BEFORE THE PUBLIC UTILITY COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN RE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE,
LP FOR A PERMIT TO CONSTRUCT KEYSTONE XL PIPELINE

DOCKET NO. HP 001

PREFILED TESTIMONY BY PHYLLIS YOUNG
TRIBAL COUNCIL REPRESENTATIVE
STANDING ROCK SIOUX TRIBE

APRIL 2, 2015

Exhibit 8001

Q. State your name and address for the record.

A. My name is Phyllis Young. I reside in Fort Yates, North Dakota on the Standing Rock Indian Reservation

Q. What is your occupation?

A. I serve as a Tribal Council representative on the Standing Rock Sioux Tribal Council. I have spent my career addressing housing needs on the Reservation as a longtime commissioner of the Standing Rock Housing Authority, and working for the protection of our natural resources, both within our Reservation and in the sacred Black Hills.

Q. Did you grow up on the Standing Rock Reservation?

A. Yes, as a child, I lived in the most beautiful place in the world, in the river bottom of the Missouri River, for my first ten years. I was free. I ate a healthy diet from the gardens we planted and the natural foods growing on the land. We drank water right from the Missouri River. It was pure then.

Q. Tell us a little bit about your childhood.

A. I am a child of Oahe. When I turned 10, the Oahe Dam inundated our homeland. One hundred and ninety-seven families on our Reservation were forced to move, in the middle of the winter in January, 1960. Our homes were never re-built or compensated for. For the first time, we knew hunger, and I experienced homelessness due to the development of the dams, in the national interest. Our lives were totally disrupted. The dam created welfare and took away our Tribal self-sufficiency. It created all of the social pathologies that result from removal from one's homeland.

Q. The Oahe Dam is a big energy project, but it is approximately 100 miles from the Standing Rock Reservation. Can an off-Reservation project have that much impact on the reservation?

A. The Oahe Dam is a federal project, and the government took 56,000 acres of our Reservation land pursuant to the Act of September 2, 1958 (Public Law 85-915), and

subsequently the Act of October 30, 1992 (Public Law 102-575). The Standing Rock Sioux Tribe was forced to sue the Corps of Engineers from illegally condemning Treaty-protected land, under the Fifth Amendment of the United States constitution. Our Tribe has always defended our Treaty rights, and we shall do so in light of the Treaty violations poised by the Keystone Pipeline.

The Standing Rock Sioux Tribe possesses Treaty rights that cannot be delegated to a corporation such as TransCanada. We also have aboriginal rights, and as a result all development projects must comply with the National Historic Preservation Act. We areconcerned with the environment throughout what is now Western South Dakota, but which is our Treaty-protected land. The environment is not defined by artificial boundaries.

Q. Explain the Treaty rights of the Standing Rock Sioux Tribe.

A. The Standing Rock Sioux Tribe is comprised of constituent bands of the Great Sioux Nation. The Great Sioux Reservation was established in the Treaty of Fort Laramie of April 29, 1868, comprising the Missouri River and all of present-day South Dakota west of the Missouri. (15 Stat. 635). The pipeline route runs directly through our Treaty-protected lands. Consequently, I am also concerned with the potential environmental impacts in our Treaty territory and the effect on our Treaty rights.

Article 12 of the 1868 Fort Laramie Treaty prohibits any cession of Sioux Nation Treaty lands without % majority consent of the Sioux. (15 Stat. 638). Nevertheless, the clamor for gold in the Black Hills led Congress to enact the Act of February 28, 1877 (19 Stat. 254), which was an unconstitutional taking of over 7 million acres in the sacred Black Hills, from the Great Sioux Reservation. In response to land pressure for homesteaders, Congress subsequently passed the Act of March 2, 1889 (25 Stat. 888), which further reduced our land base and divided the Great Sioux Reservation into our present-day Reservation lands.

