
**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA**

**IN THE MATTER OF THE
APPLICATION BY SCS CARBON
TRANSPORT LLC FOR A PERMIT TO
CONSTRUCT A CARBON DIOXIDE
TRANSMISSION PIPELINE**

HP22-001

**INTERVENORS
LEROY WEISZHAAR AND
JOAN WEISZHAAR
INITIAL PRE-FILED TESTIMONY
IN OPPOSITION TO SUMMIT'S
APPLICATION**

Q: Please state your name.

A: We are LeRoy Weiszhaar and Joan Weiszhaar and we provide testimony here on our own behalf.

Q: Do you either personally own or lease land or are you a fiduciary for or member or beneficiary of any entity that owns or leases land or real property in South Dakota, that you believe would be negatively affected by the proposed Summit hazardous CO2 pipeline (hereafter "proposed hazardous pipeline")?

A: Yes.

Q: For the land discussed here that would be affected and impacted by the proposed hazardous pipeline, give the Commissioners an understanding of how long the land has been in your family including a little history of the land and its importance to you.

A: We have lived on this farm since 1968, nearing 56 years. We are a 3-generation operation with the 4th growing up and learning right alongside of us. We are very proud to live and work on a farm and ranch in South Dakota the addition of this pipeline in the ground right alongside a current natural gas pipeline would be in our opinion a very bad decision. We are simply against any pipeline project that is for private gain to any company while exercising the use of eminent domain. If I could put the meaning of our land in a dictionary it would say exactly that ITS OUR

EXHIBIT

LO87

exhibitsticker.com

LAND which means we bought it we paid for it we pay the taxes on it so we do what is appropriate for it on our terms not somebody else's

Q: Do you depend on the income from your land to support your livelihood or the livelihood of your family?

A: Yes, we rely on the land to provide a way to pay for the property, also to help sustain our operation as we have worked extensively to increase the size of our operation that means income is of the utmost importance. Our goal is to keep this operation passing down to the next generation.

Q: As far as you know, does Attachment No. 1 purportedly depict Summit's "preliminary route" and preliminary permanent easement and other easements they desire across your property for pre-construction, construction, maintenance and operation of their proposed hazardous pipeline on, under, across, over, and through the land described?

A: As far as I know, yes. This is what they refer to as "**Exhibit B**" to their proposed Easement and is the best estimation we have been provided or able to obtain. However, as described this appears to be preliminary and not final. We don't "know" what the final proposal is or isn't or exactly how much land and the location of all the negative impacts should the PUC approve this project to cut across my land. They have not confirmed specifically and exactly what permanent, temporary, access, and other easements and property rights they seek on our land, and it appears they believe they have the power to unilaterally and at any moment move and or expand the perpetual and "temporary" easements they seek. The uncertainty around this is troubling and it seems they are seeking permission from the PUC for the idea of a route rather than a final route.

Q: As you analyze Summit's proposed "preliminary" route and easements across your property, as depicted Attachment No. 1, please describe your property and its particular features and characteristics such that the Commissioners will be able to understand why digging, trenching, constructing, and operating a

hazardous CO2 pipeline across your property is challenging or simply a bad idea in your opinion.

A: Any route is obviously going to cause problems for us. We have ground that is native range land that will never be the same after a major disturbance to that soil. Digging that up will allow weeds to infiltrate and make a large dip in the ground. The already existing pipeline trench from the natural gas line has left an existing big dip in the ground and that was put in in the 1980's. This would be no different. We still are uneasy with this route running so close to that existing pipeline.

If the PUC approves Summit's proposed route, they therefore authorize Summit's proposed easements near or potentially on our land as well as force upon us all the terms of Summit's easement forever. These potential actions by the PUC would have a permanent – forever – negative effect and impact on our land as well as our financial future, and on the economy of our county and State. If the PUC approves Summit's proposed route, they therefore authorize Summit's proposed easements near or potentially on our land as well as force upon us all the terms of Summit's easement forever. These potential actions by the PUC would have a permanent – forever – negative effect and impact on our land as well as our financial future, and on the economy of our county and State.

Q: What is your understanding of the Public Utilities Commission's (PUC) role related to this proposed hazardous pipeline?

A: Based on information provided in a PUC document entitled "South Dakota Public Utilities Commission Information Guide to Siting Pipelines" which is included here as **Attachment No. 2**, and my participation in these matters, I understand the PUC has the power to approve or deny Summit's Permit Application. If approved by the PUC, Summit would be able to forever route and site its proposed hazardous pipeline on, under, through, over, and across my land in question here and conduct any pre-construction, construction, and post-construction activities they deem necessary at any time, forever, that it wants without my permission. If the PUC were to approve the Application and the route approved crossed any portion of my land,

I would then be subject to an easement agreement which restricts what I can do on my land and how I, my tenants, invited persons, and all future generations can conduct ourselves on the land – forever. An approval by the PUC is the trigger for Summit to condemn my land using eminent domain powers to which I am opposed. So, the PUC has in its hands whether or not me and all future generations who seek to use, develop, and work the land in question as we see fit will be unwillingly subjected to unwanted and restrictive permanent easements preventing us from doing so and subjecting us to liability and risk. The PUC’s actions, if approval of the Application, would also negatively impact our economic future forever. The PUC has my and this lands entire future in its hands.

Q: Have you heard or read that the PUC has nothing to do with easements or similar claims?

A: Yes, and that is logically and practically an incorrect assertion. Can you have a pipeline route without easements? The answer is no – a pipeline route is simply a series of connected easements – that’s what a route is. This pipeline will not be built without PUC Approval and easements. If and only if the PUC approves this hazardous pipeline application will my land and all future owners, tenants, and visitors to my land be negatively affected by pipeline easements, access easements, work space easements, and all the limitations, restrictions, dangers, and risks associated with those easements and what this proposed hazardous pipeline company and its future owners can do on my land and prevent me from doing on my land. No PUC approval means no unwanted easements and no unwanted property right transfer from me to the hazardous pipeline company. You cannot separate what the PUC is doing in this proceeding with the taking of my property rights. PUC approval is a vote by this Commission that it is okay for my property rights to be taken and forever affected against my will and for the benefit of the proposed hazardous pipeline and for the economic gain of its wealthy investors.

Q: And what about the condemnation piece – the PUC says it has nothing to do with condemnation have you heard that and if so, what do you think?

A: I have heard that claim but again, same logic as above – no PUC approval means there is no project and no economic incentive to attempt to use eminent domain powers to condemn my land and my property rights. Only if the hazardous pipeline wanted to intimidate and scare me or send me a “message”, or if they were so confident that this process is a rubber stamp for them would they start condemnation actions before the PUC officially approved the route. But even if they would start condemnation prematurely, they would not go through the entire process and trial and the ultimate final taking of my rights unless the PUC approved their Application, so no PUC approval means there will not be a final forever taking of my land or property rights.

Q: What should the PUC consider when assessing how the proposed hazardous pipeline will directly affect your land and property rights?

A: In addition to what I have already discussed, you cannot have an intelligent consideration of a Route Application without reviewing Summit’s proposed Easement Agreement (herein referred to as the “Easement”) with a fine-tooth comb. This is the document that is part and parcel of a PUC Application approval. When you think about what a Pipeline Route is you conclude it is simply a long-connected chain of many Easements – no easements, no route. It is important to me that the PUC review this document in detail, understand the implications, and then consider all the implications relative to my land and property and how it is being used now and thinking into the future – forever – of how a PUC approval would therefore affect my land and my family. Each and every factor, as discussed in **Attachment No. 2**, is implicated by the Easement. A true and accurate copy of an example South Dakota Summit “Easement Agreement” is included here as **Attachment No. 3**. The provisions and terms found in this exemplar are consistent with what has been presented to me.

Q: Please walk through the Easement and highlight your major concerns so the Commission can understand how their approval of Summit’s Application would affect you forever.

A: Well, the first question and concern I have is the company that would have perpetual rights in my land is identified as Summit Carbon Solutions, LLC, a Iowa limited liability company with its principal office in Ames, Iowa.¹ I have tried to determine who owns this LLC and what its assets are but I can't figure it out and I am very concerned that the PUC could force this LLC upon me and no one knows who is behind the LLC curtain. Summit has refused to disclose the hidden layers of LLC member entities so that it is a secret who Summit really is and the PUC has no idea who it is dealing with. If I am forced against my will to have a co-owner of my land via Summit's desired perpetual easement against my land to do as they see fit within the easement language, then I want to know exactly who I am dealing with and the PUC should require the LLC to reveal its owners and investors and if those owners and investors are also entities the PUC should require transparency **at every level of ownership** so we ultimately know the real people behind this newly formed for-profit private company. When looking up Sumit Carbon Solutions, LLC on the Iowa Secretary of State website it states the LLC was formed on June 28, 2021 – and it says it is a Foreign Limited Liability Company and that the actual state of incorporation is Delaware not Iowa as the Easement suggests. This Iowa Secretary of State search also reveals these companies that appear to be related:

Business Entities Results

 [print](#)

Searched: **Summit Carbon**

Results 1 - 6 of 6

<u>Business No.</u>	<u>Name</u>	<u>Status</u>	<u>Type</u>
677862	SUMMIT CARBON CAPTURE III, LLC	Active	Legal
677575	SUMMIT CARBON CAPTURE II, LLC	Active	Legal
671355	SUMMIT CARBON CAPTURE, LLC	Active	Legal
700745	SUMMIT CARBON PROJECT HOLDCO LLC	Active	Legal
646300	SUMMIT CARBON SOLUTIONS, LLC	Inactive	Legal
677150	SUMMIT CARBON SOLUTIONS, LLC	Active	Legal

When you then turn to the Delaware Secretary of State business entity search, it reveals these entities:

¹ See page 1 of the Easement

FILE NUMBER	ENTITY NAME
4931823	SUMMIT CARBON CAPTURE ALASKA, LLC
5004361	SUMMIT CARBON CAPTURE HOLDINGS, LLC
5004363	SUMMIT CARBON CAPTURE, LLC
5644331	SUMMIT CARBON HOLDINGS, LLC
6494069	SUMMIT CARBON PROJECT HOLDCO LLC
5927410	SUMMIT CARBON SOLUTIONS, LLC

What we have learned from the North Dakota PSC Summit proceedings is that as of May 9, 2023, these entities owned some or all of SCS Carbon Transport LLC, which is the North Dakota PSC Applicant and the South Dakota PUC Applicant: Summit Agriculture Group, SK Group, Tiger Infrastructure Partners, TPG Rise Climate, and Continental Resources, Inc.

Q: What is your next concern the PUC should be aware of?

A: Summit’s Easement refers to not only it as the “Company” involved but the defined term “Company” also includes any and all of Summit’s unknown “successors and assigns.” This means if the PUC approves Summit’s Application it is automatically approving any future unknown person, entity, country, or foreign sovereign wealth fund – including potentially countries and interests adverse to South Dakota and the United States – to be my unwanted partner in my land – forever. I have no vote, no power, and no say-so.

Q: What is your next concern the PUC should be aware of?

A: Summit’s Easement states that we, as “Landowner” “hereby grants, sells and conveys unto Company [Summit and all future unknown successors and assigns], for use by Company and its agents, employees, designees, contractors, guests, invitees, successors and assigns, and all those acting by or on behalf of it, the following easements...”² Again, we are not forced to deal only with Summit –

² *Id.* Para 1 Grant.

because the Easement says any unknown “agent, employees, designees..” etc. can use all the easements described.

Q: What is your next concern the PUC should be aware of?

A: Summit’s desired easements on my land are all shown as “approximate locations” so no one really knows the actual location or size of their desired easements and taking on my land and I don’t believe the PUC should approve an “approximate” route – they should evaluate a precise route, so this process is completely transparent.

Q: What is your next concern the PUC should be aware of?

A: Summit’s desires several easements, one is referred to as “Pipeline Easement” and it is to be “fifty feet (50’) in width” and “free and unobstructed” and “permanent.” I can’t understand why Summit should be approved by the PUC to have a “permanent” easement when they are not proposing a permanent or forever project. Also, the fact they demand a “free and unobstructed” easement calls into question what we can do on and across the easement forever.

Q: What is your next concern the PUC should be aware of?

A: Summit states in their Easement that they can use the desired “Pipeline Easement” for “the purposes of owning, accessing, surveying, establishing, laying, constructing, reconstructing, installing, realigning, modifying, replacing, improving, substituting, operating, inspecting, maintaining, repairing, patrolling, protecting, changing slopes of cuts and fills to ensure proper lateral and subjacent support for and drainage for, changing the size of, relocating and changing the route or routes of, abandoning in place and removing at will, in whole or in part, one pipeline not to exceed twenty-four inches (24") in nominal diameter...” I want the PUC to understand that evaluation of the factors found in **Attachment No. 2** must be analyzed considering Summit can permanently and forever not only locate a hazardous pipeline on my land but also at anytime and forever access, survey, modify, patrol, cut and change the contours and slopes of my land, change and relocate the pipeline route, and abandon the pipeline in place, all on my land and

without any permission or say-so from me or future owners. These rights alone, and we are still in the first paragraph of the Easement, not only poses a threat of serious injury to my social and economic condition but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region. All of the above uses they want are “for the transportation of carbon dioxide and its naturally occurring constituents and associated substances and any appurtenant facilities above or below ground, including aerial markers, power drops, telecommunications, cathodic protection, and such other equipment as is used or useful for the foregoing purposes ...”³ So, while they are marketing now the transportation of Carbon Dioxide, they have the wiggle room to change that at anytime to anything that could fit under “and its naturally occurring constituents and associated substances...” Where are the limits? I thought this was a CO2 pipeline only. If the PUC were to approve this Application, which it should not, it must limit what can be transported in this hazardous pipeline. Clearly, not knowing the limitations of what could be flowing on, under, through, and across my land also poses a threat of serious injury to my social and economic condition but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region. They also can place any facility and equipment of any kind above the ground or below ground on my land so long as Summit deems it “as is used or useful for the foregoing purposes” which covers any and everything they choose to do. So, it appears what they would be able to do with the Pipeline Easement includes about everything and there are no time limitations, restrictions, or notice requirements as to any of these activities. Should the PUC approve this hazardous pipeline, which it should not, it should require reasonable limitations as to when these activities can be performed, for how long, and should be required to notify landowner well in advance of any such activity or entry onto landowner’s land.

³ *Id.* para 1.a.

Further, Summit's desired right to abandon in place their hazardous pipeline on my land must not be allowed. Should the PUC approve this hazardous pipeline, which it should not, it should require Summit, at landowner's sole request, to remove the pipeline. If a landowner does not request this or if Summit and a particular landowner reach agreement and financial terms allowing the hazardous pipeline to remain, that should be up to each landowner. There is no provision for Landowner compensation for such abandonment nor any right for the Landowner to demand removal. Such unilateral powers and the threat and ability to abandon the pipeline in place poses a threat of serious injury to my social and economic condition but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern the PUC should be aware of?

A: The Easement language and powers are far too vague and wide ranging, again no limitations and these roving rights Summit would claim subject me and my property to significant restrictions as their rights dominate mine; this will prevent me and future owners and users of my land from improving and developing the land in the ordinary course. These restrictions have negative economic impacts now and into the future. I will not be able to increase the value and usable features on my land and will not do so in fear of having to remove any such desired improvements or be subject to Summit's claims my desires interfere with their Easement rights. The less I can improve my land, the less valuable it is, the less real property and personal property tax is generated, and the more South Dakota is harmed.

Q: What is your next concern the PUC should be aware of?

A: The second easement Summit seeks is a "Temporary Easement." However, there is no definition of how long this can be and it only terminates "on the Company's delivery to Landowner of written notice of termination..." If the PUC were to approve this Application, which it should not, in addition to locating a hazardous pipeline on my land Summit reserves the sole right to also locate upon my land and use temporary construction areas and additional temporary workspaces areas. There

is no limitation on how large these can be and there is no limitation on what “temporary”⁴ means. How long is temporary? How long would Summit be able to argue “temporary” is all the while prohibiting me from using my land how I see fit.

Q: What is your next concern the PUC should be aware of?

A: The next easement sought is an “Access Easement” which again is a “free and unobstructed” easement “in, to, through, on, over, under, and across” my land forever “for the purposes of ingress and egress to the Pipeline Easement...” and to the “Temporary Construction Easement and for all purposes necessary and at all times convenient...” to Summit. So, if the PUC approves this Application, which it should not, Summit gets a blanket easement and access across my entire property forever that I have to keep “free and unobstructed.” This means I cannot locate equipment, livestock, or anything that could hinder Summit’s unrestricted total access of my land. Summit would take a forever right to travel anywhere it desires on my entire Property – not just within the Easement area. This ability to have free reign on a landowners’ entire property reduces the value of the property and chills my desire to economically improve my property which again is a detriment not only to me but to the entire State in lost tax revenue. Such unilateral powers and the forever restrictions upon my land and me and all future generations poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, Summit unilaterally can determine the final location of the pipeline and it does not have to be in the middle of the easement: “the centerline of the pipeline may not, in all instances, lie in the middle of the Pipeline Easement.” See Easement paragraph 2 “Location.” To make matters worse – should Summit chose to change location,

⁴ See para 1.b. of the Easement

Landowner then, at their time and cost, has review, execute, and deliver to Summit any correct documents or any modifications that Summit requests. See Easement paragraph 2 “Location.”

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, Summit seeks to limit the compensation available for all the easements and any other damages that Landowner would suffer up and until the time of Summit’s restoration of our land following pipeline installation. Additionally, Summit seeks to cap damages to growing crops and yield loss for the three years following the initial construction of the pipeline. Summit claims it will pay Landowner “a reasonable sum” for any “subsequent actual, proven damages to growing crops...” but there is no mechanism or metrics of how this would work. My research shows that previous Landowners have had difficulty getting compensation for damages caused by pipeline construction and given yield loss can continue decades into the future this provision should concern the PUC. These provisions and limitations pose a threat of serious injury to my social and economic condition.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, Summit does not have to repair or restore my land to as good a location or better as it found it as that claim in promotional statements. In fact, Summit only has to restore my land “insofar as reasonably practicable...” as solely determined by Summit. See Easement paragraph 4 – “Restoration.” Should there be a dispute in this regard, Landowner would have to incur more costs, expenses, and wasted time hiring legal counsel and perhaps experts, and likely litigating the matter. Therefore, these provisions and limitations pose a threat of serious injury to my social and economic condition.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, Summit would have the unilateral power to tell Landowner what they can and can’t do on all of the

easements. If anything, that Landowner wants to do on their property above the surface of where the pipeline or any easement is located that in Summit's "sole discretion" "causes a safety hazard or unreasonably interfere[s]" with Summit's rights, then Landowner is prohibited from taking such action. See Easement paragraph 5.a. – "Landowner's Use." Such restrictions chill the natural use of the property and negatively affects the value of the property and poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, I cannot, unless previously being given permission by Summit, construct anything on the easements, cannot drill or operate any well or equipment for production or development of minerals, cannot remove soil or change the grade or slope of my land, cannot impound surface water, and cannot plant trees or place landscaping. Landowner also cannot place any above ground or below ground "obstruction" of any kind that Summit may deem to interfere with or be inconvenient to operation of the pipeline or other Pipeline Facilities or use of the Easements without written permission from Summit – which they can withhold. See Easement paragraph 5.b. – "Landowner's Use." Worse yet, if I do utilize my property as I see fit, and Summit in its sole discretion determines any such actions in any way "...interferes or may interfere with its right..." then Summit "shall have the immediate right to correct or remove such violation or obstruction at the sole expense of Landowner." Such restrictions chill the natural use of the property and negatively affects the value of the property and poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, Landowner is prohibited “during the initial construction of the Pipeline Facilities or any construction, maintenance, repair, replacement or removal work on the Pipeline Facilities...” from using any portion of the Easements for any purpose. See Easement paragraph 5.c. – “Landowner’s Use.” Such restrictions chill the natural use of the property and negatively affects the value of the property and poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, I am prohibited from using my land for agricultural and pasturage purposes if they are in anyway interfere with Summit’s use of the Easement. So, assume Summit where to bury its proposed hazardous pipeline only four (4) or five (5) feet below the surface, then I can’t use any equipment with tires four (4) or five (5) feet in diameter or larger in my operations for fear if I would sink, the tires could come in contact with the pipeline. Preventing my ability to stay competitive and utilize larger equipment to work my land negatively impacts me by not allowing me to be as efficient as possible and reduces my profitability. There is no reason for me to keep buying the newest and latest equipment which hurts local businesses. All of this has a negative impact on the State’s economy and poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, Summit has the sole and exclusive “right to sell, assign, apportion, mortgage or lease this Agreement

[the Easement]...” otherwise transfer this Agreement in whole or in part...”⁵ If Summit exercises any of these rights and some unknown and unwanted party becomes the owner of the Easement on and pipeline and equipment on my land, not only do I have no say-so. Additionally, if Summit sells or assigns any part of the Agreement or the Easements to anyone else, then Summit “... shall be released from its obligations under this Agreement.” All of this has a negative impact on the State’s economy and poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region. If the PUC were to approve this Application, which it should not, it must require any new entity that would become owner or operator of this hazardous pipeline to first apply for and be granted permission to take this project over from Summit. Assignment to any unknown person, company, or government could have terrible impacts upon all of South Dakota depending upon who may buy it and I don’t know of any safeguards in place for us or the State to veto or have any say so in who may own, operate, or be responsible for this pipeline in the future. This concerns me because it would allow my easement to be transferred or sold to someone or some company or country or who knows what that I don’t know and who we may not want to do business with.

Q: What is your next concern the PUC should be aware of?

A: If the PUC were to approve this Application, which it should not, the liability and insurability aspects of this hazardous pipeline being forever located on my land are very concerning. See Easement paragraph 6 – “Indemnification.” Summit says it “shall pay commercially reasonable costs” for damages resulting from their use of the Easements. Why don’t they pay any and all costs if there is damage resulting from their use of the Easements? Who determines what “commercially reasonable” means? I doubt I do. How much expense and time and frustration does Landowner

⁵ See paragraph 7 of the Easement

go through fighting for payment of actual damages? The Easement also states that Company (Summit) shall indemnify and hold Landowner harmless for damages resulting from their use of their easements. Summit has acted as if this is a big concession – that they should be responsible for the damage they cause. However, their indemnification and hold harmless language does nothing at all to protect Landowner from any claim – a mere claim – that Landowner or its agents (tenants or others) acts of gross negligence or willful misconduct within the Easements caused damage. And there is no protection at all for any claims that Landowners or their agents took any action outside the Easements that may have caused issues within the Easements that then lead to damages or losses. Discussed in more detail later is Landowners inability to obtain liability insurance to protect itself from the damages and losses that occur when hazardous pipelines have a rupture or break that leads to a spill or release causing damages. Such restrictions chill the natural use of the property and negatively affects the value of the property and poses a threat of serious injury to my social and economic condition, but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then I have no liability protection and am directly exposed to liability as Summit offers no indemnification or hold harmless protections to me for what damages or injury occur on my property outside of the specific Easement areas. This is true because, as discussed above, if the PUC approves this Application, then Summit has a blanket right to access my entire property and is not limited to the Easements. Also, Summit can allege either I or any person whom is on my property is negligent or partially negligent and I could be subjected to damages claims that would bankrupt me. Summit also shifts potential liability to me for any of my negligent acts that may occur in the Easement areas.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then I am exposed for significant personal liability for any damages due to the existence of and potential release or rupture or spill from the hazardous pipeline. I have reviewed my insurance documents and coverage for my property and obtained information from my insurance company. I have learned that my insurance policies have what is known as a “pollution exclusion” and that I would have no insurance coverage should any damage or injury be caused by a carbon dioxide release from the hazardous pipeline as carbon dioxide is considered a “pollutant” under my policy. I have considered this scenario: “If a hazardous pipeline transporting carbon dioxide is placed upon my land, and either I or someone I have invited onto my land is determined to be responsible for some damage to the pipeline or responsible for an event that caused some damage to the pipeline, and then CO2 escapes and injures a person, or livestock, or property either on my own property or on my neighbors – do any of my insurance policies I have provide me a lawyer for a defense AND provide me insurance coverage to pay for the damage/injuries?” In considering these questions I have determined not only does my policy not afford me a lawyer and not afford me a legal defense that I also have no coverage for such a scenario, nor can I purchase coverage or an insurance rider. I would be completely unprotected and exposed to liability, and I would have to pay for my defense out of my own pocket and personally pay for and damages ultimately attributed to me. This is unacceptable. The PUC must deny this project for these reasons alone. The PUC cannot put landowners out in the cold to defend ourselves without any assistance. I should never have these kinds of risks due to the presence of a hazardous pipeline I do not want. If the PUC were to approve this Application, which it should not, it must require Summit to be solely responsible for any injuries or damages of any kind either directly or indirectly caused by any release of CO2 from their pipeline other than those caused by criminal acts of the landowners. The PUC must also require Summit to add each and every landowner and their tenants as additional insureds on all Summit liability insurance policies. The PUC should require that

Summit add each landowner and inhabitant and tenant on each affected property to Summit' insurance policy all as additional insureds.

Q: Do you have any other concerns about this liability issues?

A: When evaluating the impact on property rights implicated by Summit's Indemnity provision, you must consider the potentially extremely expensive fight a Landowner would have over this question of whether or not damage was an act of negligence. Putting this kind of potential liability upon the Landowner is incredibly problematic and is detrimental to the protection of property rights. I don't think this unilateral power which I can't do anything about as the landowner is in the best economic interest of the land in question or the State of South Dakota for landowners to be treated that way. This poses a threat of serious injury to my social and economic condition but it also substantially impairs my health, safety and welfare all the while unduly interfering with the orderly development of my land and therefor the region.

Q: Is there any specific event or example you are aware of that makes this concern more real for you?

A: Yes, one need not look further than a November 3, 2015, lawsuit filed against Nemaha County, Nebraska landowner farmers who accidentally/negligently struck two Magellan Midstream Partners, LP pipelines, one used to transport a mixture of gasoline and jet fuel and a second used to transport diesel fuel. Magellan alleged negligence and sued the Nebraska farmer for \$4,151,148.69. A true and accurate copy of the Federal Court Complaint is here as **Attachment No. 4**. The ability of a large company like Summit, or whoever buys their pipeline once they cash out to be able to sue me or place blame on me because they choose to put something on my land against my will is in no way in the public interest and is a reason this Application must be denied.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, then Summit forces landowner to deal directly with its tenant regarding any compensation landowner negotiates for any Easement or any damages landowner receives in terms

of allocating any such payments between landowner and tenant. This guarantees that landowner will never be made whole by Summit for such damages as landowner and tenant have different interests and should each independently be compensated by Summit for such damages. Landowner should not be made to be the agent of Summit to deal separately with claims its tenant may be entitled to bring for compensation.

Q: What is your next concern?

A: If the PUC were to approve this Application, which it should not, it is essentially approving a roving right for Summit to locate its hazardous pipeline anywhere on my land. On Exhibit B of the Easement it talks about “proposed route” “proposed pipeline easement” and states the Exhibit B is “is not intended to depict the final alignment.” It is not a plat or a survey. So, I am in the dark – as is the PUC – of what it would be approving given there is no “final” route to approve. The PUC should deny the Application on this basis alone. It is not fair for Summit to have a roving right across my entire property or any length, size, and location of easements on my land it desires.

Q: What is your understanding of the significance of the Easement as proposed by Summit?

A: My understanding is that this is the document that will govern all of the rights and obligations and duties as well as the limitations of what I can and cannot do and how I and any future landowner and any person I invite to come onto my property must behave as well as what Summit is and is not responsible for and how they can use my land forever. This is why the PUC cannot pretend the Easement is anything other front and center in these proceedings. No court no judge no jury can change the terms of the Easement, only the PUC now can consider what Summit wants to force upon all of the land at issue in these proceedings and consider those effects in terms of the factors the PUC is to consider when evaluating Summit’s Application.

Q: You have discussed a number of concerns of how you would be negatively impacted by the terms and restrictions in the Easement alone should the PUC

grant Summit's Application, do you think those negative effects go beyond just you as directly affected landowner?

A: Yes, while myself, my family, future generations, and my land would all be directly and negatively impacted it doesn't stop there. Just like Summit wants to claim there is a multiplier effect economically by the spending during construction and increased consumption by the workers or others in South Dakota, the flip side is that the negative impacts on me and my land are forever – the easement is forever and therefore any restrictions or limits or outright bans on my and any future landowners' ability to use their land as they see fit, and to improve or develop their land is a direct and ongoing negative economic impact locally on small business that are not getting contracted to do work or certain projects, I believe the value of my land decreases should this hazardous pipeline and associated Easement terms cast a cloud over my land forever, and I intend to protest my valuations and seek a reduction in property tax which will negatively affect that State – and Summit is not making this up. They will pay no real property taxes on any of the Easements obtained. My state also suffers due to the ripple effect of less development, expansion, and property improvement. This project has no net benefits – it is a net negative on the State.

Q. Do you have additional concerns how you would be negatively affected should the PUC approve this Application?

A: Yes, I didn't mention the compensation piece. Summit proposes to pay me one time only for the Easements. They do not propose recurring annual or quarterly payments. They make my land a liability when it was previously an asset. If this was forced upon us we should be paid a royalty of some percentage of the annual profits and value generated by Summit and its investors. They can't earn dollar number one without my land and the land of others and we should be compensated much differently than they propose. It is not fair to the landowner, the county, or the State. It is not fair to the landowner because they want to have my land forever for use as they see fit so they can make a daily profit from their customers. If I was to

lease ground from my neighbor I would typically pay twice a year every year as long as they granted me the rights to use their land. That only makes sense – that is fair. If I was going to rent a house in town I would typically pay monthly, every month until I gave up my right to use that house. By Summit getting out on the cheap and paying once in today’s dollars that is monthly, bi-annual, or at least an annual loss in tax revenue collection on the money I would be paid and then pay taxes on and contribute to this state and this country. It is money I would be putting back into my local community both spending and stimulating the local economy and generating more economic activity right here. Instead Summit’s shareholders keep all that money and it never finds its way to South Dakota.

Q: Do you think it is in the public interest of South Dakota to not be one-hundred percent clear on exactly who could become the owner of over hundreds of miles of South Dakota land?

A: No, Summit should have to reveal all of its owners at each level and all of those owners and so on until there is no mystery as to who is behind this newly formed deal company.

Q: Do you think it is in the public interest of South Dakota to not be one-hundred percent clear on exactly who will be operating and responsible for hundreds of miles of hazardous pipeline underneath and through South Dakota land?

A: No.

Q: Do you think that type of uncertainty and lack of control over a major piece of infrastructure crossing South Dakota is in the public interest?

A: No, certainly not, in fact, just the opposite.

Q: Does it makes sense to you that PUC approval of the Application would lead to a perpetual Easement affecting you and your land?

A: I am unaware of any data proving there is a perpetual supply of carbon dioxide and the irony is we are supposed to produce less carbon dioxide and curb those activities more each year so one of the purposes of this project renders it by definition very limited in time and not something that a permanent easement should be available.

Nowhere in Summit's application does it even attempt to argue let alone prove there is a perpetual necessity for this hazardous pipeline or to transport CO2 to unproven underground storage in North Dakota. My understanding of energy infrastructure like wind towers is they have a decommission plan and actually take the towers down when they become obsolete or no longer needed. Nothing manmade lasts forever. My land however will, and I want my family or future South Dakota families to have that land as undisturbed as possible and it is not in my interest or the public interest of South Dakota to be forced to give up perpetual and permanent rights in the land for this specific kind of pipeline project. It is also not prudent to authorize a forever interference on my property so Summit can chase twelve (12) years of tax credits at over \$1,500,000,000.00 per year.

Q: Do you have any other concerns about the Easement language that you can think of that is important for the PUC to know at this time?

A: Generally such unilateral restrictions and limitations on my rights are not conducive to the protection of property rights or my economic interest. I reserve the right to discuss any additional concerns that I think of at the time of live testimony during the Hearing.

Q: Based upon what you have shared with the Commission above regarding Summit's proposed Easement terms and agreement, do you believe those to be reasonable or just, under the circumstances of the pipeline's impact upon you and your land?

A: No, I do not believe those terms to be reasonable or just for the reasons that we discussed previously.

Q: As the owner of the land in question and as the person who knows it better than anyone else, do you believe that Summit offered you just, or fair, compensation for all of what they proposed to take from you so that their hazardous pipeline could be located across your property?

A: No, I do not. Not at any time has Summit, in my opinion, made a fair or just offer for all the potential impacts and effects and the rights that I'm giving up, and what

we will be prevented from doing in the future and how their pipeline would impact my property forever and ever.

Q: Has Summit ever contacted you and specifically asked you if you thought their proposed location of their proposed pipeline across your land was in your best interest?

A: No, they have not.

Q: Has Summit ever contacted you and specifically asked you if you thought their proposed location of their proposed pipeline across your land was in the public interest of the State of South Dakota or for public use?

A: No, they have not.

Q: Are you familiar with the Fifth Amendment to the U.S. Constitution and the Takings Clause and the corollary in the South Dakota Constitution?

A: Yes, I am.

Q: What is your understanding as those relate to taking of an American citizens property?

A: My understanding is that, according to the United States Constitution and South Dakota's Constitution, that if the government is going to take land for public use, then in that case, or by taking for public use, it can only occur if the private landowner is compensated justly, or fairly.

Q: What is your understanding of the PUC's framework for decision making relative to this proposed hazardous pipeline?

A: **Attachment No. 2** includes four (4) main elements of proof that Summit has the sole burden to prove as summarized here: a) that Summit will comply with all applicable laws and rules; b) that no aspect of Summit's proposed hazardous pipeline will pose a threat of serious injury to: the environment, or to the social condition of current inhabitants or expected inhabitants in the siting area, or to the economic condition of current inhabitants or expected inhabitants in the siting area; c) that no aspect of Summit's proposed hazardous pipeline will substantially impair the health, safety, or welfare of the inhabitants; and d) that no aspect of Summit's

proposed hazardous pipeline will unduly interfere with the orderly development of the region – with special consideration given to the views and positions of the governing bodies of affected local units of government.

Q: What is your testimony regarding whether or not Summit will comply with all applicable laws and rules?

A: That is impossible for the PUC to know and therefore it can't find in Summit's favor on that element. This type of analysis can only be based on what Summit claims it will do and given they have already admitted to failing to follow the law regarding their failure to timely and sufficiently notify all required persons affected by their Application and proposed route, the evidence available weighs against this element being able to be satisfied. Further, South Dakota counties have passed moratoria, ordinances, and regulations related to hazardous pipeline setbacks and other issues and Summit has not yet committed to following those applicable laws and rules and rather has stated they will not follow them or has sued to get out of following so rules and regulations. Until Summit dismisses all these lawsuits against the various counties and affirmatively agrees to abide by any such setbacks and other ordinances, the PUC must deny their Application for failure to meet their burden of proof as to this element.

