Minnesota INTERFAITH POWER & LIGHT

Docket No: 22-422
Project Name: Otter Tail to Wilkin Carbon Dioxide Pipeline Project
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https://apps.commerce.state.mn.us/web/project/14959

Three interconnected environmental emergencies face our communities, here and around the globe:

> The climate crisis.
> The destruction of ecosystems.
> Pollution.

Each of these crises grows in magnitude every passing year. And each will continue to grow, with consequences falling like dominoes, until we stop adding to the problems with the further extracting, refining, and burning of fossil fuels.

At COP 28, the world's climate conference held in Dubai this past November, United Nations Secretary General Antonio Guterres spoke with clarity about the only path holding hope to limiting global climate catastrophe:

> "The science is clear. The 1.5 limit is only possible if we ultimately stop burning all fossil fuels. Not reduce. Not abate. Phaseout with a clear timeframe aligned with 1.5 degrees."

It is the perspective of the signing organizations that the draft environmental impact assessment for the Otter Tail to Wilkin Carbon Dioxide Pipeline Project does not offer a partial solution or path to address these crises, but exacerbates them each in the pursuit of a system that extends the life of unsustainable ethanol production in service of the fossil fuel industry's desire to never be phased-out.

This comment centers on impacts of the proposed pipeline in three general areas, identifying needed information and suggestions for improving this DEIS to more accurately discern the proposal's most likely:

1) Impact on Climate
2) Impact on Rural Communities and Ecosystems
3) Impact on Wider Water Systems

The stated purpose of the project is to "reduce the carbon intensity of the ethanol produced and thereby improve the ethanol plant's ability to compete in low carbon fuel standard (LCFS) markets."

While it is not within the scope of the DEIS to evaluate the appropriateness of the LCFS as a policy, it is the purview of the DEIS to discern the environmental impacts that will likely result from this project so that decision makers can weigh potential benefits in one category against harms in others.

I. Impact on Climate

Enhanced Oil Recovery Facilitated by the Proposed Pipeline Must Be Acknowledged as Likely

Though the permit application by Summit Carbon Solutions says it has no plans to use the CO_2 captured at the ethanol plant for enhanced oil recovery, there is a great deal of evidence that would suggest the captured CO_2 would inevitably be used for enhanced oil recovery to facilitate the extraction of more oil than would otherwise be accessible.

1. **Statements made by Summit Carbon Solutions**
   Company representatives have said enhanced oil recovery could be facilitated by this pipeline:

   "If another carrier decided to use, or ask us to transport CO2 for another purpose, like enhanced oil recovery, then that's a possibility."
   - Jimmy Powell Summit Carbon Solutions COO, **Sept. 5, 2023,** IUB hearing[1]

   "Summit is also exploring other options, including injecting the gas into depleted oil fields to boost oil production."
   - Bruce Rastetter, CEO of Summit Carbon Solutions AG, **March 2, 2021,** MPR News article[2]

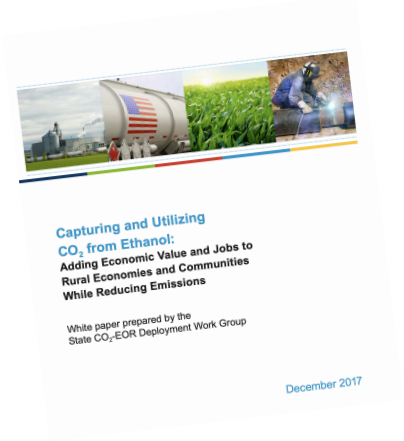
2. **State Work Group Report (2017) outlining plan for using CO_2 from ethanol plants for EOR**

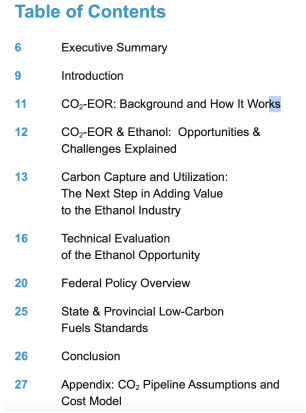
[1] Beach, J. (2023, September 5). Summit Carbon Solutions leaves open transporting CO2 for oil wells. *Agweek*. https://www.agweek.com/news/policy/summit-carbon-solutions-leaves-open-transporting-co2-for-oil-wells

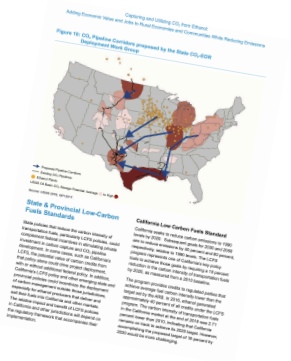
[2] Associated Press. (2021, March 2). Iowa company wants to store carbon dioxide under North Dakota. *MPR News*. https://www.mprnews.org/story/2021/03/02/iowa-company-wants-to-store-carbon-dioxide-under-north-dakota

A December 2017 report prepared by the State CO_2 - EOR Deployment Work Group articulated the business plan to take CO_2 captured at ethanol facilities through a to-be-built network of pipelines to oilfields so the CO_2 can be used for Enhanced Oil Recovery.