The Standing Rock Sioux Tribe and Great Sioux Nation have continuously asserted our Treaty rights to the Black Hills and 1868 Fort Laramie Treaty lands.. In 1975, the United States Court of Claims awarded the Sioux Nation $108 million, including interest, for the unconstitutional taking of this land. (*United States* v. *Sioux Nation of Indians,* 518 F.2d 1298 (Ct. Cl. 1975)). The court declared that, "A more ripe and rank case of dishonorable dealings will never, in all probability, be found in our history." (*Id* at 1302). The Supreme Court

affirmed the Court of Claims ruling, but the Great Sioux Nation and Standing Rock Sioux Tribe have not accepted the monetary damages. *(United States v. Sioux Nation of Indians,* 448 U.S. 371 (1980). Accordingly, we retain our claim to this land under the Fort Laramie Treaty.

There have been various proposals in Congress to resolve the Sioux Nation land claim. (E.g. 99th Cong., S. 1453, *Sioux Nation Black Hills Act).* We continue to pursue a just and honorable resolution to the Treaty violations of the United States. In fact, on May 4, 2012, the United Nations Special Rapporteur for the Rights of Indigenous Peoples, S. James Anaya, issued the following statement about the claim of the Great Sioux Nation and the Standing Rock Sioux Tribe, under the 1868 Fort Laramie Treaty:

> The Black Hills in South Dakota... hold profound religious and cultural significance to the (Sioux Nation). During my visit, indigenous people reported to me that they have too little control over what happens in these places, and that activities carried out around them at times affront their values. It is important to note, in this regard, that securing the rights of indigenous people to their lands is of central importance to indigenous people's socio-economic development, self determination and cultural integrity.

Our land claim under the 1868 Fort Laramie Treaty is acknowledged at the United Nations. Our Treaty rights are the basis of our existence as a Tribal Nation. They are not a historical anomaly; they are valid existing legal claims under federal and international law. As the U.S. Supreme Court stated,

> The Indian nations had always been considered as distinct, independent political communities, retaining their original rights, as the undisputed possessors of the soil, from time immemorial... The very term "nation" so generally applied to them, means "a people distinct from others." The constitution, by declaring treaties already made, as well as those to be made, the supreme law of the land, has adopted and sanctioned the previous treaties with the Indian nations, and consequently admits their rank among those powers who are capable of making treaties. The words "treaty" and "nation" are words of our language, selected in our diplomatic and legislative proceedings, by ourselves, having each a definite and well understood meaning. We have applied them to Indians, as we have applied them to other nations of the earth. They are applied to all in the same sense.

(Worcester v. Georgia, 31 U.S. (6 Pet.) 515, 559-560 (1832)).

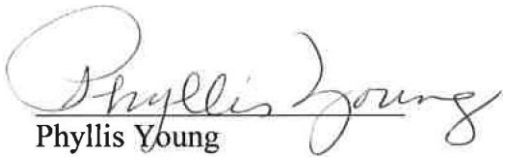
Under the Fort Laramie Treaty, we have the right to a healthy environment. Article 2 of the Treaty describes our ownership interest to the lands of the Great Sioux Reservation, as "set apart for the absolute and undisturbed use and occupation..." of the Great Sioux Nation. (15 Stat. 635). The revised route of the Keystone XL Pipeline would cross this land, for hundreds of miles. Under Article 11 of the Fort Laramie Treaty, "Should such roads or other works be constructed on the lands of their reservation, the Government will pay the tribe whatever amount of damage may be assessed by three disinterested commissioners to be appointed by the President for that purpose, one of said commissioners to be a chief or head man of the Tribe." (15 Stat. 638). Thus, under Article 11 of the Fort Laramie Treaty, we are entitled to have a seat at the table on decisions involving projects such as the Keystone XL Pipeline.