Q: Do you believe any aspect of Summit's proposed hazardous pipeline will pose a threat of serious injury to the environment?

A: Yes, I do. There are many aspects of the proposed hazardous pipeline that pose threat of serious injury to the environment. I adopt and incorporate here all such concerns of all other witnesses. There are many such environmental concerns and I also adopt and share those as incorporated here and found in **Attachment No. 5**, It's Time to End Carbon Capture of Climate Policy; **Attachment No. 6**. The facts, opinions, and arguments referenced here by no means include all such threats posed but highlight some of the many.

Q: Do you believe any aspect of Summit’s proposed hazardous pipeline will pose a threat of serious injury to the social condition of current inhabitants or expected inhabitants in the siting area, if yes, why?

A: Yes. The proposed Summit pipeline will pose a threat of serious injury to current future and social conditions, for the following reasons.

The proposed project’s finances and commercial foundation are dependent for ongoing commercial viability on the federal 26 U.S.C. § 45Q carbon capture tax credit program, which I will refer to as the 45Q Program. This dependency creates a risk to South Dakota’s social conditions. The purpose of the 45Q program is to reduce carbon emissions as a means to mitigate climate change. It was originally established by Congress in 2008 with a maximum tax credit benefit of \$20 per metric ton of carbon captured and sequestered. In 2018, Congress increased this value to \$50 per metric ton. In 2022, Congress further increased the value to up to \$85 per metric ton as part of the Inflation Reduction Act. The 45Q Program tax credits are available for the first twelve years of a capture facility’s operation, but the program has no limit on the total amount of tax credit claims by taxpayers or the tons of carbon dioxide sequestered. Thus, the 45Q program does not limit the number of capture, transportation, and sequestration projects it may support. Further, these tax credits are essentially transferrable and the Inflation Reduction Act allows certain entities to claim them as a cash benefit paid by the U.S. Treasury, in certain circumstances converting this tax credit into a federal grant.

The Summit Project was proposed in 2021 when the 45Q tax credit for sequestered carbon stood at \$50 per metric ton. Then, in 2022, the tax credit was increased to \$85 per metric ton. At a tax credit rate of \$85 per metric ton, and given the Summit pipeline system’s ultimate capacity of 15 million metric tons per year, the emitters of carbon dioxide that are contracted with Summit could receive up to \$1.275 billion in federal tax credits per year, or \$15.3 billion over twelve years. This federal tax benefit would provide essentially all of the revenue needed to pay for construction

of the proposed project as well as Summit's ongoing transportation and sequestration services. That is, the proposed Summit Project is financially entirely dependent on the ongoing existence of the federal 45Q Program.

The Summit Project does not appear to have any other current government subsidies or market-based support sufficient to support its financial viability. Summit claims that its contracted ethanol plants may benefit from the low carbon fuel credits currently available in California, as well as possible similar programs that may be established in other states. However, the value of these low carbon credits is highly variable and dependent on supply of and demand for such credits. The more entities that lower their carbon score, the less valuable the credits become. The carbon dioxide emitters that are connected to the Summit system may be able to benefit from low carbon fuel credits to some degree, but by themselves such credits would likely not support the construction and ongoing operation of the proposed project. Low carbon fuel credits existed before Congress increased the value of the 45Q tax credits to levels that made the proposed project financially viable, indicating that the low carbon fuel credits by themselves were not sufficient to support development of regional carbon capture pipelines systems. Thus, low carbon fuel standard programs, now and in the future, are unlikely to provide sufficient financial benefits to justify the construction and ongoing operation of Summit's proposed pipelines.

Another possible commercial foundation for the Summit system is use of captured carbon dioxide in enhanced oil recovery operations. For example, carbon dioxide has been captured at the Arkalon and Bonanza ethanol plants in Kansas, since 2009 and 2013, respectively and transported to enhanced oil recovery operations 15 miles to Oklahoma and 90 miles to Texas, respectively. However, these existing ethanol carbon capture and enhanced oil recovery projects have always been dependent on the 45Q Program and are much smaller scale projects. Moreover, enhanced oil using supercritical carbon dioxide has existed since the 1970s, but has not generated sufficient revenue by itself to support the cost of constructing carbon capture

facilities and transporting anthropogenic carbon dioxide long distances to enhanced oil recovery operations. If enhanced oil recovery had been sufficiently profitable without federal subsidies to support anthropogenic carbon capture, then the carbon capture industry would have grown without the need for federal tax credits. Therefore, it is very unlikely that use of the captured carbon dioxide for enhanced oil recovery would by itself support the costs of constructing and operating the proposed project.

In addition, there is a commercial market for limited amounts of carbon dioxide for use in industrial and retail settings, but the total demand of such commercial markets is very small relative to the capacity of the Summit Project, and existing demand is met via existing carbon dioxide production facilities. Commercial demand for carbon dioxide is simply too small to support infrastructure on the scale of the proposed project.

Neither the low carbon fuel credits, enhanced oil recovery, nor other existing commercial uses of carbon dioxide are likely to provide sufficient revenue to support development of carbon capture systems on a scale of the Summit Project. Thus, the Summit Project's current and future financial viability is entirely dependent on the continuation of the 45Q Program.

This dependency creates substantial long-term risks to the financial security of South Dakota's ethanol and corn industries. First, unlike other federal agricultural programs that subsidize South Dakota's otherwise market-based agricultural economy, the market for captured carbon dioxide is based for all practical purposes entirely based on the 45Q Program. The 45Q Program does not subsidize an existing market-based industry; it creates an entirely new industry, namely the carbon dioxide sequestration industry, which collects a pollutant and disposes of it. The 45Q Program converts a liability (carbon dioxide) into an asset. Absent the 45Q program, the carbon dioxide sequestration industry would not exist to the extent necessary to support construction and operation of Summit Project. While it is true that construction of the Summit Project would create a new revenue stream in the

form of tax credits for ethanol plant investors, it is also true that this revenue stream would be entirely dependent on the continued existence of the 45Q Program, that in turn would depend on the financial health of the federal government and ongoing political support for the 45Q Program. As federal budget deficits increase, political pressure to limit federal expenditures will likely also increase, putting at risk funding programs deemed unnecessary or politically vulnerable, such as the 45Q Program.

Summit's application states that, "[t]he Heartland Greenway System will facilitate significant CO₂ emissions reductions that will allow industry and governments in the project footprint to meet their carbon reduction goals." Summit, however, does not identify any provision in South Dakota state law or local ordinances that mention or even recognize the existence of climate change, much less impose carbon reduction goals. Thus, the policy purpose for the Summit Project, which is climate change mitigation, is not in accordance with South Dakota law and does not advance state policy objectives. South Dakota's governments do not agree that climate change exists and have not adopted policies to mitigate it. Yet, Summit seeks South Dakota government approval for its project, the sole purpose of which is to mitigate climate change. Approval of the Summit Project advances a policy objective with which the State of South Dakota does not agree.

Moreover, there are no federal mandates that South Dakota must approve the Summit Project or any other carbon capture climate change mitigation project. Federal law does not require South Dakota to support carbon capture and storage. It is possible that future federal air quality regulations may make carbon capture one option for addressing carbon dioxide emissions, but the promulgation of such possible rule is at best years in the future, subject to litigation, subject to rejection by future federal administrations aligned with South Dakota's position on climate change policy, and therefore entirely speculative. The Commission cannot approve the proposed project based on a claim that federal mandates require approval of the proposed project, because such mandates do not currently exist and

may never exist. While the federal government currently has climate change policy objectives, it has not required development of carbon capture projects, but rather created tax credits that encourage but do not mandate such development. Participation in the 45Q Program is voluntary. Therefore, the federal government has left decisions on the merits of carbon capture projects to the judgment of state governments, which are free to support or reject any particular project or the carbon capture industry as a whole.

Given the State of South Dakota's rejection of the need for climate change mitigation and its freedom to accept or reject carbon capture development, a Commission approval of Summit's proposed project would likely be seen by many South Dakotans as an extreme example of hypocritical government action. As such, Commission approval of the Summit Project would result in substantial reputational damage to and a loss of citizen trust and faith in the Commission and South Dakota's state government in general. Since faith in government institutions is part of the bedrock of American society, such damage would constitute "a threat of serious injury . . . to the social . . . condition of inhabitants or expected inhabitants in the siting area," as well as within all of South Dakota.

The Summit Project also creates a threat of serious injury to the social conditions in South Dakota due to excessive state and local dependency on a politically unstable federal funding program. The threat of anthropogenic climate change is the subject of considerable political controversy within the United States and South Dakota. The future commercial viability of the 45Q Program and the Summit Project is entirely dependent on ongoing federal political support for climate change mitigation in general and the 45Q Program in particular. A change in federal leadership that agrees with the State of South Dakota's position on climate change could result in future congressional and administrative actions to reduce or even eliminate the 45Q Program. Further, the ongoing viability of the 45Q Program is dependent on the financial health of the federal government, including the fiscal impacts of the ever-growing federal budget deficit. Given that the 45Q Program

includes no cap on federal financial outlays, it will increase the federal deficit potentially by tens or even hundreds of billions of dollars annually, depending on how fast it grows. In the event of a severe economic downturn or a federal government default on its loans, Congress could reduce or entirely eliminate the 45Q Program, prior statutory commitments notwithstanding. Thus, the commercial foundation for the Summit Project is built on a political foundation that is too unstable to justify making South Dakota's corn and ethanol industries dependent on it.

In the event that the 45Q Program falls out of favor, the commercial foundation for the Summit Project could disappear quickly, causing it to precipitously cease operation, in which case South Dakota's corn and ethanol industries would face a potentially existential financial shock that could significantly disrupt South Dakota's agricultural industries, many rural communities, and the state's overall economic wellbeing. Further, landowners would be saddled with paying for the cost of abandoned pipeline mitigation. It is one thing for South Dakota to accept federal subsidies for production of agricultural commodities for which there will always be demand. It is an entirely different thing to base a substantial part of South Dakota's farm economy on an entirely new federally created non-market-based industry that captures a waste product for which there will never be significant commercial demand. There is a risk to tying South Dakota's market-based agricultural economy to politically and fiscally unstable federal largess. Construction of the Summit Project would make its contracted ethanol producers and the farmers that provide them with corn overly dependent on a politically unstable federally created artificial market for carbon dioxide. The demise of this market, for either political or fiscal reasons, would severely damage the State's agricultural economy and disrupt rural communities throughout South Dakota. Such community disruption would constitute "a threat of serious injury . . . to the social . . . condition of inhabitants or expected inhabitants in the siting area," as well as within all of South Dakota.

While the promised financial benefits of the Summit Project appear to be tempting, their acceptance would come at a cost and create a threat of serious injury to the political and social fabric of the State of South Dakota.

Further, I adopt and incorporate the opinions found in **Attachment No. 7** and those found in **Attachment No. 8**.

Q: Do you believe any aspect of Summit’s proposed hazardous pipeline will pose a threat of serious injury to the economic condition of current inhabitants or expected inhabitants in the siting area, if yes why?

A: In addition to those already discussed, based upon my experience and all the information obtained throughout this process and simple common sense the answer is yes – this hazardous pipeline does pose a threat of serious injury in this way. There are many such economic concerns. If the PUC approves this Application I will likely not invest in and develop my property as I would have without the effects of such a hazardous pipeline. The fact I can’t purchase insurance to cover me and my property against certain claims and allegations and the fact whether or not I am alleged to be liable for or to have contributed to a leak or rupture event rests in the hands of Summit’s insurance defense attorneys should they seek to spread their risk of liability on to me, it is likely I and others will not use the easement area and surrounding areas to their highest and best use given the less activity in that area means the less likely we could be blamed for something relative to the pipeline or supporting equipment.

I share the concerns of Marvin Lugert and Loren Staroba about future fertility of the land and compaction and yield loss and loss in productivity not just in years one through three post-construction, but forever. As discussed by Mr. Lugert and Mr. Staroba, they have experienced continual yield loss for 20 to 45 years post-pipeline construction. All the claims and glossy brochures about how great the unknown contractors and workers who have the responsibility of screening the topsoil and other important aspects is just talk. I adopt and share those as incorporated here and found in **Attachment No. 9**, related to soil compaction and reduced yields – and

that was a study funded by a major pipeline player. I also incorporate the conclusions and findings in **Attachment No. 10**.

The facts, opinions, and arguments referenced herein by no means include all such economic threats posed but highlight some of the many. The overall chill on development, expansion and freedom to do as you choose on and with your land are all significant economic detriments that occur only if the PUC approves this Application.

Q: Do you believe any aspect of Summit's proposed hazardous pipeline will substantially impair the health, the safety, or the welfare of the inhabitants, if yes why?

A: In addition to what we have already discussed, yes, this proposed hazardous pipeline would substantially impair the health and the safety and welfare of the inhabitants. There are many such substantial impairment concerns and I adopt and share those as incorporated here and found in **Attachment No. 11**. The facts, opinions, and arguments referenced here by no means include all such threats posed but highlight some of the many. I further adopt the testimony of Dr. Schettler and Carolyn Raffensperger.

Q: Do you believe any aspect of Summit's proposed hazardous pipeline will unduly interfere with the orderly development of the region, if yes, why?

A: Yes, I incorporate my answers above here. Adding a hazardous and dangerous pipeline to the region and taking people's rights away while telling them what they can and can't do is a direct undue interference with the orderly development of each affected parcel, the surrounding parcels, and thereby the region. The existence of this particular hazardous CO2 pipeline carries a stigma and perception that it is bad and dangerous. Such stigmas mean it is more likely that people will not want to purchase land with such a hazardous CO2 pipeline or would seek a discount to do so. I am aware of property that had interest for purchase but did not get bids once it was discovered a CO2 company sought to locate a hazardous pipeline on the land.

Q: What is your understanding regarding the views and positions of the governing bodies of affected local units of government in and around the proposed siting and corridor area?

A: I am aware of many local boards who continue to exercise their rightful local power to enact intelligent land use restrictions in ordinances and through setback requirements. Many counties are not in favor of this project. Others have enacted Moratoria pending further advances in federal law and guidance on the subject and pending further study. It would be irresponsible for the PUC to approve this Application until all counties have weighed in and complete their local ordinances related to CO2 pipelines.

Q: What is it that you are requesting the PUC Commissioners do in regard to Summit's Application for its proposed hazardous pipeline across South Dakota?

A: I am respectfully and humbly requesting that the Commissioners think far beyond a temporary job spike that this project may bring to a few counties and beyond the relatively small amount of taxes this proposed foreign pipeline would possibly generate. Instead think about the perpetual and forever impacts of this pipeline as it would have on the landowners specifically, first and foremost, but also thereby upon the entire state of South Dakota. This project is not in the best interest of the state of South Dakota. When you look at all the negative effects that will be in place forever versus limited benefits, if any, this proposed hazardous pipeline should not be approved. There are no net benefits of this project. It is not right to subject hundreds of miles and land and countless numbers of people and business to this hazardous pipeline all for the sole benefit of Summit's owners and possibly four or so Ethanol companies in South Dakota. This is not for the greater good, it is not for public use, Summit is not a common carrier, and this Application is a bad idea the must be denied. I also am against corporate welfare and the billions of dollars in our taxpayer dollars that will be allocated to this project if it is built.

Q: Does Attachment No. 12 here contain additional information to support your concerns that if the PUC approves this Application, you will be unable to obtain liability insurance to that would assist in providing you a defense against claims of liability should CO2 from the proposed pipeline to be located on your land cause injury or damage to any person or thing that you wish to be part of your testimony that you can discuss in more detail as needed at the Hearing?

A: Yes.

Q: Does Attachment No. 13 here contain other documents that further illustrate your concerns about Summit's Application and that you wish to be part of your testimony that you can discuss in more detail as needed at the Hearing?

A: No.

Q: Do you believe the PUC should approve Summit's Application to locate its proposed hazardous CO2 pipeline, on, under, across, over, and through the land in question?

A: No. they should not for all of the reasons expressed herein. However, if the PUC was to approve the Application, then it should force Summit to move the route along property boundaries and away from structures and any sensitive land features. Summit hasn't constructed an inch of this pipeline and they can and should re-route if approved.

Q: Although you have made it clear that you believe there is no appropriate location on or near your property for a hazardous high pressure CO2 Pipeline, if the PUC asked you to provide a potential alternative location or route on your property, please describe where that would be, if any such potential location exists.

A: There is no place on my land which is appropriate for a hazardous CO2 pipeline for all the reasons discussed here. We feel that that this company does not care about what happens after they pass our ground and move to the next property to tear it up for someone else.

Q: Are all of your statements in your testimony provided above true and accurate as of the date you signed this document to the best of your knowledge?

A: Yes, they are.

Q: Have you fully expressed each and every opinion, concern, or fact you would like the PUC Commissioners to consider in their review of Summit's Application?

A: No, I have not. This is a company that is simply out for the benefit of themselves they will not care what happens to any of us if something goes wrong. It will simply be collateral damage to them as they stand to make billions off of the land usage of private landowners who have given their whole lives to trusting the system that should protect us from this absolute takeover of our rights. Please consider everything carefully before the easy button gets pressed and the path gets cleared for the complete takeover of more innocent family farms and ranches. This is only the beginning of what is yet to come these companies won't stop banging down our doors.

I have shared that which I can think of as of the date I signed this document below, but other things may come to me, or my memory may be refreshed and I will add and address those things at the time of the Hearing and address any additional items at that time as is necessary. Additionally, I have not had an adequate amount of time to receive and review all of Summit's answers to our discovery and the discovery of others, so it was impossible to competently and completely react to that in my testimony here and I reserve the right to also address anything related to discovery that has not yet concluded as of the date I signed this document below. Lastly, certain documents requested have not yet been produced by Summit and therefore I may have additional thoughts on those I will also share at the hearing as needed.

Q: Thank you, I have no further questions at this time and reserve the right to ask you additional questions at time of the Hearing in this matter.

Dated June 16, 2023

/s/ LeRoy Weiszhaar

LeRoy Weiszhaar

/s/ Joan Weiszhaar

Joan Weiszhaar

Attachment No. 1

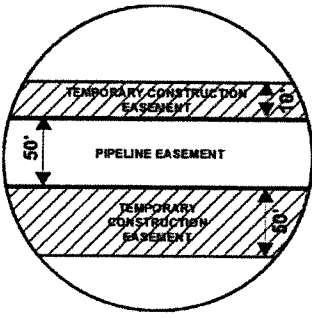
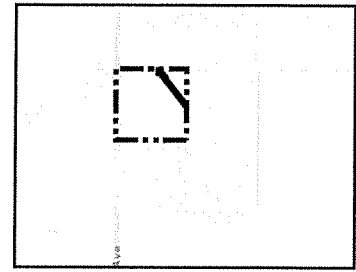


EXHIBIT "B"

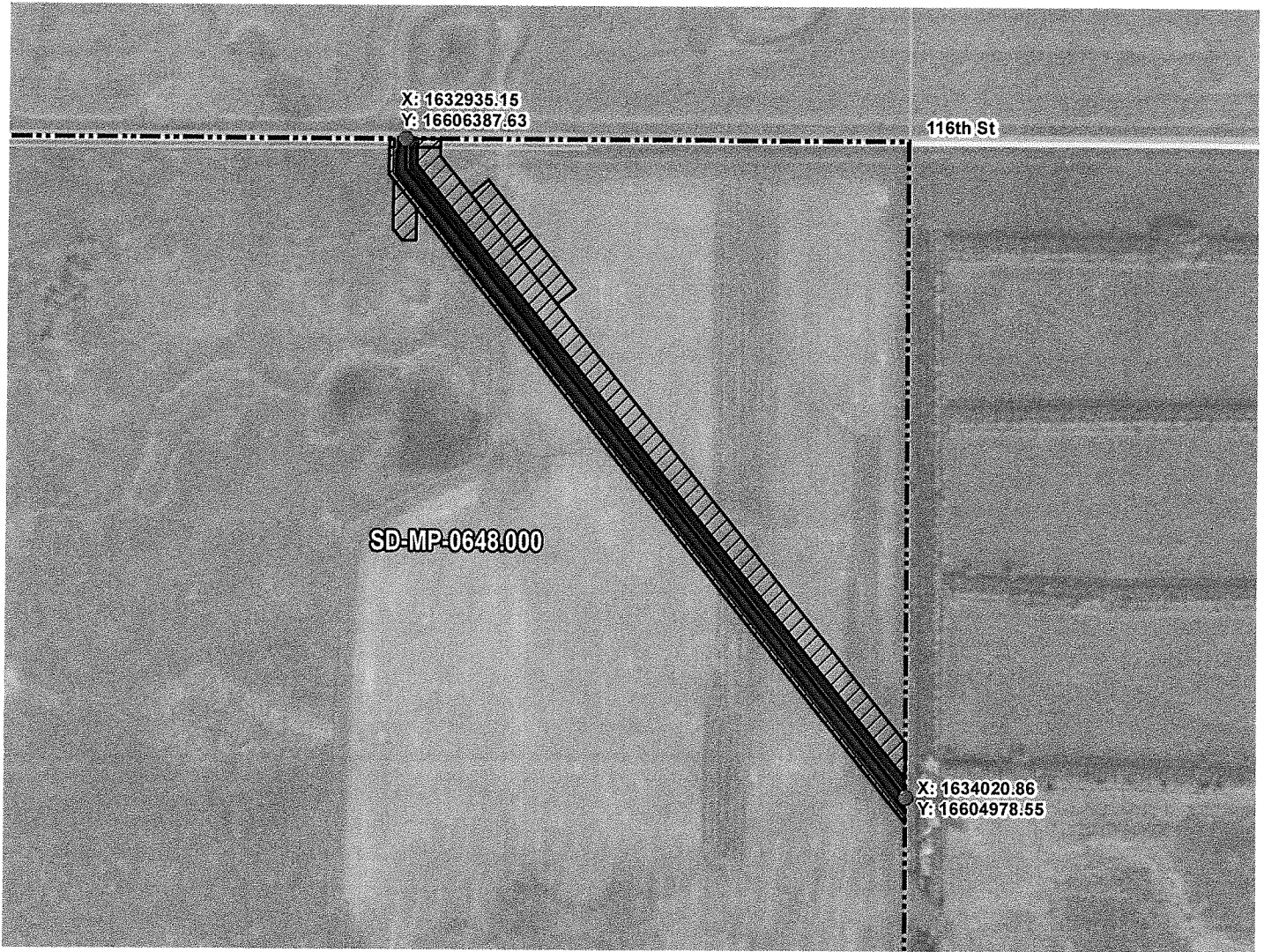
PRELIMINARY ROUTE

MCPHERSON COUNTY, SOUTH DAKOTA



VICINITY MAP
N.T.S.

SEC. 27 T126N R68W



ROUTING LENGTH = 1792.166 FT +/-

IMPACTS: PIPELINE EASEMENT = 2.057 AC. +/- / TEMPORARY CONSTRUCTION EASEMENT = 2.822 AC. +/-

Legend

- PROPOSED ROUTE
- PARCEL BOUNDARY
- ADJACENT PROPERTIES
- PIPELINE EASEMENT
- TEMPORARY CONSTRUCTION EASEMENT
- SECTION BOUNDARY
- COUNTY BOUNDARY

NOTES:

1. THIS IS A PRELIMINARY DOCUMENT AND IS INTENDED TO DEPICT THE APPROXIMATE LOCATION OF A PROPOSED PIPELINE EASEMENT.
2. THIS DOCUMENT DOES NOT REPRESENT A LAND SURVEY AND IS NOT INTENDED TO DEPICT THE FINAL ALIGNMENT
3. COORDINATE SYSTEM: UTM ZONE 14 NORTH, NAD83, US SURVEY FEET

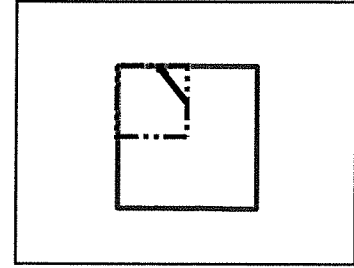
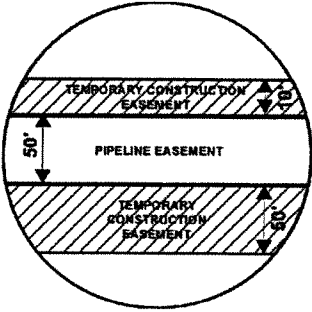


PRELIMINARY PIPELINE ROUTE		
DRAWN BY:	AC	SUMMIT CARBON SOLUTIONS MIDWEST CARBON EXPRESS LEROY M WEISZHAAR TAX ID: 1248 TRACT NUMBER: SD-MP-0648.000
CHECKED BY:	JW	
MAP DATE:	12/17/2021	
SCALE:	1 inch = 348'	
REV NO.	DATE	DESCRIPTION
E	12/8/2022	REVISED PARCEL BOUNDARY
F	3/2/2023	REVISED WORKSPACE
DRAWING NO. C-MCE-ACQ-SD-MP-0648.000		PROJECT NO. 450959
		SHEET NO. 01 of 01

EXHIBIT "B"

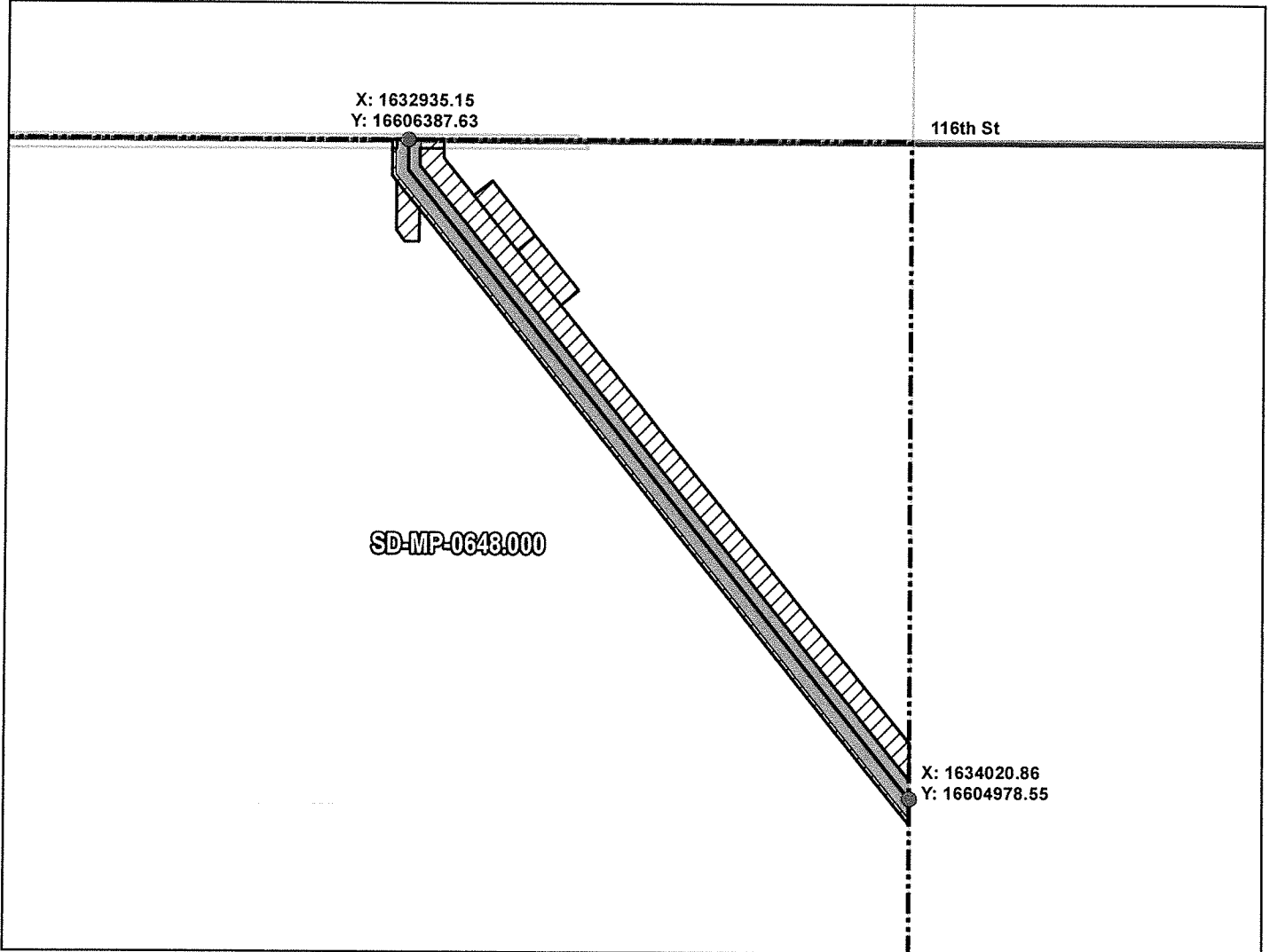
PRELIMINARY ROUTE

MCPHERSON COUNTY, SOUTH DAKOTA



VICINITY MAP
N.T.S.

SEC. 27 T126N R68W



ROUTING LENGTH = 1792.166 FT +/-

IMPACTS: PIPELINE EASEMENT = 2.057 AC. +/- / TEMPORARY CONSTRUCTION EASEMENT = 2.822 AC. +/-

Legend

- PROPOSED ROUTE
- ROADS
- PARCEL BOUNDARY
- ADJACENT PROPERTIES
- ▨ PIPELINE EASEMENT
- ▧ TEMPORARY CONSTRUCTION EASEMENT
- SECTION BOUNDARY
- COUNTY BOUNDARY

NOTES:

1. THIS IS A PRELIMINARY DOCUMENT AND IS INTENDED TO DEPICT THE APPROXIMATE LOCATION OF A PROPOSED PIPELINE EASEMENT.
2. THIS DOCUMENT DOES NOT REPRESENT A LAND SURVEY AND IS NOT INTENDED TO DEPICT THE FINAL ALIGNMENT
3. COORDINATE SYSTEM: UTM ZONE 14 NORTH, NAD83, US SURVEY FEET

SIGNATURE: _____ DATE: _____



SUMMIT CARBON SOLUTIONS

PRELIMINARY PIPELINE ROUTE		
DRAWN BY:	AC	SUMMIT CARBON SOLUTIONS MIDWEST CARBON EXPRESS LEROY M WEISZHAAR TAX ID: 1248 TRACT NUMBER: SD-MP-0648.000
CHECKED BY:	JW	
MAP DATE:	12/17/2021	
SCALE:	1 inch = 350'	
REV NO.	DATE	DESCRIPTION
E	12/8/2022	REVISED PARCEL BOUNDARY
F	3/2/2023	REVISED WORKSPACE
DRAWING NO. BW-MCE-ACQ-SD-MP-0648.000		PROJECT NO. 450959 SHEET NO. 01 of 01

Attachment No. 2

South Dakota Public Utilities Commission Information Guide to Siting Pipelines

This guide is intended to offer a simple overview of the Public Utilities Commission’s process in making a decision to approve or deny the construction of pipeline facilities specific to South Dakota Codified Laws Chapter 49-41B (www.sdlegislature.gov/Statutes/Codified_Laws) and South Dakota Administrative Rules Chapter 20:10:22 (www.sdlegislature.gov/Rules/RulesList). This guide is informational and does not address all situations, variations and exceptions in the pipeline siting process and proceedings of the PUC.

PUC Authority

The South Dakota Legislature gave the PUC authority to issue permits for certain pipelines. South Dakota pipelines within the commission’s siting jurisdiction include those designed to transport coal, gas, liquid hydrocarbons, liquid hydrocarbon products, or carbon dioxide, for example. In considering applications, the commission’s primary duty is to ensure the location, construction and operation of the pipeline will produce minimal adverse effects on the environment and the citizens. The commission determines these factors based on definitions, standards and references specified in South Dakota Codified Laws and Administrative Rules. In pipeline siting cases, the commission has one year from the date of application to make a decision.

The commission strives to issue a reasoned decision and conditions, where appropriate, that uphold the law and discourage a potentially expensive and lengthy appeal process.

In rendering its decision, the commission may grant the permit, deny the permit, or grant the permit with terms, conditions or modifications of the construction, operation or maintenance as the commission finds appropriate and legally within its jurisdiction. The commission does not have authority to change the route or location of a project. The decision of the commission can be appealed to the circuit court and, ultimately, to the South Dakota Supreme Court.

The PUC is not involved in the easement acquisition process that occurs between applicants and landowners. Likewise, the PUC does not have a role in the eminent domain process, which is handled in the circuit court system. Landowners with concerns about these issues should seek advice from their personal attorney.

Applicant Responsibility

The applicant that seeks the PUC’s approval must show its proposed project:

- will comply with all applicable laws and rules;
- will not pose a threat of serious injury to the environment nor to the social or economic condition of inhabitants or expected inhabitants in the siting area;
- will not substantially impair the health, safety or welfare of the inhabitants; and
- will not unduly interfere with the orderly development of the region with due consideration having been given to the views of the governing bodies of affected local units of government.

PUC Staff Role

PUC staff members assigned to work on a pipeline siting case will typically include one attorney and multiple analysts. Staff attorneys have educational and practical experience in administrative law, trial procedure and business management principles. Staff analysts have expertise in engineering, research and economics. Some of the work the staff does involves reviewing data and evidence submitted by the applicant and intervenors, requesting and analyzing opinions from experts, and questioning the parties. The staff considers this information relative to state laws and rules and presents recommendations to the Public Utilities Commissioners.

Public Involvement

South Dakotans have a variety of ways to stay informed and involved. Read more on back.

South Dakota Public Utilities Commission
500 E. Capitol Ave., Pierre, SD 57501
605-773-3201; 1-800-332-1782
www.puc.sd.gov; puc@state.sd.us

09/2022

Review the electronic docket. A docket is the continually updated collection of documents filed with the commission for a particular case. Dockets are accessible under the Commission Actions tab on the PUC website, www.puc.sd.gov. Dockets are labeled to correspond with their type and filing date. For example, the Navigator Heartland Greenway Carbon Dioxide Pipeline docket is HP22-002; HP for hydrocarbon and carbon dioxide pipeline, 22 for the year 2022 and 002 to indicate it was the second hydrocarbon and carbon dioxide pipeline docket filed with the commission in 2022.

Attend a public input meeting. The PUC will hold a public input meeting or meetings on a pipeline siting case, with 30 days notice, as physically close as practical to the proposed route. At the meeting, the applicant describes its project and the public may ask questions and offer comment. Commissioners and staff attend this public meeting.

Submit comments. Members of the public are encouraged to submit written comments about an active siting case to the PUC. These ***informal*** public comments are reviewed and considered by the PUC commissioners and staff. Comments should include the docket number or siting project name, commenter's full name, mailing address, e-mail address and phone number. These comments should be emailed to puc@state.sd.us or mailed or hand-delivered to PUC, 500 E. Capitol Ave., Pierre, SD 57501. Comments are posted in the "Comments" section of the docket within a reasonable time after having been received. The commenter's name, city and state will be posted along with their comment. Comments received from businesses, organizations or other commercial entities (on letterhead, for example) will include the full contact information for such.

