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To: Jan Hasselman
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Re: Accufacts Review of the U.S. Army Corps of Engineers (USACE) Environmental Assessment (EA) for the Dakota Access Pipeline ("DAPL")

I. Summary

Accufacts Inc. ("Accufacts") was asked to perform a detailed pipeline technical review of the above EA for the DAPL proposal, including the USACE's mitigated finding of no significant impact.[1] I have concluded that the EA is seriously deficient and cannot support the finding of no significant impact, even with the proposed mitigations. The analysis is incomplete such that potential risks and impacts to the federal areas and waters have not been adequately presented nor evaluated. Important details are missing in the EA. As explained below, the EA understates the risks of pipeline failure and related oil release from this pipeline impacting Lake Oahe and the Missouri River. Additional information, not provided in the EA, is needed to prudently assess this pipeline proposal, as well as to evaluate various key assumptions and claims that the USACE relies upon in their incomplete mitigation approaches and finding.

This EA specifically focused on two federal flowage easements: one near the upper end of Lake Sakakawea, in Williams County, North Dakota, and the other in federally-owned property at Lake Oahe in Morton and Emmons Counties, North Dakota.[2] The USACE states that "The EA addresses the purpose and need of the pipeline, as well as the location and method of installation of the pipeline, but the analysis is limited to the effects of allowing the pipeline

[1] USACE Digital Library, " Environmental assessment: Dakota Access Pipeline Project, crossings of flowage easements and federal lands," prepared on behalf of U.S. Army Corp of Engineers – Omaha District, July 2016, at http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll7/id/2801, p. 1.
[2] *Ibid*.

to cross federal flowage easements near the upper end of Lake Sakakawea, and federally owned lands at Lake Oahe in North Dakota."[3]

In analyzing the pipeline technical issues in the EA, Accufacts has determined there are at least four major areas of deficiency in the EA as they relate to potential DAPL future oil spill risks that could impact the above sensitive areas:

1. The EA fails to properly evaluate the impact of the DAPL, including the risk of oil spills, on the federal easements and waters of the United States.

2. The ability to timely remotely identify oil releases are overstated and unsubstantiated.

3. The lack of specific information in the EA strongly suggests deficiencies in the worst case discharge determination that could affect the unusually sensitive areas, and related oil spill response planning.

4. Nondestructive testing for girth weld inspection should clearly specify 100% radiographic testing.

Accufacts provides neutral technical evaluation on pipeline matters, based on over 40 years experience in the field and pipeline incident investigation (see Attachment 2, Kuprewicz CV). Accufacts' major findings and conclusions are discussed in further detail below:

II. The EA fails to properly evaluate the impact of the DAPL, including the risk of oil spills, on the federal easements and waters of the United States.

While the EA largely focuses on the above identified water crossing activities related to construction HDD, the USACE does not provide appropriate detailed analysis as to the oil spill risks to these sensitive waters, either from the specific crossings or from other sections of the pipeline that could release oil that could reach these High Consequence Areas, or HCAs (e.g., unusually sensitive areas, or USAs).[4] For the DAPL segments that could affect these HCAs, the EA fails to provide sufficient detail to support the finding of low risk with the proposed mitigations. The sources of risks are not prudently explained, and information is not provided in enough detail to permit an independent confirmation of USACE findings. As a result, the level of risk is not adequately justified in the EA. Given the lack of adequate detail and further

[3] *Ibid*.
[4] High Consequence Areas, 49CFR§195.450 Definitions.

explanation, especially given the number of pipeline ruptures following inline inspections coupled with the failure of remote and timely rupture detection by control center personnel in recent years, the EA findings cannot be supported.

