construction and operations and apply the data, but this analysis was a little different because the purpose of the re-route was to protect groundwater. Mixing these two purposes will create confusion and may not provide information in a way that is most usable. Here are some specific examples:
 - Table identifies zero Karst for re-routes and comparable segments. This seems odd because several pages of the Appendix were dedicated to explaining that you can't avoid Karst. Presumably this apparent contradiction is because the original construction and operation table only looked at surface karst, while this analysis considers all karst.
 - Many table units are undecipherable, (what is an acre of Watershed Health Assessment?)
 - Large differences in data within the re-route and comparable segments should be QA/QCed to make sure they are real, and then provide some explanation of why the re-route or route segment has such a large discrepancy.
- The revised text does a good job describing how much (mileage) of each route is shared with other utility corridors, but it lacks the mileage of new utility corridor. Identification of this new greenfield corridor will help compare the impacts of each route.
- The standard language that all impacts are incremental in nature and the full increment is described in EIS may not fully achieve the intent of this EIS revision. There are some type resource impacts that will have greater incremental impacts on a new corridor as opposed to an existing corridor. For these types of resources, it would be helpful if the Methodology section included examples of when the new corridor had greater impacts. Habitat fragmentation and water crossings are good examples of cases when a new corridor incremental impact is greater than an existing corridor incremental impact.

I hope this helps.

Randall Doneen
(651) 259-5156
Environmental Review Unit Supervisor
Minnesota Department of Natural Resources





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Appendix U

System Alternative 04 Karst Reroute

Background

Sections 5.2.1 and 6.3.2 of the Line 3 Project Final Environmental Impact Statement (EIS) discuss the implications of karst conditions for construction and operation of a pipeline. These two sections consider potential construction and operational impacts related to both (1) surface manifestations of karst (karst topography) and (2) below surface karst conditions, such as fractures, joints, dissolution features, caves, and void spaces in the bedrock aquifer matrix (i.e., karst aquifers and the associated groundwater vulnerability). These two sections identify concerns ranging from surface sinkhole formation to groundwater contamination due to turbidity, sedimentation, or chemical releases.

In addition, the accidental release discussion in Chapter 10, Section 10.2.2.3 of the Final EIS notes that in karst regions, groundwater may flow more rapidly than in other areas, increasing the risk of transporting contamination long distances.

System Alternative 04 (SA-04) is one of the alternatives evaluated in the Final EIS that crosses karst. It crosses karst geology in southeastern Minnesota, Iowa, and Illinois.¹ Several commenters on the Draft EIS stressed concerns about the vulnerability of groundwater in karst areas along SA-04 because of the potential for the rapid spread of contamination should there be an accidental oil release.²

In its December 2017 review of the adequacy of the Final EIS, the Minnesota Public Utilities Commission (Commission) highlighted these concerns and requested analysis of a “reroute” of SA-04 to address the karst issue. The Commission’s December 14, 2017, order states: “the EIS needs to (i) indicate how far and where SA-04 would need to be moved to avoid the karst topography it would otherwise traverse and (ii) provide a revised environmental-impact analysis of SA-04 specifically to reflect the resulting relocation of that alternative.”³

Scope of Karst Analysis

A karst landscape unit, or more simply a “karst unit,” is a “three-dimensional belt or block of soluble bedrock area surrounded by other less soluble rock types.” The three-dimensional nature of a karst landscape can be broadly broken down into three parts: (1) exokarst, (2) epikarst, and (3) endokarst.⁴

Exokarst is composed of surface karst features and topography, including surface subsidence, sinkholes, and fractures. Epikarst is the zone of openings or fractures that extend from the surface (the exokarst) down as much as 10–30 meters below the surface. Endokarst refers to the deeper components of the

¹ Line 3 Project Final EIS at page 5-36 (Table 5.2.1.1-4).

² Appendix T-1 Comment 2621-14; Comment 2681, pages 7–10; Comment 1422-1; Comment 1833-2; and Comment 2447-3.

³ Minnesota Public Utilities Commission (December 14, 2017) Order Finding Environmental Impact Statement Inadequate, e-dockets No. 201712-138168-01.

⁴ Pike, R.G., T.E. Redding, R.D. Moore, R.D. Winker and K.D. Bladon (editors). 2010. Compendium of forest hydrology and geomorphology in British Columbia. B.C. Min. For. Range, For. Sci. Prog., Victoria, B.C. and FORREX Forum for Research and Extension in Natural Resources, Kamloops, B.C. Land Manag. Handb. 66. Available at www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh66.htm.

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Comment [M(C1)]: See Comment below on data sources: none listed for Illinois. <http://www.isgs.illinois.edu/outreach/geology-resources/karst-landscapes-illinois-dissolving-bedrock-and-collapsing-soil>

underground karst landscape, including void spaces, caves, and bedrock aquifers where groundwater occurs in granular pore spaces, partings, joints, fractures, and dissolution features.⁵

The extent and boundaries of karst units are defined through a review of bedrock geology to identify limestone or other soluble bedrock units coupled with field investigation of near surface features.⁶

The Commission’s order required the Final EIS to indicate how far and where SA-04 would need to be moved to avoid karst “topography.” This appendix addresses karst units more broadly, including both near surface karst topography (exokarst) and karst conditions present at depth (epikarst and endokarst). This is because the ground water vulnerability concerns identified by the Commission could be associated with areas where surface karst features like sinkholes are present, as well as areas where karst conditions are present at depth.

Route Refinement Considerations

As described in more detail below, technical staff⁷ reviewed a number of datasets to identify potential groundwater vulnerability associated with karst units in Minnesota, Iowa, and Illinois. In preparation of this appendix, however, technical staff noted that karst areas are just one of many concerns that need to be balanced in order to appropriately refine any route.

As noted in Section 5.1.4 of the Final EIS, if SA-04 is identified as environmentally preferable in the Certificate of Need determination, alternative routes would be evaluated during a route permit process, and detailed field surveys and engineering would result in refinements to the route, the width of the construction footprint, and construction methods to further avoid and minimize impacts. Final routing analysis, including surveys, engineering, and other refinements would be needed~~need~~ to balance a much larger suite of factors than just karst.

Methodology

The following data sources were used to evaluate the possibility of rerouting SA-04 to avoid karst:

- U.S. Geological Survey (2014),⁸ Carbonate Rocks in the Contiguous United States. This data includes carbonate bedrock information, including exposure data for carbonate rocks buried under greater than 50 feet of glacially derived insoluble sediments in a humid climate and carbonate rocks buried under less than 50 feet of glacially derived insoluble sediments in a humid climate;
- Minnesota Department of Natural Resources (Minnesota DNR) (2018),⁹ Minnesota Regions Prone to Surface Karst Feature Development, Karst Feature Inventory Points. This data contains

Comment [M(C2)]: See data sources.

Comment [TE3]: Could during the needs determination the PUC select this route as it was used only as a comparison? I thought they would need to reject the need determination and then go through the whole process again. Need to make sure the language is consistent with the main document.

Comment [M(C4)]: Why not using state data from Illinois?
<http://www.isgs.illinois.edu/outreach/geology-resources/karst-landscapes-illinois-dissolving-bedrock-and-collapsing-soil>

⁵ Pike, R.G., T.E. Redding, R.D. Moore, R.D. Winker and K.D. Bladon (editors). 2010. Compendium of forest hydrology and geomorphology in British Columbia. B.C. Min. For. Range, For. Sci. Prog., Victoria, B.C. and FORREX Forum for Research and Extension in Natural Resources, Kamloops, B.C. Land Manag. Handb. 66. Available at www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh66.htm.

⁶ *Ibid.*

⁷ Technical staff included geologists from Department of Commerce, Energy Environmental Review and Analysis; Ecology and Environment, Inc.; Minnesota DNR; and Minnesota Pollution Control Agency.

⁸ U.S. Geological Survey. 2014. Carbonate Rocks in the Contiguous United States. Available: <https://pubs.usgs.gov/of/2014/1156/pdf/of2014-1156.pdf>.

⁹ Minnesota DNR. 2018. Minnesota Regions Prone to Surface Karst Feature Development, Karst Feature Inventory Points. Available at: <https://gisdata.mn.gov/dataset/geos-karst-feature-inventory-pts>.

information on karst features mapped over the last 25 years. The data file is static, but contains data obtained on the Time Period of Content date, which is shown as 2018; and

- Iowa Geological Survey, Department of Natural Resources (2005),¹⁰ Potential Karst Geology of Iowa. This data coverage contains information representing areas within 1,000 feet of known sinkholes and other areas that have carbonate bedrock within 50 feet of the ground surface.

Routing through areas with a thicker layer of glacial sediment over soluble carbonate bedrock would not entirely avoid the potential groundwater vulnerabilities associated with karst. Therefore, deeper soluble carbonate bedrock areas (more than 50 feet of overburden) were included in the analysis as well as areas with near surface soluble carbonate bedrock (less than 50 feet of overburden).

Reroute Assessment

Avoidance Approach

As a first step, the technical staff reviewed potential route options that would completely avoid karst features, including areas with deeper karst bedrock. Figure 1 shows the extent of karst units in the Minnesota, Iowa, Wisconsin, and Illinois region, illustrating the difficulty of avoiding these units in the routing of a pipeline, particularly through Iowa and to a final destination of Joliet, Illinois.

Technical staff agreed that while avoiding or minimizing karst in Minnesota was possible, there was no reasonable route through Iowa and Illinois that entirely avoided karst. Completely avoiding karst would require a major new route option crossing northern Minnesota, following, for example, the RA-03AM route to a point north of the Twin Cities, then crossing the St. Croix River, and ultimately connecting into the existing Enbridge Energy, Limited Partnership system in Wisconsin. As shown in Figure 2, such a route would avoid construction of a new pipeline through karst between Wisconsin and Illinois. However, this route would fail to address SA-04's primary objective of avoiding the headwaters area and high quality waters in the surrounding region. As a result, this SA-04 reroute concept through northern Minnesota was not considered further.

Minimization Approach

Since a logical reroute of SA-04 to avoid karst was not feasible, technical staff considered options to minimize crossing shallow karst as a next-best approach. In an effort to identify options to minimize crossing shallow karst (less than 50 feet below the surface), technical staff reviewed possible routes, including a proposal from the Friends of the Headwaters that would reroute SA-04 through south-central Minnesota and central and southern Iowa. The technical staff modified the route slightly to minimize overall length, avoid significant population features (such as bisecting cities), and maximize paralleling of existing linear corridors. Figure 3 shows the resulting potential route (ROUTE NAME).

The technical staff concluded that while this alternative crosses areas with less shallow carbonate bedrock than SA-04, it results in a longer overall pipeline length, including an additional 50 miles of pipeline through areas where soluble carbonate bedrock is located more than 50 feet below the surface. Detailed analysis of local surface geology, depth to groundwater, and a number of other variables would be necessary to draw conclusions on which route would ultimately minimize exposure of vulnerable groundwater resources.