Please follow these guidelines when submitting written comments to the PUC:

- For comments sent by email, the maximum file size is 10 MB. If you have questions, please contact South Dakota PUC staff at 605-773-3201 (Monday – Friday, 8 a.m. – 5 p.m. Central Time).
- For comments sent by U.S. mail or hand delivered, no more than twenty (20) 8.5" x 11" pages, including attachments and support materials, should be submitted with a comment. Sheets with printing on both sides are counted as two pages.
- A reference document, article or other attachment not written by the person

commenting should clearly identify the source of the content. The inclusion of any copyrighted material without accompanying proof of the commenter's explicit right to redistribute that material will result in the material being rejected.

- In instances where individual comments are deemed to be a duplicate or near duplicate copies of a mass message campaign, the PUC will post only a representative sample and list the name, city and state of the commenter.
- Comments containing threatening language or profanity will be rejected.
- Multimedia submissions such as audio and video files will not be accepted as written comments.
- Electronic links will not be accepted.

Become an intervenor. Individuals who wish to be ***formal*** parties in a siting case may apply to the commission for intervenor status. Intervention deadline is clearly indicated within the docket. Intervention is appropriate for people who intend to actively participate in the case through legal motions, discovery (requests for facts or documents), the written preparation and presentation of actual evidence, and in-person participation in a formal hearing. Intervenors are legally obligated to respond to discovery from other parties and to submit to cross-examination at a formal hearing. Individuals seeking only to follow the progress of a siting case or to offer comments for the PUC's consideration need not become intervenors.

Communicate on record. Verbal communication between a commissioner and a person with an interest in a matter before the commission that does not occur in a public forum or as part of the official record should be avoided. Those who communicate in writing with a commissioner about an open or imminent docket matter should understand that their comments will become part of the official record and subject to review by all parties and the public. Likewise, comments made at a PUC public proceeding or submitted to the commission relative to a docket matter become part of the record, open to review by all parties and the public. Because commissioners have a decision-making role in docket matters, any discussion with a commissioner about an open or imminent docket must take place in an open forum, such as a public meeting, with notice given to all parties.

Attachment No. 3

Prepared By:
Brett Koenecke
May, Adam, Gerdes & Thompson LLP
503 S. Pierre St. / PO Box 160
Pierre, SD 57501
605-224-8803

Return Document to:
Summit Carbon Solutions LLC
c/o TRC Solutions
800 S 7th Avenue
Sioux Falls, SD 57104

Tract No. SD- _____

EASEMENT AGREEMENT

This easement agreement ("Agreement") is made as of the date of the last Landowner signature to the Agreement (the "Effective Date") by and between _____ whose mailing address is set forth below, (hereinafter referred to as "Landowner", whether one or more), and **Summit Carbon Solutions, LLC**, an Iowa limited liability company, whose mailing address is 2321 N Loop Drive, Suite 221, Ames, Iowa, 50010, and its successors and assigns (such entity and its successors and assigns are collectively referred to as the "Company"). For the consideration of TEN AND No/100 Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. **Grant.** Landowner owns the real property described on Exhibit A, incorporated by reference herein, ("Landowner's Property") and hereby grants, sells and conveys unto Company, for use by Company and its agents, employees, designees, contractors, guests, invitees, successors and assigns, and all those acting by or on behalf of it, the following easements in, over, through, across, under, and along Landowner's Property in the approximate locations shown on Exhibit B, incorporated by reference herein, except as noted below:
 - a. **Pipeline Easement.** A free and unobstructed permanent, non-exclusive pipeline easement fifty feet (50') in width ("Pipeline Easement"), for the purposes of owning, accessing, surveying, establishing, laying, constructing, reconstructing, installing, realigning, modifying, replacing, improving, substituting, operating, inspecting, maintaining, repairing, patrolling, protecting, changing slopes of cuts and fills to ensure proper lateral and subjacent support for and drainage for, changing the size of, relocating and changing the route or routes of, abandoning in place and removing at will, in whole or in part, one pipeline not to exceed twenty-four inches (24") in nominal diameter for the transportation of carbon dioxide and its naturally occurring constituents and associated substances and any appurtenant facilities above or below ground, including aerial markers, power drops, telecommunications, cathodic protection, and such other equipment as is used or useful for the foregoing purposes, (collectively, the "Pipeline Facilities").
 - b. **Temporary Easement.** For the period beginning on the Effective Date and terminating on the Company's delivery to Landowner of written notice of termination, which Company shall deliver within a reasonable time after completion of construction on the Landowner's Property, a free and unobstructed non-exclusive temporary construction

easement (the "Temporary Construction Easement") for the purpose of accessing, surveying, establishing, laying, constructing, reconstructing, installing, realigning, modifying, replacing, improving, substituting, operating, inspecting, maintaining, repairing, patrolling, protecting, changing slopes of cuts and fills to ensure proper lateral and subjacent support for and drainage for, changing the size of, relocating and changing the route or routes of, abandoning in place and removing at will, in whole or in part the Pipeline Facilities in the Pipeline Easement.

- c. Access Easement. A free and unobstructed non-exclusive easement in, to, through, on, over, under, and across the Landowner's Property and over the property of Landowner adjacent to the Easements and lying between public or private roads and the Easements (the "Access Easement") for the purpose of ingress and egress to the Pipeline Easement and, while in effect, Temporary Construction Easement and for all purposes necessary and at all times convenient to exercise the rights granted to it by this Agreement. Access Easement may not be specifically shown on Exhibit B.

The Pipeline Easement, Temporary Construction Easement and Access Easement may be collectively referred to in this Agreement as the "Easements".

2. Location. Exhibit B shows the approximate location of the Pipeline Easement and Temporary Construction Easement and may show portions of the Access Easement. Company shall have the right to select the exact location of the Easements and the location of the pipeline and other Pipeline Facilities within the Pipeline Easement, such that the centerline of the pipeline may not, in all instances, lie in the middle of the Pipeline Easement. The parties acknowledge that Exhibit B may be in preliminary form, whether as sketches or surveys or otherwise. Accordingly, the parties agree that upon completion of a more complete depiction of the locations of the Easements, the Company, without joinder of Landowner, may replace Exhibit B with Exhibit B-1, which shall be such final, more complete exhibit, by affidavit, amendment or otherwise. However, upon the request of Company, Landowner agrees to cooperate with Company and to execute and deliver to Company any additional documents, including an amendment to this Agreement, for the purpose correcting the legal description or location of the Easements or making such other modifications requested by Company to accomplish the purposes of this Agreement. Company shall provide Landowner with a copy of the recorded affidavit, amendment or re-recorded Agreement.
3. Damages. The consideration paid by Company includes the value of the Easements and all damages, excluding livestock damages, within the Easements arising as a direct result of the initial construction of the Pipeline Facilities and subsequent restoration of Landowner's Property. Landowner (or, if leased, its tenant) has been compensated for all damages to growing crops within the Easements for the three (3) years following initial construction of the Pipeline Facilities and restoration of Landowner's property. Landowner releases and forever discharges Company from all such damages. Company agrees to pay Landowner a reasonable sum for any subsequent actual, proven damages to growing crops on Landowner's Property directly caused by the exercise of Company's rights under this Agreement.
4. Restoration. After it has exercised its rights to use the Easements in any manner that disturbs the surface of the Easements, Company will, insofar as reasonably practicable and except as the surface may be permanently modified in accordance with the rights granted under this Agreement, restore the ground disturbed by the Company's use of the Easements and will

construct and maintain soil conservation devices on the Pipeline Easement as may be reasonably required to prevent damage to the property of Landowner from soil erosion resulting from operations of Company under this Agreement. Company shall restore all fences to as nearly as reasonably practicable to their condition prior to the use of said Easements, except for any portion within the Easements that is permanently altered in accordance with rights given under this Agreement. If Landowner notifies Company that any drainage tile or irrigation systems on the Grantor's Property have been damaged as a direct result of Company's activities in connection with the Easements, then Company shall investigate the damages and, if Company confirms the claim, at Landowner's option, repair or replace such tile or irrigation or pay Landowner the costs to repair or replace such tile or irrigation.

5. Landowner's Use.

- a. Subject to the following subsections, Landowner may use the Easements for any and all purposes not inconsistent with the purposes set forth in this Agreement. Landowner's uses may include but shall not be limited to agricultural, open space, and installation and maintenance of fences (provided Company shall at all times have access through any such fence by means of a gate), provided that any such use is not otherwise prohibited by applicable law and provided that such use does not, in Company's sole discretion, cause a safety hazard or unreasonably interfere with Company's rights under this Agreement. The use of the Pipeline Easement by Landowner shall be regulated by Company requirements and all appropriate ordinances, regulations, resolutions or laws of the governmental entity with authority over the Pipeline Easement.
- b. Landowner may not use any part of the Easements in a way that may damage, destroy, injure, and/or interfere with the Company's right to use said Easements for the purposes set forth in this Agreement. Without limiting the generality of the previous statement, Landowner is not permitted to conduct any of the following activities on the Easements without the written permission of Company: (1) construct or permit the construction or installation of any temporary or permanent building or site improvements; (2) drill or operate any well or any equipment for the production or development of minerals; (3) remove soil or change the grade or slope; (4) impound surface water; or (5) plant trees or landscaping. Landowner further agrees that no above or below ground obstruction, whether temporary or permanent, man-made or natural, that, in the sole discretion of Company, may endanger or interfere with the efficiency, safety, or convenient operation of the pipeline and other Pipeline Facilities or use of the Easements may be placed, erected, installed or permitted to exist without the written permission of Company. In the event the terms of this paragraph are violated, or the Easements are otherwise obstructed in a manner that Company determines in its sole discretion interferes or may interfere with its rights hereunder, Landowner shall immediately remove such violation or obstruction upon receipt of written notice from Company or Company shall have the immediate right to correct or remove such violation or obstruction at the sole expense of Landowner. Landowner shall promptly reimburse Company for any actual expense related to such correction or removal. Landowner further agrees that it will not interfere in any manner with the purposes for which the easements under this Agreement are conveyed. Any improvements, whether above or below ground, temporary or permanent, installed by Landowner subsequent to the date that Company acquires the Easements, may be removed by Company without liability to Landowner for damages.

- c. Landowner acknowledges and agrees that during the initial construction of the Pipeline Facilities or any construction, maintenance, repair, replacement or removal work on the Pipeline Facilities, Landowner may not have use of the Easements for any purpose so as to avoid disrupting such construction or other work or compromising the safety considerations of the construction or repair work. Landowner agrees to abide by any and all safety instructions established by the Company.
6. **Indemnification.** Company shall pay commercially reasonable costs and indemnify and hold Landowner harmless for any loss, damage, claim, or action resulting from Company's use of the Easements, except to the extent such loss, damage, claim, or action results from the gross negligence or willful misconduct of Landowner or its agents.
7. **Assignment.** Company shall have the right to sell, assign, apportion, mortgage or lease this Agreement, as amended from time to time, and the Easements granted under it, in whole or in part, to one or more parties, and Company shall be released from its obligations under this Agreement to the extent of such sale, assignment, apportionment, or lease, provided that any such purchaser, assignee, apportionee, or lessee assumes Company's obligations. The Pipeline Easement and Access Easement shall be permanent, and the Easements and provisions of this Agreement, including all benefits and burdens, shall constitute a covenant and burden on the land and shall run with the land.
8. **Landowner's Interest.** Landowner, for itself, its heirs, successors, and assigns, represents, warrants, and covenants that it is the sole true and lawful owner(s) of Landowner's Property and has full right and power to grant and convey the Easements. Landowner hereby binds itself and its heirs, assigns, devisees, successors, and legal representatives to warrant and forever defend the above-described Easements and rights, unto Company, and Company's successors and assigns, against every person whomsoever lawfully claiming or to claim the same, or any part thereof. Landowner relinquishes, releases and waives all rights of dower, homestead and distributive shares in and to the Easements.
9. **Landowner Liens.** Landowner consents to Company contacting any lender, mortgagee, or other pre-existing holder of a lien or interest in the Property in order to secure a consent, subordination, non-disturbance agreement or such other document as Company deems necessary for the benefit of the parties. Such form may be recorded in the real estate records of the county in which Landowner's Property lies. Upon the request of Company, Landowner agrees to fully cooperate with Company in order to secure such document from each lender, mortgagee, or other pre-existing holder of a lien or interest in the Property. Landowner shall not be required to incur any third party out of pocket expenses in connection with assisting Company in the pursuit of the foregoing documents; all such third party out of pocket expenses relating to the same shall be paid by Company.
10. **Property of Company.** Notwithstanding any rule of law or equity, unless otherwise sold, bartered or conveyed to another party, the pipeline and all other Pipeline Facilities shall at all times remain the property of the Company notwithstanding that the pipeline or those facilities may be annexed or affixed to the freehold or abandoned in place by Company.

11. Miscellaneous.

- a. To the extent provisions included in Exhibit C, incorporated by reference herein, if any, conflict with provisions of this Agreement, provisions of Exhibit C control.
- b. All notices given or permitted to be given under this Agreement shall be in writing. Notice is considered given either (i) when delivered in person to the recipient named above, (ii) upon deposit in the United States mail in a sealed envelope or container, postal charges prepaid, return receipt requested or certified mail, or (iii) upon deposit with an overnight courier service. Either party may, by notice given at any time, require subsequent notices to be given to another individual person, whether a party or an officer or representative, or to a different address, or both.
- c. This Agreement and the Easements granted under it shall be interpreted in accordance with the laws of the State of South Dakota and all applicable federal laws. All actions or proceedings with respect to this Agreement shall be instituted only in state court of the states of Iowa or South Dakota, and Landowner consents to the jurisdiction of or venue in such courts.
- d. Company may exercise all or any of its rights in this Agreement at any time, and Company's non-use or limited use of any such rights shall not constitute forfeiture of or otherwise limit any such rights.
- e. The waiver or failure to enforce any provision of this Agreement by either Landowner or Company or the waiver of a breach or violation of any provision of this Agreement by either party shall not operate as or be construed as a waiver of any subsequent breach, or waiver or failure to enforce, of any provision of this Agreement.
- f. This Agreement may be signed in counterparts and all such counterparts shall be deemed as originals and binding upon each party executing any counterpart and upon its respective heirs, devisees, representatives, successors and assigns. Company's payment of consideration for this Agreement is evidence of Company's acceptance of the Agreement. This Agreement, or a memorandum giving notice of this Agreement, and exhibits, including subsequent Exhibit B-1, may be recorded in the real estate records of the county or counties where Landowner's Property lies. Company may exercise its discretion in whether or not to record any document or exhibit referenced herein, including, but not limited to, Exhibit B or Exhibit B-1. The parties agree that failure to record any document or exhibit shall not affect its validity or the validity of this Agreement. Any document not recorded will be held by Company for safekeeping.
- g. This Agreement, including all exhibits, addendums and amendments to the Agreement, and any payment or damage calculation sheets provided to the Landowner and any other documents signed contemporaneously with this Agreement, contain the entire agreement between the parties and there are not any other representations or statements, verbal or written that have been made modifying, adding to, or changing the terms of this Agreement. Except as provided in paragraph 2, this Agreement, shall not be abrogated, modified, rescinded, or amended in whole or in part without the written consent of Landowner and Company, in writing and executed by each of them.
- h. If any provision of this Agreement is invalid under any applicable statute or is declared invalid by a court of competent jurisdiction, then that provision shall be deemed to be severed from this Agreement and the remainder of this Agreement shall continue in full force and effect and shall be construed to the furthest extent legally possible so as to accomplish the purposes set forth in this Agreement.

Attachment No. 4

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEBRASKA

ZURICH AMERICAN INSURANCE)
COMPANY, a New York Corporation,)
)
Plaintiff,)
)
v.)
)
RICHARD ANDREW, JANE ANDREW,)
LUKE ANDREW, and BRYCE ANDREW,)
)
Defendants.)

CASE NO. _____

COMPLAINT

COMES NOW Plaintiff, Zurich American Insurance Company (“Plaintiff”), a New York Corporation, and for its causes of action against Defendants, states and alleges as follows:

PARTIES

1. Plaintiff is a corporation organized and existing under the laws of the State of New York, with its principle place of business located at 1400 American Lane, Schaumburg, Illinois.
2. Defendant, Richard Andrew, is a citizen of the State of Nebraska.
3. Defendant, Jane Andrew, is a citizen of the State of Nebraska.
4. Defendant, Luke Andrew, is a citizen of the State of Nebraska.
5. Defendant, Bryce Andrew, is a citizen of the State of Nebraska.

JURISDICTION AND VENUE

6. Venue is proper in this judicial district under 28 U.S.C. § 1391(a) because Defendants reside in this district, and a substantial portion of the events or omissions giving rise to Plaintiff’s claims occurred in this district.

7. This Court has jurisdiction over this matter pursuant to 28 U.S.C. § 1332(a) because the amount in controversy exceeds \$75,000.00, exclusive of interest and costs, and because diversity of citizenship exists with respect to Plaintiff and all Defendants.

GENERAL ALLEGATIONS

8. At all times material to this action, Defendants were agents of each other and were acting within the course and scope of their agency relationships, and the negligence of any Defendant is imputed to all Defendants.

9. At all times material to this action, Defendants were engaged in a joint venture and were acting within the course and scope of the joint venture at the time of the event described below.

10. At all times material to this action, Defendants were engaged in a partnership, were carrying on a business for profit, shared profits of the business, and were acting within the course and scope of the partnership at the time of the event described below.

11. At all relevant times, Defendants Luke Andrew and Bryce Andrew were the lessees of property located in the East $\frac{1}{2}$ of the Southwest $\frac{1}{4}$, Section 15, Township 4, Range 15 (the "Property"), Nemaha County, Nebraska, and were engaged in commercial farming operations for the benefit of all named Defendants in this action.

12. On or about December 10, 2011, Defendants Luke Andrew and Bryce Andrew were engaged in excavation activities on the Property, including the clearing of various vegetation near the northernmost property line of the Property.

13. The excavation was in the area of two pipelines owned and operated by Magellan Midstream Partners, LP ("Magellan"), including a 12" pipeline used to transport a mixture of gasoline and jet fuel as well as an 8" pipeline ("the Pipelines") used to transport diesel fuel.

14. At all times relevant to this action, Magellan owned a right-of-way and easement on the Property in the areas where the pipelines ran and Defendants had actual and constructive knowledge of the right-of-way and easement.

15. At all times relevant to this action, Defendants had actual and constructive notice of the pipelines on the Property and had notice that Magellan owned and operated such pipelines.

16. On or about December 10, 2011, while engaged in excavation activities, Defendants Luke Andrew and Bryce Andrew struck the pipeline, causing the release of approximately 2,167 barrels of mixed gasoline and jet fuel from the 12" pipeline and approximately 643 barrels of diesel fuel from the 8" pipeline onto the Property (The line strikes will hereinafter be referred to as "the Release").

17. As a result of the line strikes and release, Magellan was required by state and federal

law to engage in cleanup and remediation activities related to the Release.

18. At the time of the Release, Magellan was the named insured on a policy of insurance, Policy No. EPC 669256201 (“the Policy”), issued by Plaintiff.

19. Plaintiff has made payment on behalf of Magellan under the Policy and has a contractual and equitable right of subrogation and is subrogated to Magellan’s rights of recovery against Defendants for amounts paid on its behalf.

FIRST CLAIM: NEGLIGENCE

20. Paragraphs 1-20 of this Complaint are incorporated as if fully set forth herein.

21. Defendants owed a duty to perform their work on the Property and within the right-of-way and easement owned and operated by Magellan in a reasonable manner, to use reasonable care in constructing improvements on the Property, to comply with the statutory requirements of Neb. Rev. Stat. § 76-2301 et seq., the One Call Notification System (“OCNS”), and to protect the Pipelines on the Property from damage during Defendants’ work on the Property.

22. Defendants negligently struck the Pipelines while performing excavation work on the Property.

23. Defendants were negligent in the following particulars:

- a. Defendants failed to perform their work on the Property within the right-of-way and easement in a reasonable manner;
- b. Defendants failed to use reasonable care in their work on the Property and the Pipelines’ right-of-way and easement;
- c. Defendants failed to comply with the statutory requirements of the OCNS;
- d. Defendants failed to notify Magellan of Defendants’ intent to excavate on December 10, 2011 in and over the right-of-way and easement on the Property;
- e. Defendants failed to give Magellan the opportunity to exercise its rights under the OCNS.

24. As a direct and proximate result of Defendants’ negligence, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

25. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

26. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its first claim in an amount in excess of \$4,151,148.69 for Defendants' negligent strike of the Pipelines.

SECOND CLAIM: TRESPASS

27. Paragraphs 1-29 of this Complaint are incorporated as if fully set forth herein.

28. Magellan owned and occupied a valid right-of-way and easement in and to the area of the Property where the Pipelines were located at the time of the Release.

29. Defendants physically invaded Magellan's rights within and to the right-of-way and easement where the Pipelines were located at the time of the Release.

30. Defendants had no right, lawful authority, or express or implied invitation, permission, or license to enter upon and disturb Magellan's rights and interests in and to the right-of-way and easement where Magellan's pipelines were located at the time of the Release.

31. Magellan's interest in and to the right-of-way and easement of the Pipelines were injured during the course of Defendants' trespass.

32. As a result of Defendants' trespass, Plaintiff has paid \$3,044,255.19 on behalf of Magellan related to clean up, remediation, and other damages caused by the Release.

33. Clean up, remediation, and other damages are ongoing and Plaintiff continues to incur costs related to the same, with estimated future damages totaling \$1,106,893.50.

34. Plaintiff prays that the Court enter judgment against Defendants and award Plaintiff's damages on its second claim in an amount in excess of \$4,151,148.69.

WHEREFORE Plaintiff hereby prays for a judgment of this Court in its favor and against Defendants for its damages in an amount to be proven at trial, pre-judgment and post-judgment interest, its costs incurred in prosecuting this action, and such other reasonable sums as this Court deems just and equitable.

JURY DEMAND

Plaintiff, pursuant to Fed. R. Civ. P. 38 and Local Rule 40.1(b) demands a trial by jury on all issues so triable in Omaha, Nebraska.

ZURICH AMERICAN INSURANCE COMPANY,
Plaintiff,

By: /s/ Albert M. Engles
ENGLES, KETCHAM, OLSON, & KEITH, P.C.
1350 Woodmen Tower
1700 Farnam Street
Omaha, Nebraska 68102
(402) 348-0900
(402) 348-0904 (Facsimile)
Albert M. Engles, #11194
Dan H. Ketcham, #18930
Michael L. Moran, #24042
James C. Boesen, #24862

Attachment No. 5

It's Time to End Carbon Capture of Climate Policy

An Open Letter to US and Canadian Leaders

On behalf of our millions of members and supporters across the United States and Canada, we call on policymakers to recognize that carbon capture and storage (CCS) is not a climate solution. It is a dangerous distraction driven by the same big polluters who created the climate emergency.

CCS is unnecessary. Renewable energy sources like solar and wind are cheaper and cleaner than fossil fuels. CCS just makes dirty energy more expensive and more energy-intensive.

CCS does not work. CCS projects have systematically overpromised and underdelivered. Despite the billions of taxpayer dollars wasted on CCS to date, the technology has not made a dent in CO2 emissions.

CCS will do little to reduce industrial emissions. Deploying CCS at scale is not economically viable for most heavy-emitting industries, such as plastic or chemical manufacturing. It diverts resources from available and scalable alternatives such as replacing fossil fuels with clean renewable energy sources to supply power and heat, and reusing inputs to reduce the production of virgin material.

CCS makes dirty energy even more dangerous for frontline communities. Facilities equipped with carbon capture technology have to burn more fossil fuel to get the same energy output, resulting in increased emissions of toxic and hazardous pollutants, like fine particulates (PM2.5).

CCS imposes even more risks on communities from CO2 pipelines and storage. Transporting, injecting, and storing CO2 presents new environmental, health, and safety hazards in communities targeted for CCS infrastructure. Pipelines can leak or rupture, and injection can contaminate water sources. These risks fall disproportionately on Black, Brown, Indigenous, and low-income communities, further entrenching a bleak history of environmental racism.

Most CCS benefits polluters. Nearly 80% of captured carbon is used to pump more oil out of the ground through "enhanced oil recovery." Polluting industries are using the myth of CCS to justify business-as-usual operations that are dangerous for the climate and communities. Pumping even more public funds into new CCS subsidies for fossil fuel and petrochemical industries will just prop up unsustainable business models.

We don't need to fix fossil fuels; we need to ditch them. Instead of capturing carbon to pump it back underground, we should keep fossil fuels in the ground in the first place. And instead of bankrolling CCS, public funds should be boosting sustainable, job-creating solutions to the climate crisis, for fossil-dependent workers and communities: phasing out oil, gas, and coal; investing in energy efficiency and non-combustion renewable energy sources; and protecting forests and other ecosystems that naturally capture and store carbon.

It's time for decision-makers to abandon the dirty, dangerous myth of CCS. We call on you to:

**Stop subsidizing CCS. Stop permitting CCS. Stop using CCS to justify climate inaction.
And don't pretend you're a climate leader if CCS is part of your climate plan.**

198 methods
2 Degrees Northampton
350 Bay Area Action
350 Brooklyn
350 Butte County
350 Central Mass
350 Colorado
350 Conejo / San Fernando Valley
350 Corvallis
350 Eugene
350 Hawaii
350 Juneau
350 Kishwaukee
350 Maine
350 Massachusetts
350 Merced
350 Montana
350 New Hampshire
350 New Orleans
350 NYC
350 Sacramento
350 Seattle
350 Spokane
350 Tacoma
350 Triangle
350 Wenatchee
350.org
A Community Voice
Action Center on Race & the Economy
ActionAid USA
Advocates for Springfield
AFGE Local 704
Alabama Interfaith Power & Light
Alberta Liability Disclosure Project
Algalita
Alliance for a Green Economy
Alliance for Affordable Energy
Amazon Watch
American Environmental Health Studies Project
American Family Voices
American Indian Movement Southern California
Animals Are Sentient Beings
Animas Valley Institute
Anthropocene Alliance
Atchafalaya Basinkeeper
Athens County's Future Action Network
Atlantic Coast Conference Climate Justice Coalition
Ban Single-Use Plastics
Below 2°C
Ben & Jerry's
Berks Gas Truth
Better Path Coalition
Beyond Plastics
Biofuelwatch
Black Mesa Trust
Black Voters Matter Fund
Bold Alliance
Breathe Project
British Columbia Hydro Ratepayers Association
Bronx Climate Justice North
Buckeye Environmental Network
Bucks County Concerned Citizens Against the Pipelines
Bucks Environmental Action
Businesses for a Livable Climate
California Businesses for a Livable Climate
California Democratic Party Environmental Caucus
California River Watch
California Safe Schools
Call to Action Colorado
Canadian Association of Physicians for the Environment
Canadian Environmental Law Association
Canadian Health Association for Sustainability & Equity
Canadian Unitarians for Social Justice
Canadian Voice of Women for Peace
Canadians for Tax Fairness
Cape Downwinders
Carrie Dickerson Foundation
Catholic Divestment Network
CatholicNetwork US
Catskill Mountainkeeper
Center for Biological Diversity
Center for Climate Integrity
Center for Coalfield Justice
Center for Environmental Health
Center for Environmentally Recycled Building Alternatives
Center for International Environmental Law
Center on Race, Poverty & the Environment
Chicago Area Peace Action
Choctawhatthee Riverkeeper
Church Women United in New York State
Citizen Power
Citizens Action Coalition
Citizens Awareness Network
Citizens' Resistance at Fermi 2
Ciudadanos Del Karso
Clean Air Action Network of Glens Falls
Clean Air Now
Clean Energy Action
Clean Energy Now Texas
Climate Action Now Western Mass
Climate Action Powell River
Climate Action Rhode Island / 350 Rhode Island
Climate Emergency Unit
Climate Hawks Vote
Climate Justice Alliance
Climate Justice Montreal
Climate Justice Ottawa
Climate Reality Project New Orleans
ClimateFast
Coal River Mountain Watch
Coalition Against Death Valley
Coalition Against Pilgrim Pipeline New Jersey
Coalition for a Nuclear Free Great Lakes
Coalition for Outreach, Policy, Education
Colorado Businesses for a Livable Climate
Colorado Small Business Coalition
Columbus Community Bill of Rights
Comite Pro Uno
Committee for Human Rights in Latin America
Common Ground Community Trust
Community Action Works
Community Church of New York
Community Climate Council
Comox Valley Council of Canadians
Concerned Citizens for Nuclear Safety
Concerned Citizens of Saint John
Concerned Health Professionals of New York
Concerned Ohio River Residents
Conejo Climate Coalition
Congregation of Sisters of Saint Agnes
Conservation Congress
Conservation Council for Hawaii
Cool Effect
Cooperative Energy Futures
Corporate Accountability
Cottonwood Environmental Law Center
Council of Canadians / Le Conseil des Canadiens
Courage California
Courage Montreal
Curr Dynasty Creative
Damascus Citizens for Sustainability
DC Environmental Network
Deep Green Resistance New York
Deep South Center for Environmental Justice
Democratic Environmental Caucus of St. Bernard Parish
Descendants Project
Detroit Hamtramck Coalition for Advancing Healthy Environments
Dis Organization for Solar Power
Dogwood Alliance
Don't Gas the Meadowlands Coalition
Don't Waste Arizona
Don't Waste Michigan
Drawdown Bay Area
Earth Action
Earth Care
Earth Day Initiative
Earth Day Network
Earthworks
Ecoequity
EcoHealth Network
Ecologos Water Docs
Education, Economics, Environmental, Climate & Health Organization
Electric Auto Association of Central Coast California
Elgin Green Groups 350
Empower Our Future
Endangered Species Coalition
Environmental Defence Canada
Environmental Protection Information Center
Environmental Transformation Movement of Flint
Environmental Working Group
Environnement JEUnesse
Environnement Vert Plus
Équiterre
Extinction Rebellion New Brunswick
Extinction Rebellion New Orleans
Extinction Rebellion San Francisco Bay Area
Family Farm Defenders
Fenceline Watch
First Presbyterian Church of Brooklyn
First Unitarian Universalist Church of New Orleans
Five Calls Civic Action
Florida Student Power Network
Food & Water Watch
Food Shift
For Our Kids North Shore British Columbia
For Our Kids Toronto
Forest Unlimited
Fossil Free California
Fossil Fuel Divest Harvard
Fox Valley Citizens for Peace & Justice
FrackBusters New York
FrackTracker Alliance
Franciscan Action Network
FreshWater Accountability Project
Fridays for Future Toronto
Friends of Buckingham
Friends of the Earth Canada
Friends of the Earth U.S.
Fuerza Mundial
Genesis Farm
Georgia Strait Alliance
Glasswaters Foundation
Global Alliance for Incinerator Alternatives
Global Justice Ecology Project
Global Witness
Grand(m)others Act to Save the Planet
Grandmothers Advocacy Network
Grassroots Environmental Education
Grassroots Global Justice Alliance
Great Egg Harbor Watershed Association
Great Old Broads for Wilderness
Great Plains Action Society
Greater Grand Rapids NAACP
Greater New Orleans Interfaith Climate Coalition
Green Education & Legal Fund
Green New Deal Virginia
Green Newton
Green Retirement
Green State Solutions
Greenaction for Health and Environmental Justice
GreenARMY
GreenFaith
GreenLatinos
GreenPeeps USA
GreenRoots
Greenvest
Gulf Coast Center for Law & Policy
Haiti Cholera Research Funding Foundation USA
Harambee House
Harvard Solar Gardens
Healthy Gulf
Heirs To Our Oceans
Homewise Realty
Hudson River Sloop Clearwater
Idle No More SoCal
In the Shadow of the Wolf
Indian Point Safe Energy Coalition
Indigenous Environmental Network
Indivisible CA-43
Indivisible Pittsfield
Inland Ocean Coalition
INOCHI / Women for Safe Energy
Institute for Agriculture and Trade Policy
Institute for Policy Studies Climate Policy Program
Interfaith Council for Peace & Justice
International Indigenous Youth Council Los Angeles
International Marine Mammal Project
Iowa Citizens for Community Improvement
Ironbound Community Corporation
John Muir Project
Just Earth
Just Transition Alliance
Justice & Beyond
Klamath Forest Alliance
KyotoUSA
LaPlaca & Associates
Leadnow
Living Rivers
Local Environmental Action Demanded Agency
Long Beach 350
Long Island Progressive Coalition
Longmeadow Pipeline Awareness Group
Los Padres ForestWatch
Louisiana League of Conscious Voters
Lower 9th Ward Neighborhood Watch
Manhattan Project for a Nuclear-Free World
Maryland Legislative Coalition
Mass Peace Action
Massachusetts Forest Watch
Maternal & Child Health Access
Metro New York Catholic Climate Movement
Michigan Alliance for Justice in Climate
Michigan Environmental Justice Coalition
Michigan Interfaith Power & Light
Mid-Missouri Peaceworks
Milwaukee Riverkeeper
MiningWatch Canada
Mission Blue
Moral ReSources
Mothers Out Front
Mothers Out Front Tompkins
Movement Rights
MoveOn.org Hoboken
My Sea to Sky
Nassau Hiking & Outdoor Club
Nature Canada
Nature Rhythms
Network in Solidarity with the People of Guatemala
Network of Spiritual Progressives
Nevada Nuclear Waste Task Force
New Energy Economy
New Jersey State Industrial Union Council
New Mexico Environmental Law Center
New York / New Jersey Environmental Watch
New York Country Earth Action Group
New York Lawyers for the Public Interest
Ni Btháska Stand Collective
Nobody Leaves Mid-Hudson
North American Climate, Conservation, and Environment
North American Water Office
North Bronx Racial Justice
North Carolina Council of Churches
North Carolina Interfaith Power & Light
North Country Earth Action
North Range Concerned Citizens
Northern Michigan Environmental Action Council
Northridge Indivisible
No Waste Louisiana
Nuclear Information & Resource Service
Nuclear Watch South
NY-16 Indivisible
NYC Environmental Justice Alliance
Occupy Bergen County
Ocean Conservation Research
Ohio Valley Environmental Coalition
Oil & Gas Action Network
Oil Change International
On Behalf of Planet Earth
Organized Uplifting Resources & Strategies
Our Climate Education Fund
Our Revolution Minnesota
Our Santa Fe River
Parents for Climate
Partnership for Policy Integrity
Pax Christi USA New Orleans
Peak Plastic Foundation
Peninsula Interfaith Climate Action
People Over Petro Coalition
People's Solar Energy Fund
People's Health Movement Canada
People's Party
Peoples Climate Movement New York
Physicians for Social Responsibility Arizona
Physicians for Social Responsibility Iowa
Physicians for Social Responsibility Pennsylvania
Pipe Line Awareness Network for the Northeast
Plastic Free Delaware
Plastic Pollution Coalition
PlasticFreeRestaurants.org
Plymouth Friends for Clean Water
Post Carbon Institute
Power Past Fracked Gas
Power Shift Network
Presentation Sisters
Preserve Montgomery County Virginia
Progressive Democrats of America
Public Citizen
Public Goods Institute
Publish What You Pay United States
Pueblo Action Alliance
Rachel Carson Council
Rainforest Action Network
Rapid Shift Network
Reconstructionist Rabbinical Association
RedTailed Hawk Collective
Redwood Justice Fund/ Prison Radio
Renewable Energy Long Island
Réseau Québécois sur l'Intégration Continentale
Resistance Action Tuesdays & Thursdays Pack
Resource Renewal Institute
Respecting Aboriginal Values & Environmental Needs
RESTORE: The North Woods
Rio Grande Valley Great Old Broads for Wilderness
RISE St. James
River Guardian Foundation
River Valley Organizing
Riverdale Jewish Earth Alliance
RootsAction
Safe Energy Rights Group
San Luis Obispo Mothers for Peace
Sane Energy Project
Santa Barbara Standing Rock Coalition
Santa Cruz Climate Action Network
Save Our Illinois Land
Save RGV from LNG
Save the Frogs!
Science & Environmental Health Network
Seniors For Climate Action Now!
Sequoia ForestKeeper
Seven Circles Foundation
Shenandoah Energy Services
Sierra Club Canada Foundation
Sierra Club Delta Chapter
Simcoe County Environmental Youth Alliance
Simcoe County Greenbelt Coalition
Sisters of Charity Federation
Sisters of Charity of New York
Snake River Alliance
Social Eco Education Los Angeles
Socially Responsible Agriculture Project
Society of Native Nations
Solidarity Info Service
Sonoma County Climate Activist Network
South Shore Audubon Society
Southeast Faith Leaders Network
SouthWings
Spirit of the Sun
Spottswoode Winery
Springfield Climate Justice Coalition
Stand.earth
Stop Fracking Long Beach
Stop SPOT & Texas Gullfink: Save Our Gulf Coast
Stop the Algonquin Pipeline Expansion
Sullivan Alliance for Sustainable Development
Sunflower Alliance
Sunrise Knoxville
Sunrise Movement New Orleans
Sustainable Belmont
Sustainable Medina County
Sustainable Orillia Youth Council
Syracuse Cultural Workers
TBL Communications
Texas Campaign for the Environment
Texas Environmental Justice Advocacy Services
Texas Grassroots Alliance
The Borneo Project
The Climate Center
The Climate Mobilization
The Climate Reality Project Canada
The Enviro Show
The Forest Foundation
The Freedom BLOC
The Future Left
The Green House Connection Center
The Last Beach Cleanup
The Last Plastic Straw
The Lilies Project
The River Project
The Wei
Three Mile Island Alert
Toledo Coalition for Safe Energy
Transition Sebastopol
Turtle Island Restoration Network
Unitarian Universalist Congregation of Binghamton Green Sanctuary
Unitarian Universalist Mass Action
Unitarian Universalists for a Just Economic Community
Unit North Metro Denver
United Church of Christ Environmental Justice Ministry
Utah Valley Earth Forum
Valley Watch
Verde
Veterans for Peace Climate Crisis & Militarism Project
Wall of Women
Wasatch Clean Air Coalition
Washington Physicians for Social Responsibility
Washtenaw350
Water and Air Team Charlevoix
Waterkeeper Alliance
Waterspirit
West Dryden Residents Against Pipeline
Western Organization of Resource Councils
Western Rural + Plains States Project
Western Watersheds Project
White Rabbit Grove RDNA
Wild Nature Institute
WildEarth Guardians
Wilderness Committee
Wildsight
Women Watch Afrika
Women's Earth and Climate Action Network
Women's Healthy Environments Network
Working Families Joliet
Young Democrats of America
Environmental Caucus
Youth United for Climate Crisis Action
Youth Vs. Apocalypse
Zero Hour

This ad paid for by the Center for International Environmental Law, a not-for-profit organization that uses the power of law to protect the environment, promote human rights, and ensure a just and sustainable society. For a complete copy of the open letter to policymakers and to learn more about CCS visit: <https://www.ciel.org/CarbonCaptureAndStorage>

Attachment No. 6



BLOG POST

Over 500 Organizations Call on Policymakers to Reject Carbon Capture and Storage as a False Solution

On July 19th, over 500 organizations across the United States and Canada expressed **deep concerns about the US and Canadian governments' support for carbon capture and storage (CCS) and carbon capture, utilization, and storage (CCUS) technologies** in an open letter to policymakers in the United States and Canada. The letter's key messages and demands were published as full-page advertisements in *The Washington Post* (https://www.ciel.org/wp-content/uploads/2021/07/CCS-Ad_The-Washington-Post_FINAL.pdf) and Ottawa's *Hill Times* (https://www.ciel.org/wp-content/uploads/2021/07/CCS-Ad_The-Hill-Times_FINAL.pdf) newspapers.