The Table of Contents includes the role Low Carbon Fuel Standards play in supporting this business plan.







3. Oil Industry Demand for CO_2 for Enhanced Oil Recovery

Representatives of the oil industry in North Dakota and their allies have said they need CO_2 to get more oil from their marginally producing oil fields.

President of the North Dakota Petroleum Council, Ron Ness, said: “The use of EOR (enhanced oil recovery) techniques is critical to our future success. By injecting CO_2 in wells as they decline in productivity, EOR will substantially extend the life of a well and the amount of oil that can be recovered from that well.”[3]

Ness has also said:
"We have the opportunity to extend the life of the Bakken another 30 to 50 years, and produce another 5 to 8 billion more barrels, just because of technology."[4]

Covering a decision by the North Dakota Public Services Commission to deny a permit for Summit Carbon Solutions, KFYR-TV reported the Director of the North

[3] Ron Ness, *The Future of Oil and Natural Gas Industry in North Dakota is Bright*, North Dakota Petroleum Council, https://www.ndoil.org/the-future-of-oil-and-natural-gas-industry-in-north-dakota-is-bright/.

[4] Paul Jurgens, *North Dakota Expects to Reach 5 Billion Barrel Mark in Oil Production in 2024*, KFGO, Dec. 29, 2023, https://kfgo.com/2023/12/29/north-dakota-expects-to-reach-5-billion-barrel-mark-in-oil-production-in-2024/.

Dakota State Department of Mineral Resources, Lynn Helms, saying of using CO_2 for enhanced oil recovery:

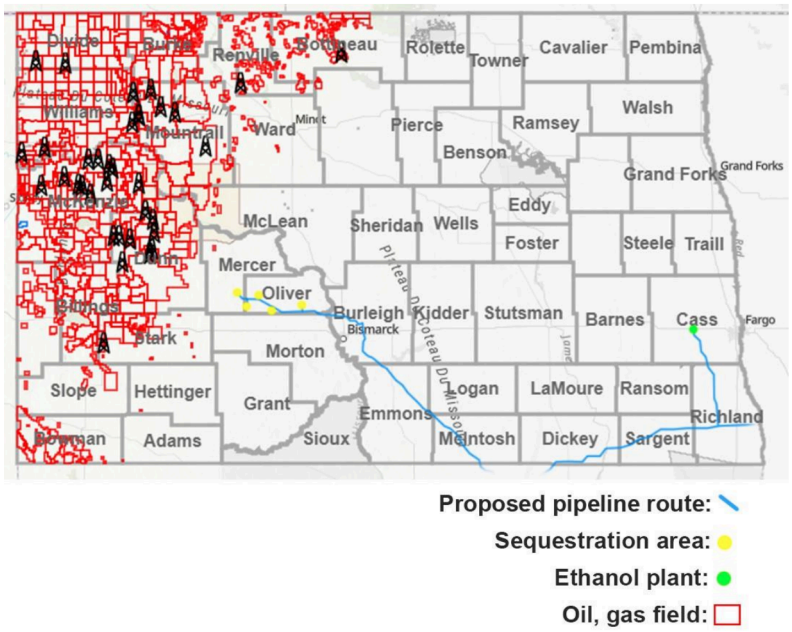
“We’ve got to find a way for carbon capture and utilization to become a part of North Dakota’s economy or we will leave billions of barrels of oil in the ground.”[5]

John Harju, Vice President of Strategic Partnerships at the Energy and Environmental Research Center in Fargo, North Dakota, has stated:

"I think if we don't get adequate volumes of CO_2 to our Bakken system, we're going to leave 90-plus percent of the oil in the ground."[6]

Importantly, industry allies have explicitly stated that North Dakota will need to get this CO_2 from other states.[7]

4. **Proximity of CO_2 pipeline end points to oil fields**
   The proposed pipeline project will deliver carbon to the direct vicinity of oil wells, as shown in the map below from the ND Public Services Commission/ND Oil and Gas Division.