¹⁰ Iowa Geological Survey, Department of Natural Resources. 2005. Potential Karst Geology of Iowa. Available at: ftp://ftp.igsb.uiowa.edu/gis_library/IA_state/geologic/Karst/karst.html.

Comment [M(C5): Was any consideration given to water crossings or other geomorphological features outside of karst area that would have the potential to transfer accidental release to Karst Regions?

Comment [M(C6): Does Figure 1 also show the potential route options one of which goes through WI?

Comment [M(C7): First time Wisconsin is mentioned? Assuming it was not in the original route – so in one of the potential route to avoid Karst... so what data sources were used for WI? Might help to clarify this briefly and add data to methods above.

Comment [MW8]: Why wasn't a route straight down through Eastern SD or SW MN considered instead of going through Mankato? If the line would cut down through Des Moines, then over through Peoria and then co-locate with existing Enbridge Lines to Joliet. Avoids a lot of karst

Comment [M(C9): Not sure which depths are being considered in this and subsequent discussions. Seems there are areas in the epi/endoKarst layers that are of concern. Being more specific here to connect this section to the tables below would be helpful. Table indicates 0 accounts for 50 feet karst below ground.

Department of Commerce, Energy Environmental Review and Analysis (DOC EERA), Ecology and Environment, Inc., and Minnesota DNR technical staff concluded that while routing through areas with thicker layer glacial sediment over soluble carbonate bedrock may aid in minimizing exposure, such an approach does not entirely avoid the groundwater vulnerabilities associated with karst that the Commission identified as a critical concern.¹¹ Given the failure of this reroute to avoid groundwater vulnerabilities of concern, as well as the potential resource exposure associated with its additional length, the route does not appear to address the request in the Commission’s order. DOC EERA, Ecology and Environment, Inc., and Minnesota DNR technical staff, therefore, saw limited value in an extensive detailed analysis. Nonetheless, to avoid any perception of prejudice, a full environmental assessment was conducted for this route and is provided below.

In addition, more limited reroute options were investigated to assess whether minor revisions to SA-04 could be made to minimize near surface karst without adding many miles of additional pipeline through areas with soluble carbonate bedrock at depth, which itself creates additional oil spill risk. There was discussion and general agreement among technical staff that slight tweaks could be made to existing SA-04, specifically around Austin, Minnesota, to better avoid near surface karst. Figure 4 shows the resulting slightly modified SA-04 route segment. (ROUTE NAME). This modification avoids shallow soluble carbonate bedrock and surface karst features near Austin, Minnesota, shifting the line north and east, crossing through areas with soluble carbonate bedrock of greater depth with minimal additional overall pipeline length.

Similar to the major reroute identified above, routing this short segment through areas with thicker layer glacial sediment over soluble carbonate bedrock may aid in minimizing exposure, but does not entirely avoid the groundwater vulnerabilities associated with karst that the Commission identified as a critical concern. However, given the minimal additional length and additional new exposure that could be associated with this modified route segment, detailed environmental analysis for this reroute was also conducted to further inform the Commission on the possible benefits and drawbacks of this potential approach for minimizing karst.

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Comment [M(C10): Other agencies?...MPCA or was the MN Geological Survey consulted on any of this?

Comment [DR(11): How come no reference to MPCA?

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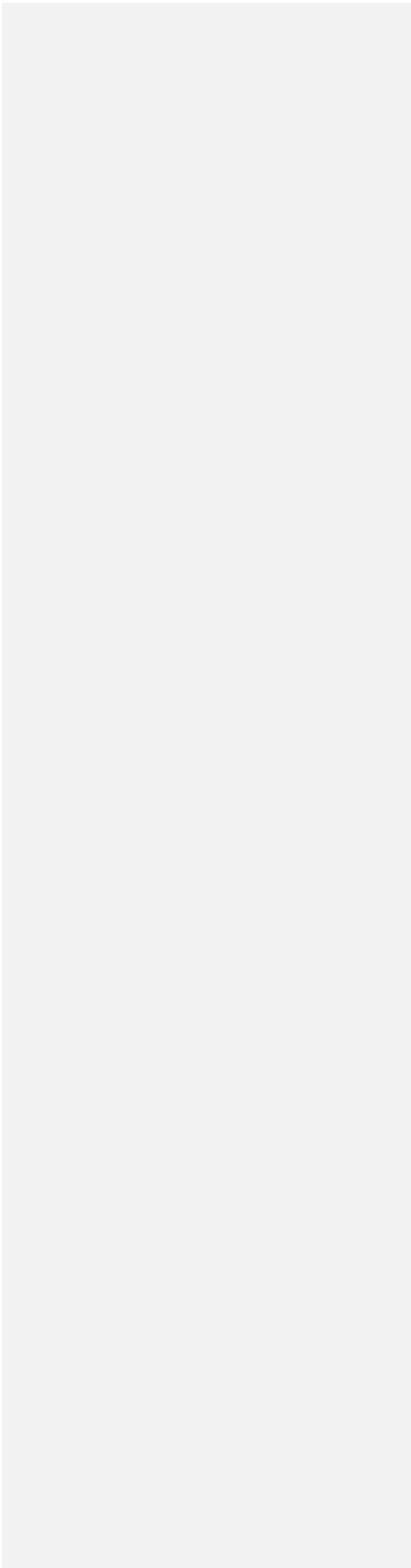
Comment [TE12]: Is this the right way to say this? Missing MPCA.

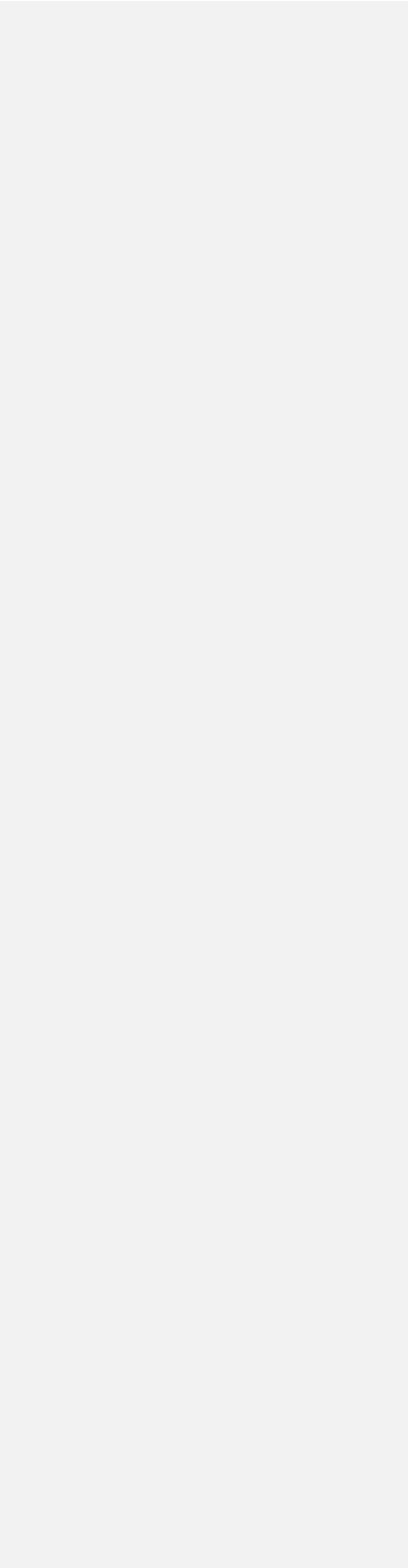
Comment [TE13]: I don't like the way this is worded. I think we did see value in doing a detailed analysis as we could not make a determination one way or another unless one was done. Is there another way to say this?

Comment [DR(14): This isn't completely accurate. DOC EERA may not have seen value. I think our (DNR) perspective was that each route had its trade-offs and the relative risk to groundwater of each route was too close to call with the data we had in front of us.

¹¹ Minnesota Pollution Control Agency was unable to express formal agreement or disagreement with this assessment during this review process.

Insert Figures 1-4





Chapter 5 Tables

Groundwater

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Karst (50 feet) (acres)	0	0	0	0	
Karst (1000 feet) (acres)	0	0	0	0	
Bedrock (25 feet) (acres)	1,581	1,118	182	242	
Bedrock (1000 feet) (acres)	63,286	44,715	7,324	9,687	
Wellhead Protection Area (1,000 feet) (acres)	157	175	1,010	138	
Wellhead Protection Area (25 feet) (acres)	4.3	3.4	26.4	3	
MN Well (1,000 feet) (count)	90	101	64	35	
MN Well (25 feet) (count)	1	0	2	0	
IA Wells (1000 feet) (count)	3	666	2	68	
IA Wells (25 feet) (count)	0	17	0	9	
IA GW Vulnerability (1000 feet) (acres)	63,283	44,707	7,320	9,679	
IA GW Vulnerability (25 feet) (acres)	1,581	1,118	182	241	
Watershed Health (1000 feet) (acres)	21,927	26,640	15,099	10,966	
Watershed Health (25 feet) (acres)	548	665	377	272	
MN Aquifer Vulnerability (1000 feet) (acres)	1,981	2,945	2,118	1,414	Information represents only areas of High vulnerability
MN Aquifer Vulnerability (25 feet) (acres)	45	63	50	33	Information represents only areas of High vulnerability
Sole Source Aquifer (EPA) (1000 feet) (acres)	0	0	0	0	
Sole Source Aquifer (EPA) (25 feet) (acres)	0	0	0	0	
MN WHAF (mean score)	45	45	45	44	
What's in my Neighborhood (1000 feet) (count)	30	47	41	7	
What's in my Neighborhood (25 feet) (count)	1	0	4	0	
EPA Registered Sites (25 feet) (count)	1	0	0	0	

Comment [M(C15): I am guessing there will be a statement clearly identifying these headings to the above discussion and map, in a table description or lead-in paragraph?

Comment [M(C16): Is this relating to 50 feet below surface referencing epi/endo karst area? And second unit is indicating the number of acres of that feature the line impacts? Will there be more explanation for clear interpretation of the units used and how the measurements were made? Also table summaries or legends or captions to help in this interpretation?

Comment [M(C17): Seems that above it was indicated that Karst could not be avoided and large areas of this were covered? Why all 0's

Comment [DR(18): Advisable to explain why there are zeros for Karst when you just had several paragraphs about not being able to avoid karst.

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Comment [TE19]: I don't understand? How are these 0? Are these only surface Karst? Need to include <50', >50' for the shallow a ...

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Comment [TE20]: Is this right? When there are large differences, it would be good to ...

Comment [DR(21): This seems odd, do we know where this huge increase occurred?

Comment [DR(22): What are these? Acres of watershed health does not seem right

Comment [M(C23): How does this compare to other uses of Vulnerability?