Despite occupying center stage in the “net-zero” climate plans trumpeted by the United States and Canada at the Leaders' Summit on Climate, government spending programs, and bills pending before Congress and Parliament, **carbon capture is not a climate solution**. On the contrary, investing in carbon capture delays the needed transition away from fossil fuels and other combustible energy sources. It poses significant new environmental, health, and safety risks, particularly to Black, Brown, and Indigenous communities already overburdened by industrial pollution, dispossession, and the impacts of climate change.

Upon the letter's release, leaders from several signatory organizations made the following statements:

Center for International Environmental Law

“CCS is life support for the fossil fuel industry — and a death sentence for the planet. We need to ditch fossil fuels, not ‘fix’ them with technologies that are dangerous, costly, unproven at scale, and at odds with environmental justice. Rather than bankroll the buildout of massive and risky CCS infrastructure on top of polluting industries, policymakers should finance the future, by replacing fossil fuels with renewables and creating sustainable jobs.” — **Nikki Reisch, Director of the Climate & Energy Program**

Environmental Defence Canada

“Carbon capture is being used as a Trojan horse by oil and gas executives to continue, and even expand, fossil fuel production. It's a dangerous distraction driven by the same polluters who created the climate emergency. The Government of Canada should not use any kind of financial support or tax incentive to prop up false climate solutions that only serve to delay the necessary transition off of fossil fuels. Instead, we should be focused on real climate solutions including renewable energy and energy efficiency that are job-creating, safe, affordable and ready to be deployed.” — **Julia Levin, Senior Climate and Energy Program Manager**

Institute for Policy Studies

“Carbon capture is an unproven technology, and there's no certainty it will ever be economically feasible. It is downright dangerous to pin our hopes on such a speculative technology to address the dire climate emergency humanity already faces. The U.S. government should stop incentivizing this technology through the tax code, or funding a buildout of carbon capture infrastructure through the various infrastructure proposals under consideration.” — **Basav Sen, Climate Policy Director**

Global Witness

“It's simple: the world cannot meet its climate targets relying on carbon capture. The majority of CCS that exists is being used to extract more oil, ultimately driving more climate pollution. There is only one winner when it comes to these unproven and costly technologies: fossil fuel companies, who are trying to cash in on the climate emergency while being propped up with government handouts. The Biden administration must say enough is enough, and prioritize real climate solutions, good green jobs, and the health of our communities over the interests of polluters' profits.” — **Zorka Milin, Senior Policy Advisor**

Gulf Coast Center for Law & Policy

“Industrial carbon capture utilization and storage is a false solution to this global climate crisis. Once again, Black, Indigenous and poor communities will be sacrificed just to ensure profit for polluting industries. We must reset our priorities to put people before profit. Let’s choose to use this moment to put people to work toward a healthy, safe and equitable future.” — **Colette Pichon Battle, Executive Director of the Gulf Coast Center for Law & Policy and National Lead for the Red, Black & Green New Deal at the Movement for Black Lives.**

Food & Water Watch

“Incentivizing carbon capture is simply throwing a lifeline to the fossil fuel industry, when we need to be throwing a lifeline to the planet. The US government has already spent billions of dollars on carbon capture to no end. Continuing to do so is throwing good money after bad; diverting resources that could be put to use actually confronting our climate crisis. We demand Congress to end support of carbon capture and invest in truly renewable energy.” — **Mitch Jones, Policy Director**

Friends of the Earth, US

“Why are Senate Democrats putting Big Oil talking points into policy at the expense of frontline communities already overburdened with pollution?” said **Sarah Lutz, Climate Campaigner**. “When it comes to CCS and the harms that would result from this polluter gimmick, the Administration should heed the recommendations from its own White House Environmental Justice Advisory Council.”

Partnership for Policy Integrity

“We can’t burn our way out of the climate crisis. CCS technologies are being touted as a magic bullet for capturing the carbon from burning any kind of fuel – including woody biomass. This ignores the other harmful health and environmental impacts along every step of the fuel production chain, particularly in low-income communities of color where wood pellet production facilities and biomass power plants are disproportionately sited. There is a much better way of capturing carbon and effectively storing it while safeguarding the health of our communities – it’s called letting our forests grow.” — **Laura Haight, U.S. Policy Director**

Indigenous Environmental Network

“Driving up more funding for carbon capture technology is a subsidy for the fossil fuel industry. Oil, coal and gas will use these funds to build out more pipelines and concentrate fossil fuel pollution on already impacted Indigenous nations and environmental justice communities. Billions of dollars for carbon capture essentially redirects money away from renewable energy like solar and wind. We do not have time and money to waste on more questionable carbon capture infrastructure.” — **Tom Goldtooth, Executive Director**

Center for Biological Diversity

“Promoting dangerous carbon capture and storage is just one more way a dying fossil fuel industry is trying to save itself at the expense of our climate and communities. We don’t have time or money to waste on fossil fuel deception in a climate emergency. Instead of propping up dirty energy, we need to focus on proven clean energy solutions like solar and wind.” — **Victoria Bogdan Tejada, Staff Attorney**

Ohio Valley Environmental Coalition (OVEC)

“Carbon capture technology is still in the early stages of development and not at a scale necessary to curtail the climate crisis. It is being used by industry and governments as a diversion to avoid addressing the climate crisis in a timely way using proven green technology.” — **Dr. Randi Pokladnik, volunteer**

GreenLatinos

“Carbon capture and storage (CCS) technologies are false solutions that perpetuate and exacerbate existing burdens for frontline communities. They enable the perpetuation of toxic emissions along with very real potential risks of environmental damage is a glaring red flag for lawmakers. For Latino/a/x and other disproportionately pollution burdened communities, continued investment in carbon capture technology and subsidies amounts to a continuation of a long history of environmental injustice. We call on Congress to stop investing in CCS and instead focus investments on energy efficiency and renewables that facilitate a transition to a lower carbon and pollution-free future.” — **Lydia Cardona, Climate and Clean Air Program Manager**

New York Lawyers for the Public Interest

“The climate crisis is upon us, it’s impacting every facet of our lives as well as taking far too many lives in its perilous process. Unfortunately, far too many of our lawmakers have become ensorcelled with profligate and unproven mechanisms to address the climate crisis including so-called carbon capture technology. These false solutions are the latest climate disinformation campaign by fossil fuel cartels and their political acolytes to beguile the people at a time when we need to scale up and scale out proven solutions rooted in frontline and Indigenous wisdom. Worse yet, these lawmakers, including Administrator McCarthy, are ignoring the voices and recommendations of leading Environmental Justice practitioners, including those who sit on the President’s White House Environmental Justice Advisory Council, who have stated emphatically that they don’t want these false solutions in their communities. It must, therefore, be stated lucidly that support for CCS is an exacerbation of environmental racism, an affront on Tribal/Indigenous sovereignty, and nothing more than a perverse lifeline to industries that profit off of death and calamity.” — **Anthony Rogers Wright, Director of Environmental Justice**

Climate Justice Alliance

“False promises abound as big business salivates over the money to be made in appearing to care about the climate crisis that they created. The push for Carbon Capture and Storage is just another example of corporate controlled mechanisms being promoted as solutions when they actually cause harm to communities and the planet and have not been proven to do what needs to be done to address climate change—reduce emissions at source. If the fossil fuel and gas industries really want to atone for their sins they should immediately abandon this market-based scheme and fund truly renewable and regenerative community controlled approaches to a Just Transition, not ones that sacrifice frontline communities, yet again.”

Oil Change International

“Carbon capture and storage isn’t just a colossal waste of money and an environmental justice disaster — it’s a lifeline to the fossil fuel industry and politicians unwilling to stand up to Big Oil and Gas. The desperate focus on false solutions like CCS is a dangerous distraction from the critical work of ending fossil fuel subsidies and winding down the fossil fuel era with a just transition.” — **Collin Rees, Senior Campaigner**

Michigan Environmental Justice Coalition

“While low-income communities and communities of color face the brunt of the climate crisis, the U.S government is trying to provide subsidies and incentives for false solutions like Carbon Capture and Storage (CCS) projects. Detroit just experienced historic rainfall leaving many people with flooded basements, power and broadband outages, and water contamination. We need climate reparations and direct community investments in climate resilient infrastructure, not false solutions that benefit corporations and burden our communities. CCS allows the fossil fuel industry to continue polluting our neighborhoods while falsely claiming to be reducing greenhouse gas emissions. Michigan Environmental Justice Coalition stands for the health of people and the planet and against corporate greenwashing.” — **Juan Jhong-Chung, Policy Associate**

Waterkeeper Alliance

Carbon capture and storage is a pipe(line) dream for the fossil fuel industry. They would obtain further subsidies for polluting our air, water and communities and also get to greenwash their image,” said Chris Wilke of Waterkeeper Alliance. “Not only is this unproven technology unlikely to lead to effective progress toward reducing carbon in the atmosphere, it also represents a false solution that risks squandering this important moment while we still have a real chance at staving off the worst impacts of climate change.” — **Chris Wilke, Global Advocacy Manager**

Catholic Network.US

“As Catholics we are pro-life for all life and are not for false solutions that send more money to fossil fuel companies and the wealthiest in the guise of CCS, which will be an expensive failure. The opportunity cost is too high.” — **Marie Venner, Chair**

GET INVOLVED
TAKE ACTION
(/GET-INVOLVED)

SHARE:



STAY INFORMED

First Name

Last Name

Email

SIGN-UP

SUPPORT OUR WORK

DONATE NOW

([HTTP://ACT.CIEL.ORG/SITE/DONATION2?DF_ID=1501&MFC_PREF=T&1501.DONATION=FORM1&S_SRC=HOME](http://act.ciel.org/site/donation2?DF_ID=1501&MFC_PREF=T&1501.DONATION=FORM1&S_SRC=HOME))

**Tweets from
@ciel_tweets**

 **Center for
International ...**
Michigan ... 

©2022 Center for International Environmental Law (CIEL), All Rights Reserved. Site by Roo id (https://go.rooid.com/welcome/?client=CIEL)

Attachment No. 7



Environmental Justice Organizations post
Comments on Carbon Capture and Storage to
the White House Council on Environmental
Quality

- [April 19, 2022](#)



Brenda Mallory
Chairwoman, Council on Environmental Quality
730 Jackson Place, NW
Washington, DC 20503

Re: Request for Comments Council for Environmental Quality’s “Carbon Capture, Utilization, and Sequestration Guidance,” 87 Federal Register 8808 (February 16, 2022), Docket CEQ-2022-0001

18 April 2022

Dear Chair Mallory:

The Climate Justice Alliance (CJA) in coordination with Indigenous Environmental Network, Institute for Policy Studies, Grassroots Global Justice Alliance, Michigan Environmental Justice Coalition, and New York Lawyers for the Public Interest appreciate the opportunity to offer comments on the Council on Environmental Quality's, *Carbon Capture, Utilization, and Sequestration Guidance Document* ("Guidance Document").

These comments, led by environmental justice organizations, and supported by numerous ally organizations, highlight the serious concerns with the recently issued Guidance Document on carbon dioxide removal technologies that includes: carbon capture and sequestration/carbon capture utilization and storage (CCS and CCUS), direct air capture (DAC), and other related technologies.

Technological fixes such as CCS/CCUS will never address extraction-driven climate and ecological crises as long as fossil fuels continue to be extracted and burned, or put to other toxic uses such as hydrogen combustion or plastics production. Likewise, bioenergy with carbon capture and storage (BECCS) will never address the ecological crisis caused by destruction of forests for fuel. It should be noted that, currently, the only large-scale use of "captured" carbon dioxide is for enhanced oil recovery (EOR). Currently, 75 percent of carbon dioxide captured via industrial means is used to boost fossil fuel recovery, a fact that is profoundly overlooked in the Guidance Document.

From our perspective, the Guidance Document appears to act as a mechanism for fast-tracking the approval of massive CCS/CCUS and associated carbon dioxide permits in spite of significant opposition from the environmental justice community as well as the larger ecosystem of climate justice advocates. Even the timing of the Guidance Document's release seems concomitant with the Infrastructure Investment and Jobs Act (IIJA), which includes provisions that significantly undermine the National Environmental Policy Act (NEPA), which acts as a vanguard for environmental justice communities. In addition, IIJA diminishes the ability of communities to secure injunctions for harmful projects by expediting environmental reviews and increasing hurdles for communities to challenge projects in court.

President Biden declared it the policy of his administration to, "secure environmental justice and spur economic opportunity for disadvantaged communities that have been historically marginalized and overburdened by pollution and underinvestment..." However, this intention is not reflected in the Guidance Document or the process that led to its preparation. We, therefore, invite CEQ to consider our concerns and work more intentionally with Indigenous and environmental justice communities prior to the proliferation of CCS/CCUS technology and associated infrastructure in such a way that better aligns with the commitments made by President Biden, CEQ, and other federal agencies to prioritize environmental justice.

Background and Framing

The proliferation of CCS/CCUS and associated infrastructure will inevitably have a profound impact on environmental justice communities – in some instances it already has, as was the case in Yazoo County, Mississippi following the rupture and explosion of a carbon dioxide pipeline that left many injured. CCS/CCUS also contributes to worsened air quality by increasing lifecycle emissions of toxic air pollutants, disproportionately harming disadvantaged and other environmental justice communities. In addition to worsening existing sources of

pollution, CCS/CCUS has the potential to expose environmental justice communities to new, under-studied risks associated with the buildout of carbon dioxide pipelines, as was the case in the aforementioned Yazoo County, Mississippi incident.

We declare the entire concept of CCS/CCUS is antithetical to environmental justice principles. As such, any attempt to reconcile CCS/CCUS guidance in the context of environmental justice is an exercise in futility. Whereas CCS/CCUS is an “end of the pipe” solution that attempts to remove carbon dioxide after fossil fuels have been extracted, transported, processed, and burned, causing harm to communities and ecosystems at every stage. True environmental justice requires addressing the root causes of the problem by leaving fossil fuels in the ground and reducing emissions expeditiously.

Therefore, we call on CEQ to withdraw the Guidance Document, and undertake a better, more inclusive process that demonstrates and exercises transparency, participation, as well as the consent of environmental justice community members that leads to a new guidance document. Further, we request a longer comment period of at least 60 days, and an additional process that would give stakeholders more opportunities to give input on CEQ’s guidance, including:

- Broader community engagement including direct outreach to frontlines and environmental justice communities, potential geographic hearings or listening sessions, etc;
- Development of further reports that go beyond CEQ’s 2021 report to Congress, *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration* (“CEQ 2021”), to assess the potential harmful impacts of CCUS on disadvantaged and other environmental justice communities that should be completed before any final guidance is issued; and
- A recommendation by CEQ for the cessation of all CCS/CCUS permitting projects until the final guidance is developed with robust stakeholder engagement.

Further, we are extremely concerned, pursuant to the Consolidated Appropriations Act of 2021, CEQ has been tasked with establishing “not less than [two] task forces, which shall each cover a different geographical area with differing demographic, land use, or geological issues,” for the purpose of facilitating the permitting and development of CCS projects. The law was enacted in December 2020 and gave CEQ 18 months to establish these task forces, which likely means that the process of establishing these task forces is close to completion. However, we, and numerous environmental advocates with whom we frequently work, have heard of no public announcements from CEQ whatsoever about which geographic regions they have selected, who the proposed members of the task forces are, nor any other relevant information.

We find this lack of transparency to be deeply concerning, and demand that CEQ immediately:

- Make public its plans for establishing these task forces;
- Prohibit the task forces from recommending permit processes for CCS/CCUS projects until environmental justice principles of transparency, consent, and participation are met to the satisfaction of the environmental justice community; and
- Provide meaningful opportunities for impacted communities in the selected geographic regions to engage and participate in the work of these task forces.

CEQ Failed to Undertake Meaningful Engagement with Indigenous and Environmental Justice Communities

Environmental justice movements arose in response to decades of disproportionate environmental harms experienced by Indigenous, Black, Latin(a/o), Asian, and other communities of the global majority, and the poor in the United States and worldwide resulting from centuries of slavery, colonization, and the promulgation of racist, sexist, and inequitable policies. In response to legacy environmental racism, environmental justice movements have developed key principles, such as the 1991 Principles of Environmental Justice, the 1996 Jemez Principles of Democratic Organizing, and various principles of Just Transition.

Unfortunately, CEQ failed to consider any of these principles or include consultation with Indigenous and environmental justice Peoples and organizations in its preparation of the Guidance Document. This is antithetical to Section 219 of President Biden's Executive Order (E.O) 14008, which, in part, stipulates, "Agencies shall make achieving environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."

Additionally, the Guidance Document does not comply with mandated consultation policies with federally recognized Tribes pursuant to E.O. 13175. It is our assertion that CEQ and the Biden Administration should require Indigenous Peoples' consent, not just consultation, in accordance with the principle of Free Prior and Informed Consent for any decision impacting Indigenous Peoples, before any guidance on CCS/CCUS is issued to ensure meaningful consultation.

Furthermore, the process that led to the Guidance Document is inconsistent with CEQ's own "Guiding Principles for Meaningful Engagement" included as part of its 2016 Document, *Promising Practices for EJ Methodologies in NEPA Reviews*. Therein, CEQ recommends, "Meaningful engagement efforts with potentially affected minority populations, low-income populations, and other interested individuals, communities, and organizations are generally most effective and beneficial for agencies and communities when initiated early and conducted (as appropriate) throughout each step of the NEPA process."

The Guidance Document is inconsistent with public engagement recommendations and conclusions contained in CEQ 2021. For instance, the Guidance Document indicates the 2021 report was "... developed in response to the Congressional mandate to identify public engagement opportunities through existing laws, including under the National Environmental Policy Act of 1969." However, we find that the Guidance Document's assurances of consultation with environmental justice communities, and safeguards to prevent any harm to them, are specious. In fact, it can be argued that the entire process associated with the introduction of legislative priorities for carbon dioxide removal technologies has lacked inclusion and consent, since the views of environmental justice communities were not intentionally solicited, such as during a Congressional hearing for the Utilizing Significant Emissions with Innovative Technologies (USE IT) Act (which is included as part of Consolidated Appropriations Act of

2021), which, did not include a single representative of an environmental justice community or climate justice organization.

These and other recommendations to better engage with disadvantaged and other environmental justice communities were clearly absent from the process that led to the Guidance Document. Therefore, as previously mentioned, CEQ must undertake broader community engagement including direct outreach to frontline, Indigenous, and environmental justice communities through a series of public hearing opportunities that are accessible to concerned and other interested residents.

Guidance Documented Cites Selective Data That Fail to Document Past and Present CCS/CCUS Challenges

The Guidance Document is largely informed by key findings included as part of CEQ 2021, which includes a litany of inconsistencies, unfounded conclusions, and, in some cases, blatant inaccuracies. For instance, one of CEQ 2021's key findings asserts, "Key guidance documents and best practices have been developed by the Federal Government, industry, and non-governmental organizations to assist CCUS project developers in moving CCUS efforts forward responsibly and efficiently." However, CEQ failed to cite any of these sources in CEQ 2021 and they are largely unknown to the various environmental justice organizations we solicited to determine their familiarity with these "key guidance documents and best practices."

Additionally, CEQ 2021 claims, "The Federal Government has an existing regulatory framework that is rigorous and capable of managing permitting and review actions while protecting the environment, public health, and safety as CCUS projects move forward." Yet, as our comments will demonstrate, CEQ itself confirms there is, for instance, no federal agency that currently holds jurisdiction over carbon dioxide pipelines – they are largely regulated by the states. In short, the fact that the recommendations of the Guidance Document are informed by CEQ 2021 is concerning and should be addressed prior to finalization of any guidance for the permitting and regulation of CCS/CCUS and associated infrastructure.

CEQ claims there is "growing scientific consensus" CCUS technologies and permanent sequestration are likely needed to prevent the worst impacts of climate change but fails to provide any references to back up this claim. However, CEQ conveniently ignored the growing body of evidence proving that carbon removal methods have not demonstrated energy efficiency or efficacy. As an example, according to three leading climate scientists, reliance on technological carbon removal, and the underlying misleading concept of "net zero" emissions targets, create a false sense of complacency by holding onto the promise of non-existent or experimental technologies, which could mitigate greenhouse gas emissions in the distant future, reducing the impetus to make deep cuts in emissions today.

Furthermore, the Guidance Document omits consensus from numerous environmental justice organizations who contend that carbon removal technologies perpetuate harm and risk to environmental justice communities. In fact, President Biden's White House Environmental Justice Advisory Council (WHEJAC), which includes leaders of the environmental justice community, explicitly named CCS/CCUS as an example of the types of projects that will not benefit disadvantaged and other environmental justice communities. Additionally, national

climate justice base-building organizations such as CJA have unequivocally indicated their opposition to CCS/CCUS, as well more than 500 national and international organizations who recently called on lawmakers in the United States and Canada to, “reject carbon capture and storage (CCS) and Carbon Capture, Utilization, and Storage (CCUS) as dangerous distractions and to end the ‘carbon capture of climate policy.’”

Omitting these resources from the Guidance Document could be seen as the federal government not acting objectively and signaling its preference for one technology over another. And, the fact that the IIJA earmarked an estimated \$12.1 Billion for CCS/CCUS projects compared to less than \$1 Billion for renewable energy projects compounds our concerns. This, despite the fact that over 80 percent of CCS/CCUS projects globally have been scuttled due to irreconcilable and exorbitant costs and/or the ineffectiveness of the technology altogether.

The Guidance Document makes no mention of the vast amount of taxpayer dollars spent on CCS/CCUS demonstration projects that never came to fruition. It’s troubling that CEQ makes no mention of the report prepared by the Government Accountability Office (GAO) which reveals that all eight Department of Energy (DOE) funded CCS demonstration projects for coal fired power plants have either been withdrawn, terminated, or are no longer in operation. Even the Wall Street Journal declared that government funded CCS/CCUS initiatives have, “a dismal record,” as part of a piece that also revealed the fact that there are neither federal requirements nor incentives that discourage corporations utilizing CCS/CCUS from releasing greenhouse gasses into the atmosphere.

For these reasons and more, CEQ must prepare additional reports that go beyond CEQ’s 2021 report in an effort to assess costs to taxpayers for subsidizing this technology and potential harmful impacts of CCS/CCUS on disadvantaged and other environmental justice communities.

Guidance Document Contains Inconsistent Policy Conclusions That Could Result in Confusion and Litigation

CEQ must elucidate the extent to which federal agencies have jurisdiction over carbon dioxide (CO₂) pipelines. The Guidance document and CEQ 2021 offer differing and, at times, ambivalent determinations. For instance, CEQ 2021 indicates, “no Federal entity is responsible for siting interstate CO₂ pipelines across Federal and non-Federal lands. States establish the regulatory frameworks within their state boundaries, which include responsibility for siting and permitting intrastate pipelines as well as segments of interstate hazardous liquids pipelines within the state boundary.” It goes on to say, “Because states and localities have distinct regulatory regimes, it may be more complex to move CCUS efforts forward in some jurisdictions than others.” However, the Guidance document suggests, “Because multiple Federal and State agencies will be responsible for planning and permitting priority pipeline pathways, and in order to ensure that these actions are aligned with climate, economic, and public health objectives, CEQ will convene the relevant agencies to assess opportunities for improvement in carbon dioxide pipeline permitting.”

CEQ must better stipulate which Federal, and which state agencies have jurisdiction over these pipelines. Moreover, since CO₂ pipelines in most cases would be transporting gasses that will eventually be utilized for a wide range of products (such as fertilizer, EOR and other forms of

commerce), CEQ must indicate how CO2 transported via pipeline across state lines would be consistent with the Interstate Commerce Clause.

Regarding compliance with NEPA, the Guidance Document evokes the idea of Tiering via Programmatic Environmental Impact Statements (EIS) to increase the efficiency of the permitting processes for CCS/CCUS and associated infrastructure. This is a problematic approach when considering that analyses of larger regions may not necessarily accurately account for the baseline conditions of physical, socioeconomic, or cultural resources for a specific geography within a larger region. This is precisely why, 43 CFR § 46.140(b) stipulates, “To the extent that any relevant analysis in the broader NEPA document is not sufficiently comprehensive or adequate to support further decisions, the tiered NEPA document must explain this and provide any necessary analysis.” Moreover, according to CEQ’s 2014 document, *Effective Use of Programmatic NEPA Reviews (2014)*, the agency, “finds it inappropriate to establish a presumption that substantive analysis is unnecessary or should be precluded in subsequent tiered documents.” Furthermore, CEQ must ensure their recommendations for tiering are not viewed as segmenting – the breaking up of a larger project into smaller components, in order to avoid finding no significant impact of a project considered as a whole, which, pursuant to 40 CFR 1500 – 1508, is prohibited.

Utilizing Programmatic EISs also increases the risk for localized environmental justice impacts to be overlooked and unaccounted for. Broader analyses will not necessarily depict specific, localized environmental justice impacts of a proposed action that is part of a larger, regional proposal. In fact, it is common practice to identify an environmental justice community by comparing the socioeconomic demographics of a local geography to its surrounding area. As such, a larger project’s demonstration of no impact in one area of a region is not necessarily representative of potential impacts for the entire region, or for local areas specifically. Inadequate analysis of environmental justice impacts would be inconsistent with Executive Order 12898 and could lead to litigation.

To these ends, CEQ should recommend that all CCS/CCUS projects require project-level EISs in lieu of programmatic EISs. Efficiency should never come at the expense of thorough analyses that investigate the full scope of potential impacts, especially to Indigenous and other environmental justice communities.

Conclusion

CCS/CCUS is an unproven, profligate technology scheme that’s already cost taxpayers billions of dollars while putting Indigenous and other environmental justice communities at increased risk for disproportionate impacts including, but not limited to, exposure to toxic emissions and explosions due to ruptured and malfunctioning pipelines. The Guidance Document fails to address these issues or demonstrate the efficacy of CCS/CCUS as a true solution for reducing emissions. In fact in certain cases, such as the Quest Plant in Alberta, Canada, CCS/CCUS actually released more carbon dioxide than it sequestered.

Environmental justice organizations and advocates are gravely concerned that CEQ is hastily promoting an ineffective technology that will only allow the fossil fuel industry to continue emitting greenhouse gasses at a time when the science tells us we have less than a decade to

properly address the climate crisis. For environmental justice communities, where the vast majority of CCS/CCUS facilities would be located, the situation is even more dire and CEQ's Guidance Document provides little to no reassurances that impacts to these communities will be properly analyzed or mitigated.

CEQ must revisit the entire process that led to the Guidance Document and allow for a longer comment period of at least 60 days, as well as undertake an additional process that allows Indigenous and other environmental justice communities more opportunities for broader community engagement, direct outreach to environmental justice communities, and additional studies to assess the potential harmful impacts of CCS/CCUS.

We look forward to working with CEQ in an effort to assist the Biden Administration with living up to its environmental justice commitments as stipulated in EO 14008 and public statements made by the president and numerous representatives of federal agencies.

Sincerely,

Climate Justice Alliance
Grassroots Global Justice Alliance
Indigenous Environmental Network
Institute for Policy Studies Climate Policy Program
Michigan Environmental Justice Coalition
New York Lawyers for the Public Interest

Supporting Environmental Justice Organizations:

7 Directions of Service
Alliance for Affordable Energy
Asian Pacific Environmental Network (APEN)
Center for Coalfield Justice
Center for Community Action and Environmental Justice
Communities for a Better Environment
Central California Asthma Collaborative
Central Valley Air Quality Coalition (CVAQ)
Cheyenne River Grassroots Collective
Citizens for Clean Air and Water in Freeport Texas
Citizens for Coalfield Justice
Coalition Against Death Alley
Common Ground Rising
Communities for a Better Environment
Cooperation Jackson
Detroit Hamtramck Coalition for Advancing Healthy Environments
East Michigan Environmental Action Council
Friends For Environmental Justice
Giniw Collective
Greater New Orleans Housing Alliance
Greater New Orleans Interfaith Climate Coalition
Gulf Coast Center for Law & Policy
Harambee House, Inc. / Citizens for Environmental Justice
Healthy Gulf

Honor the Earth
Idle No More SF Bay
Inclusive Louisiana
Indigenous Lifeways
Ironbound Community Corporation
Just Transition Alliance
Kickapoo Peace Circle
Lakota People's Law Project
Little Manila Rising
Little Village Environmental Justice Organization
Micronesia Climate Change Alliance
Migiziwillfly
Mujeres Unidas y Activas
Multicultural Alliance for a Safe Environment
Native Movement
NC Climate Justice Collective
New York City Environmental Justice Alliance
Nicaragua Center for Community Action
North Dakota Native Vote
OPAL Environmental Justice Oregon
Parable of the Sower Cooperative
People Organizing to Demand Environmental and Economic Rights (PODER)
People's Action
Pueblo Action Alliance
SouthWest Organizing Project
Spirit of the Sun, Inc.
Texas Environmental Justice Advocacy Services (t.e.j.a.s.)
The People's Justice Council
Turtle Island Restoration Network
United Native Americans
UPROSE
UUFDF Environmental Justice Team
Waterspirit
Women's Earth and Climate Action Network

Supporting Organization Sign On:

1000 Grandmothers for Future Generations
198 methods
350 Bay Area Action
350 Colorado
350 Conejo / San Fernando Valley
350 Mass
350 New Orleans
350 Seattle
350 Seattle
350 Triangle
350.org
350Hawaii

5 Gyres Institute
A Community Voice
Accelerate Neighborhood Climate Action
Activist San Diego
AFGE Local 704
Agricultural Justice Project
Animals Are Sentient Beings Inc
Association of Young Americans
Athens County's Future Action Network/ACFAN
Beyond Plastics
Biofuelwatch
Bold Alliance
Breathe Project
Buckeye Environmental Network
Businesses for a Livable Climate
Cabrini Care for Creation
California Communities Against Toxics
California Faculty Association
California Safe Schools
Call to Action Colorado
Capitol Heights Presbyterian
Care for Creation Team
CatholicNetwork US
Center for Biological Diversity
Center for Environmental Health
Center for International Environmental Law
Citizen Power, Inc.
Citizen's Alliance for a Sustainable Englewood
Citizens Resistance At Fermi Two (CRAFT)
Clean Air Council
Clean Energy Action
Climate Hawks Vote
CO Businesses for a Livable Climate
CO Dem. Party – Energy & Environmental Initiative
CO Small Business Alliance
Coalition to Protect New York
COCRN Colorado Community Rights Network
Colorado Western Slope Businesses for a Livable Climate
Community for Sustainable Energy
Concerned Citizens of St. John
Concerned Health Professionals of Pennsylvania
ConnectX Eco
Dakota Rural Action
DC Statehood Green Party
Divest Ed
Dogwood Alliance
Don't Waste Arizona
Earth Action, Inc.