Q. Did the State Department consult with the Standing Rock Sioux Tribal government on the Keystone XL Pipeline?

A. No.

Q. Did TransCanada consult with the Standing Rock Sioux Tribal government on the Keystone XL Pipeline?

A. No. Instead, there were efforts to co-opt certain Tribal communities. I reference the TransCanada memorandum dated November 13, 2013, exhibiting disrespect to Tribal members of the Cheyenne River Sioux Tribe; and the TransCanada letter dated July 18, 2012, attempting to bribe the Ideal community on the Rosebud Reservation. TransCanada has never demonstrated any respect for the Indian Nations. That is why the PUC should deny certification of the permit for the Keystone XL Pipeline Project.



Phyllis Young

STATE OF NORTH DAKOTA)

SIOUX COUNTY)

SUBSCRIBED and SWORN to before me this ....._. .....,--

TAMERA ALKIRE
Notary Public
State of North Dakota
My Commleelon Expire& Feb. 4, 2021

NOTARY PUBLIC

My Commission Expires_____

Go Forward Action Required

Prepare and deliver communication materials	Jason Veness, Stakeholder and Tribal Relations
Develop a Security Plan	Michael Nagina, Security
Provide a Map of the Work Force Camps in South Dakota	James Odom, Project Manager
Integrate planning with PGI	Lou Thompson, Manager Tribal Relations

Meeting De-Brief

Debrief participants included - Shawn Howard, James Odom, Steve Marr, Gary Duggan, Don Greenwood, Bud Andersen, Rick Perkins, Beth Jensen, Drew Duncan, Jason Veness, Lou Thompson

1. The meeting was held in Faith, SD – owing to some pressure for hosting in it in the school at Takini.
    a. Instead of exacerbate the issue we decided to more the meeting to Faith, SD
    b. A prayer was offered by tribal elders to set the tone of the meeting
2. About 40 people attended the meeting to get information on the work force camps
    a. Questions ranged from clarifications on work force camps to issues associated with the project in general
3. Opponents of the project soon began venting their concerns and it became clear that their intent was to try and raise fear in the people and intimidate TransCanada
4. Out of respect for the elders, leadership and people who were there to listen to the information on work force camps we decided to withdraw and leave the meeting instead of giving the opposition a venue to continue grandstanding.

Opportunities and Lessons learned

1. James Odom – We partially clarified issues and answered questions on workforce camps however owing to the vocal oppositions being present that message was neutralized. As well any neutrals in the crowd may have walked away from the meeting leaning towards the opposition because we gave them an opportunity to be vocal. On a related note there was no control of the room from a messaging perspective – no one to moderate the questions. A suggestion would be to have a moderated event if we chose to engage in the future.
2. James Odom/Steve Marr?– If we host an event like this in the future we would want to have overt security visible in the crowd.
3. Don Greenwood – As far as security was concerned, keeping a low profile was the best choice and we would not recommend overt security presence (previous meeting with the tribes Don mentioned that all police officers were searched and that tribal representatives tried to arrest them for bringing weapons on reservation)
4. Travis Kelley – Not sure if the information shared on workforce camps was beneficial in any measurable way. Would not endorse another meeting of this type in the future. Would recommend more structured facilitation of a meeting or town hall style event. Would have liked to have had someone watching in the crowd who could monitor the situation and pull the plug earlier.

Exhibit 8005

5. Drew Duncan – This meeting was not conducive to reducing the risk of opposition in the state. In fact meetings like this raised the fear of local in the non-tribal communities and gave them reason to be non-supportive in the future. Meetings like this are not beneficial as they raise tension in the communities. We need to focus our efforts on the supporters of the project and stay away from engaging the local, vocal opponents in the community.
6. Lou Thompson – It is the TR groups responsibility for ensuring violent opposition to the project and in the community is addressed. Although the meeting was generally viewed internally as being of little benefit there are tremendous benefits from the meeting that are not immediately recognizable but still valid (listed below). The fact is TransCanada has an obligation and responsibility to tribal people to provide information to those that want it and need it. The TR team will continue to find ways to meaningfully engage tribal people in SD. Committed to including other business partners on TR planning in the future.