[5] Michael Anthony, *North Dakota Department of Mineral Resources Warns More CO2 Needed to Sustain Oil Production Long-Term*, KFYRTV, Aug. 16, 2023, https://www.kfyrtv.com/2023/08/16/north-dakota-department-mineral-resources-warns-more-co2-needed-sustain-oil-production-long-term/.

[6] Jurgens, 2023.

[7] Jurgens, 2023.

Map Courtesy of ND Public Services Commission/ND Oil and Gas Division, republished in *South Dakota Searchlight*, "Critics Allege CO2 Pipelines Farm the Government for Climate Money While Helping Oil Industry" November 10, 2023 [8]

5. **As a pipeline is considered a "Common Carrier,"** there is no way to ensure that the CO_2 captured and transported via those pipelines will not end up being used for EOR.

To suggest that the CO_2 captured in Minnesota and taken to North Dakota by pipeline will not have a strong chance of being used for EOR is to ignore the facts of the situation. It is incumbent upon the EIS to acknowledge there is a very strong likelihood that the CO_2 captured at the ethanol plant in Minnesota will be used for enhanced oil recovery and further perpetuate the burning of fossil fuels.

Emissions Result from the Pipeline Delivering CO_2 for Enhanced Oil Recovery Must Be Calculated and Attributed to this Pipeline

It is imperative that emissions from oil extracted through enhanced oil recovery be included in the emissions assessments and carbon intensity scores for this document and others. The impact of continued burning of fossil fuels has significant environmental implications – not just for our ability to meet climate goals, but also for the communities who suffer from the pollution fossil fuels create – including extraction, refining, transportation and burning.

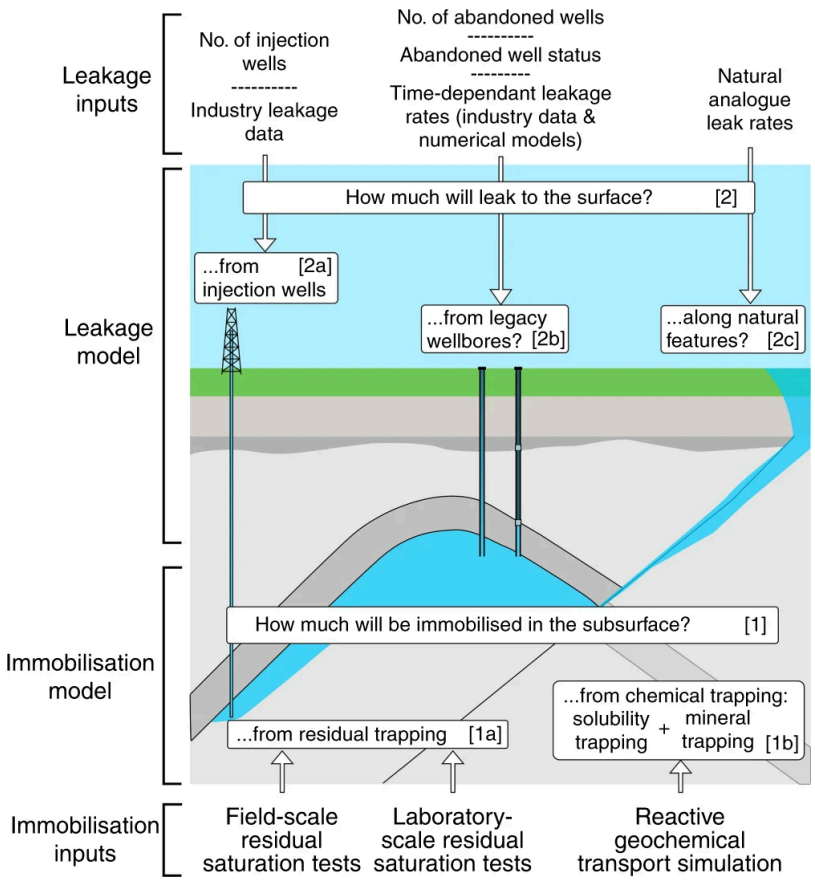
Sequestration Discussion Must Acknowledge CO_2 Leakage Potential and the Increased Probabilities for Leaks if Not Monitored and Repaired Continuously

The DEIS is calculating emissions on the assumption that carbon sequestration will have a positive impact on climate and carbon emissions. This is not an appropriate assumption with accounting for potential leakage during and after the sequestration process.

