BEFORE THE STATE OF NORTH DAKOTA
PUBLIC SERVICE COMMMISSION

IN THE MATTER OF DAKOTA ACCESS, LLC CONSOLIDATED APPLICATION FOR AN AMENDED CERTIFICATE OF CORRIDOR COMPATIBILITY AND AMENDED ROUTE PERMIT; DAKOTA ACCESS PIPELINE PUMP STATION - EMMONS COUNTY SITING APPLICATION

CASE. NO. PU-19-204 | OAH FILE. NO. 20190280

PRE-FILED TESTIMONY OF RICHARD KUPREWICZ
ON BEHALF OF INTERVENOR STANDING ROCK SIOUX TRIBE

November 1, 2019

INTRODUCTION

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND POSITION.

A. My name is Richard B. Kuprewicz. I am the President of Accufacts Inc. ("Accufacts") which is located at 8151 164th Ave NE, Redmond, Washington 98052.

Q. PLEASE DESCRIBE ACCUFACTS.

A. Accufacts provides pipeline safety expertise in gas and liquid pipeline investigation, auditing, risk management, siting, construction, design, operation, maintenance, training, Supervisory Control and Data Acquisition, leak detection, management review, emergency response, and regulatory development and compliance.

In my role as President, I provide independent consulting services and expert advice on pipeline matters. My clients are local, state and federal agencies, non-governmental organizations, members of the public, and pipeline industry representatives. In particular, my work is focused on pipeline operations in unusually sensitive areas, such as areas of high population density or significant environmental sensitivity.

For example, following several pipeline failures and tragedies, I was appointed to represent the public interest in developing the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration's ("PHMSA") federal regulations for both liquid and gas transmission integrity management (often

known as transmission integrity management programs or TIMP). I also was involved—again on the public side—in the development of safety regulations for distribution pipelines (also known as distribution integrity management programs or DIMP).

I have testified to Congress and various Public Utility Commissions ("PUCs") / Public Service Commissions ("PSCs") on pipeline matters, and authored many papers concerning pipeline issues in both the U.S. and Canada. I am experienced and knowledgeable concerning various state and federal pipeline safety regulations, as well as their Canadian counterparts.

Q. PLEASE SUMMARIZE YOUR WORK EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. I have over 46 years of experience in the energy industry, including operations, engineering, process safety management, and in recent decades, have been involved in many pipeline failure investigations. I hold B.S. degrees in Chemistry and Chemical Engineering from the University of California, Davis, and an MBA from Pepperdine University.

My c.v. is attached to this document. It summarizes my background and includes a list of papers I have authored that address pipeline technical matters and are in the public domain; they support my qualifications to testify on this matter before the North Dakota Public Service Commission ("Commission").

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?

A. I am testifying on behalf of Standing Rock Sioux Tribe ("SRST"). The SRST has retained me to assist them in this matter and I am being compensated for my time at a rate of $400 per hour.

Q. HAVE YOU TESTIFIED BEFORE THIS COMMISSION PREVIOUSLY?

A. No.

Q. HAVE YOU TESTIFIED BEFORE OTHER STATE OR DISTRICT UTILITY COMMISSIONS?

A. Yes. I have testified:

- before the Nevada PUC on behalf of the Nevada Office of the Attorney General Bureau of Consumer Protection concerning Southwest Gas Corporation's new and accelerated pipeline replacement proposals (totaling almost $770 million) (Docket Nos. 12-02019 and 12-04005);
- before the Mississippi PSC on behalf of the Mississippi Public Utilities Staff regarding Atmos Energy Corporation's capital request for about $300 million for system integrity improvements (Docket No. 2015-UN-049);
- before the Minnesota Office of Administrative Hearings for the Minnesota PUC on behalf of Friends of the Headwaters regarding an Enbridge Energy, Limited Partnership proposal to replace and reroute an existing Line 3 with a new, approximately $7.5 billion liquid transmission pipeline to move

Canadian dilbit[1] (Docket No. MPUC PL-9/CN-14-916 and MPUC PL-9/PPL-15-137);