Groundwater

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
EPA Registered Sites (1000 feet) (count)	95	72	13	22	
Drinking Water SMA (25 feet) (acres)	0	5.6	10	4.9	
Drinking Water SMA (1,000 feet) (acres)	22	216	397	182	
Pollution Sensitivity of Near-Surface Material (25 feet) (acres)	518	624	340	232	
Pollution Sensitivity of Near-Surface Material (1,000 feet) (acres)	20,763	24,968	13,649	9,294	

EPA = U.S. Environmental Protection Agency
 FOH = Friends of the Headwaters
 GW = groundwater
 MN = Minnesota
 SMA = Supply Management Area
 WHAF = Watershed Health Assessment Framework

Comment [M(C15): I am guessing there will be a statement clearly identifying these headings to the above discussion and map, in a table description or lead-in paragraph?

Surface Water

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
NHD Flow (0.5 mile)	1,212	899	278	183	Includes MN and IA
NHD Flow (25 feet)	329	259	98	56	Includes MN and IA
NHD Flow (60 feet)	338	265	104	56	Includes MN and IA
NHD Waterbody (0.5 mile)	242	193	68	66	
NHD Waterbody (25 feet)	21	11	6	0	
NHD Waterbody (60 feet)	24	11	9	0	
USACE Navigable (25 feet)	0	0	0	0	
USACE Navigable (60 feet)	0	0	0	0	
National Rivers Inventory (25 feet)	3	1	0	0	

Comment [M(C24): Again I am guessing on these units and assume this indicates distance from route?

Surface Water

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
National Rivers Inventory (60 feet)	3	1	0	0	
Public Waters - Basins (25 feet)	3	0	0	0	
Public Waters - Basins (60 feet)	5	0	0	0	
Public Waters - Courses (25 feet)	20	15	13	6	
Public Waters - Courses (60 feet)	20	15	13	6	
Trout Streams (MN) – 25 feet	0	0	0	0	
Trout Streams (MN) – 60 feet	0	0	0	0	
Trout Streams (IA) – 25 feet	0	0	0	0	
Trout Streams (IA) – 60 feet	0	0	0	0	
Impaired Lakes (IA) – 25 feet	0	0	0	0	
Impaired Lakes (IA) – 60 feet	0	0	0	0	
Impaired Streams (IA) – 25 feet	11	2	1	0	
Impaired Streams (IA) – 60 feet	11	2	1	0	
303d Listed (MN) – 25 feet	9	5	3	3	
303d Listed (MN) – 60 feet	9	5	3	3	
Impaired Lakes (MN) – 25 feet	0	0	0	0	
Impaired Lakes (MN) – 60 feet	0	0	0	0	
Impaired Streams (MN) – 25 feet	10	9	5	4	
Impaired Streams (MN) – 60 feet	10	9	5	4	
Wild Rice Lakes (MN) – 25 feet	0	0	0	0	
Wild Rice Lakes (MN) – 60 feet	0	0	0	0	

Wetlands

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
NWI – 25 feet (acres)	65	8.1	14	8.1	
NWI – 60 feet (acres)	91	71.6	37	11.8	
MN Public Wetlands – 25 feet (acres)	0.4	0	0	0	
MN Public Wetlands – 60 feet (acres)	0.6	0	0	0	
Calcareous Fens – 25 feet (count)	0	0	0	0	
Calcareous Fens – 60 feet (count)	0	0	0	0	

FOH = Friends of the Headwaters
 IA = Iowa
 MN = Minnesota
 NHD = National Hydrography Dataset
 NWI = National Wetlands Inventory
 USACE = U.S. Army Corps of Engineers

Floodplains

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
FEMA Flood Hazards – 25 feet (acres)	1,526	1,340	494	473	
FEMA Flood Hazards – 60 feet (acres)	2,137	1,890	662	662	

FEMA = Federal Emergency Management Agency
 FOH = Friends of the Headwaters

Soils

Measurement/Data Evaluated Miles/Percent	SA-04 FOH Reroute (acres/percentage)	Comparable Segment of SA-04 (acres/percentage)	SSA-04 Segment Route (acres/percentage)	Comparable Segment of SA-04 (acres/percentage)	Notes on Data Sources
Prime Farmland	252.9 / 88%	299.8 / 87%	81.7 / 95%	67.2 / 86%	Prime farmlands, including soils that are considered prime farmlands when drained or irrigated
Highly Erodible Soils (wind)	8.7 / 3%	6.6 / 2%	1.1 / 1%	1.0 / 1%	WEGs 1 & 2
Highly Erodible Soils (Water)	81.4 / 28%	178.6 / 53%	22.9 / 27%	19.4 / 25%	slopes > 5% + slopes 0-5% with $kfactor > 0.4$
Hydric Soils	110.5 / 38%	112.4 / 33%	35.1 / 41%	33.5 / 43%	A yes/no field that indicates whether or not a map unit component is classified as a "hydric soil".
Compaction Prone Soils	74.9 / 26%	11.4 / 21%	11.2 / 13%	18.1 / 0.1%	Soils with clay loam or finer textures in somewhat poor, poor, and very poor drainage classes
Course Textured Soils	29.5 / 10%	195 / 6%	15.9 / 18%	8.16 / 11%	Sandy loams and coarser soils, including gravels
Stony/Rocky Soils	1.3 / <0.1%	0.3 / <0.01%	2.3 / 3%	1.0 / < 0.1%	Soils with a cobbly, stony, bouldery, gravelly, or shaly modifier to the textural class

FOH = Friends of the Headwaters
WEG = Wind Erodibility Group

Comment [M(C25)]: Define?

Elevation

Measurement/Data Evaluated Miles/Percent	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Alternative	Comparable Segment of SA-04	Notes on Data Sources
Elevation High	1,328 feet above MSL	1,296 Feet above MSL	1,329 Feet above MSL	1,359 Feet above MSL	USGS, ESRI
Elevation Low	605 feet above MSL	580 Feet above MSL	1,121 Feet above MSL	1,173 Feet above MSL	USGS, ESRI
Net Elevation change beginning to end	+342 feet	-342 feet	+61 feet	-61 feet	USGS, ESRI
Total Distance	287.38 miles	346.47 miles	78.05 miles	86.24 miles	

ESRI = Environmental Systems Research Institute
 FOH = Friends of the Headwaters
 MSL = mean sea level
 USGS = United States Geological Survey

Vegetation

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
NLCD cover classes, entire route	<ul style="list-style-type: none"> ▪ Evergreen Forest ▪ Deciduous Forest ▪ Grassland/Herbaceous ▪ Pasture/Hay ▪ Cultivated Crops ▪ Woody Wetlands ▪ Barren Land ▪ Emergent Herbaceous Wetlands ▪ Open Water ▪ Developed 	<ul style="list-style-type: none"> ▪ Evergreen Forest ▪ Deciduous Forest ▪ Grassland/Herbaceous ▪ Pasture/Hay ▪ Cultivated Crops ▪ Woody Wetlands ▪ Barren Land ▪ Emergent Herbaceous Wetlands ▪ Open Water ▪ Developed 	<ul style="list-style-type: none"> ▪ Evergreen Forest ▪ Deciduous Forest ▪ Grassland/Herbaceous ▪ Pasture/Hay ▪ Cultivated Crops ▪ Woody Wetlands ▪ Barren Land ▪ Emergent Herbaceous Wetlands ▪ Open Water ▪ Developed 	<ul style="list-style-type: none"> ▪ Evergreen Forest ▪ Deciduous Forest ▪ Grassland/Herbaceous ▪ Pasture/Hay ▪ Cultivated Crops ▪ Woody Wetlands ▪ Barren Land ▪ Emergent Herbaceous Wetlands ▪ Open Water ▪ Developed 	Original FEIS table included a short description of each cover type. If needed, an additional step can be taken to cross-reference the information presented herein to another source.

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
IA and MN noxious weed species	<p>MN:</p> <ul style="list-style-type: none"> ▪ common buckthorn ▪ glossy buckthorn ▪ reed canary grass ▪ smooth brome ▪ honeysuckle ▪ wild parsnip ▪ common reed ▪ white sweetclover ▪ yellow sweetclover ▪ Canada thistle ▪ sow thistle ▪ birdsfoot trefoil ▪ cow vetch <p>IA: none listed</p>	<p>MN:</p> <ul style="list-style-type: none"> ▪ common buckthorn ▪ glossy buckthorn ▪ reed canary grass ▪ smooth brome ▪ honeysuckle ▪ Russian-olive ▪ wild parsnip ▪ common reed ▪ white sweetclover ▪ yellow sweetclover ▪ Canada thistle ▪ birdsfoot trefoil ▪ cow vetch ▪ crown vetch <p>IA: none listed</p>	<p>MN: none listed</p> <p>IA: none listed</p>	<p>MN: none listed</p> <p>IA: none listed</p>	<p>Data do not show results for either SA-04 route. This is likely an artifact of the way data are reported.</p> <p>Data set does not include binomials, or status. If needed, an additional step can be taken to cross-reference the information presented herein to another source.</p>

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
Ecoregions – Level III and Level IV (miles of each within segment)	Level III: Western Corn Belt Plains Level IV: Des Moines Lobe (172.0 miles) Eastern Iowa and Minnesota Drift Plains (1.7 miles) Rolling Loess Prairies (169.3 miles) Level III: Interior River Valleys and Hills Level IV: Upper Mississippi Alluvial Plain (3.5 miles)	Level III: Western Corn Belt Plains Level IV: Des Moines Lobe (55.2 miles) Eastern Iowa and Minnesota Drift Plains (177.2 miles) Rolling Loess Prairies (51.1 miles) Level III: North Central Hardwood Forests Level IV: Big Woods (3.9 miles)	Level III: Western Corn Belt Plains Level IV: Eastern Iowa and Minnesota Drift Plains (86.2 miles)	Level III: Western Corn Belt Plains Level IV: Eastern Iowa and Minnesota Drift Plains (78.0 miles)	Original FEIS table included short descriptions of the Level IV ecoregions. If needed, an additional step can be taken to cross-reference the information presented herein to another source.
NLCD cover classes: Construction, Operations, and With 0.5 mile buffer.	Construction ▪ (acres, % of 2,939.8) ▪ Evergreen Forest (0) ▪ Deciduous Forest (93.7; 3.1%)	Construction ▪ (acres, % of 2,438.2 acres) ▪ Evergreen Forest (0) ▪ Deciduous Forest (9.9; <1%)	Construction ▪ (acres, % of 731.62 acres) ▪ Evergreen Forest (0) ▪ Deciduous Forest (13.0; 1.8%) ▪ Grassland/	Construction (total acres, % of 6,771.7 acres) ▪ Evergreen Forest (0) ▪ Deciduous Forest (120; 1.8%)	

- Comment [M(C26):** Not clear? Is this total acres within that areas being constructed and the % of the total areas constructed ?
- Comment [M(C27):** Why so different?
- Comment [DR(28):** Acres of what?
- Comment [DR(29):** Why is this so much larger when it's supposed to be comparable?