"Sequestered" CO_2 leaks into the atmosphere in a variety of ways, as shown by the graph below from a Nature study and the carbon emissions from this leakage must be calculated and attributed to this proposed pipeline project[9].

[8] South Dakota Searchlight. (2023, November 10). Critics allege CO2 pipelines farm the government for climate money while helping oil industry. https://southdakotasearchlight.com/2023/11/10/critics-allege-co2-pipelines-farm-the-government-for-climate-money-while-helping-oil-industry/

[9] Alcalde, J., Flude, S., Wilkinson, M. *et al.* Estimating geological CO2 storage security to deliver on climate mitigation. *Nat Commun* 9, 2201 (2018). https://doi.org/10.1038/s41467-018-04423-1



In addition, the DEIS should note that continued sequestration requires substantial monitoring and maintenance, a responsibility that industry has indicated a desire to discharge. For instance, in the Texas state legislature proposed bills "would allow operators to pass on their liability to the state 10 years after their injections end. Similar laws are already in place in North Dakota and Wyoming" [10].

Monitoring sequestration sites is a massive and expensive job. Without investment in proper and continuous monitoring for hundreds of years, the sequestered CO_2 is likely to escape.

Carbon Intensity Values Must Not Be Grounded in Flawed Science

One of the most serious concerns surrounding the establishment of a market framework for reducing emissions is that industry stakeholders might try to rig the game in their

[10] Webb, S. (2023, April 17). Why injecting CO2 underground is a legal morass. *E&E News*. Retrieved from https://www.eenews.net/articles/why-injecting-co2-underground-is-a-legal-morass/

favor. It is therefore imperative to demonstrate scientific trustworthiness by rejecting those studies that lack integrity.

The Scully et al. study (2021)[11] is deeply flawed and should not be allowed to inform the assignment of carbon intensity scores for the ethanol plants or producers under review in this or other proposals.

Two examples illustrate how the Scully study is not a credible review of the state of the science of corn ethanol for purposes of assigning carbon intensity.

1) **Scully deconstructs then recombines data**[12] from different studies to arrive at its own estimate for the carbon intensity of land use change to corn production – *which is lower than any of the studies in the range of estimates it considered* – then labels this new lower number a "central best estimate."

   See Figure 1 below, reproduced from Spawn et al.

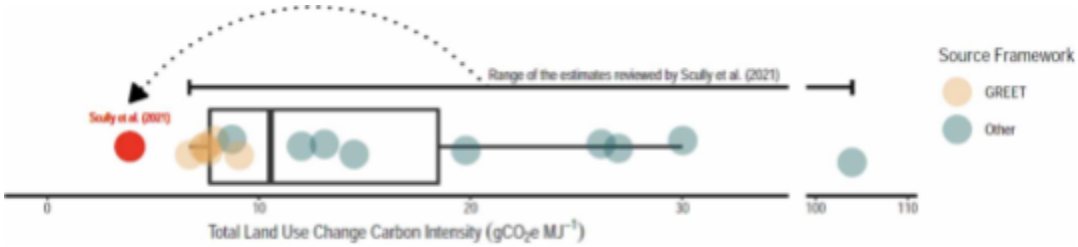


Figure 1. Boxplot of all the studies initially considered by Scully *et al (represented by blue and beige dots)*, as well as the much lower estimate the Scully et al authors advance after reviewing these studies (represented by the red dot). Each dot shows the total land use change carbon intensity estimate from a particular study. These values were taken from figure 2 of Scully *et al*.[4]

2) **Scully creates its own model to predict that the conversion of pastureland to cropland results in soil carbon sequestration instead of losses**.[13] Scully achieves this by assuming the land history to be "50 years as cropland followed by 25 years of pasture and 25 years of cropland" — essentially pre-depleting the

[11] Melissa J Scully et al 2021 Environ. Res. Lett. 16 043001
[12] Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001

[13] Extensive research that shows soil carbon is "generally lost upon converting perennial vegetation to annual cropland regardless of the land use history or subsequent tillage regime." (See Spawn at p. 3 and footnotes 15-21). Spawn states "To our knowledge, there exists no empirical evidence supporting the proposition that cropland-pasture conversion to corn production generally enhances soil organic carbon stocks." (Spawn at p. 4)

baseline soil organic carbon stocks then misleadingly calling it conversion from pastureland to cropland.

The Scully study was funded by Poet, a large biofuels producer, and has been widely cited by industry interests as determining that corn ethanol is up to 46% less carbon intensive than gasoline. The flawed methodologies and assumptions underlying this study should make its findings ineligible for use in determining carbon intensity scores.