- before the District of Columbia Public Service Commission on behalf of the Office of the Attorney General, providing Testimony on an Accufacts' Safety Review of Washington Gas Light ("WGL") DC gas system related to an AltaGas-WGL holdings merger (DC PSC FC 1142, DOEE OGC case #3609 Proposed Settlement Agreement),
- in hearings before a Pennsylvania Public Utilities Commission, or "PAPUC," Administrative Law Judge concerning matters related to the Energy Transfer/Sunoco pipeline companies' highly volatile liquid transmission pipelines, known as the Mariner East Pipeline Projects, on behalf of West Goshen Township, PA, Docket No. C-2017-2589346 July 18, 2017. Submitted testimony to the PAPUC on pipeline safety matters concerning the Proposed Joint Settlement, between the Pennsylvania Bureau of Inspection and Enforcement ("BI&E") and Sunoco Pipeline L.P. ("SPLP"), Docket No C-2018-3006534, dated August 15, 2019 on behalf of West Goshen Township, and

[1] Dilbit is short for "diluted bitumen." Bitumen is diluted with a lighter petroleum liquid to allow it flow through pipelines.

- before the State of Illinois Commerce Commission on behalf of Save Our Soil Land and the Sierra Club providing testimony regarding the Joint Petition of Dakota Access, LLC and Energy Transfer Crude Oil Company, LLC to install additional pumping stations and pumping facilities on existing certified pipelines in the State of Illinois, (Docket No. 19-0673), October 1, 2019.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I was asked to review the potential impacts of increasing flow capacity via adding a pump station and pumping equipment near Linton, ND on the existing 30-inch Dakota Access Pipeline within North Dakota ("DAPL").

Q. DID YOU PREPARE OR DIRECT THE PREPARATION OF THIS TESTIMONY AND THE ACCOMPANYING EXHIBITS?

A. Yes.

SUMMARY OF TESTIMONY

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. Dakota Access Pipeline, LLC ("Applicant") is proposing to nearly double the capacity of the DAPL pipeline from approximately 570,000 barrels per day ("bpd") to 1,100,000 bpd by adding a pump station, as well as injecting Drag Reducing

Agent ("DRA"), [2] on the existing pipeline (the "DAPL Capacity Expansion").[3] The DAPL Capacity Expansion will increase the flow velocity of the pipeline to extreme levels, magnifying DAPL's risks to the environment and to the welfare of the citizens of North Dakota.

I will summarize several major areas of concern that I recommend the Commission require Applicant to address before allowing Applicant to proceed further with the DAPL Capacity Expansion:

1. To date, Applicant has not provided the Commission with sufficient information regarding the design and operation of, or the potential risks associated with, the DAPL Capacity Expansion. The Commission should require Applicant to supplement the record in the manner explained below before taking any further action.
2. Based on the limited information that Applicant has provided to the Commission to date, the risks posed by the DAPL Capacity Expansion's increased flow velocities and operating pressures fail to ensure that it will produce minimal adverse effects on the environment and upon the welfare of the citizens to North Dakota.

[2] DRA is an additive, usually injected at the part per million level, that reduces the energy loss along a liquid pipeline associated with flow turbulence, allowing higher capacity and actual liquid velocities.

[3] While Applicant's application states that the current capacity of the pipeline is 600,000 bpd, other records indicate a capacity of 570,000 bpd. *See, e.g.,* In the matter of the application of Dakota Access, LLC for an amendment to certificate and permit in accordance with the Dakota Access Pipeline Optimization in Emmons County, North Dakota, Case No. PU-14-842, "Application of Dakota Access, LLC for Waiver or Reduction of Procedures and Time Schedules," p. 3.