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<ul style="list-style-type: none"> ▪ Grassland/Herbaceous (112.9; 3.8%) ▪ Pasture/Hay (155.8; 5.3%) ▪ Cultivated Crops (2,325.9; 79.1%) ▪ Woody Wetlands (34.2; 1.1%) ▪ Barren Land (1.2; <1%) ▪ Emergent Herbaceous Wetlands (13.3; <1%) ▪ Open Water (12.2; <1%) ▪ Developed (190.5; 6.5%) ▪ Shrub/Scrub (0.2; <1%) 	<ul style="list-style-type: none"> ▪ Grassland/Herbaceous (76.3; 3.1%) ▪ Pasture/Hay (28.5; 1.2%) ▪ Cultivated Crops (2,154.9; 88.3%) ▪ Woody Wetlands (7.8; <1%) ▪ Barren Land (11.4; <1%) ▪ Emergent Herbaceous Wetlands (29.4; 1.2%) ▪ Open Water (3.8; <1%) ▪ Developed (116.2; 4.8%) 	<ul style="list-style-type: none"> Herbaceous (46.3; 6.3%) ▪ Pasture/Hay (27.9; 3.8%) ▪ Cultivated Crops (472.8; 64%) ▪ Woody Wetlands (0.4; <1%) ▪ Barren Land (0.8; <1%) ▪ Emergent Herbaceous Wetlands (1.4; <1%) ▪ Open Water (1.2; <1%) ▪ Developed (167.8; 22.9%) 	<ul style="list-style-type: none"> ▪ Grassland/What Herbaceous (260; 3.8%) ▪ Pasture/Hay (217.3; 3.2%) ▪ Cultivated Crops (5,542.2; 81.8%) ▪ Woody Wetlands (43.5; <1%) ▪ Barren Land (14.2; <1%) ▪ Emergent Herbaceous Wetlands (46.5; <1%) ▪ Open Water (18.6; <1%) ▪ Developed (509.7; 7.5%) 	
	<ul style="list-style-type: none"> Operations (Permanent ROW) ▪ (acres, % of 2,099.9 acres) ▪ Deciduous Forest (66.8; 3.2%) ▪ Grassland/Herbaceous (79.8; 3.8%) ▪ Pasture/Hay 	<ul style="list-style-type: none"> Operations (Permanent ROW) ▪ (acres, % of 1,741.7 acres) ▪ Deciduous Forest (6.6; <1%) ▪ Grassland/Herbaceous (54.6; 3.1%) ▪ Pasture/Hay 	<ul style="list-style-type: none"> Operations (Permanent ROW) ▪ (acres, % of 522.7 acres) ▪ Deciduous Forest (9.5; 1.8%) ▪ Grassland/Herbaceous (33.4; 6.4%) ▪ Pasture/Hay 	<ul style="list-style-type: none"> Operations (Permanent ROW) ▪ (acres, % of 473.1 acres) ▪ Deciduous Forest (2.2; <1%) ▪ Grassland/Herbaceous (17.2; 3.6%) ▪ Pasture/Hay 	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	(111.0; 5.3%) ▪ Cultivated Crops (1,662.2; 79.1%) ▪ Woody Wetlands (24.9; 1.2%) ▪ Barren Land (0.9; <1%) ▪ Emergent Herbaceous Wetlands (9.1; <1%) ▪ Open Water (8.4; <1%) ▪ Developed (136.7; 6.5%)	(20.2; 1.2%) ▪ Cultivated Crops (1,540.3; 88%) ▪ Woody Wetlands (5.9; <1%) ▪ Barren Land (8.3; <1%) ▪ Emergent Herbaceous Wetlands (20.6; 1.2%) ▪ Open Water (2.6; <1%) ▪ Developed (82.6; 4.7%)	(20.1; 3.8%) ▪ Cultivated Crops (357.7; 68.4%) ▪ Woody Wetlands (0.4; <1%) ▪ Barren Land (1.0; <1%) ▪ Emergent Herbaceous Wetlands (1.0; <1%) ▪ Open Water (1.0; <1%) ▪ Developed (99.0; 18.9%)	(3.7; <1%) ▪ Cultivated Crops (421.5; 89%) ▪ Woody Wetlands (1.0; <1%) ▪ Barren Land (0.5; <1%) ▪ Emergent Herbaceous Wetlands (1.5; <1%) ▪ Open Water (1.0; <1%) ▪ Developed (24.8; 5%)	
	Within 0.5 Mile Buffer (total acres, % of 222,138.6 acres) ▪ Evergreen Forest (11.3; <1%) ▪ Deciduous Forest (6,948.4; 3.1%) ▪ Grassland/Herbaceous (9,513.1; 4%) ▪ Pasture/Hay (12,653.8; 6%)	Within 0.5 Mile Buffer (total acres, % of 184,001.2 acres) ▪ Evergreen Forest (43.9; <1%) ▪ Deciduous Forest (2,407; 1.3%) ▪ Grassland/Herbaceous (6,138.3; 3.3%) ▪ Pasture/Hay (3,558.5; 1.9%)	Within 0.5 Mile Buffer (total acres; % of 55,669.4 acres) ▪ Evergreen Forest (8.7; <1%) ▪ Deciduous Forest (1,009.4; 1.8%) ▪ Grassland/Herbaceous (3,035.8; 5.5%) ▪ Pasture/Hay (1,893.2;	Within 0.5 Mile Buffer (total acres; % of 50,358.5 acres) ▪ Evergreen Forest (9.8; <1%) ▪ Deciduous Forest (776.1; 1.5%) ▪ Grassland/Herbaceous (1,956.5; 3.9%) ▪ Pasture/Hay (763.8; 1.5%) ▪ Cultivated	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<ul style="list-style-type: none"> ▪ Cultivated Crops (173,453.9; 78%) ▪ Woody Wetlands (2,309.8; 1%) ▪ Barren Land (114.3; <1%) ▪ Emergent Herbaceous Wetlands (1,648.6; <1%) ▪ Open Water (1,643; <1%) ▪ Developed (13,837.1; 6.2%) 	<ul style="list-style-type: none"> ▪ Cultivated Crops (155,636.3; 84.5%) ▪ Woody Wetlands (1,740.2; <1%) ▪ Barren Land (529.6; <1%) ▪ Emergent Herbaceous Wetlands (1,791; <1%) ▪ Open Water (600; <1%) ▪ Developed (11,551.2; 6.3%) ▪ Shrub/Scrub (0.2; <1%) 	<ul style="list-style-type: none"> 3.4%) ▪ Cultivated Crops (45,569; 81.8%) ▪ Woody Wetlands (225.1; <1%) ▪ Barren Land (17.2; <1%) ▪ Emergent Herbaceous Wetlands (125.9; <1%) ▪ Open Water (85.6; <1%) ▪ Developed (3,699.6; 6.6%) 	<ul style="list-style-type: none"> Crops (42,948.6; 85.2%) ▪ Woody Wetlands (413.3; <1%) ▪ Barren Land (28.2; <1%) ▪ Emergent Herbaceous Wetlands (115.0; <1%) ▪ Open Water (73.0; <1%) ▪ Developed (3,274.2; 6.5%) 	
NLCD cover classes, tallied by state	<ul style="list-style-type: none"> MN Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (29%) ▪ Woody 	<ul style="list-style-type: none"> MN Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (29%) ▪ Woody 	<ul style="list-style-type: none"> MN Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (29%) ▪ Woody 	<ul style="list-style-type: none"> MN Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (29%) ▪ Woody 	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	
	MN Subtotal = 35%	MN Subtotal = 35%	MN Subtotal = 35%	MN Subtotal = 35%	
	IA Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%)	IA Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%)	IA Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%)	IA Construction (%) ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (3%)	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<ul style="list-style-type: none"> ▪ Open Water (<1%) Developed (4%) 	<ul style="list-style-type: none"> ▪ Open Water (<1%) Developed (4%) 	<ul style="list-style-type: none"> ▪ Open Water (<1%) Developed (4%) 	<ul style="list-style-type: none"> ▪ Open Water (<1%) ▪ Developed (4%) 	
	IA Subtotal = 65%	IA Subtotal = 65%	IA Subtotal = 65%	IA Subtotal = 65%	
	MN Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (<1%) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (2%) 	MN Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (<1%) ▪ Deciduous Forest (3%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (2%) 	MN Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (2%) 	MN Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (0) ▪ Deciduous Forest (<1%) ▪ Grassland/Herbaceous (<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (11%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (2%) 	
	MN Subtotal = 35%	MN Subtotal = 35%	MN Subtotal = 35%	MN Subtotal = 35%	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	IA Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (<1%) ▪ Deciduous Forest (1.6%) ▪ Grassland/ Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (51%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (4%) 	IA Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (<1%) ▪ Deciduous Forest (3%) ▪ Grassland/ Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (51%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (4%) 	IA Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (<1%) ▪ Deciduous Forest (1.6%) ▪ Grassland/ Herbaceous (<1%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (51%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (4%) 	IA Within 0.5 Mile Buffer (%) <ul style="list-style-type: none"> ▪ Evergreen Forest (<1%) ▪ Deciduous Forest (1.6%) ▪ Grassland/ Herbaceous (3%) ▪ Pasture/Hay (3.4%) ▪ Cultivated Crops (51%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) Developed (4%) 	
	IA Subtotal = 65%	IA Subtotal = 65%	IA Subtotal = 65%	IA Subtotal = 65%	
	MN Operations (%) <ul style="list-style-type: none"> ▪ Deciduous Forest (<1%) ▪ Grassland/ Herbaceous 	MN Operations (%) <ul style="list-style-type: none"> ▪ Deciduous Forest (<1%) ▪ Grassland/ Herbaceous 	MN Operations (%) <ul style="list-style-type: none"> ▪ Deciduous Forest (<1%) ▪ Grassland/ Herbaceous 	MN Operations (%) <ul style="list-style-type: none"> ▪ Deciduous Forest (<1%) ▪ Grassland/ Herbaceous 	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	(<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	(<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	(<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	(<1%) ▪ Pasture/Hay (<1%) ▪ Cultivated Crops (30%) ▪ Woody Wetlands (<1%) ▪ Barren Land (<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%)	
	MN Subtotal = 35%	MN Subtotal = 35%	MN Subtotal = 35%	MN Subtotal = 35%	
	▪ IA Operations (%) ▪ Deciduous Forest (1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land	▪ IA Operations (%) ▪ Deciduous Forest (1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land	▪ IA Operations (%) ▪ Deciduous Forest (1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land	▪ IA Operations (%) ▪ Deciduous Forest (1%) ▪ Grassland/Herbaceous (3%) ▪ Pasture/Hay (3%) ▪ Cultivated Crops (53%) ▪ Woody Wetlands (<1%) ▪ Barren Land	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	(<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (4%) IA Subtotal = 65%	(<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (3%) IA Subtotal = 65%	(<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (3) IA Subtotal = 65%	(<1%) ▪ Emergent Herbaceous Wetlands (<1%) ▪ Open Water (<1%) ▪ Developed (3%) IA Subtotal = 65%	
MN Native Plant Community Systems and Rare Native Plant Communities	MN - within 0.5 Mile Buffer: (Type, MBS Rank, Conservation Rank, acres) ▪ Elm-Ash- Basswood Terrace Forest High S2 1.14 acres Moderate S2 55.46 acres ▪ Red Oak- Sugar Maple- Basswood- (Bitternut Hickory) Forest Moderate	MN - within 0.5 Mile Buffer: (Type, MBS Rank, Conservation Rank, acres) ▪ Southern Terrace Forest Moderate no rank 73.73 acres ▪ Southern Floodplain Forest Moderate no rank 32.9 acres Outstanding	MN - within 0.5 Mile Buffer: (Type, MBS Rank, Conservation Rank, acres) ▪ Silver Maple- Green Ash- Cottonwood Terrace Forest Moderate S3 19.03 acres ▪ Mesic Prairie (Southern) High S2 17.85 acres Moderate S2	MN - within 0.5 Mile Buffer: (Type, MBS Rank, Conservation Rank, acres) ▪ Southern Floodplain Forest Outstanding no rank 16.05 acres ▪ Southern Mesic Oak- Basswood Forest Moderate no rank 56.03 acres	These data combine the information found in Table 5.2.3-16 and Table 5.2.3-17 in the FEIS. This dataset emphasizes the rarity aspect of the native plant communities intersected by each route, in MN.