For a more detailed analysis of the Scully Study please reference Appendix A or view a full file here.

Please note: the DEIS mistakenly states on page 6-5 that the values in Table 6-1 do not account for land use change. In fact, flawed as it is, the Scully Study *does* portray itself as determining carbon intensity values that incorporate land use change.

The EIS Should replace the Scully study findings with the Lark study findings in all tables, graphs, calculations and analysis.

The DEIS creates unwarranted confusion about different studies, wrongly suggesting that some incorporate land use changes while others don't.

Table 6-1 should list the two fuels relevant to the analysis of the value of the proposed pipeline:

- Corn ethanol
- Gasoline

The carbon intensity score should be based on the Lark study[14] which the DEIS references ("*Research funded by the National Wildlife Federation and DOE found that ethanol is likely at least 24 percent more carbon-intensive than gasoline due to emissions from land use change associated with corn cultivation practices"*) but fails to apply to the fuels receiving carbon intensity scores (page 6-5).
Furthermore, the carbon intensity score found in the Lark study represents a floor, not a ceiling.[15]

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[14] The Lark study was peer reviewed and published in the *Proceeding of the National Academy of Sciences.* Lark TJ, Hendricks NP, Smith A, Gibbs HK. Environmental outcomes of the US renewable fuel standard. PNAS. 4 2022;119(9). Https: ///www.pnas.org/content/119/9/e2101084119. See also https:www.reuters.com/business/environment/us-corn-based-ethanol-worse-climate-than-gasoline-study-finds-2022-02-14/.

[15] "The findings of Lark et al. (4) are all the more striking in that their estimate of GHG emissions from RFS2 represents a floor, not a ceiling. They draw this conclusion from observations of changes in farming that occurred in the United States, but there are other major emissions sources they did not explore that, when accounted for, only add to the emissions attributable to corn ethanol" including "three such sources: 1) greater production of nitrogen fertilizers, which are derived from fossil fuels; 2) international land use change, such as when farmers in other countries convert forests and grasslands to agriculture in response to higher commodity prices; and 3) the fuel market rebound effect, which is an overall rise in fuel consumption in response to greater fuel supply. Other studies have indicated that emissions from these sources can be substantial in their contribution to total biofuel emissions." https://www.pnas.org/doi/pdf/10.1073/pnas.2200997119

The statement: *"Conventional fuels such as gasoline and diesel, which have the highest CI scores"* is not grounded in the research it cited just words before. (Page 6-5)

Without the flawed Scully Study, but instead using the DEIS's acknowledgement of the study indicating that "ethanol is likely at least 24 percent more carbon-intensive than gasoline": the carbon intensity value assigned in Table 6-1 must reflect that the carbon intensity of corn ethanol is most likely significantly higher than gasoline.

Carbon intensity comparisons and emission calculations must be based on credible science.

EIS must acknowledge that the system of creating value for CO_2 pollution from ethanol production creates a perverse feedback loop: the more you burn, the more you earn.

The DEIS should acknowledge that building pipelines for the commodification of CO_2 pollution encourages the continued production of ethanol and CO_2 pollution, even in the context of market forces that might otherwise diminish its production. Creating value for pollution creates an incentive to keep creating the pollution: the more you burn, the more you earn.

II. Impact on Rural Communities and Ecosystems

Water usage for all aspects of construction and operation must be determined prior to the completion of the EIS for review by the public and decision-makers

The DEIS acknowledges the need to minimize impact on groundwater resources, but defers providing information by placing this responsibility on the Department of Natural Resources permitting. Independent calculations should measure the impact of this project on groundwater and this information must be provided as part of the EIS.

Making the assumption that the DNR permitting system will stop any long-term impacts on water resources as explained in the DEIS Page 5-126 is not appropriate.

In 2021, Enbridge quickly exceeded their water permits and eventually applied for a ten-fold increase for dewatering [16] [17] [18] The impact on groundwater is important and far-reaching and deserves to be analyzed and reported to the public.

[16] https://files.dnr.state.mn.us/features/line3/2022-10-17-lasalleclearwater-agreement-fullyexecuted.pdf
[17] https://drive.google.com/file/d/1uBX32upqv5KbmD1ej6QJqPITLO0OLGVp/view
[18] https://waadookawaadamikwag.org/dewatering)

Minnesota continues to suffer the consequences of drought and over-commitment of water supplies. The DEIS must have a project specific assessment done on how this project throughout its lifetime, including the carbon capture technologies used, will impact these current drought conditions.