Earth Care
Earth Guardians
ecoAmerica
EcoEquity
Ecology Center
Empower our Future
End Climate Silence
Extinction Rebellion San Francisco Bay Area
Food & Water Watch
Fox Valley Citizens for Peace & Justice
FracTracker Alliance
FreshWater Accountability Project
Friends of the Earth
GAIA
Grassroots International
Greater New Orleans Climate Reality Project
Greenpeace USA
Heartwood
I-70 Citizens Advisory Group
Indivisible Ambassadors
Indivisible Ventura
Indigenous Outreach at St.Frances Cabrini Church
Inland Ocean Coalition
Interfaith Council for Peace and Justice
John Muir Project
Long Beach Alliance for Clean Energy
Long Island Progressive Coalition
Loudoun Climate Project
Louisiana League of Conscious Voters
Louisville Metro Public Defender
Madhvi4EcoEthics
Mayfair Park Neighborhood Association Board
Mental Health & Inclusion Ministries
Mn350
Montbello Neighborhood Improvement Association
Mothers Out Front Colorado
MoveOn.org Hoboken
Nancy Negrette Brows, Hair & Lashes Studio
Natural Capitalism Solutions
NELA Climate Collective
Network for a Sustainable Tomorrow
New Energy Economy
New Mexico Environmental Law Center
North American Climate, Conservation and Environment(NACCE)
North Range Concerned Citizens
Northern Alaska Environmental Center
Nuclear Energy Information Service (NEIS)
Nuclear Information and Resource Service (“for a nuclear-free, carbon-free world”)

Ohio Poor People's Campaign
Oil Change International
Our Revolution
Peace Action WI
Peak Plastic Foundation
Physicians for Social Responsibility – Los Angeles
Physicians for Social Responsibility Pennsylvania
PIIC
Plastic Pollution Coalition
Plymouth Friends for Clean Water
Private Equity Stakeholder Project
Progressive Democrats of America
Property Rights and Pipeline Center
Protect Our Water Heritage Rights (POWHR)
Putnam Progressives
Rachel Carson Council
RapidShift Network
Resist the Pipeline
Revolving Door Project
Richmond Our Power Coalition
River Valley Organizing
Rogue Climate
San Antonio Bay Estuarine Waterkeeper
San Francisco Bay Physicians for Social Responsibility
San Luis Valley Ecosystem Council
Santa Cruz Climate Action Network
Saphron Initiative
Save EPA (former employees)
School Sisters of Notre Dame
Science and Environmental Health Network
Science for the People – Twin Cities
SEED of SW NM
Small Business Alliance
SoCal 350 Climate Action
Social Eco Education (SEE)
Solar Wind Works
SolidarityINFOService
Southwest Organization for Sustainability
St Frances Cabrini Catholic Community
St luke presbyterian
Sunnyside United Neighbors, inc (SUNI)
System Change Not Climate Change
Terra Advocati
Texas Campaign for the Environment
The Green House Connection Center
The Last Plastic Straw
The Romero Institute
The Shame Free Zone

Third Act Virginia
Tishman Environment & Design Center, The New School
Triple Justice Organization
UCAN
Unitarian Universalist Association
Unitarian Universalist Mass Action
Unite North Metro Denver
United Women in Faith
Valley Watch, Inc.
Vote Climate
Wall of Women
Waterway Advocates
Western Slope Businesses for a Livable Climate
WildEarth Guardians
Wilwerding Consulting
Women's Environment and Development Organization (WEDO)
Working for Racial Equity
Womxn from the Mountain
YUCCA (Youth United for Climate Crisis Action)
Zero Hour

Attachment No. 8

Every Dollar Spent on This Climate Technology Is a Waste



Credit... Josh Haner / The New York Times

By Charles Harvey and Kurt House *New York Times* Aug. 16, 2022

<https://bit.ly/3Qw1xvU>

[Dr. Harvey is a professor of environmental engineering at the Massachusetts Institute of Technology. Dr. House is the chief executive officer of KoBold Metals, a metals exploration company.]

The technology called carbon capture and storage is aptly named. It is supposed to capture carbon dioxide emissions from industrial sources and pump them deep underground. It was a big winner in the climate provisions of the Inflation Reduction Act passed by Congress last week and signed into law by President Biden on Tuesday.

What the technology, known as C.C.S., also does is allow for the continued production of oil and natural gas at a time when the world should be ending its dependence on fossil fuels.

The Inflation Reduction Act does more to cut fossil fuel use and fight climate change than any previous legislation by expanding renewable energy, electric cars, heat pumps and more. But the law also contains a counterproductive waste of money, backed by the [fossil fuel industry](#), to subsidize C.C.S.

Fifteen years ago, before the cost of renewable energy plummeted, carbon capture seemed like a good idea. We should know: When we began a start-up 14 years ago — the [first privately funded company](#) to make use of C.C.S. in the United States — the idea was that the technology could compete as a way to produce carbon-free electricity by capturing the carbon dioxide emissions emitted from power plants and burying them. But now it's clear that we were wrong, and that every dollar invested in renewable energy — instead of C.C.S. power — will eliminate far more carbon emissions.

Even so, this technology has broad political support, including from Senator Joe [Manchin](#) of West Virginia, an [ally of the coal industry](#), because it enables the continued extraction and burning of fossil fuels while also preventing the resulting carbon dioxide from entering the atmosphere. Industry campaigns such as “Clean Coal” have also promoted the technology as something that could ramp up quickly to bridge the gap to the deployment of large-scale renewable energy. But by promoting C.C.S., the fossil fuel industry is slowing the transition away from fossil fuels.

Under the Inflation Reduction Act, facilities using this technology will be eligible for generous tax credits provided they break ground by the end of 2032 — an extension of the current deadline of 2025. Those benefits come on top of [\\$12 billion](#) in government investments in C.C.S., as well as in technology that would pull carbon dioxide directly from the air, which were included in the infrastructure bill signed by President Biden last fall.

C.C.S. is seen as a solution to the emissions problem for a range of industries, from electricity generating plants powered by fossil fuel to industrial facilities that produce cement, steel, iron, chemicals and fertilizer.

Where C.C.S. has been most widely used in the United States and elsewhere, however, is in the production of oil and natural gas. Here's how: Natural gas processing facilities separate carbon dioxide from methane to purify the methane for sale. These facilities then sometimes pipe the “captured” carbon dioxide to what are known as enhanced oil recovery projects, where it is injected into oil fields to extract additional oil that would otherwise be trapped underground.

Of the 12 commercial C.C.S. projects in operation in 2021, more than 90 percent were engaged in enhanced oil recovery, using carbon dioxide emitted from natural gas processing facilities or from fertilizer, hydrogen or ethanol plants, according to [an industry report](#). That is why we consider these ventures oil or natural gas projects, or both, masquerading as climate change solutions.

The projects are responsible for most of the carbon dioxide now sequestered underground in the United States. Four projects that do both enhanced oil recovery and natural gas processing account for two-thirds to three-quarters of all estimated carbon sequestered in the United States, with two plants storing the most. But the net effect is hardly climate friendly. This process produces more natural gas and oil, increases carbon dioxide emissions and transfers carbon dioxide that was naturally locked away underground in one place to another one elsewhere.

In an effort to capture and store carbon dioxide from fossil-fuel-burning power plants, the Department of Energy has allocated [billions](#) of dollars for failed C.C.S. demonstration projects. The bankruptcy of many of these hugely subsidized undertakings makes plain the failure of C.C.S. to reduce emissions economically.

The Kemper Power Project in Mississippi spent \$7.5 billion on a coal C.C.S. plant before giving up on C.C.S. in 2017 and shifting to a gas-powered plant without C.C.S. The plant was partially demolished in October 2021, less than six weeks before President Biden signed the infrastructure bill with its billions of taxpayer money for C.C.S.: good money thrown after bad. The FutureGen project in Illinois started as a low-emission coal-fired power plant in 2003 with federal funds, but ultimately failed as a result of rising costs.

The Texas Clean Energy and Hydrogen Energy California C.C.S. projects were allocated [over a half- billion dollars](#) collectively, then dissolved. The list goes on, with at least 15 projects burning billions of dollars of public money without sequestering any meaningful amount of carbon dioxide. Petro Nova, apparently the only recent commercial-scale power project to inject carbon dioxide underground in the United States (for enhanced oil recovery), [shut down in 2020](#) despite hundreds of millions of dollars in tax credits.

These projects failed because renewable electricity generation outcompetes C.C.S. Renewable power now is [cheaper than coal-fired power](#) without C.C.S. Add the cost of the energy required to couple C.C.S. with fossil fuel power and it becomes hopelessly [uncompetitive](#). We can only guess how much more the full costs of

C.C.S. would exceed renewable power because, after decades of promotion and many billions of dollars spent, we still have next to no real-world data about the costs of running, maintaining and monitoring large C.C.S. projects.

These C.C.S. projects are subsidized by Section 45Q of the federal tax code, which now offers companies a tax credit for each metric ton of carbon dioxide injected into the ground. Those enhanced oil recovery subsidies would rise under the new law, to [\\$60 per ton](#) from \$35. The legislation also significantly broadens the number of facilities eligible for tax credits. And they will be able to claim the tax credit through a tax refund. The 45Q program is nominally a program to fight climate change. But since nearly all carbon dioxide injections subsidized by 45Q are for enhanced oil recovery, the 45Q program is actually an oil production subsidy.

The Internal Revenue Service does not provide information about who gets the credits. But we do know that [it issued more than \\$1 billion of these credits](#) as of 2020.

These subsidies create a perverse incentive, because for companies to qualify for the subsidies, carbon dioxide must be produced, then captured and buried. This incentive handicaps technologies that reduce carbon dioxide production in the first place, tilting the playing field against promising innovations that avoid fossil fuels in the steel, fertilizer and cement industries while locking in long-term oil and gas use.

Industry campaigns for C.C.S. also have shifted their decades-long disinformation fight: Instead of spreading doubt about climate science, the industry now spreads false confidence about how we can continue to burn fossil fuels while efficiently cutting emissions. For example, Exxon Mobil advertises that it has “cumulatively captured more carbon dioxide than any other company — 120 million metric tons.”

What Exxon Mobil doesn't say is that this carbon dioxide was already sequestered underground before it “captured” it while producing natural gas and then injected it back into the ground to produce more oil. These advertising campaigns lend support to government programs to directly subsidize C.C.S.

Solving climate change requires resources; misappropriating these resources makes solving the problem harder. We have no time to waste. We need to stop subsidizing oil extraction and carbon dioxide production in the name of fighting climate change and stop burning billions in taxpayer money on white elephant

projects. Clean power from carbon capture and sequestration died with the success of renewable energy; it's time to bury this technology deep underground.

Charles Harvey is a professor of environmental engineering at the Massachusetts Institute of Technology. [Kurt House](#) is the chief executive officer of [KoBold Metals](#), an exploration company seeking metals for batteries.

Attachment No. 9

IOWA STATE UNIVERSITY

College of Agriculture and Life Sciences

<https://www.cals.iastate.edu/news/releases/pipeline-study-shows-soil-compaction-and-crop-yield-impacts-construction-right-way>

Pipeline study shows soil compaction and crop yield impacts in construction right-of-way

*Iowa State University College of Agriculture and Life Sciences
November 11th, 2021*

AMES, Iowa — An Iowa State University study looking at the impacts of soil disturbance and early remediation practices from construction of the Dakota Access Pipeline finds significant soil compaction and gradual recovery of crop yield in the right-of-way over five years.

The research funded by Dakota Access Pipeline (DAPL) aimed to investigate construction influences of the underground pipeline on farmland. The pipeline transports crude oil over 1,172 miles from North Dakota to Patoka, Illinois, passing through South Dakota and about 347 miles in Iowa. The study's primary goal was to assess the extent of soil and cropping disturbances in the approximately 150-foot right-of-way caused by land clearing, topsoil removal and soil mixing, pipeline trenching and backfilling during the construction process.

Researchers also wanted to evaluate the effectiveness of state-mandated remediation requirements and a DAPL agricultural mitigation plan designed to minimize impacts to cropland. The Iowa Utility Code requires pipeline projects to remove topsoil and apply deep tillage to exposed subsoil before replacing the topsoil. The researchers are continuing to study the benefits of these practices, which can be costly.

Such field-based research quantifying soil properties and recovery in the years after a pipeline installation on farmlands is limited across the corn-soybean regions of the United States.

“Our findings show extensive soil disturbance from construction activities had adverse effects on soil physical properties, which come from mixing of topsoil and subsoil, as well as soil compaction from heavy machinery,” said Mehari Tekeste, assistant professor of agricultural and biosystems engineering, director of the Soil Machine Dynamics Laboratory at Iowa State, and leader of the project.

Tekeste worked with a team that included: Mark Hanna, retired Iowa State Extension agricultural engineer; Robert Horton, who holds the Charles F. Curtiss Distinguished Professorship in Agriculture and Life Sciences in agronomy; and Elnaz Ebrahimi, research scientist in agricultural and biosystems engineering.

After the local pipeline construction was completed in 2016, the researchers began studying the impacts of construction and reclamation on a short stretch where the pipeline crossed an Iowa State research farm near Ames, Iowa. They monitored soil characteristics like bulk density and chemical properties at different depths across three zones within the right-of-way and adjacent undisturbed crop fields. In 2017 and 2018, they analyzed yield data for corn and soybean plots planted on the reclaimed land in the pipeline right-of-way under two tillage systems (no-till and conventional tillage) and compared the yields to crops in the undisturbed fields with similar soils. A peer-reviewed article in the journal “Soil Use and Management” summarizes their early results.

“Overall, in the first two years, we found the construction caused severe subsoil compaction, impaired soil physical structure that can discourage root growth and reduce water infiltration in the right-of-way,” said Horton, the lead soil physicist on the project. They also found changes in available soil water and nutrients.

Though the heavy equipment-induced compaction was still evident two years after construction, a deep subsoil tillage treatment showed some benefit for alleviating the compaction.


The team found crop yields in the right-of-way were reduced by an average of 25% for soybeans and 15% for corn during the first and second crop seasons, compared to undisturbed fields.

“However, we have already started to see gradual recovery in yields from the soybean-corn rotation re-established in the right-of-way,” Ebrahimi said. “Also, results from our tillage comparisons suggest that use of no-till slightly improved corn production in the right-of-way zones, especially under the unfavorable weather conditions of 2020.”

The researchers are finalizing analyses from the subsequent years of the project. What they can say at this point is the compaction and yields are very slowly starting to recover. Ebrahimi has simulated the impacts of the soil compaction on crop yields over time using the Agricultural Production Systems sIMulator (APSIM). A publication on her results is in the process of review.

“We would like to continue this research -- and especially collect more years of data on corn -- and use it to provide recommendations for best management practices that can more effectively mitigate the impacts of future pipeline installation on crop yields,” Tekeste said.

Effect of subsoil tillage during pipeline construction activities on near-term soil physical properties and crop yields in the right-of-way

Mehari Z. Tekeste¹  | Elnaz Ebrahimi¹ | Mark H. Hanna¹ | Erica R. Neideigh¹ | Robert Horton²

¹Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, Iowa

²Department of Agronomy, Iowa State University, Ames, Iowa

Correspondence

Mehari Z. Tekeste, Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, IA, USA.
Email: mtekeste@iastate.edu

Abstract

Persistence of subsoil compaction in construction right-of-way (ROW) areas is a major cropland concern following installation of underground pipelines. Soil physical disturbance and remediation practices including removal of topsoil, subsoil tillage and replacement of topsoil were investigated in a soybean–corn rotation field, which was located within a pipeline ROW. The objectives of the study were to investigate the effectiveness of subsoil tillage (300 and 450 mm) applied shortly after the pipeline installation used to help restore soil physical properties and to recover crop yields. Soil bulk density, soil cone index and crop yields (soybean and corn) from three ROW trafficked zones (Z1, Z2 and Z3) and adjacent unaffected zones were compared at one year and two years after pipeline installation. Compared to 300 mm of subsoil tillage in the ROW zones, 450 mm of subsoil tillage did not significantly improve the soil bulk density and crop (soybean and corn) yields. Compared to 300 mm of subsoil tillage, 450 mm of subsoil tillage created significantly lower soil cone index values within the treated soil layer. Compared to yield data from the adjacent unaffected zones, the ROW zones (Z1, Z2 and Z3) had statistically significant ($p < .05$) crop yield declines of 25% in soybean (2017) and 15% in corn (2018). The near-term soil physical properties and crop yield have been improved from the subsoil tillage applied in the affected zones; however, their recovery to normal conditions as in the unaffected areas has not been achieved within the 2-year period.

KEYWORDS

corn, soil bulk density, soil cone penetration resistance, soybean, subsoil tillage, tillage systems

1 | INTRODUCTION

Natural gas and oil consumption are projected (U.S. Energy Information Administration, 2019) to increase globally and domestically through 2040. According to the report released by the Interstate Natural Gas Association of America (INGAA, 2015), extraction and transportation of natural resources will require establishment of thousands of kilometres

of new pipeline infrastructures. As an inevitable consequence, installation of underground pipelines implicates extensive soil disturbance with adverse effects on soil physical properties through soil compaction and mixing of topsoil and subsoil because of construction right-of-way (ROW) activities (Naeth, McGill, & Bailey, 1987; Shi, Xiao, Wang, & Chen, 2014; Yu et al., 2010). Machinery-induced excessive soil compaction reduces crop yield (Bell, 2010; Lowery & Schuler, 1991;



Raper, Reaves, Shaw, van Santen, & Mask, 2005; Soon, Rice, Arshad, & Mills, 2000) through increases in soil bulk density and soil strength (Cambi et al., 2015; Kumar, Chen, Sadek, & Rahman, 2012; Lepilin, Laurén, Uusitalo, & Tuittila, 2019; Raper et al., 2005).

Restoration of soil productivity after disturbance depends on the severity of soil compaction, vulnerability of the loosened soil conditions to re-compaction, crop type and climate (Batey, 2015; Batey & McKenzie, 1999; Shi et al., 2014; Spoor, 2006). However, there are still knowledge gaps in understanding soil structural deterioration, effectiveness of tillage reclamation methods and revegetation strategies in disturbed ROW areas during the post-construction phase (Batey, 2015; Brown, 2012; Noble, 2006). Field-based research studies are rare that quantify soil compaction and recovery time in the subsequent years after installation of underground pipelines. Some studies have indicated the negative impacts of ROW construction activities on soil structure (Li, Deng, Cao, Lei, & Xia, 2013; Soon et al., 2000; Tekeste, Hanna, Neideigh, & Guillemette, 2019; Turney & Fthenakis, 2011) and crop yield in highly productive farmlands of the US-Midwest (Olson & Doherty, 2012). Soil structural recovery can be measured by spatial and temporal comparisons of soil characteristics, such as soil bulk density and cone penetration resistance in disturbed and non-disturbed areas.

Developing effective reclamation methods for disturbed croplands requires an accurate determination of the soil disturbance, the soil compaction and the restoration cycle of specific soil types after ROW activities. Different strategies such as application of subsoil tillage, alternative tillage systems and crop rotations can be applied during the post-construction phase. The decision on proper soil recovery management varies based on site-specific conditions, where the level of soil disturbance and environmental factors correlate with the intensity of site management necessary to promote soil restoration in cropland (Antille et al., 2016; Bolling & Walker, 2000; Li et al., 2013).

Determination of proper subsoil tillage depth, number of repeated tillage passes and traffic management to avoid unnecessary trafficking is important factors to consider in developing a best management strategy (Spoor, Tijink, & Weiskopf, 2003). The no-tillage (NT) system has been promoted to conserve soil, water and crop yields (Blanco-Canqui, Claassen, & Stone, 2010; Yadav, Lal, & Meena, 2019) and can potentially restore soil structure and productivity by increasing aggregate stability and soil organic matter (Kumar et al., 2012; Vepraskas, Busscher, & Edwards, 1995; Woodward, 1996).

Measurements made on an exposed subsoil after pipeline installation but prior to topsoil replacement at a pipeline site (Tekeste et al., 2019) indicated extremely high peak vertical soil stresses (up to 133 kPa) and bulk density (1.72 Mg m^{-3}) equal to the Proctor compaction test maximum bulk density

value. Such extreme soil compaction created during the pipeline construction phase and at a depth below the conventional deep tillage practices raised the need to investigate post-construction soil recovery management practices. Our current study investigates the effects of subsoil tillage and surface tillage on soil compaction and crop yields in pipeline installation ROW zones of a field in the Midwest region of the U.S.A.

The specific objectives of this paper are to (a) investigate the near-term effects of subsoil tillage treatments and surface applied tillage systems on soil compaction (soil bulk density and soil cone index) within the ROW zones and (b) quantify soybean and corn yield variations related to soil disturbance intensity within ROW disturbed zones relative to the adjacent unaffected areas.

2 | MATERIALS AND METHODS

2.1 | Description of the field site

Field plots were established on a crop farm along the Dakota Access Pipeline (DAPL) ROW area, which was located on an Iowa State University (ISU) farm in Story County, Iowa. A soybean (*Glycine max*)—corn (*Zea mays* L.) rotation was established on a 2 ha area after subsoil tillage reclamation practices, and topsoil replacement was completed in the ROW. As explained in the DAPL agricultural mitigation plan, the main construction activities in the ROW included removing and stockpiling topsoil (approximately depth of 525 mm), trenching and burying the pipeline, performing subsoil tillage to loosen the compaction created from the heavy machine trafficking and finally replacing the topsoil. Clarion loam (fine-loamy, mixed, super-active, mesic Typic *Hapludolls*) and Canisteo clay loam (fine-loamy, mixed, super-active, calcareous mesic Typic *Endoqualls*) were the two dominant soil series at the site (Web Soil Survey, 2018). Tekeste et al. (2019) provided further details on the heavy machinery equipment deployed during the pipeline construction phase and tillage equipment used for the subsoil tillage applications. The current study focuses on near-term soil physical properties and crop yield after the topsoil restoration practices of the DAPL agricultural mitigation plan were completed.

The field site was classified into ROW trafficked (disturbed) zones and adjacent unaffected (non-disturbed) areas. The ROW traffic area was divided into three zones based on the intensity of vehicular trafficking during the pipeline construction phase. Zone 1 (trench, Z1) was an area where the pipeline was buried, Zone 2 (Z2) was categorized as a heavy traffic area, and Zone 3 (Z3) was the area that received a relatively light traffic intensity. Each of the zones in the ROW was considered as a measurement zone. Classifying the zones as measurement zones was essential because the variations in

traffic intensity among the zones were created according to the DAPL field operation protocol.

Prior to replacing the topsoil to the ROW area, subsoil tillage treatments including two levels (300 and 450 mm) were established using a Randomized Complete Block Design (RCBD). The subsoil tillage treatment levels of 300 and 450 mm were randomly assigned on the experimental units within each of the zones in four replications. The subsoil tillage was applied directly to the exposed subsoil shortly after completion of the ROW construction activities and before topsoil was replaced. Each subsoil tillage plot was 7.6 m wide by 18.0 m long. The field plot setup also included two undisturbed (unaffected) zones, named control-north (CN) and control-south (CS), which were located on the north and south sides of the pipeline.

As part of the DAPL mitigation plan, the topsoil was replaced to the ROW zones and levelled by a Caterpillar D7E bulldozer (fully loaded weight was 256 kN with a track that had a nominal track contact length of 3.02 m and a width of 0.76 m, Figure 1). Following the site-levelling, surface tillage was performed using a field cultivator with a tool depth of 100 mm.

Post-construction phase cropping system surface soil conventional tillage operations were applied perpendicular to the pipeline on the field plots. The conventional tillage refers to operation of fall disc ripping, which was applied after the corn cropping season. Spring seed-bed tillage was applied using a field cultivator prior to planting both during the corn and soybean cropping seasons. No-till planting plots designated as 'no-till' (NT) were added during the second crop season (2018) adjacent to the conventional tillage (CT) plots.

2.2 | Soil bulk density and soil cone index measurements

During the post-construction phase, soil bulk density (BD) and soil cone index (CI) were measured in fall 2017 and fall 2018. In 2017, because of the limited number of field working days, soil cone index measurements were taken from the

relatively high traffic zones in the ROW zone (Z1 and Z2) and in one unaffected zone (CN). Both in 2017 and 2018, soil core samples for BD measurements were sampled from Z1, Z2, Z3 and the unaffected zones (CN and CS). A Giddings hydraulic-driven sampling probe (Giddings Machine Co.) was used to collect a 76 mm diameter and 1,200 mm long soil core at each sampling position. Twelve soil core sampling locations were taken along the centre of each zone within the ROW and in the unaffected crop field zones (CN and CS). Within each zone, three samples in two replicates were taken within each subsoiling depth treatment. Each tube sample was cut into 50 mm increments starting from the topsoil surface. The soil core samples were oven-dried at 105°C for 48 hr to determine dry soil bulk density and soil moisture content on a dry mass basis (% d.b.).

A tractor-mounted three-probe cone penetrometer designed and built at ISU (Tekeste et al., 2019) was used to measure the soil cone index according to ASABE standards (ASAE Standards, 2004a and ASAE Standards, 2004b). Within each top surface tillage measurement zone (9 m × 7 m), the three-probe cone penetrometer was inserted at 30 mm s⁻¹ (ASAE Standard, 2004b) on six sampling points. A total of 288 soil cone index measurements were taken within each zone. Cone penetration resistance force was measured using a Transducer Techniques model LPU-500 load cell transducer with 2224-N capacity (Transducer Techniques, LLC) and a Metromatics USB DEWE-43 DAQ System (Metromatics) acquiring data at 100Hz. Soil cone index (kPa) was calculated by dividing the cone penetration resistance force by the 285 mm² ASABE cone base area (ASAE Standard, 2004a).

2.3 | Crop planting and harvesting

Soybean (2017) and corn (2018) were planted on 760 mm row-spacing using an 8-row John Deere Max Emerge 5 Planter model pulled by a John Deere 6170R MFWD. Planting was performed parallel to the pipeline. Yield from the centre four rows of each plot, conventional and no-till sections, was combine harvested using the on-board Harvestmaster system



FIGURE 1 (a) Topsoil pile adjacent to the ROW zones. (b) The top soil was replaced by a Caterpillar D7E bulldozer after the exposed subsoil was tilled. The Caterpillar D7E fully loaded weight was 256 kN. Each track had a nominal track contact length of 3.02 m and a width of 0.76 m (Tekeste et al., 2019) [Colour figure can be viewed at wileyonlinelibrary.com]

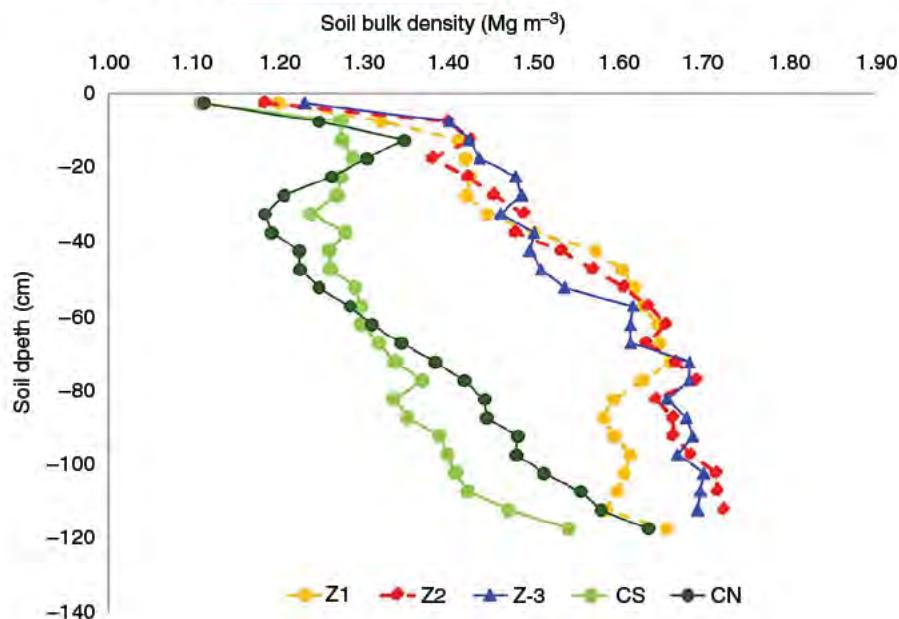


FIGURE 2 Soil bulk density profiles from fall 2017 within the ROW zones (Z1, Z2 and Z3) and the unaffected zones (CN and CS) [Colour figure can be viewed at wileyonlinelibrary.com]

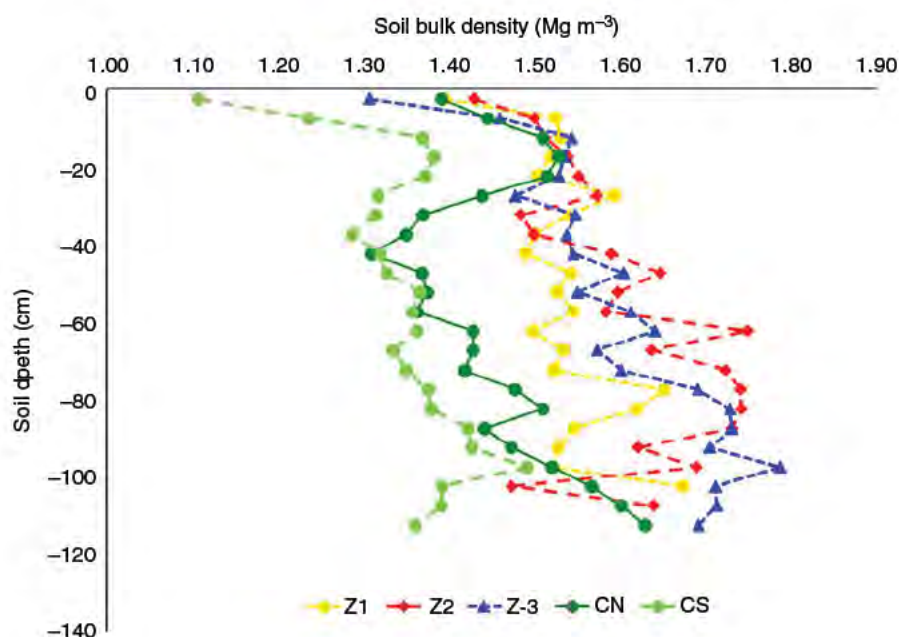


FIGURE 3 Soil bulk density profiles from fall 2018 within the ROW zones (Z1, Z2 and Z3) and the unaffected zones (CN and CS) [Colour figure can be viewed at wileyonlinelibrary.com]

HM800 grain gauge (Logan, UT) on a John Deere 9450 combine harvester. Within the smallest experiment unit (post-construction tillage system) of the ROW zones, there were a total of 16 samples of crop yield (two four centre crop rows for the two subsoil tillage treatments (300 and 450 mm) at four replicates). The harvesting pattern for the CN and CS zones was similar to the harvesting pattern within the ROW zones.

2.4 | Data analysis

All measured data for BD, CI and crop yield were subjected to analyses of variance using the GLM procedure (SAS JMP Ver. 14.JMP, 2013) and compared using Fisher's least significant

difference (LSD) method with 95% confidence (p -value .05). Analyses of variance were also performed to compare the soil physical properties and crop yields from the individual zones within ROW zones and compared with the data from the adjacent unaffected zones (control). Improvement indices were calculated as relative changes in BD and CI from 2017 to 2018 for the top soil layer (top layer soil restoration, TSR) and the subsoil layer (subsoil layer soil restoration, SSR). The conventional tillage operations perpendicular to the pipeline precluded the ability to randomize conventional and no-till plots with respect to each other within the two levels of post-construction subsoiling (300 and 450 mm) that were previously established. Statistical comparison between the two post-construction tillage systems (NT and CT) from

the near-term study was not feasible because of the inability to randomly assign the no-till and the tilled plots within each of the ROW trafficked zones. In order to avoid experimental bias because of the placement of the no-till adjacent to the tilled plots, statistical comparisons of subsoil tillage impacts on the measured soil properties and crop yields were done within each of the tillage systems.

3 | RESULTS AND DISCUSSION

3.1 | Soil bulk density

Soil bulk density profiles from the ROW zones (Z1, Z2 and Z3) (Figure 2, fall 2017; and Figure 3, fall 2018) indicated that soil compaction still persisted two years after the heavy equipment traffic and subsoil tillage. Differences in BD between the ROW and the unaffected zones were obvious in the top (0–500 mm) and deep (500–1,200 mm) soil layers. A summary of BD for the top soil layer (0–500 mm) and the deep soil layer (500–1,200 mm) is provided in Table 1.

In fall 2018, Z2 had the lowest BD in the top soil layer (0–500 mm) within the ROW. The mean BD of the top layer (fall 2018) within the ROW was 1.52 Mg m^{-3} , which was significantly larger than the BD in the unaffected zones of CN (1.44 Mg m^{-3}) and CS (1.29 Mg m^{-3}). For the deep soil layer (below 500 mm deep) from the fall 2018, no statistical differences ($\text{LSD}_{0.05} = 0.045 \text{ Mg m}^{-3}$) of BD were found among the ROW zones (Z1, Z2 and Z3) with 300 and 450 mm subsoil tillage. Within the deep soil layer, the BD averaged over both years among the ROW zones and the two subsoil tillage treatments were 1.60 Mg m^{-3} , a value estimated to be at 93% of the maximum Proctor compaction test value (Tekeste et al., 2019). The BD in the deep layer

(500–1,200 mm) within the ROW was statistically larger ($\text{LSD}_{0.05} = 0.0040 \text{ Mg m}^{-3}$) than the BD in the adjacent unaffected zones ($\text{CN} = 1.48 \text{ Mg m}^{-3}$ and $\text{CS} = 1.39 \text{ Mg m}^{-3}$).