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<p>S3 125.16 acres</p> <ul style="list-style-type: none"> ▪ Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S2 39.28 acres ▪ Elm- Basswood- Black Ash- (Hackberry) Forest Moderate S3 33.02 acres ▪ Mesic Prairie (Southern) Moderate S2 7.61 acres 	<p>no rank 16.05 acres</p> <ul style="list-style-type: none"> ▪ Silver Maple - (Virginia Creeper) Floodplain Forest Moderate S3 153.74 acres Outstanding S3 0.12 acre ▪ Southern Mesic Oak- Basswood Forest Moderate no rank 62.23 acres ▪ Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest High S3 34.36 acres Moderate S3 106.08 acres 	<p>40.67 acres</p> <ul style="list-style-type: none"> ▪ Wet Prairie (Southern) Moderate S2 0.38 acre 	<ul style="list-style-type: none"> ▪ Sugar Maple- Basswood- (Bitternut Hickory) Forest Outstanding S2 34.63 acres ▪ Southern Wet-Mesic Hardwood Forest Outstanding no rank 22.8 acres ▪ Mesic Prairie (Southern) High S2 8.73 acres Moderate S2 34.02 acres 	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<ul style="list-style-type: none"> ▪ Wet Prairie (Southern) Moderate S2 0 acres 	<ul style="list-style-type: none"> ▪ Sugar Maple - Basswood - (Bitternut Hickory) Forest High S2 67.73 acres Moderate S2 42.69 acres Outstanding S2 34.63 acres ▪ Southern Wet-Mesic Hardwood Forest Outstanding no rank 22.8 acres ▪ Calcareous Fen (South-eastern) Outstanding S1 0.85 acre ▪ Southern Dry Prairie High no rank 60.11 acres Moderate 			

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
		no rank 1.97 acres Outstanding no rank 0.91 acre ▪ Mesic Prairie (Southern) High S2 8.73 acres Moderate S2 34.02 acres Outstanding S2 2.48 acres ▪ Seepage Meadow/Carr Outstanding S3 6.74 acres			
	MN – Construction: ▪ Elm-Ash- Basswood Terrace Forest Moderate S2 0.77 acre	MN – Construction: ▪ Southern Terrace Forest Moderate no rank 0.56 acre	MN – Construction: ▪ Mesic Prairie (Southern) High S2 0.24 acre Moderate S2 8.73 acres	MN – Construction: ▪ Southern Mesic Oak- Basswood Forest Moderate no rank 0.35 acre ▪ Mesic Prairie (Southern)	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<ul style="list-style-type: none"> ▪ Red Oak- Sugar Maple- Basswood- (Bitternut Hickory) Forest Moderate S3 3.75 acres ▪ Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S2 0.68 acre ▪ Mesic Prairie (Southern) Moderate S2 0.16 acre 	<ul style="list-style-type: none"> ▪ Silver Maple - (Virginia Creeper) Floodplain Forest Moderate S3 0.02 acre ▪ Southern Mesic Oak- Basswood Forest Moderate no rank 0.35 acre ▪ Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S3 0.16 acre ▪ Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S2 		<p>Moderate S2 0.36 acre</p>	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
		0.17 acre <ul style="list-style-type: none"> ▪ Southern Dry Prairie High no rank 0.01 acre ▪ Mesic Prairie (Southern) Moderate S2 0.36 acre 			
	MN - Operations (Permanent ROW): <ul style="list-style-type: none"> ▪ Elm-Ash-Basswood Terrace Forest Moderate S2 0.53 acre ▪ Red Oak-Sugar Maple-Basswood-(Bitternut Hickory) Forest Moderate S3 2.55 acres 	MN - Operations (Permanent ROW): <ul style="list-style-type: none"> ▪ Southern Terrace Forest Moderate no rank 0.40 acre ▪ Silver Maple - (Virginia Creeper) Floodplain Forest Moderate S3 0.01 acre 	MN - Operations (Permanent ROW): <ul style="list-style-type: none"> ▪ Mesic Prairie (Southern) High S2 0.17 acre Moderate S2 1.15 acres 	MN - Operations (Permanent ROW): <ul style="list-style-type: none"> ▪ Southern Mesic Oak-Basswood Forest Moderate no rank 0.25 acre ▪ Mesic Prairie (Southern) Moderate S2 0.26 acre 	

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
	<ul style="list-style-type: none"> ▪ Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S2 0.48 acre ▪ Mesic Prairie (Southern) Moderate S2 0.11 acre 	<ul style="list-style-type: none"> ▪ Southern Mesic Oak-Basswood Forest Moderate no rank 0.25 acre ▪ Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S3 0.10 acre ▪ Sugar Maple - Basswood - (Bitternut Hickory) Forest Moderate S2 0.05 acre ▪ Southern Dry Prairie High no rank 0 acres ▪ Mesic Prairie (Southern) 			

Vegetation

Measurement/ Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on data and FEIS location
		Moderate S2 0.26 acre			

FEIS = Final Environmental Impact Statement

FOH = Friends of the Headwaters

IA = Iowa

MBS = Minnesota Biological Survey Site of Biodiversity Significance

MN = Minnesota

NLCD = National Land Cover Database

ROW = right-of-way

Fish and Wildlife Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Number of AMAs within 0.5 mile	0	2	0	0	
Number of AMAs within construction ROI	0	1	0	0	
Number of AMAs within permanent ROI	0	1	0	0	
Number of MDNR designated trout lakes and streams within 0.5 mile	0	2	0	0	NOTE: The 2 streams of the FOH SA-04 Segment Alternative do not cross the centerline.
Number of MDNR designated trout lakes and streams within construction ROI	0	0	0	0	
Number of MDNR designated trout lakes and streams within permanent ROI	0	0	0	0	
Number of MDNR designated trout lakes and streams within ATWS	N/A	N/A	N/A	N/A	No temporary works spaces in the four alternatives presented herein.

Fish and Wildlife Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Number of MDNR designated trout lakes and streams within Access Roads	N/A	N/A	N/A	N/A	No access roads in the four alternatives presented herein.
Number of Muskie Lakes within 0.5 mile	0	0	0	0	
Number of Muskie Lakes within construction ROI	0	0	0	0	
Number of Muskie Lakes within permanent ROI	0	0	0	0	
Number of MN Lakes rated for Fish IBI within 0.5 mile	0	0	0	0	
Number of MN Lakes rated for Fish IBI within construction ROI	0	0	0	0	
Number of MN Lakes rated for Fish IBI within permanent ROI	0	0	0	0	
Number of MN Lakes of Biological Significance within 0.5 mile	2	2	0	0	
MN Lakes of Biological Significance Acreage within 0.5 mile	208.8	104.01	0	0	
Number of MN Lakes of Biological Significance within construction ROI	1	0	0	0	
MN Lakes of Biological Significance Acreage within construction ROI	1.2	0	0	0	
Number of MN Lakes of Biological Significance within permanent ROI	1	0	0	0	
MN Lakes of Biological Significance Acreage within permanent ROI	0.9	0	0	0	
Number of invasive species waters (infested waters) within 0.5 mile	0	0	0	0	
Number of invasive species waters (infested waters) within construction ROI	0	0	0	0	
Number of invasive species waters (infested waters) within permanent ROI	0	0	0	0	
Number of invasive species waters (infested streams) within 0.5 mile	0	0	0	0	
Number of invasive species waters (infested streams) within construction ROI	0	0	0	0	
Number of invasive species waters (infested streams) within permanent ROI	0	0	0	0	

Comment [TE30]: Below in the “Spills” table, it has “0” for these values. Why the discrepancy?