For example, the EA mentions nearby areas of the pipeline route that are highly susceptible or have high incidence of landslide. While some of this landslide discussion is related to construction site locations for the water crossings, there appear to be other areas of the pipeline located in high landslide risk areas.[5] The North Dakota Geological Survey has noted for the DAPL "High concentrations of landslides have been mapped in many regions along the proposed route centerline shown in Figure 1 of your document."[6] According to the EA, some of these high risk areas are in close proximity to or could affect Lake Oahe. Further analysis and information as to the pipeline's location in such landslide areas and its potential impacts to the federal crossings and sensitive waterways, should the pipeline fail, must be clearly incorporated into the EA. The EA specifically states, "This strength and ductility effectively mitigates the effects of fault movement, landslides, and subsidence. Therefore, by implementing the mitigation measures presented here, impacts on the pipeline from geologic hazards are expected to be minimal."[7] But this conclusory statement is insufficient. Placing pipeline in areas with high risk of landslide is unwise, as even modern steel pipe cannot survive such high abnormal loading threat activity which usually results in pipeline rupture with high rate high volume oil spill releases. Steel tubes (pipelines) cannot bear the extreme loading forces that are associated with massive landslide movements. Statements/inferences in the EA that pipe design/steel/weld properties can mitigate the risks of landslide threat are very misleading, if not downright false. Landslide activity that could place such severe abnormal loading on pipeline segments where a release could affect the easements, especially the sensitive waterways, needs to be clearly delineated by threat type, prudently evaluated, and risk determinations communicated to permit an independent evaluation of such assertions to assure they are not biased. None of this was done in the EA.

Critical to the any determination of pipeline "low risk" is a proper evaluation and requirement to incorporate certain integrity management obligations, well in excess of minimum federal pipeline safety regulations, in mitigations to assure that the pipeline operator is wisely using assessment approaches such as In-line Inspection ("ILI") tools, or "smart pigs," in assessments

[5] USACE Digital Library, "Environmental assessment: Dakota Access Pipeline Project, crossings of flowage easements and federal lands," July 2016, pp. 26 & 27.
[6] North Dakota Geological Survey Joe Blockland Geologist April 16, 2015 letter to Monica Howard, Director of Environmental Sciences, on Dakota Access, LLC, included in EA.
[7] USACE Digital Library, "Environmental assessment: Dakota Access Pipeline Project, crossings of flowage easements and federal lands," July 2016, p. 28.

to avoid pipe failure, especially rupture from various pipeline threats the ILI tools are intended to identify. The rash of pipeline rupture failures after ILI tool runs raises questions about major gaps in integrity management and related risk management approaches for pipelines, presently codified in federal minimum pipeline safety regulations, if ILI is relied upon to avoid oil release. Additional detail concerning the use of ILI on various threats including identifying action thresholds is warranted, as too much is left to the discretion of the pipeline operator. I have observed that it is not unusual for the pipeline industry to overstate ILI tool effectiveness in identifying certain types of threats to prevent pipeline failure, especially rupture. The EA fails to identify the use of ILI inspection tools and associated trigger parameters that might prevent pipeline failure and releases into sensitive waterways. Failure to incorporate such detail leaves the pipeline open to misuse of ILI tools from overconfident and misleading statements of ILI capabilities. While focused on gas transmission pipelines, but still highly applicable to liquid pipelines, a recent paper should prove helpful in recognizing some of the limitations of ILI tool applications on certain threats to pipelines.[8]

Additional information on those DAPL segments not on the easement, but that could affect the easements in the event of pipeline failure need to be included in any prudent risk analysis. Additional information beyond that provided in the EA, such as that identified in Section VI below, must be included in any risk evaluation/determination. A more complete and detailed analysis may determine that the current federal easement crossings and pipeline route entering/leaving these federal easements are inappropriate because of potential impacts from off easement locations that could have a much greater impact on the sensitive waterways. For example, since no pipeline can be designed to withstand massive landslide forces, if such a threat exists, the pipeline should be routed out of the landslide threat area.