Discussion of Horizontal Directional Drilling Should Acknowledge the Likelihood of Many Frac-Outs and Related Impacts

Communities rely on accurate and quantifiable data to assess the environmental impacts of drilling and pipeline projects. Horizontal Directional Drilling (HDD) is destructive and polluting to ecosystems and it is incumbent on the EIS to fully acknowledge and explain this.

Despite Line 3 permit application claims that there was only a "low" probability that HDD drilling would result in a frac-out, it happened: 28 times.

From the MPCA spill data shared on August 9, 2021, Enbridge had thus far in the construction caused:

- 28 unique spill incidents in 21 water crossings
- 63% (12 out of 21) of the HDD crossings were polluted with drilling fluid
- 80% of the rivers crossed with HDD were impacted

Aquifer breaches are another outcome from pipeline construction, as we have seen from Line 3. This must be discussed in the EIS.

Also, it is simply not accurate for the EIS to portray HDD as being a benefit to wildlife and stream health as it seems to do on page ES-10:

> *"Most impacts on wildlife would be highly localized, short-term, and negligible. Impacts on freshwater species would be minimized by the use of HDD techniques and sediment controls. Operation of the project would have minimal impact on wildlife and their habitats"*

Discussion of Frac-outs should acknowledge that drilling mud releases create oil slicks at the water's surface and also indicates significant drilling-mud deposits under the surface – both of which need cleaning up.

Drilling mud at the surface of the water is like the tip of an iceberg – it is connected to a whole lot more underwater. Enormous plumes of drilling mud remain in the water unless it is removed. The DEIS should explain how the drilling mud will be tracked and then removed from the water or land when it is inadvertently leaked, not just from the top of the water where the drilling mud surfaces, but from the point of the leak. Merely

collecting what is at the surface leaves most of the drilling mud polluting the water, impacting water quality, habitat, vegetation and wildlife.

The EIS should discuss the impacts of this drilling mud on ecosystems, including consultation with ecosystem and species specialists about the impact of polluted water on the health of the ecosystem, not just in the immediate area but in the areas that are downstream from and connected to the area of pollution and degradation.

Use of the words “Minimal” and “Temporary” Distort True Consequences of the Proposed Project.

Definitions are critically important: they can help us understand or they can serve to camouflage important information.

The report uses the term ‘minimal’ over 60 times to describe the estimated impact on agriculture, environmental aesthetic, property value, public health, infrastructure, recreation, socioeconomics, air quality, topography, animal and vegetation habitat loss, soils and ecosystems, and the environment broadly.

However, the DEIS defines “minimal” to cover a very broad range of significant impacts, thereby not providing an understandable assessment of what landowners or the public might expect. According to the definitions, even “negligible” impacts are “short-term impacts that affect common resources.” “Minimal” is more than “negligible” and could affect “common resources over the short- or long-term.”

It is disingenuous for a long term impact to be called minimal. Using the term “minimal” in this EIS disguises in every instance the nature of the damage and how long it might be expected to last.

Quoting from the report on page 5-2:

> *Impact intensity levels are as follows:*
>
> - *Negligible impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.*
>
> - *Minimal impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.*

“Minimal,” used dozens of times through the DEIS, varies in its definition. For example, ‘minimal’ means anywhere from 2-3 years to 5 years of interrupted crop production (ES-6). This language is contradictory and confusing.

The use of ‘temporary’ suffers from the same problem. The DEIS uses ‘temporary’ over 40 times, with no consistent definition (page 5-38).

The point of the EIS is to help people understand the impact of the proposed project: it is incumbent on the EIS to use language that clarifies the range of impacts possible for each category that is explored. Instead of using words like “minimal” or “temporary” the description should say name the impact itself and how long it is possible the impact could be affecting the ecosystem.

The DEIS should acknowledge and assess the risk of water contamination from pesticides associated with ethanol production.

Further investment in ethanol production infrastructure incentivizes its continued use and maintains or grows the environmental consequences associated with that system. Pesticide application to corn crops is one such issue. Pesticide treated seeds also can cause harm, particularly if waste from these seeds are not disposed of properly.

An ethanol plant disaster in Mead, Nebraska in 2021 is a poignant example of environmental and human health harm from neonicotinoids in treated corn seed: significant water contamination and poisoning of the ecosystem. The rapid decline of bee colonies near Mead was an early warning sign, prompting investigations that uncovered unsafe levels of neonic compounds[19] [20].