Q. WHAT SPECIFIC AREAS ARE YOU CONCERNED ABOUT IN YOUR TESTIMONY TODAY?

A. I have several specific areas of concern related to the DAPL Capacity Expansion:

1. By substantially increasing the actual flow velocities of the oil pumped through DAPL, the DAPL Capacity Expansion significantly increases the risks of surge overpressure. This increased risk of surge overpressure in turn significantly increases the risk of spills from DAPL: it makes spills more likely, and, coupled with the increased volume of oil that will be pumped through the pipeline, it makes the potential impact of any spill significantly greater. Specifically, the DAPL Capacity Expansion will substantially increase the risk that surge overpressures in excess of 110% of maximum operating pressure ("MOP") will occur, which is prohibited under Federal law.
2. A proper transient surge analysis will likely show that expanding pipeline capacity in the manner proposed by the DAPL Capacity Expansion will increase potential oil spill volumes. I understand that the Applicant has prepared such a transient surge analysis for other State regulators, but not provided it to the Commission. Applicant should be required to produce this transient surge analysis to the Commission and to SRST as Intervenors so they may independently assess the adequacy of the controls and protective equipment Applicant propose to employ to eliminate the risk surge overpressure in excess of 110% MOP.

3. In addition to the increased risk of surge overpressure, the DAPL Capacity Expansion increases the risk of additional pipeline failures occurring due to the higher operating pressures that will be experienced along the mainline.

DETAILS OF CONCERNS

Q. DO YOU HAVE A MAIN CONCERN REGARDING THE DAPL CAPACITY EXPANSION?

A. Yes, the DAPL Capacity Expansion will increase the capacity on the existing 30-inch pipeline segment by installing a new pump station facility approximately five miles west of Linton, North Dakota. The new pump station facility will contain five electric driven motors and pumps, each with 6,000 horse-power, and DRA injection facilities. No other changes have been identified for the mainline pipeline outside of this new pump station and DRA injection protocol. In other words, Applicant seeks to use additional motors, pumps, and DRA to pump approximately twice as much oil at approximately twice the velocity through its existing pipeline. This will result in oil being pumped through DAPL at extremely high velocities, which in turn increases the risk of surge overpressure and pipeline failure. The Commission should require Applicant to provide technical details that can be independently verified as to how Applicant plans to prevent and mitigate the risks associated with surge overpressure and pipeline failure before the DAPL Capacity Expansion is allowed to proceed any further.

Q WHAT ARE YOUR SPECIFIC CONCERNS RELATED TO THE MAINLINE PIPELINE AND SURGE OVERPRESSURE?

A. Surge is the change in pressure in liquid pipelines caused by a major change in flow, such as a pump shutdown/startup or inadvertent remotely operated mainline valve closure. These are common occurrences on hazardous liquid transmission pipelines. Surge pressure increases occur within large diameter liquid hydrocarbon pipelines in microseconds and can move up and down many miles along a pipeline system at slightly under one mile per second. Surge overpressure can cause pipelines to burst.

Typical crude oil pipelines I am familiar with operate with flow velocities substantially below 15 feet per second (ft/sec). Here, however, a simple calculation from information in the public domain indicates that the DAPL Capacity Expansion will result in actual liquid velocities in excess of 15 ft/sec. This is an extreme velocity for crude oil pipelines, and it significantly increases the risk of surge overpressure.[4]

The Applicant has indicated that DRA will be utilized on the pipeline. I have considerable operational experience with DRA injection on crude oil pipelines. DRA injection can increase the efficiency of a pipeline by reducing energy loss associated with flow turbulence along the pipeline, permitting higher flow rates for

[4] Public documents indicate that the bulk of the DAPL 30-inch diameter pipeline has a wall thickness of 0.429 inches.

a particular horsepower addition. DRA injection can thus result in increased pipeline capacity and higher actual liquid velocities compared to a similar pipeline operating without DRA. However, by permitting higher velocities for a given horsepower addition, DRA injection can also increase the risk of surge. Further, the loss of DRA effectiveness can also exacerbate surge pressures as the durability of DRA within a pipeline is very limited and can disappear quickly, especially if shear forces become present.

DAPL's assertion that "The [DAPL Capacity Expansion] will not alter the existing maximum operating pressure of DAPL" does not adequately frame the risks posed by the DAPL Capacity Expansion.[5] The issue is not that the DAPL Capacity Expansion will alter DAPL's maximum operating pressure; the issue is that the DAPL Capacity Expansion will (1) increase the risk that surge overpressures greater than 110% of DAPL's MOP will occur and (2) result in DAPL transmitting oil at an operating pressure that is closer to DAPL's maximum operating pressure, which increases the risks of pipeline failure.