Benefits of the meeting – Lou and Jason

1. Identified violent opposition and their tactics
2. Clarified and corrected some of the misinformation regarding workforce camps
3. Provided factual information to the public on work force camps
4. Demonstrated that TransCanada was more than willing to increase and build upon a relationship with Tribal communities
5. Demonstrated that TransCanada would not be intimidated by an increasingly marginalized section of the tribal community in opposition to the project
6. Successfully reached out to people within the tribal community who want information on the work force camp and the project in general.
7. Opposition demonstrated they are increasingly losing ground in their community by disrespecting their own elders and leadership.

Go forward plans

1. Based on input from the Tribal Relations and Stakeholder Relations teams, the following strategy and tactical actions will continue to take place
    a. Continue to look at opportunities to influence the leadership of these communities in SD
    b. Empower PGI consulting team by supporting them with factual documentation of the project which they can communicate with tribes internally
    c. Look at opportunities to host a tour of a work force camp for tribal leadership and elders.
    d. Continue strategy of meaningful engagement and incremental success.
    e. Define opportunities for tribal participation in benefits of the project
    f. Funnel more information on TR related activities to broader internal groups
    g. Follow up with the town of Faith, SD on changes to proposed work force camps.

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DOCKET NO. HP 001

PREFILED TESTIMONY BY DOUG CROW GHOST
DIRECTOR, DEPARTMENT OF WATER RESOURCES
STANDING ROCK SIOUX TRIBE

APRIL 2, 2015

Exhibit 8010

Q. State your name and address for the record.

A. Errol D Crow Ghost Jr., 207 1st Avenue W, McLaughlin, South Dakota.

Q. What is your occupation?

A. Director / Administrator of the Standing Rock Sioux Tribe Department of Water Resources.

Q. Summarize your education and professional background.

A. I earned a Bachelor's Science Degree in Restoration Ecology, from the Salish-Kootenai College in 2002. I have worked as a professional Fire Fighter for Chief Mountain Hotshots in the U.S. Bureau of Indian Affairs from 1997-2002. I have served on the Standing Rock Tribal Council as a District Representative of the Bear Soldier District 2009-2013, and served on the Health, Education and Welfare Committee. I am a veteran of the armed forces, with an honorable discharge in 1996. (Army Active).

Q. Describe your duties as Director of the Standing Rock Sioux Tribe?

A. I supervise all of the Department's activities involving the regulation of water flows and water quality on the Standing Rock Indian Reservation. I oversee implementation of the Standing Rock Sioux Tribe Water Code, which requires permits for most diversions of surface and groundwater. I also supervise all Clean Water Act Section 106 activities, including the maintenance of baseline water quality data through the sampling and analysis of surface water and ground water resources, and the development of water quality standards for the Standing Rock Reservation. This involves calibration of testing and sampling equipment, including maintaining required updates, sample collection methods, chain of custody forms, quality control practices and quantitative analysis procedures, and use designations of our waters. As needed, our Department also samples for domestic drinking water source supplies for appropriate parameters, and consults with the Standing Rock Municipal, Rural and Industrial Water Supply system on compliance with the Clean Water Act and Safe Drinking Water Act.

I assist with the coordination between the Standing Rock Sioux Tribe and state and federal water management agencies. The Standing Rock Sioux Tribe is engaged in a multi-year effort to identify needed water flows and perfect our reserved water rights, through negotiations

with water teams appointed by the governors of South Dakota and North Dakota. I serve as the lead Tribal agent with the Army Corps of Engineers on the management of Missouri River water flows. I also serve as a lead organizer on the Standing Rock Emergency Response Committee, for purposes of responding to chemical or other spills, flood management and related emergency response by the Tribal government.

Q. What is the Winters Doctrine?

A. The judicially crafted *Winters Doctrine* (1908) provides water for the needs of Native Americans who reside on Tribally-reserved lands. This judicial guarantee is highly significant, given the demands for this critical natural resource in a region where water is often not abundantly available.