Fish and Wildlife Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
streams) within permanent ROI					
Number of non-indigenous aquatic species within 0.5 mile	4	0	0	0	
Number of non-indigenous aquatic species within construction ROI	0	0	0	0	
Number of non-indigenous aquatic species within permanent ROI	0	0	0	0	
Number of MN Sentinel Lakes within 0.5 mile	0	0	0	0	
Number of MN Sentinel Lakes within construction ROI	0	0	0	0	
Number of MN Sentinel Lakes within permanent ROI	0	0	0	0	
Number of MN freshwater mussel sites within 0.5 mile	0	1	0	0	
Number of Perennial Streams Crossed by Centerline in MN	6	9	8	3	
Number of Intermittent Streams Crossed by Centerline in MN	12	31	25	7	
Number of Ephemeral Streams Crossed by Centerline in MN	0	0	0	0	
Number of Canal/Ditch Crossed by Centerline in MN	33	25	20	12	
Number of Artificial Path Crossed by Centerline in MN	8	2	0	1	
Number of Connectors Crossed by Centerline in MN	2	1	0	0	
Total Number of Streams Crossed by Centerline in MN	61	68	53	23	
Number of Perennial Streams Crossed by Centerline in IA	92	56	20	9	
Number of Intermittent Streams Crossed by Centerline in IA	175	162	24	32	
Number of Ephemeral Streams Crossed by Centerline in IA	4	0	0	0	
Number of Canal/Ditch Crossed by Centerline in IA	3	0	0	0	

Fish and Wildlife Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Number of Artificial Path Crossed by Centerline in IA	22	4	0	2	
Number of Connectors Crossed by Centerline in IA	1	0	0	0	
Total Number of Streams Crossed by Centerline in IA	297	222	44	43	
Vegetative Cover Acreage (all NLCD Cover Classes)	Covered by Vegetation Section				
Vegetative Cover Acreage in construction ROI (all NLCD Cover Classes)					
Vegetative Cover Acreage in permanent ROI (all NLCD Cover Classes)					
Wildlife Conservation Lands					
MN					
Construction ROW (120 feet)					
Conservation Easement (number)	10	3	3	0	
Conservation Easement (acres)	11.04	8.28	3	0	
State Conservation Area (number)	1	1	1	1	
State Conservation Area (acres)	2.45	0.17	0.18	0.17	
Permanent ROW (50 feet)					
Conservation Easement (number)	10	3	2	0	
Conservation Easement (acres)	7.76	5.9	1.54	0	
State Conservation Area (number)	1	1	1	1	
State Conservation Area (acres)	1.75	0.12	0.13	0.12	
0.5 mile					
Conservation Easement (number)	19	24	9	1	
Conservation Easement (acres)	668.33	643.73	277.79	1.35	
Resource Management Area (number)	2	0	0	0	
Resource Management Area (acres)	7.46	0	0	0	
State Conservation Area (number)	7	5	1	2	

Fish and Wildlife Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
State Conservation Area (acres)	254.13	132.3	14.18	47.87	
IA					
Construction ROW (120 feet)					
Conservation Easement (number)	2	0	0	0	
Conservation Easement (acres)	1.14	0	0	0	
Local Park (number)	1	0	0	0	
Local Park (acres)	3.95	0	0	0	
State Conservation Area (number)	3	0	0	0	
State Conservation Area (acres)	31.28	0	0	0	
State Park (number)	1	0	0	0	
State Park (acres)	1.95	0	0	0	
Permanent ROW (50 feet)					
Conservation Easement (number)	2	0	0	0	
Conservation Easement (acres)	0.82	0	0	0	
Local Park (number)	1	0	0	0	
Local Park (acres)	2.82	0	0	0	
State Conservation Area (number)	3	0	0	0	
State Conservation Area (acres)	22.44	0	0	0	
State Park (number)	1	0	0	0	
State Park (acres)	1.36	0	0	0	
0.5 mile					
Conservation Easement (number)	12	3	0	1	
Conservation Easement (acres)	215.17	163.91	0	58.19	
Local Park (number)	2	0	0	0	
Local Park (acres)	135.38	0	0	0	
State Conservation Area (number)	6	1	0	1	

Fish and Wildlife Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
State Conservation Area (acres)	1,632.37	81.55	0	81.55	
State Park (number)	1	1	0	0	
State Park (acres)	107.38	0	0	0	
State Recreation Area (number)	0	0	0	1	
State Recreation Area (Acres)	0	8.32	0	8.32	
Number of IBAs within construction ROI	3	2	0	0	
IBA Acreage within construction ROI	32.2	34.2	0	0	
Number of IBAs within permanent ROI	3	2	0	0	
IBA Acreage within permanent ROI	23.0	24.5	0	0	
Number of IBAs within 0.5 mile	3	2	0	0	
IBA Acreage within 0.5 mile	2,276.2	2,737.0	0	0	
Raptor Stick Nests within 0.5 mile	N/A	N/A	N/A	N/A	Field survey data was not collected for these alternatives.

AMA = Aquatic Management Area
 ATWS = additional temporary workspace
 FOH = Friends of the Headwaters
 IA = Iowa
 IBA = Audubon Important Bird Area
 MDNR = Minnesota Department of Natural Resources
 MN = Minnesota
 N/A = not applicable
 NLCD = National Land Cover Database
 ROI = region of interest
 ROW = right-of-way

Comment [DR(31): How can there be one park but zero acres?

Comment [DR(32): How can there be 8.32 acres when there are zero recreation areas?

Comment [M(C33): Any state or fed data available to use to indicate at least a min of known nesting sites?

Unique Natural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Threatened and Endangered Species					
Federally Listed Species (No. of species)	12	13	5	5	(INTERNAL NOTE: IPaC was used for both MN and IA for consistent methodology b/n the two states. Only partial NHIS data were available for MN, and no natural heritage data was available for IA.)
Critical Habitat - 1 Mile (No. of Species)	0	0	0	0	
Critical Habitat - 1 Mile (No. of Acres)	0	0	0	0	
Known Occurrences of State-protected Animal Species Within 120-foot wide Construction ROW (No. of Species)	0	0	0	0	Note: Applies to MN only.
Known Occurrences of State-protected Animal Species Within 50-foot wide Permanent ROW (No. of Species)	0	0	0	0	Note: Applies to MN only.
Known Occurrences of State-protected Animal Species Within 0.5 mile on both sides of centerline (No. of Species)	4	9	0	5	Note: Applies to MN only.
Known Occurrences of State-protected Plant Species Within 120-foot wide Construction ROW (No. of Species)	0	0	1	0	Note: Applies to MN only.
Known Occurrences of State-protected Plant Species Within 50-foot-wide Permanent ROW (No. of Species)	0	0	0	0	Note: Applies to MN only.
Known Occurrences of State-protected Plant Species Within 0.5 mile on both sides of centerline (No. of Species)	1	5	4	3	Note: Applies to MN only.
Species of Greatest Conservation Need					
Construction (Acres)					
Mammals					(INTERNAL NOTE: These results are analogous to the GAP analysis done by Cardno (e.g., Table 5.2.5-2 and Table 5.2.5-23). The species distribution models used by Cardno were used for this analysis. However, E & E was unable to duplicate the results presented in the FEIS. E & E has found that more species distribution models overlap the
Mammals (Low)	2,510.31	2,160.49	950.42	612	
Mammals (Medium)	149.65	45.51	75.15	13.78	
Mammals (High)	0.1	0.01	0.01	0	
Total (Acres)	2,660.06	2,206.00	1,025.59	625.78	
Birds					

Comment [M(C34): Why – explanation and locations?

Comment [DR(35): Why only partial data available within MN?

Comment [M(C36): Why 0 if species are listed above and below? Explanation ?

Unique Natural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Birds (Low)	2,912.39	2,427.65	1,254.40	661.69	project. In this analysis, Low, Medium, and High numbers of species were defined as follows:
Birds (Medium)	26.81	2.27	0.29	0.04	
Birds (High)	0	0	0	0	
Total (Acres)	2,939.19	2,429.92	1,254.69	661.74	Mammals: Low = 0 to 2 species; Medium = 2 to 5 species; High = 5 to 8 species.
Reptiles and Amphibians (Herptiles)					
Reptiles and Amphibians (Low)	1,350.10	1,025.42	174.67	84.29	Birds: Low = 0 to 9 species; Medium = 0 to 19 species; High = 19 to 28 species
Reptiles and Amphibians (Medium)	2.17	1.05	0	0	Amphibians and Reptiles: Low = 0 to 5 species; Medium = 5 to 10 species; High = 10 to 16 species.
Reptiles and Amphibians (High)	0	0	0	0	
Total (Acres)	1,352.27	1,026.47	174.67	84.29	
Operation (Acres)					
Mammals					
Mammals (Low)	1,795.67	1,542.91	398.44	437.2	
Mammals (Medium)	104.87	32.65	32.71	9.8	
Mammals (High)	0.05	0	<0.01	0	
Total (Acres)	1,900.59	1,575.56	431.15	447	
Birds					
Birds (Low)	2,080.69	1,734.12	522.61	472.58	
Birds (Medium)	18.69	1.54	0.12	0	
Birds (High)	0	0	0	0	
Total (Acres)	2,099.38	1,735.66	522.73	472.58	
Reptiles and Amphibians (Herptiles)					
Reptiles and Amphibians (Low)	963.92	731.71	73.02	60.49	
Reptiles and Amphibians (Medium)	1.58	0.73	0	0	
Reptiles and Amphibians (High)	0	0	0	0	
Total (Acres)	965.49	732.44	73.02	60.49	
0.5 Mile (Acres)					

Comment [TE37]: Do you really want to say this? Cannot duplicate it? How were those in the main document developed? May want to say in a little different way as if you cannot duplicate what was completed in the main document, may be seen as not an appropriate analysis.

Comment [M(C38): How were these numbers determined – seem arbitrary? Based on what scientific evidence; proven index? Biodiversity and richness are usually used as indicators...not sure what this is measuring? **Species of Greatest Conservation Need** is it defined somewhere and methods used? Could be valuable just not seeing methods and support for results.

Unique Natural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Mammals					
Mammals (Low)	190,117.15	159,150.39	50,164.88	45,392.76	
Mammals (Medium)	11,199.50	6,420.28	1,947.70	1,621.83	
Mammals (High)	14.29	6.74	0.79	0.22	
Total (Acres)	201,330.94	165,577.41	52,113.38	47,014.81	
Birds					
Birds (Low)	220,297.35	183,182.46	55,613.77	50,293.80	
Birds (Medium)	1,763.92	414.55	39.32	43.96	
Birds (High)	0	0.00	0	0	
Total (Acres)	222,061.27	183,597.01	55,653.09	50,337.76	
Reptiles and Amphibians (Herptiles)					
Reptiles and Amphibians (Low)	102,101.04	78,485.58	7,311.98	6,314.88	
Reptiles and Amphibians (Medium)	258.29	131.05	0.12	0	
Reptiles and Amphibians (High)	0.00	0.00	0	0	
Total (Acres)	102,359.33	78,616.63	7,312.11	6,314.88	
Wildlife Action Network Habitats (MN Only)					
Construction (Acres)					
Low	0	0	0.4	0	
Low-Medium	11.9	3.17	0	0	
Medium	8.94	2.08	0.13	0	
Medium-High	2.1	26.22	0.14	0.26	
High	0	11.44	0	0	
Total (Acres)	22.95	42.91	0.67	0.26	
Operation (Acres)					
Low	0	0	0.17	0	
Low-Medium	8.5	2.26	0	0	

Unique Natural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources	
Medium	6.38	1.49	0.05	0		
Medium-High	1.5	18.63	0.06	0.18		
High	0	8.27	0	0		
Total (Acres)	16.39	30.65	0.28	0.18		
0.5 Mile (Acres)						
Low	0.81	1.31	17.85	0		
Low-Medium	1,135.92	366.33	0.01	0		
Medium	681.69	405.17	10.74	0		
Medium-High	299.72	1973.15	7.1	29.14		
High	0	737.24	0	0		
Total (Acres)	2,118.14	3,483.21	35.7	0		
Minnesota Biological Survey Sites of Biodiversity Significance						
Construction (Acres)						
Outstanding	0	0.76	0	0		
High	0	2.9	0.4	0		
Moderate	6.34	8.39	10.68	0.84		
Total (Acres)	6.34	12.04	11.08	0.84		
Operation (Acres)						
Outstanding	0	0.54	0	0		
High	0	2.07	0.17	0		
Moderate	4.55	5.93	1.28	0.6		
Total (Acres)	4.55	8.54	1.44	0.6		
0.5 Mile (Acres)						
Outstanding	0	149.92	0	73.48		
High	1.14	352.5	17.85	10.28		
Moderate	376.23	698.32	72.63	105.09		

Unique Natural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Total (Acres)	377.37	1,200.73	90.48	188.85	
Minnesota Scientific and Natural Areas					
Construction (Number)	0	0	1	0	NOTE: No Research Natural Areas or Research or Educational Areas occur in Iowa within any of the ROIs. In the EIS these areas were considered analogous to SNAs for states other than MN.
Construction (Acres)	0	0	0.31	0	
Operation (Number)	0	0	1	0	
Operation (Acres)	0	0	0.13	0	
0.5 Mile (Number)	0	0	1	0	
0.5 Mile (Acres)	0	0	14.18	0	

Comment [M(C39)]: below it indicates 0 ?