The BD restoration (improvement index) calculated as percentage changes of 2018 BD data relative to the 2017 BD data is shown in Table 1. The BD restoration for the 0 to 500 mm soil layer was not significant because of subsoil tillage applied on the ROW zones ($p = .196$) or because of interaction effects of the ROW zones and subsoil tillage ($p = .11$). In the subsoil layer (500 to 1,200 mm), the BD showed significant improvements on Z1 ($\text{SSR} = 9.2$) ($p < .05$), which was better than the improvements in Z2 ($\text{SSR} = 1.25\%$) and in Z3 ($\text{SSR} = -0.60\%$). Within the ROW zones, the BD in the subsoil layer decreased from 1.65 Mg m^{-3} (fall 2017) to 1.60 Mg m^{-3} (fall 2018). No statistical differences in BD recovery were observed in the subsoil tillage treatments within each ROW zone ($p > .05$).

3.2 | Soil cone index

Figure 4 illustrates soil cone index (CI) profiles in fall 2017 and fall 2018 in ROW zones that received 300 and 450 mm subsoil tillage (Figure 4a–d). The subsoil tillage treatments in Figure 4 refer to the subsoil tillage treatments applied on the exposed subsoil prior to the topsoil replacement in fall 2016 (Tekeste et al., 2019). Within the ROW zones (Z1 and Z2), two peak soil cone penetration values occurred. One peak was at an approximate depth of 100 mm with the mean maximum values averaged by ROW and subsoil tillage depth of 2.06 MPa in 2017 and 1.73 MPa in 2018 (Figure 4a–d). The second peak in the soil cone penetration values occurred in the heavy equipment trafficked subsoil layer (300–600 mm soil layer) with mean maximum values averaged by ROW of

TABLE 1 Soil bulk density measured in fall 2017 and fall 2018 in a surface soil layer (0–500 mm) and a subsoil layer (500–1,200 mm) in post-pipeline construction right-of-way (ROW) zones (Z1, Z2 and Z3) and in unaffected zones (CN and CS)

Zone	Soil depth class (mm)	Soil bulk density (Mg m^{-3})				Soil bulk density restoration ^b (%)
		Fall 2017		Fall 2018		
		Mean ^a	SD	Mean	SD	
Z-1	0–500	1.46 (C)	0.06	1.53 (B)	0.14	–4.6 (TSR)
Z-1	500–1,200	1.67 (A)	0.04	1.53 (B)	0.14	9.2 (SSR)
Z-2	0–500	1.42 (DC)	0.04	1.49 (C)	0.11	–4.7 (TSR)
Z-2	500–1,200	1.62 (AB)	0.08	1.60 (A)	0.11	1.3 (SSR)
Z-3	0–500	1.42 (C)	0.08	1.55 (B)	0.09	–8.4 (TSR)
Z-3	500–1,200	1.66 (A)	0.03	1.67 (A)	0.05	–0.6 (SSR)
CN	0–500	1.23 (E)	0.08	1.44 (D)	0.12	
CN	500–1,200	1.41 (D)	0.03	1.48 (C)	0.06	
CS	0–500	1.25 (E)	0.03	1.29 (E)	0.05	
CS	500–1,200	1.31 (E)	0.05	1.39 (D)	0.04	

^aMean soil bulk density values followed by the same letter are not significantly different at $\alpha = 0.05$.

^bTSR and SSR were calculated as relative changes in BD from 2017 to 2018.

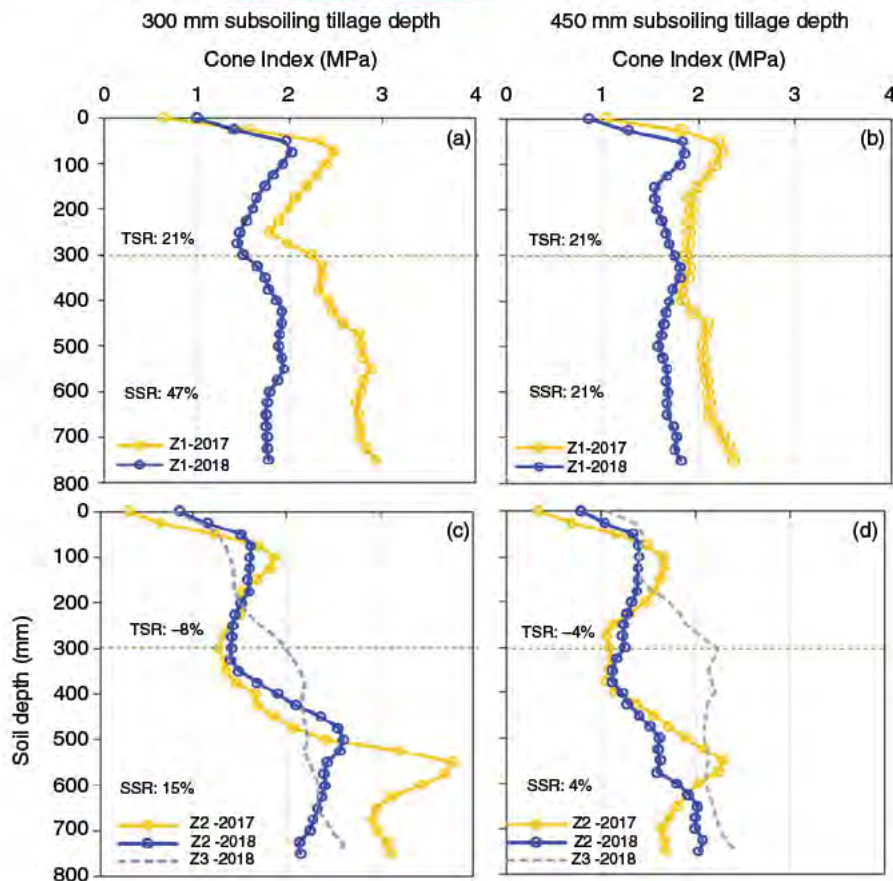


FIGURE 4 Soil cone penetration resistance profile for soils within trafficked ROW zones and unaffected zone from the fall 2017 and fall 2018 data. Within the ROW trafficked zones, subsoil tillage treatments of 300 mm (a, c) and 450 mm (b, d) were applied. Dashed lines (at 300 mm) separate the top soil layers from the subsoil layers. TSR and SSR (%) represent soil strength improvement within the affected zones (i.e. Z1, Z2) comparing data from fall 2017 and fall 2018. In Z3, TSR and SSR were not calculated because data were not collected in fall 2017 [Colour figure can be viewed at wileyonlinelibrary.com]

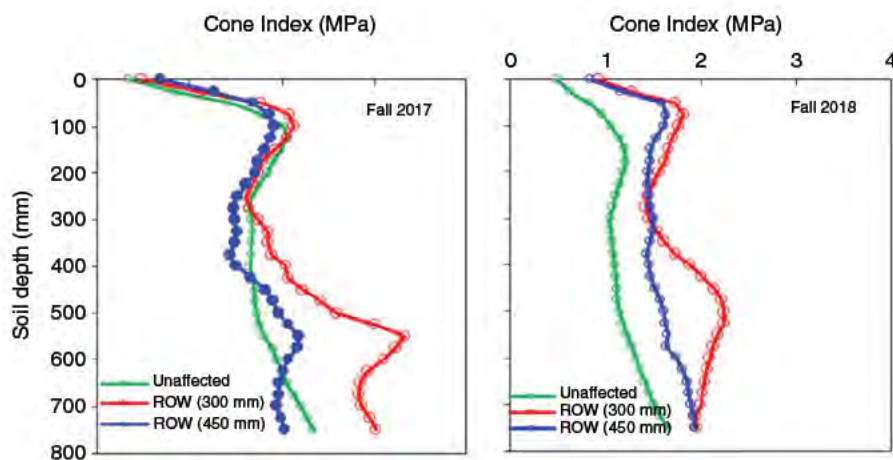


FIGURE 5 Mean soil cone penetration resistance profiles within ROW and unaffected zones from fall 2017 and fall 2018 data. Within the ROW trafficked zones, subsoil tillage treatments of 300 and 450 mm were applied [Colour figure can be viewed at wileyonlinelibrary.com]

2.76 MPa in 2017 and 1.99 MPa in 2018. Even though subsoil tillage was used, subsoil (below 300 mm) within Z1 and Z2 (Figure 4a–d) had significantly larger CI values ($p < .01$) compared to subsoil (below 300 mm) in the unaffected zones (Figure 5). The excessive soil compaction (CI greater than 2 MPa) in Z3 (fall 2018) occurred at a shallower depth than in Z1 and Z2. As part of the DAPL construction activities, the exposed subsoil surface in Z3 was at a higher elevation than the other ROW zones. Thus, the maximum CI occurred at a shallower depth in Z3 than in Z1 and Z2, because less topsoil was replaced on Z3 than on Z1 and Z2.

The TSR and SSR percent improvements from fall 2017 data (Figure 4) were found only in Z1 and Z2. The amount of soil strength improvement from 2017 to 2018 (Figure 4a–d; TSR vs. SSR) varied by zone and depth. Among both top- and subsoil layers, Z1 showed a higher recovery rate than Z2 (Figure 4). Within the ROW (affected), the mean CI profile values in fall 2018 were less than those in fall 2017, indicating a temporal reduction of soil strength (ROW mean TSR and SSR of 7.5% and 22%, respectively).

The heavy equipment-induced subsoil compaction was still evident for 2 years after subsoil tillage (300 mm or

450 mm) (Figure 5), because the ROW CI values were significantly larger ($p < .01$) than those in the unaffected zones. Significant impacts ($p < .01$) in reducing the mean CI were observed in the 300–600 mm soil layer of the subsoil tillage treatments. The 2017 and 2018 soil cone penetration measurements (Figure 5) indicated that the 450 mm subsoil tillage loosened the traffick-induced deep compaction better than the 300 mm subsoil tillage. Relative per cent changes in CI from the disturbed (ROW) zones and the unaffected (undisturbed) zones increased by 46.2% (CT) and 54.3% (NT) in the 300 mm, and by 31.5% (CT) and 48.3% (NT) in the 450 mm subsoil tilled fields, respectively (Table 2). Shi et al. (2014) found the values of soil properties (alkali hydrolyzable nitrogen (AN), available phosphorous (AP), total nitrogen (NT) and soil organic matter (SOM)) in the ROW areas (trench, piling and working areas, which are equivalent to Z1, Z2 and Z3) were lower compared to the values outside the working areas (20 and 50 m from the pipeline line). According to Håkansson (1994), subsoiling can only partially loosen compaction in deep subsoil layers, and in regions with high precipitation, it may not be practical. Lowery and Schuler (1991) reported that deep compaction was not removed completely by subsoil tillage even four years after heavy axle load traffic. The excessive subsoil compaction within the ROW in particular at the deeper soil layer (300–600 mm) could remain for many years (300–450 mm) (Raper et al., 2005). The presence of soil compaction in the topsoil layers two years after pipeline operations might be because of the heavy vehicle (Caterpillar D7E) used to bulldoze the stockpiled soil back to the ROW. The topsoil compaction was not entirely removed by the shallow tillage (100 mm field cultivation).

The per cent changes in CI between the ROW zones and the unaffected area by the subsoil tillage treatments are shown

TABLE 2 Mean soil cone index (MPa) values from each zone in the ROW as influenced by subsoil tillage (300 and 450 mm) in conventional tillage (CT) and compared with the mean soil cone index (MPa) values from the unaffected zones in fall 2018. *SD* represents averaged standard deviation of means ($n = 8$)

Zones	Subsoil tillage (mm)	Soil Cone index (Mpa)		Relative change ^a (%)
		Mean	SD	
Zone 1	300	1.73	0.52	33
Zone 1	450	1.63	0.26	25
Zone 2	300	1.89	0.56	45
Zone 2	450	1.47	0.42	13
Zone 3	300	2.08	0.75	60
Zone 3	450	2.03	0.63	56
Unaffected		1.3	0.4	

^aRelative change (%) was calculated from differences of mean soil cone index in each zone and subsoil depth relative to the unaffected zone.

in Tables 2 and 3. No-till plots had higher CI than the CT plots by 4% within the ROW and 2% in the unaffected areas, possibly contributing to the lack of statistical significance. Other studies (Bueno, Amiama, Hernanz, & Pereira, 2006; Kumar et al., 2012; Roth, Mayer, Frede, & Derpsch, 1988) reported that changing a tillage system from conventional tillage (CT) to no-tillage (NT) could result in higher soil BD and CI values especially in topsoil. Lower CI values are associated with the tilled layer near the soil surface. Cavalaris and Gemtos (2002) reported a linear increase of CI in their 0–200 mm soil layer, where the increase was steeper in the no-tillage system compared to the conventionally tilled soils. Radford, Yule, McGarry, and Playford (2007) reported that positive impacts of no-tillage (NT) were because of improvements in soil structure and soil resilience capacity after a disturbance, because soil organic matter increased, especially in the surface layer.

3.3 | Crop yields

The ROW working zones (Z1, Z2 and Z3) had statistically significant ($p < .05$) crop yield declines of 25% in soybean (2017) and 15% in corn (2018) in contrast to the crop yields from the adjacent unaffected zones (Figure 6). Yield reduction within zones ($p < .01$) followed the damage from soil compaction as the highest soybean yield was measured in the unaffected zones (mean from CN and CS of 4.2 Mg ha^{-1}), which had less soil compacted zones, followed by Z1 (3.2 Mg ha^{-1}), Z3 (3.1 Mg ha^{-1}) and Z2 (2.9 Mg ha^{-1}). The highest mean corn yield in the CT tilled zone (fall 2018) was observed in the unaffected zones (14.4 Mg ha^{-1}) followed by the corn yield from Z1 (12.5 Mg ha^{-1}), Z3 (11.9 Mg ha^{-1})

TABLE 3 Mean soil cone index (MPa) values from each zone in the ROW as influenced by subsoil tillage (300 and 450 mm) in no-tillage (NT) system and compared with the mean soil cone index (MPa) values from the unaffected zones in fall 2018. *SD* represents averaged standard deviation of means ($n = 8$)

Zones	Subsoil tillage (mm)	Soil Cone index (Mpa)		Relative change ^a (%)
		Mean	SD	
Zone 1	300	1.89	0.46	47
Zone 1	450	1.82	0.29	41
Zone 2	300	2.05	0.92	59
Zone 2	450	1.83	1.29	42
Zone 3	300	2.03	0.65	57
Zone 3	450	2.09	0.46	62
Unaffected		1.29	0.37	

^aRelative change (%) was calculated from differences of mean soil cone index in each zone and subsoil depth relative to the unaffected zone.

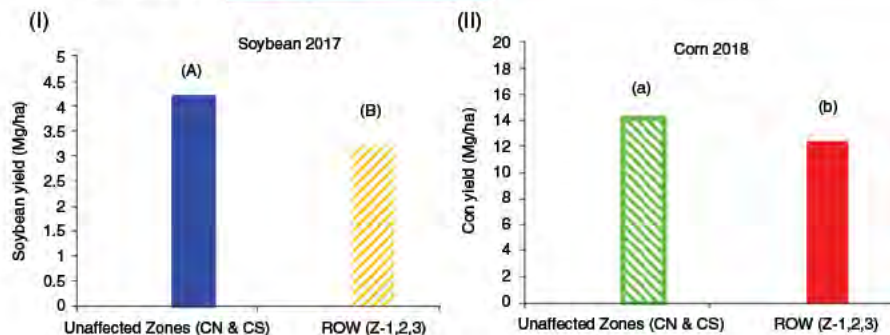


FIGURE 6 Soybean (I) and corn (II) crop yields (Mg ha^{-1}) from ROW affected (Z1, Z2 and Z3) and unaffected zones (CN and CS). Same letters assigned to the bars are not significantly different at the p -value of .05 [Colour figure can be viewed at wileyonlinelibrary.com]

and Z2 (11.5 Mg ha^{-1}). In the no-tilled (NT) zones (fall 2018), the highest mean corn yield was also observed in the unaffected zones (14.6 Mg ha^{-1}) followed by the corn yield from Z1 (13.3 Mg ha^{-1}), Z2 (12.6 Mg ha^{-1}) and Z3 (12.4 Mg ha^{-1}). Soybean and corn yields from the highest trafficked zone (Z2) were statistically lower compared to Z1 (Table 4). No statistical differences in crop yields were observed for the subsoil tillage treatments within each ROW zone ($p > .05$).

For corn from the ROW, the yield from the NT system in the ROW was 7% larger than that for the conventionally tilled soil. The difference in corn yield in the unaffected areas between the CT and NT system was minimum (-1%). As shown in previous studies (Gaultney, Krutz, Steinhardt, & Liljedahl, 1982; Lowery & Schuler, 1991; Raghavan, McKyes, Taylor, Richard, & Watson, 1979; Schjonning & Rasmussen, 1994), heavy axle load-induced soil compaction showed significant crop yield declines (9% – 50%) compared to the control. Our study indicated that the yield depressions on soybean (fall 2017) and corn (fall 2018) could be attributed to heavy equipment traffic-induced increases in soil bulk density and soil cone penetration resistance, which caused mechanical impedance to root growth. Raper et al. (2005) reported negative impacts of soil compaction on crop yield occurred as soil cone index exceeded 2 – 2.5 MPa . Another potential reason for crop yield depressions in the

ROW might be because of the mixing of top- and subsoil layers during construction activities and replacement of topsoil (data are not presented in this paper). Adjacent to the experiment site (approximately 1.6 km) along the pipeline, visual observations (Figure 7) were made in a soil trench cut perpendicular to the pipeline and across the ROW. The visual assessment showed that soil profiles in Z1 and Z2 had relatively poor soil structure and stubby (thicker) roots compared to the soil profile in the adjacent unaffected zone. Such a visual assessment could potentially be integrated into a post-construction feasibility assessment to minimize top- and subsoil mixing, especially during the topsoil replacement phase.

For short-term post-construction soil compaction management, application of subsoiling may be beneficial in the top- and subsoil layers to loosen the compacted layers that had soil cone index exceeding 2 MPa , a root limiting threshold value (Raper et al., 2005; Taylor & Gardner, 1963). The improved trend on crop yield in the short-term introduction of the NT system might be attributed to the benefits of reduced tillage practices (Sommer & Zach, 1992). Sommer and Zach (1992) reported the benefits of non-inverting soil loosening conservation tillage in reducing soil erosion, which implied that reduced tillage practices might have potential benefits as a long-term reclamation management strategy at pipeline construction sites.

Zone	Crop Yield (Mg ha^{-1})					
	Soybean ^a		Corn ^b			
	CT		CT		NT	
	Mean	SD	Mean	SD	Mean	SD
Z-1	3.2 (B)	0.57	12.5 (B)	1.50	13.3 (AB)	1.21
Z-2	2.9 (B)	0.43	11.5 (B)	2.01	12.6 (B)	1.49
Z-3	3.1 (BC)	0.32	11.9 (B)	1.57	12.4 (B)	1.88
Unaffected	4.2 (A)	0.59	14.4 (A)	1.12	14.6 (A)	0.81

^aSoybean yield values followed by the same letter are not significantly different at $\alpha = .05$.

^bCorn yield values followed by the same letter are not significantly different at $\alpha = .05$.

TABLE 4 Soybean (fall 2017) and corn (fall 2018) yields (Mg ha^{-1}) from the ROW (Z1, Z2 and Z3) and the unaffected zones (average of CN and CS) in conventional tillage (CT) system, and no-tillage (NT) system (fall 2018). The no-till plots were added during the second crop season (2018)



FIGURE 7 Visual observation of the soil structure from Zone 1, Zone 2 and the unaffected zone. A trench approximately 1 m wide by 2 m deep was excavated. Soil structure and root distribution were observed on the exposed trench face. The trench was on the DAPL pipeline, and it was located approximately 1.6 km east of the experimental plots [Colour figure can be viewed at wileyonlinelibrary.com]

4 | CONCLUSIONS

Pipeline construction activities and subsoil tillage remediation impacts on soil properties resulted in significantly ($p < .05$) larger CI and BD within the ROW zones compared to the adjacent unaffected zones. There were statistically significant ($p < .05$) crop yield declines of 25% in soybean (2017) and 15% in corn (2018) in the ROW zones relative to the crop yields in the adjacent unaffected zones. Subsoil tillage of 450 mm created statistically smaller soil cone index values in the 300–600 mm soil layer in the ROW, compared to the subsoil tillage of 300 mm ($p < .05$). BD and crop yield (soybean and corn), however, did not statistically differ for subsoil of 300 mm and 450 mm ($p > .05$). Within the near-term period, introducing no-till resulted 7% increase in corn yield (2018).

ACKNOWLEDGEMENTS

We acknowledge DAPL for providing funding to conduct this study. We also acknowledge field support from Kent Berns, Supervisor Agricultural Station, Carl Pederson, Agricultural Specialist at the Department of Agricultural and Biosystems Engineering at Iowa State University in Ames, Iowa, and Kent Heikens, Agricultural Science Research Technician (Soils) at the National Laboratory for Agriculture and the Environment, USDA-ARS in Ames, Iowa.

ORCID

Mehari Z. Tekeste  <https://orcid.org/0000-0003-2463-1061>

REFERENCES

- Antille, D. L., Huth, N. I., Eberhard, J., Marinoni, O., Cocks, B., Poulton, P. L., & Schmidt, E. J. (2016). The effects of coal

seam gas infrastructure development on arable land in southern Queensland, Australia: Field investigations and modeling. *Transactions of the ASABE*, 59(4), 879–901. <https://doi.org/10.13031/trans.59.11547>

ASAE Standards (2004a). *S313. 3: Soil cone penetrometer*. St. Joseph, MI: ASAE.

ASAE Standards (2004b). *EP542: Procedures for using and reporting data obtained with the soil cone penetrometer*. St. Joseph, MI: ASAE.

Batey, T. (2015). The installation of underground pipelines: Effects on soil properties. *Soil Use and Management*, 31(1), 60–66. <https://doi.org/10.1111/sum.12163>

Batey, T., & McKenzie, D. C. (1999). Deep subsoil compaction. *Soil Use and Management*, 15(2), 136. <https://doi.org/10.1111/j.1475-2743.1999.tb00078.x>

Bell, L. W. (2010). Impacts of soil compaction by livestock on crop productivity livestock on crop productivity. *Soil Tillage Research*, 113(1), 19–29. <https://doi.org/10.1016/j.still.2011.02.003>

Blanco-Canqui, H., Claassen, M. M., & Stone, L. R. (2010). Controlled traffic impacts on physical and hydraulic properties in an intensively cropped no-till soil. *Soil Science Society of America Journal*, 74, 2142–2150. <https://doi.org/10.2136/sssaj2010.0061>

Bolling, J. D., & Walker, L. R. (2000). Plant and soil recovery along a series of abandoned desert roads. *Journal of Arid Environments*, 46, 1–24. <https://doi.org/10.1006/jare.2000.0651>

Brown, V. K. (2012). *Establishing and maintaining enhanced infiltration on compacted construction site subsoils through shallow and deep Tillage with soil amendments* (Master's Thesis). North Carolina State University, Raleigh, NC. Retrieved from <https://repository.lib.ncsu.edu/handle/1840.16/7904>

Bueno, J., Amiana, C., Hernanz, J. L., & Pereira, J. M. (2006). Penetration resistance, soil water content, and workability of grasslands soils under two tillage systems. *Transaction of the ASABE*, 49, 875–882. <https://doi.org/10.13031/2013.21727>

Cambi, M., Cerini, G., Fabiano, F., Foderi, C., Laschi, A., & Picchio, R. (2015). Impact of wheeled and tracked tractors on soil physical



- properties in a mixed conifer stand. *iForest – Biogeosciences and Forestry*, 9(1), 89–94. <https://doi.org/10.3832/for1382-008>
- Cavalaris, C. K., & Gemtos, T. A. (2002). *Evaluation of four conservation Tillage methods in the sugar beet crop. Agricultural Engineering International: The CIGR Journal of Scientific Research and Development*. LW, 01–008, IV.
- Dakota Access, LLC (DAPL) (2016). *Agricultural mitigation plan*. Adopted and Approved by the Iowa Utilities Board, State of Iowa.
- Dexter, A. R. (1997). Physical properties of tilled soils. *Soil and Tillage Research*, 43(1–2), 41–63. [https://doi.org/10.1016/S0167-1987\(97\)00034-2](https://doi.org/10.1016/S0167-1987(97)00034-2)
- Gaultney, L., Krutz, G. W., Steinhardt, G. C., & Liljedahl, J. B. (1982). Effects of subsoil compaction on corn yields. *Transactions of the ASAE*, 25(3), 0563–0569. <https://doi.org/10.13031/2013.33573>
- Hakansson, I. (1994). Soil tillage for crop production and for protection of soil and environmental quality: A Scandinavian viewpoint. *Soil & Tillage Research*, 30, 109–124. [https://doi.org/10.1016/0167-1987\(94\)90002-7](https://doi.org/10.1016/0167-1987(94)90002-7)
- Interstate Natural Gas Association of America (2015). *North America Midstream Infrastructure through 2035- Significant Development Continues*. Retrieved from <https://www.ingaa.org/File.aspx?id=34748&v=e87cdf4d>
- Kumar, A., Chen, Y., Sadek, A., & Rahman, S. (2012). Soil cone index in relation to soil texture, moisture content, and bulk density for no-tillage and conventional tillage. *Agricultural Engineering International: The CIGR Journal*, 14(1), 26–37.
- Lepilín, D., Laurén, A., Uusitalo, J., & Tuittila, E. S. (2019). Soil deformation and its recovery in logging trails of drained boreal peatlands. *Canadian Journal of Forest Research*, 751, 743–751. <https://doi.org/10.1139/cjfr-2018-0385>
- Li, Y., Deng, X., Cao, M., Lei, Y., & Xia, Y. (2013). Soil restoration potential with corridor replanting engineering in the monoculture rubber plantations of Southwest China. *Ecological Engineering*, 51, 169–177. <https://doi.org/10.1016/j.ecoleng.2012.12.081>
- Lowery, B., & Schuler, R. T. (1991). Temporal effects of subsoil compaction on soil strength and plant growth. *Soil Science Society of America Journal*, 55, 216–223. <https://doi.org/10.2136/sssaj1991.03615995005500010037x>
- Naeth, M. A., McGill, W. B., & Bailey, A. W. (1987). Persistence of changes in selected soil chemical and physical properties after pipeline installation in Solonchic native rangeland. *Canadian Journal of Soil Science*, 67, 747–763. <https://doi.org/10.4141/cjss87-073>
- Noble, B. F. (2006). *An overview of environmental impact assessment in Canada. Introduction to environmental impact assessment* (pp. 17–26). Oxford, UK: Oxford University Press.
- Olson, E. R., & Doherty, J. M. (2012). The legacy of pipeline installation on the soil and vegetation of southeast Wisconsin wetlands. *Ecological Engineering*, 39, 53–62. <https://doi.org/10.1016/j.ecoleng.2011.11.005>
- Radford, B. J., Yule, D. F., McGarry, D., & Playford, C. (2007). Amelioration of soil compaction can take 5 years on a Vertisol under no till in the semi-arid subtropics. *Soil Tillage Research*, 72(2), 249–255. <https://doi.org/10.1016/j.still.2006.01.005>
- Raghavan, G. S. V., McKyes, E., Taylor, F., Richard, P., & Watson, A. (1979). The relationship between machinery traffic corn yield reductions in successive years. *Transactions of the ASAE*, 1256–1259.
- Raper, R. L., Reaves, D. W., Shaw, J. N., van Santen, E., & Mask, P. L. (2005). Using site-specific subsoiling to minimize draft and optimize corn yields. *Transactions of the ASABE*, 48(6), 2047–2052. <https://doi.org/10.13031/2013.20081>
- Roth, C. H., Mayer, B., Frede, H. G., & Derpsch, R. (1988). Effect of mulch rates and tillage systems on infiltrability and other soil physical properties of an Oxisol in Parana, Brazil. *Soil Tillage Research*, 11, 81–91.
- Schjonning, P., & Rasmussen, K. J. (1994). Danish experiments on subsoil compaction by vehicles with high axle load. *Soil and Tillage Research*, 29, 215–227. [https://doi.org/10.1016/0167-1987\(94\)90060-4](https://doi.org/10.1016/0167-1987(94)90060-4)
- Shi, P., Xiao, J., Wang, Y. F., & Chen, L. D. (2014). The effects of pipeline construction disturbance on soil properties and restoration cycle. *Environmental Monitoring and Assessment*, 186, 1825–1835. <https://doi.org/10.1007/s10661-013-3496-5>
- Soil Survey Staff (2018). *Natural resources conservation service, United States Department of Agriculture*. Web Soil Survey. Retrieved from <https://websoilsurvey.sc.egov.usda.gov/>
- Sommer, C., & Zach, M. (1992). Managing traffic induced soil compaction by using conservation tillage. *Soil and Tillage Research*, 24, 319–336.
- Soon, Y. K., Rice, W. A., Arshad, M. A., & Mills, P. (2000). Effect of pipeline installation on crop yield and some biological properties of boreal soils. *Canadian Journal of Soil Science*, 80, 483–488.
- Spoor, G. (2006). Alleviation of soil compaction: Requirements, equipment, and techniques. *Soil Use and Management*, 22, 113–122. <https://doi.org/10.1111/j.1475-2743.2006.00015.x>
- Spoor, G., Tijink, F. G., & Weisskopf, P. (2003). Subsoil compaction: Risk, avoidance, identification, and alleviation. *Soil Tillage Research*, 73(1–2), 175–182. [https://doi.org/10.1016/S0167-1987\(03\)00109-0](https://doi.org/10.1016/S0167-1987(03)00109-0)
- Taylor, H. M., & Gardner, H. R. (1963). Penetration of cotton seedling taproots as influenced by bulk density, moisture content and strength of soil. *Soil Science*, 96, 153–154.
- Tekeste, M. Z., Hanna, H. M., Neideigh, E. R., & Guillemette, A. (2019). Pipeline right-of-way construction activities impact on deep soil compaction. *Soil Use and Management*, 35, 293–302. <https://doi.org/10.1111/sum.12489>
- The Federal Energy Regulatory Commission, Strategic Plan (2017). *Docket No. RM93-11-000*. Retrieved from <https://www.ferc.gov/industries/oil/gen-info/pipeline-index.asp>
- Turney, D., & Fthenakis, V. (2011). Environmental impacts from the installation and operation of large-scale solar power plants. *Renewable and Sustainable Energy Reviews*, 15, 3261–3270. <https://doi.org/10.1016/j.rser.2011.04.023>
- U.S. Energy Information Administration (2019). *Short-term energy outlook*. Retrieved from <https://www.eia.gov/outlooks/steo/report/>
- Vepraskas, M. J., Busscher, W. J., & Edwards, J. H. (1995). Residual effects of deep tillage vs. no-till on corn root growth and grain yield. *Journal of Production Agriculture*, 8(3), 401–405. <https://doi.org/10.2134/jpa1995.0401>
- Woodward, C. L. (1996). Soil compaction and topsoil removal effects on soil properties and seedling growth in Amazonian Ecuador. *Forest Ecology and Management*, 82, 197–209. [https://doi.org/10.1016/0378-1127\(95\)03667-9](https://doi.org/10.1016/0378-1127(95)03667-9)
- Yadav, G. S., Lal, R., & Meena, R. S. (2019). Long-term effects of vehicular passages on soil carbon sequestration and carbon dioxide

- emission in a no-till corn-soybean rotation on a Crosby silt loam in Central Ohio, USA. *Journal of Plant Nutrition and Soil Science*, 182, 126–136. <https://doi.org/10.1002/jpln.201800480>
- Yu, X. F., Wang, G. P., Zou, Y. C., Wang, Q., Zhao, H. M., & Lu, X. G. (2010). Effects of pipeline construction on wetland ecosystems: Russia-China Oil Pipeline Project. *Royal Swedish Academy of Sciences*, 39(5–6), 447–450. <https://doi.org/10.1007/s13280-010-0055-y>

How to cite this article: Tekeste MZ, Ebrahimi E, Hanna MH, Neideigh ER, Horton R. Effect of subsoil tillage during pipeline construction activities on near-term soil physical properties and crop yields in the right-of-way. *Soil Use Manage.* 2021;37:545–555. <https://doi.org/10.1111/sum.12623>

Attachment No. 10

Pipeline right-of-way construction activities impact on deep soil compaction

Mehari Z. Tekeste  | Harold M. Hanna | Erica R. Neideigh | Andrew Guillemette

Iowa State University, Ames, Iowa

Correspondence

Mehari Z. Tekeste, Iowa State University,
Ames, IA.

Email: mtekeste@iastate.edu.

Funding information

DAPL

Abstract

A 762-mm-diameter pipe 1,886 km long was installed to transfer crude oil in the USA from North Dakota to Illinois. To investigate the impact of construction and restoration practices on long-term soil productivity and crop yield, vertical soil stresses induced by a Caterpillar (CAT) pipe liner PL 87 (475 kN vehicle load) and semi-trailer truck (8.9 kN axle load) were studied in a farm field. Soil properties (bulk density and cone penetration resistance) were measured on field zones within the right-of-way (ROW) classified according to construction machine trafficking and subsoil tillage (300-mm-depth tillage and 450-mm-depth tillage in two repeated passes) treatments. At 200 mm depth from the subsoiled surface, the magnitude of peak vertical soil stress from trafficking by the semi-truck trailer and CAT pipe liner PL 87 was 133 kPa. The peak vertical soil stress at 400 mm soil depth appeared to be influenced by vehicle weight, where the Caterpillar pipe liner PL 87 created soil compaction a magnitude of 1.5 greater than from the semi-trailer truck. Results from the soil bulk density and soil cone penetration resistance measurements also showed the ROW zones had significantly higher soil compaction than adjacent unaffected corn planted fields. Tillage to 450 mm depth alleviated the deep soil compaction better than the 300-mm-depth tillage as measured by soil cone penetration resistance within the ROW zones and the unaffected zone. These results could be incorporated into agricultural mitigation plans in ROW construction utilities to minimize soil and crop damage.

KEYWORDS

deep tillage, soil bulk density, soil compaction, soil cone penetration resistance, vertical soil stress

1 | INTRODUCTION

Soil compaction is a process of soil particle rearrangement that reduces the air-filled fraction of soil pores and has been recognized as a major problem associated with crop production (Hamza & Anderson, 2005; Soane & Van Ouwerkerk, 1994). Compaction of soils often results in decreased soil aeration and hydraulic conductivity and increased soil bulk density and soil strength (Al-Adawi & Reeder, 1994; Hillel, 1998). Excessive soil compaction negatively affects crop

yield and accelerates soil erosion (Al-Adawi & Reeder, 1994; Hillel, 1998; Soane & Van Ouwerkerk, 1994). Reviews on how soil compaction is created and management practices to minimize its negative effects on crop yield and the environment have been published by Hamza and Anderson (2005), Raper and Kirby (2006), and Batey (2009).