Federal regulations are clear: "No operator may permit the pressure in a pipeline during surges or other variations from normal operations to exceed 110 percent of [MOP]. Each operator must provide adequate controls and protective equipment

[5] In the matter of the application of Dakota Access, LLC for an amendment to certificate and permit in accordance with the Dakota Access Pipeline Optimization in Emmons County, North Dakota, Case No. PU-14-842, "Application of Dakota Access, LLC for Waiver or Reduction of Procedures and Time Schedules." p. 3.

to control the pressure within this limit."[6] At 1,100,000 bpd, the DAPL Capacity Expansion will result in actual flow velocities within the 30-inch mainline pipeline in excess of 15 ft/sec. 15 ft/sec is an extremely high velocity for crude oil, especially for a large diameter pipeline such as DAPL. Such high velocities can easily cause pipeline surge overpressures well above 110% MOP within microseconds.

Applicant has not identified for the Commission the controls and protective equipment it intends to use in order to ensure that no surge overpressure events in excess of 110% MOP will occur. In a filing by Dakota Access, LLC and Energy Transfer Crude Oil company, LLC in the Illinois Commerce Commission proceeding on the request to increase the capacity of the DAPL pipeline, the Applicant has produced a confidential transient surge analysis that contains some of this information. The Commission should require Applicant to produce the transient surge analyses (both for the base and increased capacity cases) in this proceeding so that the Commission, and the SRST as Intervenors, can engage in informed discussions as to whether additional safety equipment modifications might be necessary to adequately mitigate the risks of surge overpressure. Applicant should not expect the Commission to approve the DAPL Capacity Expansion without first providing its transient surge analysis, along with any other related safety information that may be necessary to independently verify the soundness of Applicant's transient surge analysis and overpressure risk mitigation plans.

[6] 49CFR§195.406(b).

Specifically, Applicant should describe its surge overpressure protection approach(es) and the specific safety equipment placement and setpoints. Such information is especially vital as it relates to mainline valve design and pump station installation at the higher flow rates to assure surge pressures will not exceed 110% MOP on the 30-inch mainline spanning North Dakota. Based on my extensive experience, surge protection equipment placed only at pump stations is inadequate to prevent surge overpressures on the mainline pipeline. Additional surge overpressure safety equipment must be installed on the mainline valves in order to adequately mitigate surge overpressure risks.

Q ARE THERE GREATER RISKS OF PIPELINE FAILURE ASSOCIATED WITH INCREASING OPERATING PRESSURES FROM MAJOR INCREASES IN FLOW RATES?

A. Yes, and they can only be adequately assessed by evaluating two categories of information that should be in Applicant's possession: hydraulic profiles of the system, and how those hydraulic profiles overlap with High Consequence Areas (HCAs).

By way of background, there is no such thing as an invincible steel pipeline. All steel pipelines contain anomalies, imperfections in pipe steel or welds, or weld heat affected zones (aka HAZs), for various reasons. Higher operating pressures increase the risk that such anomalies and imperfections will become points of

failure. That is precisely why federal minimum pipeline safety regulations require operators to periodically reassess the integrity of hazardous liquid pipeline sections where an inadvertent release would affect populated areas, drinking water sources, or unusually sensitive ecological resources – which are deemed “High Consequence Areas,” or HCAs. DAPL’s Lake Oahe Crossing is one such HCA, but there are likely many other HCAs in North Dakota that Applicant has failed to identify to the Commission or Intervenors. The Commission should require Applicant to rectify this.

Following several recent liquid transmission pipelines ruptures, it was discovered that more than one pipeline operator had failed to identify pipeline segments that were obviously in HCAs and thus should have been subject to prudent periodic integrity assessment in those areas. Given the proposed increased operating pressures associated with the DAPL Capacity Expansion, the Commission should require the Applicant to identify all HCAs by milepost for the 30-inch pipeline within North Dakota to assure they are indeed properly classified and that DAPL fulfills its integrity reassessment obligations.

In order to assess whether Applicant has adequately identified all HCAs and developed adequate integrity reassessment measures, Applicant should also be required to produce hydraulic profiles for the system.