E & E = Ecology and Environment, Inc.
 FEIS = environmental impact statement
 FOH = Friends of the Headwaters
 IA = Iowa
 MN = Minnesota
 NHIS = Natural Heritage Information System
 ROI = region of interest
 SNA = Scientific and Natural Area

Public Lands

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Federal Lands within Construction ROW (acres)	0.0	0.0	0.0	0.0	
Federal Lands within Permanent ROW (acres)	0.0	0.0	0.0	0.0	
MN State Wildlife Management Areas within Construction ROW (acres)	2.4	0.5	0.3	0.2	
MN State Wildlife Management Areas within Permanent ROW (acres)	1.7	0.4	0.1	0.1	
IA Conservation and Recreation Lands within	3,510.9	311.2	360.8	232.2	

Comment [DR(40)]: Another big unexpected swing in acres. Do we know what feature resulted in such a large number of acres

Public Lands

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
0.5 mile of the centerline (acres)					
MN NRCS Conservation Easements within Construction ROW (acres)	0.0	0.0	4.5	0.0	
MN NRCS Conservation Easements within Permanent ROW (acres)	0.0	0.0	1.5	0.0	
IA NRCS Conservation Easements within Construction ROW (acres)	1.4	0.0	0.0	0.0	
IA NRCS Conservation Easements within Permanent ROW (acres)	1.0	0.0	0.0	0.0	

FOH = Friends of the Headwaters

IA = Iowa

MN = Minnesota

NRCS = Natural Resources Conservation Service

ROW = right-of-way

Commodity Production

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
MN – Agricultural Land					
Cultivated crops within Construction ROW (acres)	629.1	755.7	531.6	296.6	
Cultivated crops within Permanent ROW (acres)	448.5	540.3	233.0	212.0	
Grass/Pastureland within Construction ROW (acres)	4.4	5.3	8.2	0.5	
Grass/Pastureland within Permanent ROW (acres)	3.4	3.6	3.4	0.3	
Prime Farmland within Construction ROW (acres)	221.8	271.3	328.5	96.9	
Prime Farmland within Permanent ROW (acres)	159.3	194.3	137.5	69.6	

Commodity Production

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Farmland of Statewide Importance within Construction ROW (acres)	67.3	96.5	46.1	46.4	
Farmland of Statewide Importance within Permanent ROW (acres)	47.6	68.6	19.4	32.9	
Market Value of Agricultural Land					Market Value of Agricultural Land unable to be determined due to lack in available data
IA – Agricultural Land					
Cultivated crops within Construction ROW (acres)	1,696.9	1,399.5	299.2	292.6	
Cultivated crops within Permanent ROW (acres)	1,213.6	1,000.0	124.7	209.6	
Grass/Pastureland within Construction ROW (acres)	151.3	23.2	39.9	4.6	
Grass/Pastureland within Permanent ROW (acres)	107.7	16.7	16.7	3.4	
Prime Farmland within Construction ROW (acres)	726.7	818.0	255.6	211.8	
Prime Farmland within Permanent ROW (acres)	519.8	583.9	106.5	150.7	
Farmland of Statewide Importance within Construction ROW (acres)	779.0	165.7	20.0	8.8	
Farmland of Statewide Importance within Permanent ROW (acres)	555.7	118.2	8.3	6.5	
Market Value of Agricultural Land					Market Value of Agricultural Land unable to be determined due to lack in available data
MN – Forested Land					
Deciduous Forest within Construction ROW (acres)	15.6	4.3	6.5	1.4	
Deciduous Forest within Permanent ROW (acres)	11.2	2.9	2.8	0.9	
Evergreen Forest within Construction ROW (acres)	0.0	0.0	0.0	0.0	
Evergreen Forest within Permanent ROW (acres)	0.0	0.0	0.0	0.0	
Mixed Forest within Construction ROW (acres)	0.0	0.0	0.0	0.0	
Mixed Forest within Permanent ROW (acres)	0.0	0.0	0.0	0.0	

Commodity Production

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Market Value of Forested Land					Market Value of Forested Land unable to be determined due to lack in available data
IA – Forested Land					
Deciduous Forest within Construction ROW (acres)	78.1	5.6	15.9	2.0	
Deciduous Forest within Permanent ROW (acres)	55.6	3.7	6.7	1.2	
Evergreen Forest within Construction ROW (acres)	>0.01	0.0	0.0	0.0	
Evergreen Forest within Permanent ROW (acres)	0.0	0.0	0.0	0.0	
Mixed Forest within Construction ROW (acres)	0.0	0.0	0.0	0.0	
Mixed Forest within Permanent ROW (acres)	0.0	0.0	0.0	0.0	
Market Value of Forested Land					Market Value of Forested Land unable to be determined due to lack in available data
MN – Mineral Land					
Mining Sites within Construction ROW (number of sites)	0	0	0	0	
Mining Sites within Permanent ROW (number of sites)	0	0	0	0	
Mineral Resources within Construction ROW (number of sites)	0	0	0	0	
Mineral Resources within Permanent ROW (number of sites)	0	0	0	0	
Market Value of Mineral Land					Market Value of Mineral Land unable to be determined due to lack in available data
IA – Mineral Land					
Mining Sites within Construction ROW (number of sites)	2	1	2	0	
Mining Sites within Permanent ROW (number of sites)	2	1	1	0	
Mineral Resources within Construction ROW (number of sites)	1	0	0	0	
Mineral Resources within Permanent ROW (number of sites)	0	1	0	0	

Commodity Production

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Market Value of Mineral Land					Market Value of Mineral Land unable to be determined due to lack in available data

FOH = Friends of the Headwaters

IA = Iowa

MN = Minnesota

ROW = right-of-way

Recreation and Tourism

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Parks, Forests, and Special Management Areas Crossed by the Centerline (miles)	6.2	1.0	0.2	<0.0	
Parks, Forests, and Special Management Areas within Construction ROW (acres)	52.3	8.5	4.8	0.2	
Parks, Forests, and Special Management Areas within Permanent ROW (acres)	37.3	6.0	1.6	0.1	
State-Designated Land Based Trails (MN) within Construction ROW (number of crossings)	0	2	1	0	
State-Designated Land Based Trails (MN) within Permanent ROW (number of crossings)	0	2	1	0	
State-Designated Land Based Trails (IA) within Construction ROW (number of crossings)	8	4	1	0	
State-Designated Land Based Trails (IA) within Permanent ROW (number of crossings)	8	4	1	0	
Local and State Parks within 0.5 mile of the centerline (acres)	423.2	8.0	416.9	8.0	
Snowmobile Trails (MN) within Construction ROW (number of crossings)	8	14	9	7	
Snowmobile Trails (MN) within Permanent ROW (number of crossings)	8	14	9	7	
Snowmobile Trails (IA) within Construction ROW (number of crossings)	0	0	0	0	

Recreation and Tourism

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Snowmobile Trails (IA) within Permanent ROW (number of crossings)	0	0	0	0	
State-Designated Trout Streams (MN) within Construction ROW (number of crossings)	0	0	0	0	
State-Designated Trout Streams (MN) within Permanent ROW (number of crossings)	0	0	0	0	
State-Designated Trout Streams (IA) within Construction ROW (number of crossings)	0	0	0	0	
State-Designated Trout Streams (IA) within Permanent ROW (number of crossings)	0	0	0	0	
Scenic Byways (MN and IA) within Construction ROW (number of crossings)	0	1	0	0	
Scenic Byways (MN and IA) within Permanent ROW (number of crossings)	0	1	0	0	

FOH = Friends of the Headwaters

IA = Iowa

MN = Minnesota

ROW = right-of-way

Population^a

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
MN					
Populated Areas ^b Crossed by the Centerline (number of populated areas)	0	1	0	0	
Population of Populated Areas Crossed by the Centerline (total population)	0	41,311	0	0	
Populated Areas Crossed by the Centerline (miles)	0.0	0.57	0.0	0.0	
Populated Areas Located within 1,250 feet of Construction ROW (acres)	20.36	321.89	0.0	49.28	
IA					
Populated Areas Crossed by the Centerline (number of populated areas crossed)	10	3	2	1	

Population^a

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Population of Populated Areas Crossed by the Centerline (total population)	81,220	4,602	687	64	
Populated Areas Crossed by the Centerline (miles)	5.59	0.62	1.38	0.39	
Populated Areas Located within 1,250 feet of Construction ROW (acres)	1,598.03	244.50	430.56	129.09	

Notes:

^a Breakdown of population data for each populated area crossed available, but not included for this summary table.

^b Populated areas include cities and census designated places.