III. The ability to timely remotely identify oil releases are overstated and unsubstantiated.

The EA states that "The Operator would utilize a Computational Pipeline Monitoring System (CPM) to monitor the pipeline for leaks. The CPM is a state-of-the-art pipeline monitoring tool and features a real-time transient model that is based on pipeline pressure, flow, and temperature data, which is polled from various field instruments every 6 seconds and updates the model calculations to detect pipeline system variations every 30 seconds. After the system is tuned, this state-of-the-art CPM is capable of detecting leaks down to 1 percent or better of

[8] Richard B. Kuprewicz, president Accufacts Inc., "A Review, Analysis and Comment on Engineering Critical Assessment as proposed in PHMSA's Proposed Rule on Safety of Gas Transmission and Gathering Pipelines," prepared for the Pipeline Safety Trust, May 16, 2016.

the pipeline flow rate within a time span of approximately 1 hour or less and capable of providing rupture detection within 1 to 3 minutes."[9] A study performed in 2012 reported that for hazardous liquid pipelines that utilized CPM and SCADA leak detections, "The pipeline controller/control room identified a release occurred around 17% of the time."[10] This low success rate for control room remote identification of pipeline release, even ruptures, is consistent with Accufacts' many liquid pipeline failure investigations spanning more than 40 years, especially more recent investigations. Remotely determining pipeline releases, even ruptures, particularly with respect to large rate releases, is difficult for various reasons. This is especially true if the remote monitoring is generating a large number of false release alarms that tend to train control room operators to ignore a true release alarm.

Pipeline investigation history and PHMSA/NTSB investigation files are filled with pipeline ruptures that released for many hours before they were acknowledged by the control center and appropriate operation/response action taken.[11, 12, 13] Given my many years of experience in this matter, I recommend that if remote detection via SCADA is incorporated, such detection and response should be primarily directed on rupture detection. Leak detection, the smaller rate releases, may be warranted on selective segments of the pipeline, but such efforts complicate the efforts (i.e., generate excessive false alarms) to reliable remotely indicate pipeline release to control room operators. Such a release approach should also clearly identify the measurement equipment, its precision and placement, and important transient analysis (i.e., changes in pipeline operating parameters such as crude oil variations and pump start up and shutdown impacts on parameters being monitored by the release detection system) that would indicate a rupture has most likely occurred. Pressure loss is not the most likely timely indicator of pipeline rupture for the pipeline segment(s) that could impact the sensitive watersheds. Based on my years of experience evaluating pipeline safety and SCADA systems in particular, I find that the EA has failed to provide sufficient information that would support response time

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[9] USACE Digital Library, "Environmental assessment: Dakota Access Pipeline Project, crossings of flowage easements and federal lands," July 2016, p. 90.

[10] Dr. David Shaw, Dr. Martin Phillips, Ron Baker, Eduardo Munoz, Hamood Rehman, Carol Gibson, Christine Mayernik, U.S. Department of Transportation Pipeline and Hazardous Material Safety Administration, "Final Report Leak Detection Study – DTPH56-11-D-000001," December 10, 2013, p. 2-10.

[11] NTSB/PAR-02/02 Pipeline Accident Report, "Pipeline Rupture and Subsequent Fire in Bellingham Washington, June 10, 1999," adopted October 8, 2002.

[12] NTSB/PAR-12/01 Accident Report, "Enbridge Incorporated Hazardous Liquid Pipeline Rupture and Release Marshall, Michigan July 25, 2010," adopted July 10, 2012.

[13] PHMSA Final Order Re: Case # CPF No. 5-2013-5007 to ExxonMobil Pipeline Company, "Concerning July 1, 2011 Silvertip Pipeline Rupture into the Yellowstone River," dated January 23, 2015.

claims in the EA. I also place little confidence in efforts attempting to allow for further study for such remote rupture detection as the science and dynamics of such releases should be easy to verify. In fairness, the approach is specific to a particular pipeline, its design/location, the elevation and hydraulic profile, the hydrocarbon moved, and the pipeline operation. Additional information and analysis is needed that would permit an independent verification that the rapid identification mentioned in the EA is even possible for the particular pipeline segments that could release into the unusually sensitive areas. Even if the claimed release detection parameters are true, which is highly unlikely given the lack of more detailed information in the EA, a large volume of oil would still be released before the control room were to take appropriate action. Overstatement of remote response timing in an oil spill understates the risks associated with the pipeline. Section VI lists some of the information that should be included to assist in verifying if the release detection time claims are even reasonable or possible.