Numerous studies conducted in Europe and North America during the 1980s have shown that heavy vehicles with an axle load of 10 t or higher can create subsoil compaction to a depth of 500 to 600 mm (Etana &



Hakansson, 1994; Hakansson & Reeder, 1994; Lowery & Schuler, 1991; Schjonning & Rasmussen, 1994). Schjonning and Rasmussen (1994) measured soil physical properties (i.e., bulk density and penetration resistance) and small grain yields after field traffic by a heavy vehicle (Volvo BM 860 Dump Truck). The vehicle with two front tyres of 18.0R25 XRA*TL and four rear tyres of 20.5R 25XA*TL were loaded to 10 t per front axle and 22 t per rear tandem axle. Four wheel passes by the truck on the exposed plough bottom (200 mm from the soil surface) created severe subsoil compaction (soil cone penetration resistance of 4.2 MPa) which was nearly a fourfold magnitude greater than the soil cone penetration resistance measured on the control treatment (no compaction). Hakansson and Reeder (1994) suggested limiting vehicle load to 10 t per axle in order to reduce the incidence of subsoil compaction and minimize long-term negative impacts on crop yields.

Soil compaction also occurs in cropland during utility construction activities within right-of-way (ROW) areas from heavy equipment traffic, trenching and backfilling, having adverse potential impacts on crop yields and soil quality. Batey (2015) reported bulk densities of 1.7 t m^{-3} (undisturbed) and 1.9 t m^{-3} (running track) at a depth of 350 mm, and restricted crop root growth 15 years after a pipeline was installed in the 1970s in Murthly, Perthshire, UK. On excessively deep compacted soils (bulk density values of 1.9 to 2.0 t m^{-3}) such as in pipeline sites, Spoor (2006) recommended 5 to 6 repeated passes of tillage (up to 750 mm depth) to loosen the soils. The restoration of soil productivity and crop yield post construction depends on the vulnerability of the loosened soil conditions to re-compaction, crop type, climate and proper drainage (Batey, 2015; Spoor, 2006). Limited information was available on measurement of soil compaction and crop yield in the subsequent years after the pipeline installations (Batey, 2015).

Dakota Access, LLC (DAPL) (2016) installed a 762-mm-diameter pipe over 1,886 km to transfer crude oil in the USA from North Dakota to Illinois. The Iowa pipeline section was buried at a minimum depth of 1.2 m in all agricultural lands. DAPL developed an agricultural mitigation plan that implemented measures for minimizing impacts to cropland during the pipeline construction (e.g., land clearing, separation of top soil, pipeline trenching and backfilling of the subsoil materials) and restoration phases after compaction by heavy construction equipment on all impacted agricultural cropland (Dakota Access, LLC (DAPL) 2016). The DAPL mitigation plan includes three repeated passes of deep tillage to a depth of 450 mm on exposed subsoil, restoring the topsoil condition, and soil levelling to its preconstruction conditions in compliance with Chapter 9 "Restoration of Agricultural Lands During and After Pipeline Construction" of the State of Iowa Administration Code, Section 199: Utilities Division.

Limited field-based research studies are available to support the development of the agricultural farm and crop damage compensation plan from utility construction activities on croplands. Studies evaluating the impacts of heavy construction vehicles and restoration activities on subsoil compaction and long-term crop yields may benefit industry, researchers, extension and government institutions in developing data-driven decision support and restoration of agricultural soil and crop productivity to preconstruction conditions. The overall goal of this research was to quantify the impacts of utility construction equipment, heavy vehicle traffic management, and deep tillage on soil compaction and long-term crop yields. The objectives of this study were to (a) investigate the effects of construction equipment trafficking and deep tillage within the ROW on deep soil (subsoil) compaction, and (b) investigate the effects of deep tillage treatments on soil compaction.

2 | MATERIALS AND METHODS

2.1 | Experiment description

The experimental test was established along the pipeline ROW at the Iowa State University (ISU) farm in Washington Township of Story County, Iowa. A five year long-term corn-soybean (*Zea mays L.* - *Glycine max*) crop rotation study was established on an experimental plot of a 2 ha area consisting of a ROW section (46 m wide and 244 m long) and adjacent unaffected crop fields (39 m wide and 244 m long). The study began in fall 2016, and corn was planted in spring 2017. Clarion loam (*fine-loamy, mixed, superactive, mesic Typic Hapludolls*) and Canisteo clay loam (*fine-loamy, mixed, superactive, calcareous mesic Typic Endoqualls*) are the dominant soil series at the site according to the USDA soil survey (<http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>). The ROW was set at a bearing of 123° to accommodate the pipeline direction and was approximately 46 m wide. According to the DAPL agricultural mitigation plan, topsoil with an approximate depth of 525 mm below the original cropland topsoil surface was scraped from the ROW construction zone and stockpiled. Subsoil excavated from the pipeline trench was also stockpiled separately from the topsoil and returned to the excavated trench. Preceding the replacement of topsoil, the subsoil within the ROW which had been trafficked by heavy construction equipment was tilled to a depth of 450 mm from the top surface of the exposed subsoil using a subsoiler implement with 7-shanks at 760 mm spacing. The 450-mm-depth tillage was done in three repeated passes. After the topsoil was replaced, the land was levelled and tilled using a field cultivator at a tool depth of 100 mm.

Figure 1 shows the heavy vehicles frequently used for soil separation and pipeline installation. The ground contact



Caterpillar pipe liner PL 87. Fully loaded weight = 475 kN. Each track dimension had a nominal track contact length, which is the length of track in contact with a flat, unyielding surface (ISTVS, 1977), of 3.71 m and a width of 0.76 m.



Caterpillar 349F hydraulic excavator. Fully loaded weight = 522 kN. Each track had a nominal track contact length of 5.36 m long and a width of a 0.76 m.

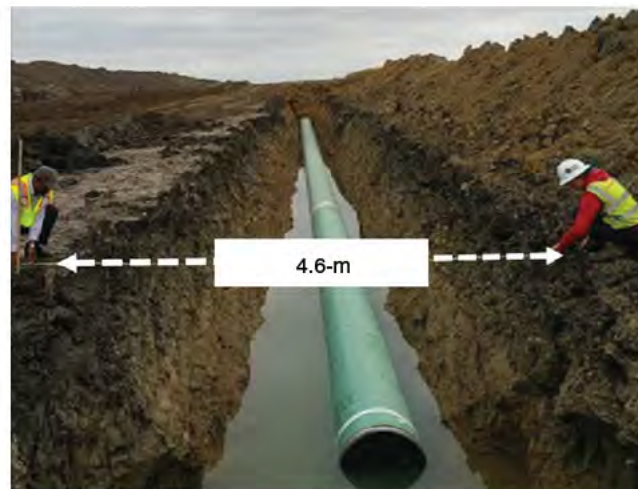


Caterpillar D7E bulldozer. Fully loaded weight = 256 kN. Each track had a nominal track contact length of 3.02 m and a width of 0.76 m.



Semi-trailer truck with three pipes (each pipe was 24.4 m long, 0.76 m outer diameter, and 9.5 mm wall thickness).

(a)



(b)

FIGURE 1 Right-of-way pipeline construction heavy equipment—Caterpillar pipe liner PL 87, Caterpillar 349F hydraulic excavator, Caterpillar D7E bulldozer and semi-trailer truck with three pipes (a). The excavated trench for the pipe and the stockpiled subsoil adjacent to the pipe (b). At the experimental site, the pipe trench width was approximately 4.6 m [Colour figure can be viewed at wileyonlinelibrary.com]

pressure estimated from the vehicle weight and track contact area for the Caterpillar pipe liner PL 87, Caterpillar D7E bulldozer and Caterpillar 349F hydraulic excavator

were 168, 111 and 128 kPa, respectively. The semi-trailer truck had single tyres on the front axle, dual tyres on each of two rear axles of the road tractor and dual tyres on each

of two rear axles of the trailer. The tyre size was 275/80R-24.5 (Michelin). According to the U.S. Department of Transportation (DOT), the front axle load of the semi-trailer truck carrying a full load should not exceed 8.9 kN on highway roads.

After observing the field operations and vehicle traffic management within the ROW, four zones were delineated depending on traffic intensity during land clearing, topsoil separation and pipe trenching and stockpiling subsoil materials. A 7.6 m wide zone with the pipe at centreline (CL) was classified as Zone-1 (Z-1). Zone-2 (Z-2) was classified as a zone adjacent to Z-1 and opposite to the stockpiled subsoil. Relative to all the zones within the ROW, Z-2 received the highest traffic intensity. Zone-3 (Z-3) received heavy equipment traffic less frequently and was located between Z-2 and the stockpiled topsoil. Between one of the unaffected crop field zones (located at the southern side of the pipe) and the stockpiled subsoil, a separate zone was classified as Zone-x (Z-x). Relative to Z-1, Z-2 and Z-3, Z-x was observed to receive the lowest traffic intensity. The four zones (Z-1, Z-2, Z-3 and Z-x) within the ROW and the two unaffected crop field zones (Control-N and Control-S) to the northern and southern side of the pipe were defined as experimental blocks in our experimental design (Figure 2). The unaffected crop zones were outside the ROW area and parallel to the pipeline.

2.2 | Peak vertical soil stress measurement

Soil stresses were measured prior to the topsoil replacement to quantify the impact of loading from the high axle vehicle trafficking on deep induced soil stresses. Within Z-x, vehicle induced peak vertical soil stresses were measured at three soil depths using a GEOKON model 3500, 1 MPa capacity,



FIGURE 2 Map of experimental research plot showing the designated construction zones (Zone-1, Zone-2, Zone-3 and Zone-x) and unaffected crop field zones (Control-S and Control-N) aligned in reference to the pipeline. Zone-P refers to where the topsoil was piled Colour figure can be viewed at wileyonlinelibrary.com

piezoelectric earth pressure sensor (GEOKON [Lebanon, NH, USA]) as a vehicle passed over the sensors. The Caterpillar pipe liner PL 87 (with bender) and semi-trailer truck (with three pipes) were tested passing over the buried sensors. The pressure sensor was 100 mm in diameter and 10 mm in thickness. Each pressure sensor was installed at one of three soil depths (200 mm, 400 mm and 600 mm) from the top surface of the exposed subsoil. The centre-to-centre distance between the adjacent sensors along the vehicle travel direction was 300 mm. A trench with a width approximately three times the diameter of the pressure sensor was excavated. Before the trench was covered with the spoil material, an approximate 50-mm-thick layer of clean Ottawa #10 sand was placed above and below the sensor, according to the pressure sensor calibration procedure explained in White, Vennapusa, and Gieselman (2009) for studies on roller compactor-induced soil stress measurement. The vertical soil stress data were acquired using a USB-1408FS data acquisition (DAQ) device (Measurement Computing Corp., Norton, MA, USA) and sampled at 100 Hz. The soil during the soil stress measurement was moist and its consistency was close to the lower plastic limit. During the one-week heavy vehicle trafficking, mean precipitation measured at the nearest weather station in Boone, Iowa was 8.5 mm.

2.3 | Soil sampling for bulk density measurement

After the pipe was installed and prior to topsoil placement, soil core samples were taken for dry soil bulk density and soil moisture content measurement within Z-1, Z-2, Z-3 and Z-x starting from the top surface of the exposed subsoil. A Gidding hydraulic driven sampling probe (Giddings Machine Co., Windsor, CO) was used to collect 76-mm-diameter and 916-mm-long soil cores at each sampling position. Nine soil core sampling locations were selected along the centre of each zone within the ROW. Similarly, nine soil core tube samples were taken from the unaffected crop field zone (Control-S). Each tube sample was cut into 50 mm increments. The soil core samples were oven-dried at 105°C for 48-hr to determine dry soil bulk density and dry basis soil moisture content.

2.4 | Deep tillage experimental design

A Randomized Complete Block Design (RCBD) subsoiling tillage experiment was established with two subsoil tillage depths (300 mm and 450 mm from the top surface of the exposed soil) within the zones (Z-1, Z-2 and Z-3; Figure 3). Each zone was considered as an experimental block, where the tillage treatments were applied in four replicates. Two repeated subsoil tillage passes were applied in parallel to the pipeline. A John Deere 8320R MFWD tractor (196 kW [263 hp] PTO power) tractor pulling a John Deere V-Ripper (5-shanks at

FIGURE 3 Based on the randomized complete block design (RCBD), the 300-mm- and 450-mm-deep tillage treatments were applied within Zone-1, Zone-2 and Zone-3 prior to topsoil replacement (“blue” rectangle). Each subsoil tillage plot size was 7.6 m width by 18 m long. Within the right-of-way (ROW), Zone-x and Zone-P (topsoil pile zone) were not part of the RCBD tillage experiment design. Crop field zones (Control-N, CN (north) and Control-S, CS (south)) were outside the ROW and unaffected by the pipeline construction [Colour figure can be viewed at wileyonlinelibrary.com]



760 mm spacing with DMI ripper points, 63.5-mm-wing width) was used to apply the subsoil tillage operation.

After the topsoil was replaced, the two unaffected zones designated as Control-N and Control-S (Figure 2) were added to the long-term (5-years) experimental plots to represent the soil and crop conditions outside the ROW that receive normal farm cultivation practices. Note that Control-N and Control-S had corn planted in the field adjacent to the ROW. At the unaffected zones, after the fall 2016 corn harvest and the pipeline construction were completed, including replacing the topsoil, Control-N received 300-mm-depth tillage using a Case 690 disk ripper pulled by a John Deere 8260R WFWD tractor (161 kW [216 hp] PTO power) which was followed by a second pass of 300-mm-depth tillage using the aforementioned John Deere 8320R MFWD tractor and the John Deere V-Ripper. In the Control-S zone, first pass tillage was completed at 300 mm depth using the Case 690 disk ripper pulled by the John Deere 8260R MFWD tractor and followed by a second pass of 450-mm-depth tillage using the John Deere V-Ripper pulled by the John Deere 8320R MFWD tractor. The disk ripper implement was the preferred tool to manage corn residue before applying the tillage using the V-Ripper without disc.

2.5 | Soil cone penetration resistance measurement

After the first year crop harvest in fall 2017, soil cone penetration resistance was measured according to the ASABE standards (ASAE Standards, 2004a,b). A tractor-mounted three-probe cone penetrometer designed and built at ISU (Figure 4) was used to measure the soil cone penetration resistance. Cone penetration resistance force was measured using a Transducer Techniques model LPU-500 load cell transducer with 2224-N capacity (Transducer Techniques,



FIGURE 4 Three-probe cone penetrometer mounted on the three-point hitch of a tractor. The lateral spacing between the penetrometer probes was 150 mm during field measurements. An ASABE 30-degree conical tip with 285 mm² cone base area was attached to each of the probes. The probe insertion rate was 30 mm s⁻¹ [Colour figure can be viewed at wileyonlinelibrary.com]

LLC (Temecula, CA)) and a Metromatics USB DEWE-43 DAQ System (Metromatics (North Lakes, Brisbane, QLD, Australia)) acquiring data at 100 Hz. Soil cone penetration resistance (kPa) was calculated by dividing the cone penetration resistance force by 285 mm² ASABE cone base area (ASAE Standards, 2004a).

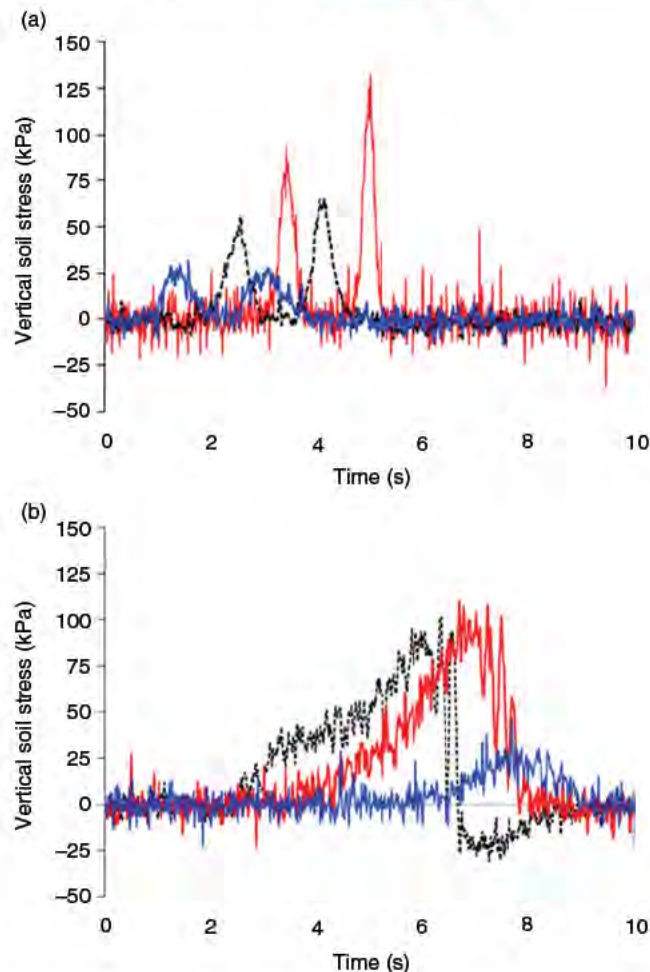


FIGURE 5 Soil vertical stress measured using the buried piezoelectric earth pressure cell at three depths (“red”—soil depth of 200-mm; “black”—soil depth of 400 mm; and “blue”—soil depth of 600 mm) as the semi-truck trailer hauling three pipes (24.4 m long, 0.76 m outer diameter, and 9.5 mm wall thickness); (a) and the Caterpillar Pipe Liner PL 87 (with bender) passes (b). Note that the comparison was made on the peak induced vertical soil stress (maximum soil vertical stress) from the front axle pass of the semi truck trailer and track pass of the Caterpillar Pipe Liner PL 87 [Colour figure can be viewed at wileyonlinelibrary.com]

2.6 | Data analysis

Data analysis to compare the vertical soil stresses from the vehicles was performed on the first pass peak vertical soil stress. In order to not hinder pipeline construction field operations, the construction equipment for loading the pressure sensors was available for only one week. Thus, the measurement with the pressure sensor buried at the three depths was limited to one replicate. The field machine productivity was approximately 0.2 km h⁻¹ (personal communication with field superintendent).

Data from soil bulk density and soil cone penetration resistance were analysed using the GLM procedure in SAS JMP Ver. 14. (JMP, 2013). Means were compared using a *p*-value of 0.05 as a

TABLE 1 Peak vertical soil stress induced from first pass of the heavy vehicle Caterpillar pipe liner PL 87 (with bender) and semi-truck trailer (with three pipes) on soil within the ROW

Soil depth (mm) ^a	Peak vertical soil stress (kPa)	
	Vehicle-A ^b	Vehicle-B ^c
200	133	133
400	115	78
600	63	49

^aSoil depth was measured from the top surface of the exposed subsoiled soil to the top surface of the sensor. ^bVehicle-A: Caterpillar pipe liner PL 87 (with bender).

^cVehicle-B: Semi-truck trailer (three pipes).

significance level. From the unaffected zone, the soil cores sampled from the top surface of the exposed subsoil to the end core length of the Gidding cylinder were used to compare with the soil bulk density at the corresponding soil depth from the ROW zones.

3 | RESULTS AND DISCUSSION

3.1 | Peak vertical soil stress

Multiple peak values of vertical soil stresses were observed as the tyres of the semi-trailer truck passed over the buried pressure sensors (Figure 5). From a single pass of the Caterpillar Pipe Liner PL 87 (with bender) travelling at 0.45 m sec⁻¹, the peak vertical soil stress occurred towards the end of the track contact length. Table 1 shows the peak vertical soil stress measured from the first pass of the two heavy vehicles. At the shallow depth (200 mm), there was small difference in the peak vertical soil stress between the front axle (DOT highway limit of 8.9 kN) pass of the semi-trailer truck (275/80R-24.5 tyre) and the single pass of the Caterpillar pipe liner PL 87 (contact area of each track 2.82 m²). At the depth of 400 mm, the peak vertical soil stress appeared to be influenced more by the vehicle weight, whereby the peak vertical soil stress from the Caterpillar liner PL87 was 1.5 times higher than from the semi-trailer truck. At 600 mm depth, the magnitude of peak vertical soil stress from the Caterpillar pipe liner PL 87 was 1.3 times the stress induced by the semi-trailer truck. Having one replicate measurement statistically limited the comparison of impacts from heavy vehicles of the semi-trailer truck versus the Caterpillar pipe liner PL87. The narrow contact ground area and tyre inflation pressure from the semi-trailer truck had a strong effect on shallow vertical soil stress, while the deep (400 mm and 600 mm) vertical soil stresses was affected more by the magnitude of vehicle load. The effect of vehicle type with high tyre inflation pressure and axle load on shallow and deep soil compaction was similar to previous studies (Bailey, Raper, Way, Burt, & Johnson, 1996; Hakansson & Reeder, 1994). Measurement of soil stress from the other heavy vehicle (Caterpillar 349F and Caterpillar D7E) passes showed similar trends as the effects from the Caterpillar pipe liner PL 87. The soil pressure measurements from the Caterpillar 349F and Caterpillar D7E passes had

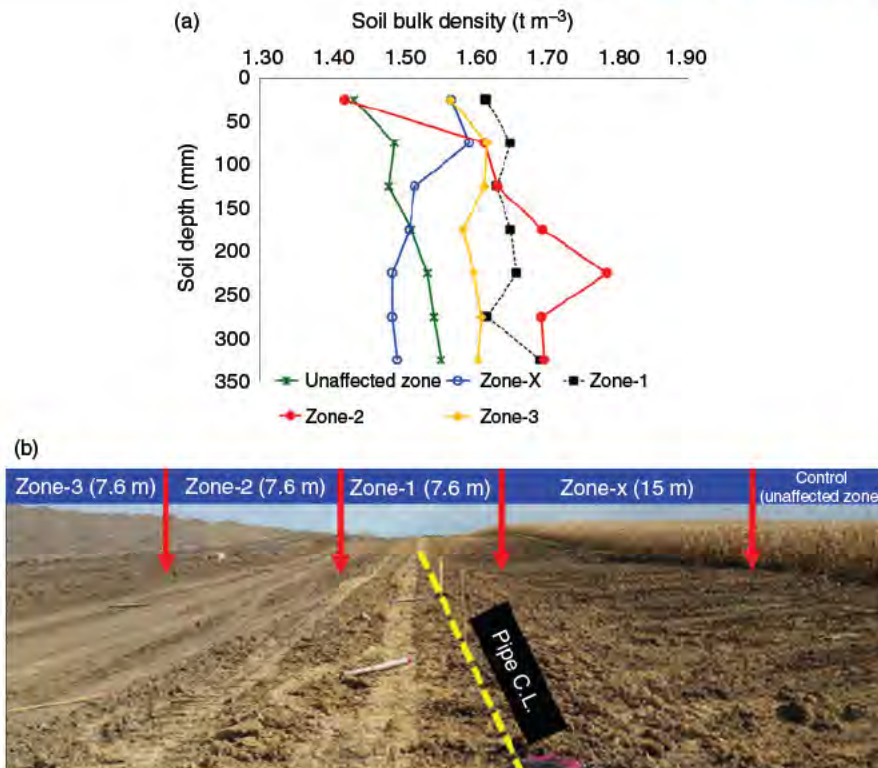


FIGURE 6 Soil bulk density with depth from the construction ROW zones (Zone-1, Zone-2, Zone-3 and Zone-x) and the unaffected zone (Control-S). The reported soil depth refers to the top surface of the exposed subsoil (b) within the ROW. “C.L.” is the pipe centreline. Each data point is a mean of nine replicates [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Mean soil bulk density (t m⁻³) by soil depth class

Soil depth class ^b (mm)	Soil bulk density (t m ⁻³)				
	Zone-1	Zone-2	Zone-3	Unaffected zone	Zone-x
0–50	1.62 (A) ^a	1.42 (B)	1.57 (A B)	1.46 (B C)	1.57 (B)
50–100	1.65 (A)	1.62 (A)	1.62 (A)	1.52 (B)	1.59 (A B)
100–150	1.63 (A)	1.63 (A)	1.62 (A)	1.51 (B)	1.52 (B)
150–200	1.65 (A)	1.70 (A)	1.58 (A B)	1.54 (B)	1.51 (B)
200–250	1.66 (A)	1.79 (A)	1.60 (B)	1.55 (B)	1.49 (B)
250–300	1.62 (A)	1.70 (A)	1.61 (A)	1.59 (A B)	1.49 (B)
300–350	1.69 (A)	1.70 (A)	1.61 (A B)	1.57 (B)	1.49 (B C)

^aThe same letter within each depth indicates there is no significant difference at $p \leq 0.05$. ^bThe zero soil depth is in reference to the top surface of the exposed subsoil. The difference between soil depth (mm) relative to undisturbed topsoil surface on the unaffected zone “Control-S” outside of the ROW and soil depth (mm) relative to the top surface of exposed subsoil was the topsoil removed from the ROW.

relatively high data variability, partly because there was substantial precipitation prior to data collection.

3.2 | Soil bulk density

The soil bulk density trend at different soil depth (Figure 6) shows the higher magnitude of soil compaction from the soil disturbance and vehicle trafficking in the construction ROW zones compared to the unaffected zone. The soil bulk density

values in Figure 6 were all relative to the top surface of the exposed subsoil.

Comparing the soil bulk density values among zones (Z-1, Z-2 and Z-3) within the ROW and the unaffected area (Table 2), the soil compaction effect from the construction activity was statistically significant ($p < 0.05$) to a depth of 300 mm below the top surface of the exposed subsoil. The differences in soil bulk density between the unaffected zone and Z-x that received relatively light traffic were minimum,

except in the top 50 mm. The deep compaction in Z-1 and Z-2 had soil bulk density close to a Proctor compaction test (ASTM D698) of maximum bulk density (1.72 t m^{-3}) at an optimal soil moisture content (21.5%, d.b.) of a loam soil (33.29% sand; 45.21% silt; 21.5% clay). The Proctor compaction test was conducted on loam soil (Clarion loam series) sampled at a nearby ISU farm location. The control (unaffected) area and the least trafficked zone in the ROW (Z-x) had wetter soil conditions (Figure 7), indicating that the compaction from the construction activities, especially on Z-2 and Z-3, seemed to restrict water infiltration prior to the bulk density measurement. The backfilled subsoil to the pipe trench in Z-1 was compacted by DAPL to reduce soil settlement.

Within the ROW (below 300 mm from the top surface of the exposed subsoil), soil compaction was found with higher bulk density in Z-1 (1.67 t m^{-3}), Z-2 (1.70 t m^{-3}) Z-3 (1.58 t m^{-3}) than the less trafficked zone (Z-x) (1.52 t m^{-3}). Soil core samples from the unaffected zone below 300 mm from the top surface of the exposed subsoil were not available due to the limit of the maximum Giddings cylinder stroke length.

3.3 | Deep tillage effect on soil cone index

Table 3 shows means and standard deviations of soil cone penetration resistance values within Z-1, Z-2 and an unaffected area (Control-N) for two soil depth layers of 0 to 300 mm and 300 to 750 mm. Taking cone penetration readings on all zones within the ROW (Z-1, Z-2, and Z-3) and adjacent zones (Control-N and Control-S) was not practically feasible without introducing wide soil moisture variations during the sampling period. To minimize undesired soil moisture effects on cone penetration resistance, we focused on Z-1, Z-2 and Control-N for comparison of

the tillage remediation effects within the ROW and the adjacent unaffected area. The soil moisture contents during the cone penetration reading from the topsoil (0–150 mm) within Z-1, Z-2 and Control-N were 16.28% d.b. ($SD = 1.72\%$), 15.98% d.b. ($SD = 1.11\%$), and 17.78% d.b. ($SD = 1.72\%$), respectively. The soil moisture content was not significantly different across the various sampling zones ($p = 0.09$).

Within Z-1 and Z-2, the 300-mm-depth tillage and 450-mm-depth tillage applied prior to topsoil replacement did not have a significant effect on the soil cone penetration resistance within the 0 to 300 mm soil depth ($p > 0.05$). Comparing the zones within ROW (Z-1 and Z-2) to the unaffected area, Z-1 had statistically the highest soil cone penetration resistance ($p < 0.01$) in the topsoil profile (0–300 mm).

Deeper than 300 mm soil depth, the effect of the utility construction equipment on deep soil compaction was noticeable, even though the ROW zones received subsoiling from the tillage treatments (300-mm-depth tillage and 450-mm-depth tillage; Figure 8). Similar to the soil bulk density, deep soil compaction in Z-2 was higher than in Z-1 and in the adjacent unaffected crop field. Overall, the 450-mm-depth tillage alleviated the deep soil compaction created by the pipeline construction equipment better than the shallow tillage (300-mm-depth tillage). No significant differences ($p > 0.05$) in the mean soil cone penetration resistance (300 to 750 mm) were observed comparing the compaction from each of the ROW zones (Z-1 and Z-2) to the unaffected zone after Z-1 and Z-2 received the 450-mm-depth tillage. In the deeper soil profile (below 600 mm; Figure 8), Z-1 and Z-2 which received the 450-mm-depth tillage had soil cone penetration resistance values close to those of the unaffected area.

After subsoiling at the 300-mm-depth tillage in Z-1 and Z-2, the deep soil compaction (300 mm to 750 mm) was not fully removed (Figure 8) and soil compaction was significantly ($p < 0.05$) higher than in the unaffected area.

The pipeline construction equipment trafficking created deep soil compaction (a hardpan) as shown by an abrupt increase in soil cone penetration resistance as the cone penetrometer was inserted into the subsoiled layer (Figure 8). Tekeste, Raper, Schwab, and Seymour (2008) and Raper, Reaves, Shaw, van Santen, and Mask (2005) detected crop-limiting soil hardpan layers on Coastal Plains soils in the southeastern United States by analysing the soil cone penetration resistance profile for a soil depth range. Raper et al. (2005) applied site-specific tillage at a depth that had a maximum soil cone index approximating the depth of soil hardpan and reported soil compaction alleviation. Schjonning and Rasmussen (1994) also reported deep soil compaction on loam soils that persisted even after 5 years traffic with four passes of a vehicle with high axle load (32t) on the bottom of a 200 mm exposed soil layer.

The deep soil compaction created on the Clarion loam and Canisteo clay loam from the pipeline construction will require depth-specific subsoiling management in the future

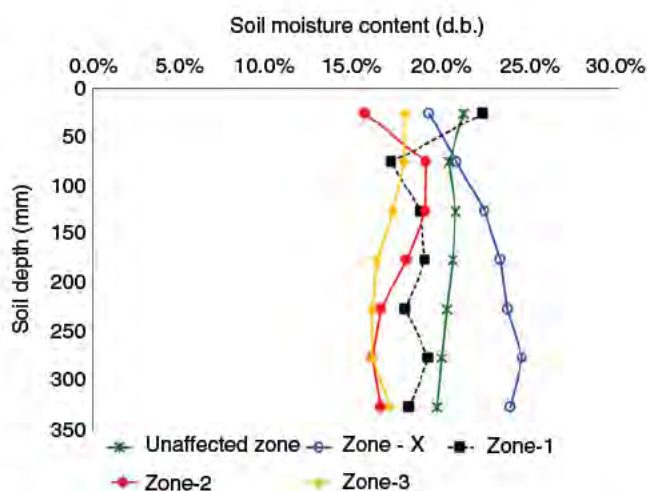


FIGURE 7 Soil moisture content of soil depth from four construction zones Zone-1, Zone-2, Zone-3, Zone-x and an unaffected zone (Control-S). The reported soil depth refers to the top surface of the exposed subsoil within the ROW. Each data point is a mean of nine replicates [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 3 Mean soil cone index (MPa) for 0 to 300-mm and 300 to 750-mm soil depth range for the Zone-1, Zone-2 and the unaffected zone

Zone	Tillage remediation	Depth range (mm) ^b	Replicate	Soil cone index (MPa)	
				Mean	SD
Unaffected zone	Control-N ^a	0–300	4	1.7	0.19
		300–750	4	1.9	0.17
Z-1	300 mm depth tillage	0–300	4	2.1	0.3
		300–750	4	2.6	0.5
	450 mm depth tillage	0–300	4	2.0	0.2
		300–750	4	2.0	0.4
Z-2	300 mm depth tillage	0–300	4	1.4	0.4
		300–750	4	2.6	1.0
	450 mm depth tillage	0–300	4	1.3	0.1
		300–750	4	1.7	0.6

^aThe tillage practice in the unaffected area was similar to the tillage in control-N. ^bThe top depth for the soil cone index reporting refers to the top surface of the unaffected zone.

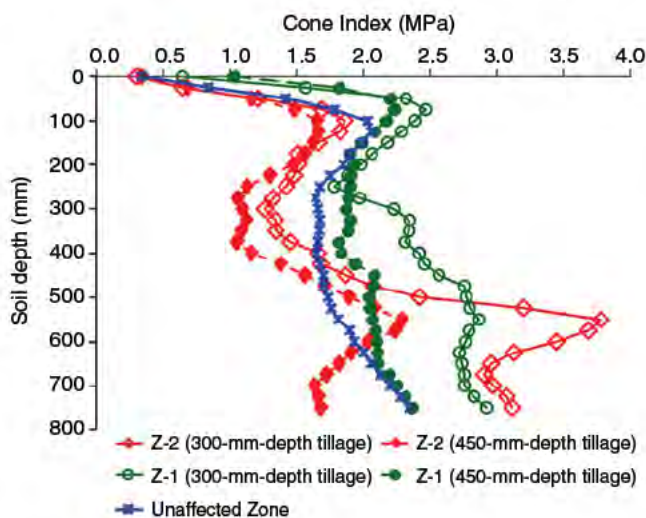


FIGURE 8 Soil cone index profile measured from the right-of-way (ROW) zones (Zone-1 and Zone-2) subsoiled at 300-mm- and 450-mm-depth tillage treatments prior to the topsoil replacement and the unaffected zone outside the ROW. The topsoil depth refers to the topsoil surface from the unaffected zone. Each data point is a mean of four replicates of the three-point cone penetrometer readings [Colour figure can be viewed at wileyonlinelibrary.com]

to remove the root-limiting hardpan layers and prevent the persistent problem of deep compaction. Excessive compaction deeper than 500 mm soil depth is relatively deeper than typical fall tillage practices (200-mm-depth tillage) in the area (Karlen, Kovar, Cambardella, & Colvin, 2013).

4 | CONCLUSIONS

A five-year long-term corn–soybean field experiment was established to assess impacts of utility construction activities and deep tillage remediation treatments (300-mm-depth

tillage and 450-mm-depth tillage applied at the exposed subsoil) within the ROW.

Using a pressure sensor, the peak vertical soil stresses measured at three soil depths (200, 400, and 600 mm) successfully identified the machine configuration (size and tractive element) that created excessive soil compaction below the exposed subsoil.