FOH = Friends of the Headwaters

IA = Iowa

MN = Minnesota

ROW = right-of-way

Employment and Income

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
MN Counties – Per Capita Personal Income^a					
Blue Earth	\$27,324	\$27,324			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Brown	\$28,444				
Dodge			\$30,495		
Faribault	\$28,168				
Freeborn		\$27,332	\$27,332	\$27,332	
La Sueur		\$29,714			
Mower		\$27,459	\$27,459	\$27,459	
Nicollet	\$28,089	\$28,089			
Sibley	\$28,811	\$28,811			
Steele			\$28,736		
Waseca		\$27,179	\$27,179	\$27,179	
Average	\$28,167	\$27,987	\$28,240	\$27,323	
MN Counties – Median Household Income^a					
Blue Earth	\$52,119	\$52,119			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Brown	\$53,319				
Dodge			\$68,718		

Employment and Income

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Faribault	\$60,029				
Freeborn		\$60,824	\$60,824	\$60,824	
La Sueur		\$75,887			
Mower		\$68,106	\$68,106	\$68,106	
Nicollet	\$61,501	\$61,501			
Sibley	\$59,596	\$59,596			
Steele			\$58,141		
Waseca		\$53,199	\$53,199	\$53,199	
Average	\$57,313	\$61,605	\$61,798	\$60,710	
MN Counties – Labor Force^a					
Blue Earth	38,519	38,519			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Brown	13,912				
Dodge			11,510		
Faribault	7,291				
Freeborn		16,013	16,013	16,013	
La Sueur		15,384			
Mower		20,241	20,241	20,241	
Nicollet	19,175	19,175			
Sibley	8,343	8,343			
Steele			19,531		
Waseca		9,997	9,997	9,997	
Average	17,448	18,239	15,458	15,417	
MN Counties – Unemployment Rate^a					
Blue Earth	4.9%	4.9%			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Brown	2.7%				
Dodge			3.3%		
Faribault	3.1%				
Freeborn		4.6%	4.6%	4.6%	
La Sueur		4.3%			
Mower		5.8%	5.8%	5.8%	
Nicollet	3.5%	3.5%			
Sibley	4.2%	4.2%			
Steele			4.3%		
Waseca		4.7%	4.7%	4.7%	
Average	3.7%	4.6%	4.5%	5.0%	

Employment and Income

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
IA Counties – Per Capita Personal Income^a					
Bremer		\$31,001			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Buchanan		\$30,216			
Cedar	\$29,271				
Cerro Gordo	\$28,763				
Chickasaw		\$26,915	\$26,915	\$26,915	
Clinton	\$27,116	\$27,116			
Delaware		\$29,978			
Fayette		\$26,002			
Franklin	\$24,909				
Grundy	\$32,953				
Hancock	\$27,732				
Hardin	\$27,657				
Howard		\$25,567	\$25,567	\$25,567	
Iowa	\$28,640				
Johnson	\$31,981				
Jones		\$27,891			
Marshall	\$25,197				
Mitchell		\$25,990	\$25,990	\$25,990	
Poweshiek	\$26,583				
Scott	\$30,037				
Tama	\$26,144				
Winnebago	\$25,917				
Average	\$28,064	\$27,853	\$26,157	\$26,157	
IA Counties – Median Household Income^a					
Bremer		\$64,264			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Buchanan		\$55,881			
Cedar	\$60,435				
Cerro Gordo	\$64,815				
Chickasaw		\$48,013	\$48,013	\$48,013	
Clinton	\$50,067	\$50,067			
Delaware		\$59,452			
Fayette		\$47,711			
Franklin	\$47,524				
Grundy	\$61,606				
Hancock	\$54,813				

Employment and Income

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources	
Hardin	\$51,821					
Howard		\$49,199	\$49,199	\$49,199		
Iowa	\$55,099					
Johnson	\$56,808					
Jones		\$55,507				
Marshall	\$54,193					
Mitchell		\$52,564	\$52,564	\$52,564		
Poweshiek	\$50,725					
Scott	\$56,454					
Tama	\$53,833					
Winnebago	\$49,278					
Average	\$54,819	\$53,629	\$49,925	\$49,925		
IA Counties – Labor Force^a						
Bremer		13,394				Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Buchanan		10,702				
Cedar	10,277					
Cerro Gordo	23,248					
Chickasaw		6,332	6,332	6,332		
Clinton	24,025	24,025				
Delaware		9,695				
Fayette		10,397				
Franklin	5,185					
Grundy	6,453					
Hancock	5,674					
Hardin	8,743					
Howard		4,787	4,787	4,787		
Iowa	8,828					
Johnson	83,133					
Jones		9,973				
Marshall	20,635					
Mitchell		5,420	5,420	5,420		
Poweshiek	10,045					
Scott	88,127					
Tama	8,768					
Winnebago	5,557					
Average	22,050	10,525	5,513	5,513		

Employment and Income

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
IA Counties – Unemployment Rate^a					
Bremer		3.2%			Data were obtained from the United States Census Bureau – American Fact Finder, 2016
Buchanan		3.8%			
Cedar	3.3%				
Cerro Gordo	4.1%				
Chickasaw		3.2%	3.2%	3.2%	
Clinton	4.6%	4.6%			
Delaware		3.4%			
Fayette		4.3%			
Franklin	5.4%				
Grundy	3.8%				
Hancock	1.8%				
Hardin	3.4%				
Howard		3.7%	3.7%	3.7%	
Iowa	1.8%				
Johnson	3.2%				
Jones		4.5%			
Marshall	5.9%				
Mitchell		3.6%	3.6%	3.6%	
Poweshiek	4.3%				
Scott	4.9%				
Tama	5.7%				
Winnebago	6.6%				
Average	4.2%	3.8%	3.5%	3.5%	
Tax Revenues					
MN					
Government Revenue					Unable to verify and determine sources used in FEIS to analyze tax revenue information
County Tax Property Tax Revenue					
Share of Government Revenue from Property Taxes					
IA					
Government Revenue					Unable to verify and determine sources used in FEIS to analyze tax revenue information
County Tax Property Tax Revenue					
Share of Government Revenue from Property Taxes					

Employment and Income

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Tax Generated					
MN					
Estimated Income Tax Generated from Direct and Indirect Construction-Related Income					Results derived from the utilizing the IMPLAN model software. Unable to calculate due to access.
IA					
Estimated Income Tax Generated from Direct and Indirect Construction-Related Income					Results derived from the utilizing the IMPLAN model software. Unable to calculate due to access.

Notes:

^a Counties greyed out are those not located in the route segment analyzed.

FEIS = Final Environmental Impact Statement

FOH = Friends of the Headwaters

IA = Iowa

MN = Minnesota

Cultural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Number of archaeological sites within Permanent ROW	9	24	0	4	Data was obtained from the IA and MN SHPOs. It represents the most current data as of January 2018. It includes only those resources reported to the respective SHPO.
Number of archaeological sites within Construction ROW (exclusive of permanent ROW)	3	9	0	1	
Number of archaeological sites within 0.5 mile	194	110	0	19	
Number of archaeological sites within 1 mile	392	134	3	30	Data was obtained from the MN SHPO. It represents the most current data as of January 2018. It includes only those resources reported to the respective SHPO.
Number of historic structures within Permanent ROW	0	0	0	0	
Number of historic structures within Construction ROW (exclusive of permanent ROW)	0	1	0	0	
Number of historic structures within 0.5 mile	0	33	5	2	Data for IA was not included in this analysis.

Cultural Resources

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Number of historic structures within 1 mile	0	48	8	4	
Number of cemeteries within 0.5 mile	25	17	7	1	Data based on ESRI shapefile.
Number of cemeteries within 1 mile	46	38	11	5	
Number of NRHP-listed properties within Permanent ROW	1	1	0	0	NHRP information acquired from the National Park Service datasets.
Number of NRHP-listed properties within Construction ROW	1	1	0	0	
Number of NRHP-listed properties within 0.5 mile	6	2	0	0	For the FOH SA-04 Segment Alternative – one resource is noted in two locations; however, it is counted as one resource within the 0.5 and 1 mile counts.
Number of NRHP-listed properties within 1 mile	9	5	2	0	

ESRI = Environmental Systems Research Institute
 FOH = Friends of the Headwaters
 IA = Iowa
 MN = Minnesota
 NRHP = National Register of Historic Places
 SHPO = State Historic Preservation Officer

Chapter 10 Tables

Spills

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Acres of HCA populated area within 2,500 feet of CL	3265	1975	781	509	
Acres of HCA unusually sensitive ecological area within 2,500 feet of CL	4425	2124	0	214	Subtracted duplicate areas from GIS analysis for FOH Original and FOH Segment Alternative
Acres of region of interest HCA drinking water sources within 2,500 feet of CL	107	1671	682	192	Subtracted duplicate areas from GIS analysis for SA-04 Segment Alternative, FOH Original, and FOH Segment Alternative
Acres of WPAs within 2,500 feet of CL	440	755	2416	435	Subtracted duplicate areas from GIS run for SA-04 Segment Alternative
Number of wells within 2,500 feet of CL	1536	1860	429	381	Further breakdown of well types was not reliable with available Cardno dataset. Reviewing FEIS cited sources, various datasets appeared to be used including personal communication to develop numbers.
Acres of reservation lands within 2,500 feet of CL	0	0	0	0	
Acres of Biological Interest within 2,500 feet of Centerline					
Aquatic management area	0	0	0	0	
Scientific and natural area	0	0	0	0	
Easement	523	745	193	101	Available Cardno data do not differentiate between easement types. This row includes Minnesota Bureau of Water and Soil Resources conservation easement, Wetland bank easement, and Emergency Watershed Protection Program Easement acreages.

Comment [TE41]: How do the spills vulnerability relate to Karst vulnerability? There is nothing relating the two here. Need more explanation on these tables and spills risk assessment. A text description would be helpful here.

Comment [DR(42): May want to say something about this large number as well.

Comment [M(C43): See above comment? Seems there are some in SNAs in MN.

Spills

Measurement/Data Evaluated	SA-04 FOH Reroute	Comparable Segment of SA-04	SA-04 Segment Reroute	Comparable Segment of SA-04	Notes on Data Sources
Lakes of biological significance	0	0	0	0	
Marginal cropland	0	0	0	0	
MBS sites	0	0	0	0	
Muskie lakes	0	0	0	0	
Native plant communities	0	0	0	0	
Native prairies	0	0	0	0	
Sensitive lakeshore areas	0	0	0	0	
Trout lakes	0	0	0	0	
Wild rice lakes	0	0	0	0	
Acres of Commodity Production Areas of Interest within 2,500 Feet of CL					
National forests	0	0	0	0	
Other forest land	0	62	0	0	
State forest	0	0	0	0	
Harvested wild rice lakes	0	0	0	0	
Acres of Recreation and Tourism Areas of Interest within 2,500 Feet of CL					
State plan/recreational areas	286	269	0	76	Includes recreational areas such as parks; also includes Emergency Watershed Protection Program Easement
State parks	54	347	0	347	
Wildlife Management Areas	743	111	0	111	
Waterfowl production areas	0	0	0	0	

CL = centerline
 FEIS = Final Environmental Impact Statement
 FOH = Friends of the Headwaters
 GIS = geographical information system
 HCA = high consequence area
 MBS = Minnesota Biological Survey
 WPA = wellhead protection area

Comment [TE41]: How do the spills vulnerability relate to Karst vulnerability? There is nothing relating the two here. Need more explanation on these tables and spills risk assessment. A text description would be helpful here.

Comment [M(C44): Again does not seem consistent with table above. Perhaps these need cross referenced? Or explained why the deviation?

Comment [TE45]: Why marginal and not Prime farmland?

Comment [M(C46): Again seems a need to cross reference all categories with tables above to ensure consistency.

Comment [RD47]: This data doesn't match construction and operation table above.

Comment [TE48]: These do not match the tables above. Why are they different?