IV. The lack of specific information in the EA strongly suggests deficiencies in the worst case discharge determination that could affect the unusually sensitive areas and related oil spill response planning.

Information concerning the worst case discharge barrels is not verifiable because the value that could reach or impact the federal easements and unusually sensitive areas has not been provided in the public documents associated with the EA. However, the lack of certain additional information, based on my experience, indicates that worst case discharge values are most likely understated.[14]

A detailed review of the water intake mitigation measures section in the EA, while incorporating some approaches in excess of minimum federal pipeline safety regulations, do not provide sufficient information to validate any possible worst case values, or the associated oil spill response plan's effectiveness. Basically, for pipelines, worst case release volume is usually driven in pipeline rupture by:

1) the type of oil,
2) pumping rate,
3) time to remotely recognize and react to a possible release,
4) elevation and hydraulic profiles between the upstream and downstream pump stations spanning the sensitive areas,
5) valve placement by milepost, type, and actuation,
6) control room shutdown and isolation procedures (can be dictated by pipeline design), and

[14] USACE Digital Library, "Environmental assessment: Dakota Access Pipeline Project, crossings of flowage easements and federal lands," July 2016, pp. 42 & 43.

7) land drainage and proximity to a High Consequence Area.

Many of the above key driving variables have not been included or adequately identified or detailed in the EA. While it is important to incorporate oil spill training exercises into any oil pipeline operation, such exercises can be ineffective, or provide an illusion of safety, if the fundamental information upon which the programs are based is incomplete or flawed. This is especially true in worst case determinations, as all too many recent failures have released oil well beyond the claimed pipeline worst case determinations.[15]

Section VI, below, identifies additional information needed to properly evaluate a worst case release, and gauge the associated facility response plan claimed effectiveness in the event of a release. In relation to the specific risk analysis presented in the EA, I have the following general observations based on many years of pipeline failure investigation:[16]

1) Corrosion threats should be based on actual measured in the field readings verifying ILI runs and not based on assumed "conservative" corrosion rates. Corrosion rates can vary considerably and should not be based on so-called industry averages that may be low for a specific pipeline operation. Such field confirmations will verify the effectiveness of external/internal corrosion efforts mentioned in the EA.

2) ILI cannot identify all construction and transportation (i.e. cracking) defects that can survive a 1.25 MAOP hydrotest. Given the nature of the product anticipated to be moved on the system, the operator should provide evidence that transportation cracking threats are not introduced that might survive a hydrotest but grow with time because of pressure cycling that may be associated with the crude oil operation.

3) Insufficient design detail has been provided in the EA to permit an evaluation as to the risks associated with incorrect operation and/or equipment failure on the segments that could affect the sensitive water crossings.

4) Additional information is needed concerning the type of fusion bonded epoxy, or FBE, coating and whether it is of the more recent generation or type that permits CP current pass-through should the FBE disbond (separate from the pipe wall). This threat potential should be an easy issue to resolve.

5) Natural forces threat appears to be driven by the landslide potential off the federal easements that could impact the waterways as discussed in detail in Section II of this report.

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[15] 49CFR§194.105 Worst case discharge.

[16] USACE Digital Library, "Environmental assessment: Dakota Access Pipeline Project, crossings of flowage easements and federal lands," July 2016, pp. 92 - 95.

6) The adequacy of the consequences section is driven by the timeliness and effectiveness of the release detection, the control room procedures to prudently respond and properly isolate a possible release that could affect the sensitive waters, and the corresponding oil spill response plan as discussed in Section III of this report. There appears to be considerable optimism in the EA in assuming a quick recognition and response by control room personnel.

The risk analysis is missing critical details to permit an independent evaluation of risk for the project that could affect the sensitive waterways including Lake Oahe.