Overall, the Mead ethanol plant disaster underscores the interconnectedness between ethanol production, environmental sustainability, and public health. A complete EIS would consider these risks. Understanding the effects of pesticide contamination on water quality and ecosystem health is important for informed decision-making and effective mitigation strategies.

III. Impact on Wider Water Systems

The EIS Must Acknowledge and Evaluate How Depleting Groundwater Supplies in MInnesota Impacts Communities Across the Continent

Lack of Groundwater in Minnesota has National Effects

[19] Neonics are neurotoxins that can have adverse effects on both insects and potentially human health, with long-term impacts still not fully understood.
[20] Rural Health Information Hub. (n.d.). Ethanol plant disaster creates environmental and human health concerns for rural community in Mead, Nebraska. https://www.ruralhealthinfo.org/toolkits/emergency-preparedness/case-studies/chemical-emergencies/mead-nebraska#:~:text=At%20one%20point%2C%20the%20ethanol,as%20it%20is%20too%20toxic.

Water is interconnected: depletion in one area can have rippling consequences nationwide.[21] Minnesota's drought and lack of groundwater retention, exacerbated by the depletion of aquifers, have far-reaching implications extending beyond state lines. As we remove water from the ground, soils compress and collapse, leading to sinking land surfaces. This phenomenon especially threatens cities built on drained marshland or fill.[22]

Lack of groundwater also impacts surface waters – consequences which are felt from the top to the bottom of a watershed.

The decrease of freshwater flow downstream from the Mississippi River is resulting in saltwater creeping upstream. This “slow-motion crisis” has devastating effects on communities and their drinking water and now is merely 25 miles away from New Orleans.

Peter LaFontaine with *Friends of the Mississippi River*, a Minnesota environmental organization, interviewed Matt Rota of Healthy Gulf, an environmental nonprofit working to strengthen environmental justice and protection in Louisiana and the lower Mississippi basin. Rota said that “when it comes to long-term resiliency, the farm landscape of the Midwest has these extensive drainage systems designed to get the water off the ground as quickly as possible. [If] we changed that to make sure the water is held in the ground as long as possible, [it] would buffer against both droughts and floods.”

This problem has a clear link to groundwater and drought issues in the Midwest. The design of the Midwest's extensive drainage systems exacerbates groundwater depletion and stifles the downstream flow of freshwater, in turn threatening the accessibility to clean drinking water in Louisiana. Minnesota farms exceeded pumping permits by a staggering 6 billion gallons in 2021, putting into question the state's ability to sustainably manage its water resources[23].

The EIS must acknowledge and analyze the role depleting groundwater resources and surface waters has on ecosystems and communities throughout the watershed.

Sincerely,

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[21] LaFontaine, P. (2023, October 12). Minnesota's drought contributes to drinking water crisis downriver. *Freshwater Society*. https://fmr.org/updates/water-legislative/minnesotas-drought-contributes-drinking-water-crisis-downriver.
[22] Rojanasakul, M., & Hernandez, M. (2024, February 13). The East Coast is Sinking. *The New York Times*. https://www.nytimes.com/interactive/2024/02/13/climate/flooding-sea-levels-groundwater.html.
[23] Stanley, G. (2023, February 18). Fighting drought, potato farmers in northern Minnesota overdrew their water permits by tens of millions of gallons. *Star Tribune*. https://www.startribune.com/drought-potato-farmers-in-minnesota-overdrew-water-permits-by-tens-millions-gallons-r-d-offutt/600252769/?refresh=true.

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Appendix

A. Scully Study Fact Sheet

Scully's Low Lifecycle Emissions Analysis for Corn Ethanol is Not Credible

In 2021, Scully et al.'s article "Carbon intensity of corn ethanol in the United States: state of the science" posits that the carbon intensity of corn ethanol is 46% lower than gasoline.[1]

Published in Environmental Research Letters, the analysis was funded by POET, LLC, a large biofuels producer, and conducted by scientists and engineers from the consulting group Environmental Health & Engineering. This page discusses some of the flaws in the Scully analysis that render its conclusions biased, unrealistic and misleading.