Adding major horsepower to a pipeline system increases the flow rate/capacity of a pipeline system especially when a new pump station raises the operating pressure of the system in various locations of the system. The increased operating pressure associated with such a flow/capacity increase can be demonstrated via hydraulic profile graphs. Hydraulic profiles are considered the "soul" of a liquid pipeline system because they present in clear, easy-to-understand graphic form the main pressure/flow dynamics of a pipeline system.

In order to site pump stations and calculate horsepower needs associated with the DAPL Capacity Expansion, the Applicant should have already prepared hydraulic profiles for the entire pipeline system for both the lower rate base and higher rate cases. Comparing the hydraulic profiles of the 30-inch pipeline system within both before and after the new pump station addition will show the Commission how the DAPL Capacity Expansion will increase operating pressures throughout the system, and the segments most at risk of failure due to substantial operating pressure increases.[7]

By analyzing the system's hydraulic profile and Applicant's delineation of HCAs and integrity reassessment measures the Commission will be able to assess the

[7] Hydraulic profile for a liquid pipeline is a simple plot/graph of pressure (usually in psig. and in feet of head) on the y-axes, versus approximate milepost along the pipeline on the x axis, while stating the gravity of the fluid and flow rate case depicted. Such plots usually also include the approximate elevation profile and MOP along the pipeline to aid in evaluating mainline valve location, remote release detection approaches, and worst case release estimates and spill plan effectiveness.

degree to which the DAPL Capacity Expansion will produce adverse effects on the environment and welfare of the citizens of North Dakota.

Applicant should not expect the Commission to approve the DAPL Capacity Expansion without first identifying all HCAs by milepost and disclosing its plans for periodically reassessing the integrity of its pipeline in areas where an inadvertent release would impact those HCAs. Nor should the Commission be expected to approve the DAPL Capacity Expansion without first reviewing hydraulic profiles for the system so that the Commission may make an informed decision as to the effects the DAPL Capacity Expansion will have on the environment and welfare of North Dakota citizens.

For the avoidance of doubt, the following critical information should be included in the hydraulic profiles that Applicant produces to the Commission:

- Pressure (usually in psig. and in feet of head) on the y-axis;
- Approximate milepost along the pipeline on the x axis;
- Gravity of the fluid and flow rate case depicted;
- Approximate elevation profile along the pipeline;
- MOP along the pipeline; and
- Approximate milepost location of all mainline valves along the pipeline.

Q HOW DO THE PROPOSED INCREASE IN THE VELOCITY AND CAPACITY OF THE PIPELINE IMPACT THE SEVERITY OF A SPILL?

A. In many of the recent liquid pipeline ruptures I have investigated, often in HCAs, the oil release that had been predicted by the operator was gravely understated. This clearly demonstrates and underscores the numerous deficiencies in oil spill response planning. My investigative experience is that most worst case discharge ("WCD") estimates are significantly too low as release rates and the time for remote identification of a release, even a pipeline rupture, are often seriously understated by over optimistic computer remote monitoring identification times.

Ruptures are high rate releases from high pressure pipelines when imperfections reach the level of a "defect," causing pipe fracture failure in microseconds either within the pipe or at welds, such as girth welds, or their heat affected zones, that hold pipe segments together. Pipeline overpressure from surge is one mechanism to cause a pipeline to rupture. The rate of oil release from a liquid pipeline rupture is more than just a function of pipeline daily capacity, as oil is released from the pumping end of a pipeline but also from the downstream segment of the break as the pipeline depressurizes out of the rupture from both ends of the pipeline system. In addition, millions of tons of pipeline inventory unpacks, or swells, from pressure loss as the pipeline depressurizes, pushing further barrels of oil out the rupture site (even after mainline valves are eventually closed). Personnel experienced in transient pipeline fluid dynamics can easily model the markedly increased rate of

a pipeline rupture release along a pipeline that easily exceeds “capacity” pumping rate.

Given this, the Commission should require the Applicant to analyze information from transient flow modeling and from the hydraulic profiles for the 30-inch pipeline at the higher flow rates to ensure that Applicant’s planning estimates for an oil release volume and location are reasonable. The Commission should further require Applicant to produce this analysis to the Commission and to SRST as Intervenors so that Applicant’s analysis can be independently verified.