V. Nondestructive testing for girth weld inspection should clearly specify 100% radiographic testing.

The two DAPL water crossings are proposed to be constructed via horizontal directional drilling, or HDD. HDD basically involves drilling a small pilot bore and proceeding with successive reaming passes to enlarge the hole diameter until the bore is significantly larger than the pipe that is eventually pulled through in a slurry of mud/bentonite to minimize forces and damage to the pipe.

The EA states that DAPL will perform "non-destructive testing of 100 percent of girth welds."[17] Nondestructive testing is not defined in federal pipeline safety regulations.[18] Non-destructive testing of 100 percent of girth welds should be clearly defined to mean radiological inspection (i.e., x-ray, gamma ray) of all girth welds that could impact the two crossings. Important to the soundness of the HDD crossings and to the pipeline segments that could affect the federal unusually sensitive waterways, is a clear commitment that all girth welds be radiologically inspected, a type of nondestructive testing that can produce clear, independently verifiable, traceable, and complete records of girth weld quality. I do not see such a clear requirement in the EA and API 1104 (a referenced industry standard providing guidance in pipeline welding) which affords too much room for misapplication.

It is worth noting that despite many attempts over the decades to develop and advance ILI technology, current ILI capabilities cannot accurately determine the quality of girth welds, especially as it relates to girth weld cracking. It is thus important that the quality of such girth welds be determined at the time of construction by radiographic inspection and assessment. I further advise that such radiological inspection records of all girth welds be maintained for the life of the pipeline. Such important quality assurance/quality control girth weld assessment records are like fingerprints, no two should ever be exactly alike. If such an

[17] *Ibid.*, p. 42.
[18] 49CFR§195.234 Welds: Nondestructive testing.

inspected/radiographic test girth weld should ever fail, the radiographic record will assist in any subsequent forensic analysis. But it is important to bear in mind that even with 100% radiographic testing of girth welds, there is still a risk of pipeline leaks due to cracked girth welds, especially if the inspection is not coupled with a prudent Quality Administration/Quality Control, or QA/QC, program that captures and rejects girth weld assessments identified to be inappropriate during construction.

VI. Specific information is needed to perform a complete and prudent risk analysis.

Any analysis should include the following information to provide assurances that the pipeline route/design/operation/maintenance activities are complete to avoid failure, the risk analysis appropriate, and more importantly, that an oil spill response plan would likely be effective if ever needed. As too many oil spills have recently demonstrated, claims of complying with federal regulation 49CFR§194 (Response Plans for Onshore Oil Pipelines) do not assure that such plans will be effective in the event of an oil release. All too often worst case pipeline releases are under calculated as released volumes are seriously underreported, and response plans proven ineffective at recovering anywhere near the amount of oil eventually determined to have actually been released. Without more information a proper analysis of worst case discharge claims and associated oil spill response plan effectiveness on sensitive receptors cannot be properly evaluated. The following incorporates much of the information identified in a previous section, but in a presentation format that quickly allows for an independent verification of equipment placement/type, related operational procedures, and integrity management applications and effectiveness for a particular pipeline:

1. the pipeline elevation profile (approximate elevation vs milepost for the pipeline segments between the nearest upstream and downstream pump stations) spanning the sensitive easements,

2. on the elevation profile, a line indicating the Maximum Operating Pressure, or MOP,

3. on the elevation profile, a hydraulic profile at the design rate case (various additional rates may be included as well for large elevation changes),

4. location of mainline valves and their type of operation (e.g., manual, remote, automatic), as well as specific safety design if warranted,

5. general location/type of critical leak detection monitoring devices by milepost,

6. identification by milepost range of High Consequence Areas, and

7. given the numerous pipeline failures following ILI tool runs, further requirements are warranted on the type of ILI tool to be run, its frequency, and tool limitations for the segments that could threaten and affect the federal waters.

Without such information an EA for a specific pipeline is incomplete. In addition, lacking such additional important information, it is impossible to recommend additional changes to the pipeline design/operation/maintenance including enhancements in rupture detection, that would be effective in prudently assuring a low risk for this pipeline to the sensitive areas identified in the EA.

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