Scully's Methodology and Assumptions Were Designed to Serve its Funder's Goal
How the Scully study is not a credible review of the 'state of the science' of corn ethanol

Despite calling itself a review of the state of the science,

> **Scully deconstructs then recombines data** from different studies[2] **to arrive at its own estimate** for the carbon intensity of land use change to corn production – which is lower than any of the studies in the range of estimates it considered[3] – then labels this new lower number a "central best estimate."[4] *See Figure 1, reproduced from Spawn et al.[5]*

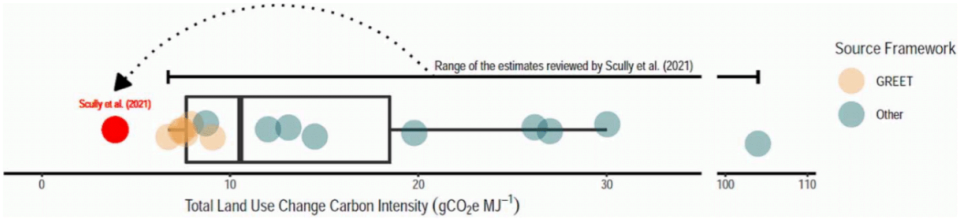

Figure 1. Boxplot of all the studies initially considered by Scully *et al (blue and yellow dots)*, as well as the much lower estimate the Scully et al authors advance after reviewing these studies (red dot). Each dot shows the total land use change carbon intensity estimate from a particular study. These values were taken from figure 2 of Scully *et al.*[4]

This lower carbon intensity figure largely results from revising downward the predicted emissions associated with land use change.[6] How does Scully achieve this?

1. **Scully selects its favorite criteria** for its assumptions about whether land is converted to corn production, self-determines these to be 'best practices,' then dismisses all other studies that include different criteria.[7] "Ultimately, select elements of just 2 of the 16 studies Scully et al initially reviewed comply with these criteria."[8]

2. **Scully creates its own model to predict the soil organic carbon gains or losses** from conversion of pastureland to cropland results in soil carbon sequestration.[9] Scully achieves this by assuming the land history to be "50 years as cropland followed by 25 years of pasture and 25 years of cropland" — essentially pre-depleting the base line soil organic carbon stocks.[10]

Scully's self-created model for predicting the emissions impact of land use change spins out over time to assert that cropland expansion sequesters more carbon in the soil than pastureland – counter to empirical evidence and ecological understanding. To do this it pre-depletes the base line soil of organic carbon stocks by assuming a land use history that is 25 years of cropland before the corn is planted.

Scully's self-created model also

- predicts that carbon sequestration takes place "regardless of the accompanying tillage and yield assumptions." [11]
- assumes achieving higher yields, but leaves out the greenhouse gas implications from the additional fertilizer needed to presumably produce those yields. [12]

Scully's non-scientific methodologies lead independent researchers to say:

"**Scully et al provide neither a comprehensive nor an impartial review.** In all, the C intensity of Scully et al for corn-grain ethanol is hardly credible."

[Scully] has "the potential to spawn perverse policy outcomes by attributing far greater climate benefits to the production and use of corn grain ethanol than can be supported by current evidence." [13]

1 Melissa J Scully et al 2021 Environ. Res. Lett. 16 043001, p. 16.

2 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, p. 5.

3 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, Figure 1, p. 2.

4 Melissa J Scully et al 2021 Environ. Res. Lett. 16 043001, p. 7.

5 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, p. 2.

6 "Yet, their proposed value proves to be considerably smaller than all prior estimates, an outcome that primarily results from their profoundly reduced estimate of LUC emissions (figure 1)." (Spawn p. 2)

7 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, p. 2.

8 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, p. 2.

9 Extensive research that shows soil carbon is "generally lost upon converting perennial vegetation to annual cropland regardless of the land use history or subsequent tillage regime." (See Spawn at p. 3 and footnotes 15-21). Spawn states "To our knowledge, there exists no empirical evidence supporting the proposition that cropland-pasture conversion to corn production generally enhances soil organic carbon stocks." (Spawn at p. 4)

10 "By simulating the most recent 25 years of cropland-pasture as cropland, this treatment effectively pre-depletes the simulated baseline of soil organic carbon stocks such that when cropland-pasture is subsequently converted to corn production in the model, its soil organic carbon is predicted to respond similar to converting generic 'cropland' to corn production." (Spawn p. 3)

11 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, p. 3.

12 "Scully et al, for example, assume a large degree of cropping intensification in their treatment of LUC, which presumably requires additional fertilizer and amendments that would increase emissions from the 'farming' sector. Yet, because they determine farming emissions separately as the mean of a GREET-based estimate and their own revisions to ecoinvent, their estimate does not appear to account for these additional intensification emissions." (Spawn p. 5)

13 Seth A Spawn-Lee et al 2021 Environ. Res. Lett. 16 118001, p. 6.