Given the higher volume the Applicant is proposing to transport and the higher velocities I discussed above, it is important for the Commission to understand how the DAPL Capacity Expansion will exacerbate releases from the pipeline.

To begin with, the Commission should understand that Applicant’s claims of being able to remotely detect leaks is in all probability unrealistic based on my extensive experience in investigating many pipeline releases, and my working knowledge of pipeline release detection systems. It is challenging enough for “state of the art” release detection systems to remotely and timely identify rupture releases, and almost impossible for such systems to reliably identify the much harder to spot lower rate “leak” releases. Leak detection claims for small opening releases (such as pitting or punctures), even on well-monitored systems, are often seriously overstated. The reality demonstrated time and time again, is that such remote leak

detection approaches are very difficult and challenging. It is a grave misrepresentation of pipeline rupture transient dynamics to claim that ruptures for a crude oil pipeline can be rapidly identified via pressure loss. For ruptures, by the time a pressure loss shows up on a remote system, considerable oil has been released. Most leaks are not determined by remote detection, but by field observations of hydrocarbon releases where the amount of oil released can be considerable before its discovery.

Q. WHAT DO YOU RECOMMEND THE COMMISSION ORDER?

A. The Commission should not approve the DAPL Capacity Expansion based on the incomplete record Applicant has developed at present. Instead, the Commission should order Applicant to produce the following documents and data to the Commission and to SRST as Intervenors to allow for independent verification and assessment before proceeding further:

1. The transient surge analyses that Applicant produced to the Illinois Commerce Commission in relation to the DAPL Capacity Expansion.
2. Hydraulic profiles of the 30-inch pipeline system within North Dakota both before and after the DAPL Capacity Expansion sufficient to show how the DAPL Capacity Expansion will increase operating pressures throughout the system. These hydraulic profiles should include: pressure on the y-axis; approximate pipeline milepost on the x-axis; the gravity of the fluid and flow rate case depicted; approximate elevation profile by milepost; MOP by milepost; and approximate location of all mainline valves by milepost.

3. An identification of all HCAs by milepost within North Dakota and Applicant's plans for periodically reassessing the integrity of its pipeline in areas where an inadvertent release would impact those HCAs.
4. Applicant's analysis of estimated oil release volumes and locations based on and as informed by its transient flow modeling and the pipeline's hydraulic profile.

I suspect that Applicant will assert that some or all of this information is "highly sensitive" in an attempt to avoid disclosure. The Commission should scrutinize such claims. To the extent the Commission concludes such claims are valid, the Commission should order the Applicant to confer with the SRST as Intervenors and the Commission to agree to a protocol for producing such information in a manner that permits the Commission and SRST as Intervenors to independently assess the DAPL Capacity Expansion in light of this critical information while protecting it from full public disclosure.

Q. DO YOU HAVE AN OPINION ON THE RISKS WITHIN NORTH DAKOTA ASSOCIATED WITH APPLICANT'S PROJECT?

Yes. Without properly addressing the issues I identified above, given:

1. the extremely high velocities associated with the major horsepower addition/expansion/DRA injection;
2. the failure to properly demonstrate how the DAPL pipeline is prudently designed to prevent surge overpressure, in excess of 110% MOP, especially at the extremely high crude oil velocities;

3. the apparent overreliance on so called “state of the art” CPM leak detections, similar claims I have seen in other pipelines that ruptured, and were not timely remotely identified by such systems; and
4. the reliance on federal worst case discharge regulations without demonstrating this approach is truly worst case for this pipeline within North Dakota;

I must conclude, based on my extensive operating/regulatory experience and many pipeline failure investigations, that the DAPL Capacity Expansion will significantly increase the risks of pipeline rupture and oil spill on the pipeline within North Dakota. Not only is the probability of a pipeline failure greater, but given the higher rates and other contributing factors, an oil release after the expansion is most likely to be significantly greater in magnitude. Based on these facts and the record before it, there is no basis to conclude that the DAPL Capacity Expansion will have a minimal adverse impact on the environment and citizens of North Dakota. In fact, just the opposite is true: based on the record before the Commission at present, the DAPL Capacity Expansion will have a substantial adverse impact on the environment and citizens of North Dakota.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. It does.