The impact on soil compaction from pipeline installation on exposed subsoil was also evaluated comparing soil bulk density within ROW and adjacent unaffected crop field area. First-year soil responses to deep tillage were also investigated using cone penetration resistance measurement. Heavy vehicle and high traffic intensity within the ROW created deep soil compaction with significantly higher soil bulk density in the pipeline zone (Z-1) and adjacent heavily trafficked zone (Z-2) to a depth of 300 mm. Comparing the soil cone penetration profile from the ROW deep tilled zones and the unaffected zone, deep tillage applied using a 450 mm depth alleviated the deep compaction created during the pipeline construction. Subsoiling using 300-mm-depth tillage, however, did not significantly reduce the deep soil compaction.

Delineating the pipeline construction zones on the basis of vehicle trafficking, the techniques to quantify machine induced peak vertical soil stress and subsoil tillage management may be used to develop soil compaction management plans for pipeline construction activities in cropland.

Future studies will include deep tillage management effects on soil compaction (bulk density and cone penetration resistance) and corn–soybean crop yields.

ACKNOWLEDGEMENTS

We acknowledge DAPL for providing funding to conduct this study. We also received field support from Kent R



Berns, Supervisor Agricultural Station, Carl H Pederson, Agricultural Specialist at the Department of Agricultural and Biosystems Engineering at Iowa State University in Ames, Iowa, and Kent Heikens, Agricultural Science Research Technician (Soils) at the National Laboratory for Agriculture and the Environment, USDA-ARS in Ames, Iowa.

ORCID

Mehari Z. Tekeste  <https://orcid.org/0000-0003-2463-1061>

REFERENCES

- Al-Adawi, S. S., & Reeder, R. C. (1994). Compaction and subsoiling effects on corn and soybean yields and soil physical properties. *Transactions of the ASAE*, *39*(5), 1641–1649.
- ASAE Standards. (2004a). S313.3: Soil cone penetrometer. St. Joseph, Mich.: ASAE.
- ASAE Standards. (2004b). EP542: Procedures for using and reporting data obtained with the soil cone penetrometer. St. Joseph, Mich.: ASAE.
- Bailey, A. C., Raper, R. L., Way, T. R., Burt, E. C., & Johnson, C. E. (1996). Soil stresses under a tractor tire at various loads and inflation pressures. *Journal of Terramechanics*, *33*(1), 1–11.
- Batey, T. (2009). Soil compaction and soil management- a review. *Soil Use and Management*, *25*, 335–345.
- Batey, T. (2015). The installation of underground pipelines: Effects on soil properties. *Soil Use and Management*, *31*, 60–66.
- Dakota Access, LLC (DAPL). (2016). Agricultural Mitigation Plan. Adopted and Approved by the Iowa Utilities Board, State of Iowa.
- Etana, A., & Hakansson, I. (1994). Swedish experiments on the persistence of subsoil compaction caused by vehicles with high axle load. *Soil and Tillage Research*, *29*, 167–172.
- Hakansson, I., & Reeder, R. C. (1994). Subsoil compaction by vehicles with high axle load-extent, persistence and crop response. *Soil and Tillage Research*, *29*, 277–304.
- Hamza, M. A., & Anderson, W. K. (2005). Soil compaction in cropping systems a review of the nature, causes and possible solutions. *Soil and Tillage Research*, *82*, 121–145.
- Hillel, D. (1998). *Environmental soil physics*. San Diego, CA: Academic Press.
- ISTVS (1977). ISTVS Standards. *Journal of Terramechanics*, *14*(3), 1533–1820.
- JMP (2013). Version 14.00. 1989-2013. SAS Institute Inc., Cary, NC, USA.
- Karlen, D. L., Kovar, J. L., Cambardella, C. A., & Colvin, T. S. (2013). Thirty-year tillage effects on crop yield and soil fertility indicators. *Soil and Tillage Research*, *130*, 24–41.
- Lowery, B., & Schuler, R. T. (1991). Temporal effects of subsoil compaction on soil strength and plant growth. *Soil Science Society of America Journal*, *55*, 216–223.
- Raper, R. L., & Kirby, J. M. (2006). Soil compaction: How to do it, undo it, or avoid doing it. ASABE Distinguished Lecture Series. Tractor Design No. 30. 2006 Agric. Equip. Technol. Conf., Louisville, KY, USA. 12–14 February 2006. St. Joseph, Mich., USA: ASABE.
- Raper, R. L., Reaves, D. W., Shaw, J. N., van Santen, E., & Mask, P. L. (2005). Using site-specific subsoiling to minimize draft and optimize corn yields. *Transactions of the ASABE*, *48*(6), 2047–2052.
- Schjonning, P., & Rasmussen, K. J. (1994). Danish experiments on subsoil compaction by vehicles with high axle load. *Soil and Tillage Research*, *29*, 215–227.
- Soane, B. D., & Van Ouwerkerk, C. (1994). Soil compaction problems in world agriculture. In B. D. Soane, & C. Van Ouwerkerk (Eds.), *Soil compaction in crop production* (pp. 1–22). Amsterdam, The Netherlands: Elsevier.
- Spoor, G. (2006). Alleviation of soil compaction: Requirements, equipment and techniques. *Soil Use and Management*, *22*, 113–122.
- Tekeste, M. Z., Raper, R. L., Schwab, E. B., & Seymour, L. (2008). Soil drying effects on spatial variability of soil hardpan attributes on Pacolet sandy loam soil. *Transactions of the ASABE*, *52*(3), 697–705.
- White, D. J., Vennapusa, P., & Gieselman, H. (2009). Investigation of dual roller integrated MDP/CMV compaction monitoring technologies and measurement influence depth, Center for Transportation Research and Education, Iowa State University, Ames, IA.

How to cite this article: Tekeste MZ, Hanna HM, Neideigh ER, Guillemette A. Pipeline right-of-way construction activities impact on deep soil compaction. *Soil Use Manage.* 2019;35:293–302. <https://doi.org/10.1111/sum.12489>

Attachment No. 11

February 28, 2022

Iowa Chapter
Physicians for Social
Responsibility



Sign in Colorado. ----- Source: [Jeffre Beall](#)

Carbon Capture and Public Health

By [Sheri Deal-Tyne](#), Health & Energy Policy Researcher, PSR Iowa, 2/28/22.

This series began with [Carbon Capture Basics](#), a basic overview of the process of Carbon Capture and Sequestration (CCS) and a brief synopsis of the current debate concerning its promotion. In this second report, we dive deeper into a frequently overlooked issue: the public health implications of CCS. *Read the first report [here](#).*

Anthropogenic, or human-made, CO₂ has been a focus of concern for scientists and environmentalists for decades. CO₂ makes up about **80%** of total greenhouse gas emissions (methane is next at 10%). The burning of fossil fuels (coal, natural gas, and oil) is the largest source of CO₂ emissions.

The UN Intergovernmental Panel on Climate Change (IPCC) released a report in 2018 announcing that CO₂ emissions would need to decline 45% from 2010 levels by 2030 and reach “net-zero” by 2050 to avoid a global temperature rise **beyond 1.5°C**. Many in the business and academic communities promote CCS and Carbon Capture and Utilization Sequestration (CCUS) as vital to reaching “net-zero” for the IPCC goal. PSR Iowa feels it is essential to recognize the significant public health risks associated with CCS. This report discusses the hazards accompanying each stage of the CCS process.

In the first stage, the CO₂ is captured and separated from other gases, using expensive technology requiring an additional energy source. Capture is proposed at various sites, including coal- and gas-fired power plants and ethanol production facilities. In the second stage, the CO₂ is compressed into liquid form, again requiring energy, and then pumped into and transported via pipelines. In the third and final stage, the liquid CO₂ is injected into the earth at the sequestration site.

Lethality of CO₂

CO₂ is the colorless and odorless gas humans exhale during respiration, contributing to the perception that CO₂ is harmless. Concentrated CO₂ is an asphyxiant and a recognized **toxicant** cited by OSHA, ACGIH, DOT, and NIOSH. Gaseous CO₂ is 1.5 times heavier than air. Liquid CO₂ is 10% heavier than water. When released in large

quantities as gas or liquid, CO₂ settles on the ground, flows downhill, and displaces ambient air.

Ambient air is the air we all breathe. The concentration of CO₂ in ambient air is around 400 parts per million (ppm) or 0.04% but can be elevated in areas with high vehicle traffic or industrial activity. *Atmospheric CO₂* is the measurement of CO₂ in the earth's atmosphere. Atmospheric CO₂ **levels** are tracked by the National Oceanic and Atmospheric Administration (NOAA) and the Scripps Institution of Oceanography.

Table. Health Effects of Exposure to Elevated CO₂ Levels

— *Information courtesy of Ted Schettler, MD, MPH*

CO ₂ concentration	Health Effect	Exposure Time
0.04% (Ambient Air)	No Health Effect	Lifetime
2% (20,000 ppm)	Respiratory center stimulated causing increases in breathing (tidal) volume	Rapid
4% (40,000 ppm)	Increases in breathing rate becomes distressing;	Immediately dangerous to life or health (IDLH) [NIOSH]
7-10%	Dimmed sight, sweating, tremor, unconsciousness	After only a few minutes
Over 10%	Convulsions, coma, death	Less than a minute
Over 20%	Emergency, Loss of consciousness, rapid death	Seconds

The physiological response to and seriousness of CO₂ inhalation varies depending on the concentration of CO₂ and the length of exposure time. Conditions from low to moderate exposures are generally reversible when a person is removed from the high CO₂ environment.

CO₂ Capture Sites

As the debate about CCS gains momentum, that familiar idiom “can’t see the forest for the trees” springs to mind. Proponents of CCS focus on the potential value of removing CO₂ from industrial sites while quietly ignoring associated hazards. Combustion of fossil fuels and ethanol production release many pollutants along with CO₂. These co-pollutants are associated with a wide range of public health dangers.

Extensive **research** has demonstrated the health hazards of coal-generated electricity. NO_x, SO₂, mercury, and PM_{2.5} are emitted from coal plants along with CO₂. NO_x causes

airway inflammation, decreased lung function, asthma exacerbation, increased response to allergens, and contributes to particulate matter and ground-level ozone. SO₂ causes wheezing, shortness of breath, chest tightness and exacerbates asthma. Continued exposure reduces the ability of the lungs to function. SO₂ reacts with water to become acid rain. Mercury is a potent neurotoxin, especially for developing fetuses and young children. PM_{2.5} contributes to premature mortality, increased hospitalizations, cardiovascular disease, bronchitis, cognitive decline, dementia, preterm birth, low birth weight, and congenital disabilities.

Pollutants from natural gas-generated electricity include less NO_x and fewer particulates, do not include mercury, but do include significant methane leakage. In addition to being a precursor to ground-level ozone formation, and as a greenhouse gas, methane is **much more potent** than CO₂.

Note that each stage of CSS technology requires its own energy sources, which generate additional emissions. CO₂ capture systems at power-generation plants and ethanol production facilities **also require copious amounts of water** for cooling and other purposes leading to extensive water consumption and increased water pollution, often in areas already facing water scarcity.

CO₂ Transport

Large-scale development of CCS across the US will require the construction of thousands of miles of new pipeline infrastructure impacting ecosystems along their routes. Liquid CO₂ is transported in a **highly pressurized state**—higher than natural gas. Additionally, liquid CO₂ is corrosive when in contact with water, increasing the risk of leaks, fractures, and ruptures. Rupture of a highly pressurized liquid CO₂ pipeline results in an explosive release of an extremely cold (less than -70° C) flood of liquid CO₂ that forms ground-hugging clouds of gas and small particles that continue to spread until supply is turned off. Because CO₂ displaces oxygen, internal combustion engines would be rendered inoperable near a leak or rupture, interfering with emergency responders. Potential mass casualties would overwhelm rural emergency health systems.

Watch [this video](#) to see what a CO₂ pipeline rupture looks like.

CO₂ Injection Sites

The rollout of CCS projects at the scale required to slow climate change effectively would require establishing CO₂ sequestration sites throughout the US. **Estimates** (see pp 18-19) of the storage potential and feasibility are theoretical and vary widely.

The risks of CO₂ sequestration **include** leakage of CO₂ and increased occurrence of earthquakes like that experienced with high-pressure water injection at fracking sites. CO₂ leaks at the surface could damage surface ecosystems or structures, threaten people and animals from high concentrations of CO₂, and contribute to greenhouse gas accumulations, all undermining the theoretical value of CCS. Leaks that occur sub-surface could affect drinking water aquifers. Conceivably, using geologic formations as storage for carbon dioxide could compromise deep not-currently-used aquifers on which future generations may depend for drinking water.

Frontline Communities

[Dr. J.M. Bacon](#), Professor of Environmental Sociology at Grinnell College, cautions us to be skeptical of “purely technological fixes when it comes to complex eco-social problems. From an Environmental Justice perspective, the first question is: how have communities been involved at the planning and decision-making stage?”

As has been widely documented, fossil fuel extraction and industrial processes have a legacy of disproportionately impacting Black, Brown, and Indigenous communities. Adding carbon capture to an existing fossil fuel or industrial site functions to extend the lifespan of that facility. Many of the communities already adversely impacted by these facilities would be further harmed by the increased emissions and water pollution associated with carbon capture units.

For example, an industrial corridor that stretches between New Orleans and Baton Rouge, Louisiana is being targeted as a [hub for carbon capture](#). This corridor is home to more than 200 oil and gas refineries, petrochemical plants, and other industrial chemical facilities. The area is known as “*Cancer Alley*” because decades of poor air and water quality from industrial pollution have increased cancer rates and other health problems. The [communities](#) most affected are predominantly Black.

The White House Environmental Justice Advisory Council (WHEJAC) Final Recommendations on climate and environmental justice include a list of “EXAMPLES OF THE TYPES OF PROJECTS THAT WILL NOT BENEFIT A COMMUNITY” ([see page 59](#)). Number 2 on the list is CCS or CCUS. It is also essential to note that number 1 on the list is “Fossil fuel procurement, development, and infrastructure repair that would in any way extend lifespan or production capacity, transmission system investments to facilitate fossil-fired generation or any related subsidy.”

History lessons: Satartia

In 2020, a CO₂ pipeline in Satartia, MS ruptured, sending 49 people to the hospital and leaving many with long-term health impacts. More than 250 people required evacuation. First responders needed self-contained breathing apparatuses to conduct their rescues. Residents’ cars ceased to run, and victims were found dazed or even unconscious. See the full story [here](#).



The Sartartia pipeline rupture. Source: [Yazoo County Emergency Management Agency](#)

Conclusion

Superficially, the potential CO₂ reduction associated with CCS projects seems desirable. However, CCS technology and associated pipeline infrastructure are economically costly and come with a significant set of public health hazards. We can achieve *more* CO₂ reduction *and* eliminate pollution and mining and pipeline infrastructure by utilizing existing and accessible renewable energy like wind, solar, efficiency, and other readily scalable and available strategies. It is reckless to spend money on unproven technologies that contribute negligible benefit or, worse, disproportionately impact already disenfranchised communities. If we instead focus funding on renewable energy projects and infrastructure, we avoid the myriad health risks associated with CCS altogether.

Dear Reader

Stay tuned for our next installment where we take a much closer look at issues surrounding three proposed CCS projects in Iowa.

GLOSSARY

ACGIH: American Conference of Governmental Industrial Hygienists

CCS: Carbon capture and storage/sequestration—The process of capturing human-made CO₂ at its source and storing it to prevent its release into the atmosphere.

CCUS: Carbon capture, utilization, and storage/sequestration—captured CO₂ is utilized in some way, typically for enhanced oil recovery.

Co-pollutant: Other types of pollutants that are generated during the burning of fossil fuels, along with CO₂

DOT: Department of Transportation

Net-zero: A nebulous term promoted by some meaning an overall balance between emissions produced and emissions taken out of the atmosphere. Net-zero often replaces the term *carbon neutral*. To save our climate and health, we need to go beyond net-zero to zero production of carbon emissions.

NIOSH: National Institute of Occupational Safety and Health

NO_x: Nitrogen oxide, a co-pollutant of fossil fuel combustion and potent greenhouse gas.

OSHA: Occupational Safety and Health Administration

Ozone: A co-pollutant of fossil fuel combustion, also known as “smog.” Ozone attacks lung tissue by reacting chemically with it.

PM_{2.5}: Particulate matter, fine particles of toxic pollutants 2.5 microns or smaller in size. Such small particulates are dangerous because they can get into the lungs’ alveoli, cross into the bloodstream, and lodge in internal organs.

Respiratory acidosis: A condition that occurs when there is an accumulation of CO₂ in body fluids that causes acidic conditions that can lead to death.

Sequestration: In context to CCS, sequestration is the storing of CO₂ in underground geologic formations.

SO₂: Sulphur dioxide, a highly toxic co-pollutant resulting from fossil fuel combustion.

WHEJAC: White House Environmental Justice Advisory Council

FURTHER READING

Alexander, Chloe and Stanley, Anna. 2021. “The Colonialism of Carbon Capture and Storage in Alberta’s Tar Sands.” *Environment and Planning E: Nature and Space*. <https://journals.sagepub.com/doi/full/10.1177/25148486211052875>

Schlossberg, Tatiana. 2019. “For a Texas Ranching Family, Toxic Coal Ash Pollution Hits Home.” *Yale Environment 360*. <https://e360.yale.edu/features/for-a-texas-ranching-family-toxic-coal-ash-pollution-hits-home>

Sokol, Karen C., Verchick, Robert R. M., and Flores, David. 2021. “The False Promise of Carbon Capture as a Climate Solution in Louisiana and Beyond.” *Center for Progressive*

Reform, Loyola University New Orleans College of Law Research Paper No. 2021-12.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3985624

Zegart, Dan. 2021. "The Gassing of Satartia." *HuffPost*.
https://www.huffpost.com/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f

Attachment No. 12



Serving South Dakota...
from South Dakota since 1916

PO Box 9 | De Smet, SD 57231 | Office - 605.854.3337
www.desmetfarmmutual.com | Fax - 605.854.3704

We have received multiple inquiries from De Smet Farm Mutual members regarding liability exposure related to the CO2 pipeline that is expected to run through or near their property. There are specific exclusions for liability protection (Coverage L) that apply to pollutants.

EXCLUSIONS THAT APPLY TO COVERAGE L – PERSONAL LIABILITY
AND TO COVERAGE M – MEDICAL PAYMENTS TO OTHERS

This policy does not apply to **bodily injury** or **property damage** which results directly or indirectly from:

the discharge, dispersal, release, or the escape of **pollutants** into or upon land, water or air.

CO2 and other chemicals (whether in solid, liquid, or gaseous form) would be pollutants as defined by your policy.

While we are not personally privy to any contracts between pipeline owners and landowners, please be aware that members may have exposure to significant personal liability for any damages caused by issues related to the pipeline on their property that are not covered by their liability insurance.

In the future, technology may render the pipeline useless or ineffective, pipeline owners and operators may change, and other factors could change that would increase the potential that you may be personally liable for cleanup, removal, and other activities that cause damage as a result of the pipeline being installed. Having a pipeline running through a member's property, carrying a pollutant, subjects them to substantial uninsurable exposure.

Bulletin (02-03-2023)

Stahl Insurance

PO Box 22
Mellette, South Dakota 57461
(605) 887-3604

April 4, 2022

Marty Francoli
38519 158th Street
Mellette, South Dakota 57461

RE: Farm and Umbrella Policies

Dear Marty:

In reviewing both your Farm and Umbrella Policies with Farmers Mutual Insurance Company of Nebraska, you had concerns. Concerning the question you have about the proposed pipeline wanting to go thru Section 28-120-64. While visiting with the Claims Department, they stated that there would be no coverage for any Liability Claims on that section or any section of land you own or rent, having anything to do with a claim concerning the pipeline.

Sincerely Yours,



Douglas L. Stahl

[Faint, mirrored text from the reverse side of the page, likely bleed-through from another document.]



Dear [redacted]

Thank you for your liability coverage inquiry into the Navigator CO2 pipeline that is expected to run through your property. There is specific exclusions for liability protection involving the release of any contaminants per the following policy language:

Coverage L (liability) does not apply to:

Bodily injury or property damage arising out of the actual, alleged, or threatened presence, discharge, dispersal, seepage, migration, release, escape of, or exposure to contaminants or pollutants at or from any source or location.

We also do not cover:

Any loss, cost, or expense arising out of any request, demand, order, or statutory or regulatory requirement that any insured or others test for, monitor, clean up, remove, contain, treat, detoxify, neutralize, remediate, dispose of, or in any way respond to or assess the effects of contaminants or pollutants;

Any loss, cost, or expense arising out of any claim or suit by or on behalf of a governmental authority of damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying, neutralizing, remediating, disposing of, or in any way responding to or assessing the effects of contaminants or pollutants;

While I am personally not privy to any proposed hold harmless agreements or the contract between the pipeline owners and yourselves; regardless of any agreements in place, there is significant personal liability exposure for yourselves while using your land for farming operations, for your own enjoyment and for your benefit renting the land out for others to do the same.

For example, if you or your tenants or even someone without permission attempts to dig, plow, trench and pierces the pipeline causing a leak, the resulting damage may be argued to be your responsibility.

As time passes, nearby landowners may change hands, the pipeline owners and operators may change, future technology may render the pipeline useless or ineffective. All of these factors among others, increase the potential that you may be held personally liable in the future for cleanup, removal and other activities that could cause damage as a result of this pipeline being installed.

As history has proved, any pipeline has a chance to fail, leak and seep resulting in significant damage to life and property. To place this type of risk or burden upon unwilling landowners, like yourselves, is tantamount to placing a risk to your livelihood without your permission.

In summary, having a pipeline running through your property, carrying CO2, a pollutant, subjects you to substantial uninsurable exposure.

Sincerely,

[redacted signature]

Renae Haug, Agent

1471 Interstate Loop, Ste 1
Bismarck, ND 58503
Bus 701 255 4433 Fax 701 224 0715
renae.haug.prgm@statefarm.com
www.renaehaug.com



5/18/2023

Leo & Susan Doppler
5412 Superior Dr
Bismarck ND 58503-6146

RE: CO2 line on your property

Dear Leo & Susan:

Thank you so much for stopping in and going over the Pipeline issue. I spoke with my underwriting department and they explained the following:

When a pipeline or service line is brought onto a person's property, there is no coverage to that service line due to it not being "owned" by our insured.

In several sections of the ND policy, there is language which explains who and what we (State Farm Fire & Casualty Company) insure, who/what is defined and there is also a section called exclusions, which are item not covered. Simply put, there would be no coverage for a loss if the pipeline were to enter/exit your land and seep and/or somehow disseminate any gases/debris/emanation or otherwise cause an "injury" to any person, animal, property and so on. One reason is due to you not "owning the pipeline" but furthermore, negligence would be a factor as well. Below are some references.

Insured, defined under our ND policy, is listed as follows:

Under Definitions:

9. "**insured**" means:

- a. **you**;
- b. **your relatives**; and
- c. any other person under the age of 21 in the care of a person described above.

Under Section II, **insured** also means:

21. "**you**" and "**your**" mean the person or persons shown as "Named Insured" in the **Declarations**.

332 PU-22-391 Filed 06/02/2023 Pages: 2
Susan Doppler Exhibit SD2 - State Farm Ins. Letter 5-18-23
Susan Doppler



Under **SECTION II – EXCLUSIONS**

1. Coverage L and Coverage M do not apply to:
 - m. **bodily injury** or **property damage** arising out of the actual, alleged, or threatened presence, discharge, dispersal, seepage, migration, release, escape of, or exposure to contaminants or pollutants at or from any source or location. Contaminants and pollutants include but are not limited to any solid, liquid, gaseous, or thermal irritant, including smoke from agricultural smudging or industrial operations, smog, soot, vapor, fumes, acids, alkalis, chemicals, pathogens, noxious substances, fuel oil, asbestos, or lead.

Further, under the liability of the ND Homeowners policy, it states:

We also do not cover:

- (1) any loss, cost, or expense arising out of any request, demand, order, or statutory or regulatory requirement that any **insured** or others test for, monitor, clean up, remove, contain, treat, detoxify, neutralize, remediate, dispose of, or in any way respond to or assess the effects of contaminants or pollutants;
- (2) any loss, cost, or expense arising out of any claim or suit by or on behalf of a governmental authority for damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying, neutralizing, remediating, disposing of, or in any way responding to or assessing the effects of contaminants or pollutants; or
- (3) contamination or pollution arising out of actually or allegedly defective building materials, nuclear substances, or waste. Waste includes materials to be recycled, reconditioned, or reclaimed;

Please refer to your ND Homeowners policy for the full language and details related to this matter. Again, thank you for bringing this to our attention and inquiring whether coverage would apply.

Sincerely,



Renae Haug, Agent

State Farm Fire & Casualty Company

NS **NORTHERN STATES**
INSURANCE SERVICES LLC

819 Hill Avenue • Grafton, ND 58237
701-352-2038
Fax 701-352-2037

04/10/2023

Marilyn Bryan
621 W Ave C
Bismarck, ND 58501

Dear Marilyn:

I got your letter asking about specific coverage on pollution, here is what I found:

I reached out to the home office at North Star Mutual Ins, PO Box 48, Cottonwood, Mn. 56229 where your current coverage is at. Listed below is the response to the questions you asked:

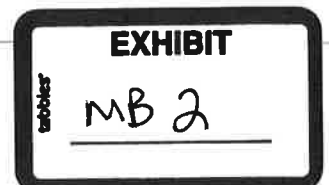
1. Yes, there is a pollution exclusion in our base liability form.
2. Yes, the CO2 being transported in the pipeline would be considered a pollutant.
3. We provide pollution coverage for "agricultural chemicals, liquids and gases intended for use in normal farming or ag operations. The CO2 in this pipeline is not considered an ag chemical, liquid or gas.
4. As the CO2 is a pollutant there would be no liability coverage or legal defense provided.
5. We do not offer an endorsement or rider that would provide this type of liability coverage.

I hope this helps clarify your coverage on this matter. I can shop around some for specific pollution coverage but not sure my vendors would provide this specific coverage.

Sincerely,



Chris L West / Agent





Farmers Union Insurance Company
PO Box 2020
Jamestown, ND 58401
Phone: 701.252.2701
Online: www.fumic.com

Dear Valued Policy Holder,

This letter acknowledges your inquiry into the CO2 pipeline that you expect to run through your property.

Farmers Union Insurance (FUI) is aware of the potential CO2 pipeline project in your area and wants you to be fully aware of the protections provided by your liability insurance policy's provisions, limitations, and coverages.

Your liability policy provides indemnity coverage and legal defense for any claim made against you as a result of your actions related to your farm liability or personal liability. It is first and foremost important to understand that your policy will only respond if you are legally liable for bodily injury or property damage as a result of your actions, inactions, or your alleged actions/inactions.

Please be aware that your liability policy contains exclusions for losses caused by pollutants. The policy may also exclude coverage for your responsibility to clean up, remove, treat, detoxify, remediate, or in any way respond to a loss caused by or due to pollutants. This means that there may be no coverage from your policy in the event that there is a release of pollutants.

You should understand that in the event that your land or property may be sold, leased, or transferred, any potential loss is subject to the insurance that is active at the time of the occurrence. Over time, the pipeline may become useless or ineffective, and if the policy is no longer in force at the time of the occurrence, you will be provided with no defense or legal indemnification.

FUI strongly recommends that you seek legal counsel prior to signing any contractual agreement. The contractual agreement will contemplate hold harmless agreements, waivers of subrogation, and potentially, the addition of outside parties as additional insureds on your policy. These contemplations are extremely important and could bind you to legal responsibilities in the event of a loss.

All claims are subject to their own merit, and as a result, it is not possible for FUI to provide you with a definitive summary of what may or may not be subject to coverage. As with all liability claims, FUI will provide coverage if you are legally liable, or deny coverage at the point it is determined that you have no coverage from your liability policy.

As always, any utility, pipeline, or other third-party exposure presents a substantial exposure to you from a liability perspective, unless the third party provides clear, contractual language which specifically holds you harmless. While no definitive coverage analysis can be provided until facts of a loss are contemplated, be aware that you may be at a substantially elevated risk of uninsurable exposure any time a third-party is allowed on your property.

Sincerely,

Brad Nold, AIC, AINS
Chief Claims Officer



May 9, 2023

Insured: Marvin Abraham
Policy #: FO233951

Dear Mr. Abraham,

Your agent Todd Newton has asked that we provide you with an assessment of the likely impact that a CO2 pipeline on your property might have on the insurability of your property with Northwest GF. First off, let me make the disclaimer that our assessments represent our analytical opinions only and are not purported to represent established science or fact. However, like all insurers, we group together homogeneous risks, meaning those having similar characteristics, in order that loss experience can be somewhat accurately predicted and adequate rates set accordingly. When risk characteristics become present that are not typically germane to a line of business, we must attempt to analyze and determine if these additional elements of risk would still be deemed insurable.

From an underwriting perspective, our research would indicate that CO2 pipelines likely present risk attributes that would not be present on other Farmowner accounts that we insure. Information that we have reviewed suggests that CO2 is an odorless, colorless asphyxiant, which can cause injury and death in sufficient concentrations. Additional literature indicated that pressurization on CO2 pipelines can be as high as 2800 psi, which is nearly double the pressurization of natural gas pipelines. Further articles suggested that it is difficult to eliminate moisture entirely from CO2, bringing the light the possibility of carbonic acid buildup (purported to have a ferocious appetite for carbon steel) thus making it possible/more probable that these pipelines may be susceptible to ductal fractures which could lead to the release of enormous amounts of CO2 as well as explosions which could entail the ejecting of large sections of pipe and shrapnel. In summary, an extensive release of CO2 could be reasonably interpreted to entail the risk of injury or death and damage to cropland, and adjacent structures.

Our concerns as an insurer would be that a policyholder could inadvertently damage an existing pipe or could be named in a lawsuit simply via the rupture/leak/explosion of a portion of the pipeline that would traverse under the insured premise. Concerns would be present that payment received for the existence of an easement could potentially make our policyholder a valid party to a lawsuit. Although your Northwest GF Farmowner policy does include pollution exclusions, there would be some ambiguity/uncertainty as to how these might apply in circumstances of injury and death. It is also never a good underwriting practice for insurers to accept risk with known significant non-covered liability exposures.

Additionally, from a first party perspective Northwest GF would likely have no coverage for CO2 damage to your owned and insured property.

We additionally are unaware if you or other policyholders with this exposure would be consulting with an attorney to explore unilateral Broad Form Indemnity Agreements in which the pipeline companies

would agree to indemnify and hold policyholders harmless for any and all damage that might occur to third parties stemming from the operation of the pipeline.

In view of the analysis and uncertainties expressed above, Northwest GF would likely elect to non-renew your policy if at the time of the renewal we were made aware of the introduction of a CO2 pipeline across your property. Until there is more experience and information available for us to analyze regarding how these arrangements are being executed and the degree of insulation protection being afforded to landowners by the pipeline companies, it would be difficult for us to intermix this exposure with other dissimilar farm accounts.

Mr. Abraham, we value your business and appreciate your loyalty to Northwest GF. I do hope you understand the concerns presented to us by this exposure.

Regards,

A handwritten signature in cursive script that reads "Brian Bowker".

Brian Bowker, Pres/CEO
Northwest GF Mutual Insurance Company

Attachment No. 13

LAND RECLAMATION of the Bison Pipeline

TRANSCANADA'S BISON PIPELINE in
Montana 04/12/2011

Pictures: Bob Zellar – Billing Gazette
Lincoln Star Journal

A cattleguard damaged during installation of the Bison high pressure gas pipeline in southeast Montana 04/12/2011



Blowing and blown soil on Robert Rusley's property on the Bison high pressure gas pipeline right of way in southeast Montana. 10/27/2010

152



10/27/2010 02:54

A pipeline sign lies fallen in a trench left after the soil over the Bison pipeline sunk in spring on Robert Rusley's property in southeast Montana 04/12/2011



One sign has fallen while another leans in the soft soil on the Bison high pressure gas pipeline right of way in southeast Montana 04/12/2011



Janelle Reiger walks on a concrete creek crossing damaged during installation of the Bison high pressure gas pipeline in southeast Montana 04/12/2011



Janelle Reiger stand in a trench left after the soil over the Bison pipeline sunk this spring on Wade Klauzer's property in southeast Montana 04/12/2011



Wade Kllauzer stands by a trench left after the soil over the Bison pipeline sunk this spring on his property in southeast Montana 04/12/2011



A pipeline sign lies fallen in a trench left after the soil over the Bison pipeline
sunk this spring on Robert Rusley's property in southeast Montana
04/12/2011



Water erosion on Wade Klauzer's property on the Bison high pressure gas pipeline right of way in southeast Montana 04/12/2011

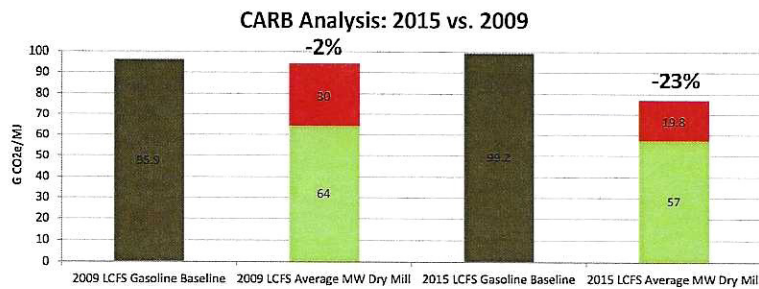


Janelle Reiger walks by a trench left after the soil over the Bison pipeline sunk this spring in southeast Montana 04/12/2011



Current Status of LCFS Carbon Scoring

- Updates to CARB’s modeling approach results in much better CI scores for ethanol:



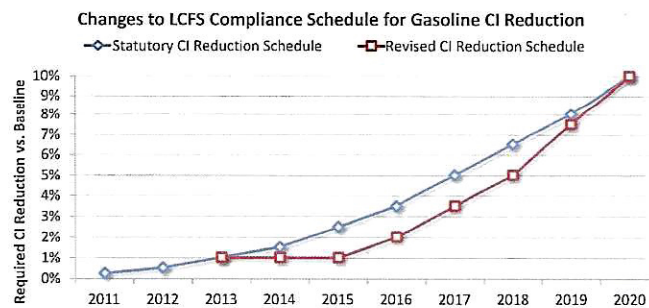
- ...but improvements still needed, especially on ILUC
- CARB beginning to understand that they need corn ethanol to facilitate compliance



19

What’s Next for LCFS?

- The LCFS has endured so far in large part because of grain ethanol (**60% of credits to date**)
- CARB froze 2014-2015 required GHG reduction at 2013 levels (1% vs. baseline)
 - Will increase to 2% reduction in 2016



20