Water policy in the Great Plains is shaped by powerful political forces. Economic demands translate into political pressures and ultimately into water law. State water laws are generally designed to allocate water for "beneficial uses," following the doctrine of prior appropriation. Stressing uses, rather than needs, is inconsistent with Native American ideals, whereby water, like other aspects of the environment, is connected to a higher sacred order. Consequently, European American water schemes have often been in conflict with Native American concepts. As Director of the Department of Water Resources, it is my job to reconcile Lakota values with modem regulatory requirements, for the optimal protection of our water.

In 1908, Native Americans prevailed in the landmark case *Winters v. United States,* 207 U.S. 564 (1908). The case involved the Gros Ventres and Assiniboines of the Fort Belknap Reservation in Montana and their right to use the water of the Milk River. When farmers upstream diverted water upstream, the United States brought an injunction against them, reasoning that this left insufficient water for agriculture on the reservation. The farmers appealed. On January 6, 1908, the Supreme Court ruled in favor of the United States and the Native Americans, arguing that the establishment of the Fort Belknap Reservation entitled the Native Americans to perpetual use of the water that it contained. Their rights were "reserved" at the date of establishment (1888), and, contrary to the doctrine of prior appropriation, those rights could not be lost through nonuse.

The Winters Doctrine was a major victory for all Native Americans, serving notice that state laws are secondary to federally reserved water rights and preventing prior appropriation

schemes from extinguishing Native American needs. In 1976, in *Cappaert* v. *United States,* 426 U.S. 128 (1976), the doctrine was extended to groundwater use on or near federally created reservations.

As a result of these court cases, under federal law, the Standing Rock Sioux Tribe possesses reserved water rights for all present and future beneficial uses that are necessary for our Reservation to be a permanent homeland for our people. We own land, and we own the water rights needed for our land to sustain our people through the generations. In times of shortage, our priority date traces back to the establishment of our Reservation in the 1868 Fort Laramie Treaty. We possess the senior water right. Our reserved water rights are very important to our Tribe.

While the Winters Doctrine protects Native American water rights, this protection is still vulnerable to changes in the prevailing political climate. Consequently, I am very concerned with the water use by TransCanada in the construction of Keystone Pipleine, as well as the potential pollution that would result from the release of oil near one of the many river crossings in South Dakota. (Peter J. Longo University of Nebraska, Kearney).

Q. What waters does the Tribe claim a right to under the Winter Doctrine?

A. We possess reserved water rights to all waters arising on, bordering or crossing our Reservation, and aquifers subsurface to our lands. This includes extensive rights to divert water from the Missouri River, Grand River, Cannon Ball River, Cedar Creek, Porcupine Creek, Oak Creek and our groundwater.

Q. Does the Winters Doctrine include the right to future water use on the Reservation?

A. Yes. It extends to all reasonable, beneficial uses that are needed in the present and in the future.

Q. How do you know much water you will need in the future?

A. We are engaged in a process with the States of South Dakota and North Dakota, by which a Tribal water team appointed by the Tribal Council meets bi-monthly with teams appointed by the governors. The purpose is to address the present and future water

consumptive needs of the Tribe, and the Missouri River water levels and Grand River instream flows that are needed to fulfill our needs.

Q. Is the Winters Doctrine a federal law?

A. Yes. Compliance with the *Winters Doctrine* would be required under Amended Condition number 1 in the 2010 Final Order in HP 09-001.

Q. Will construction of the Keystone Pipeline affect the waters claimed by the Tribe under the Winter Doctrine?

A. Yes. Keystone has estimated that the construction of the pipeline will require 79 million gallons of water. The Standing Rock Sioux Tribe asked TransCanada interrogatories about the points of diversion for all of this water, and they gave unclear, even conflicting answers. So we really do not know the sources from which TransCanada will take water. But 79 million gallons equals approximately 250 acre-feet – and that is a significant amount of water to be taken from tributaries to the Missouri River in western South Dakota, even if for temporary use. I do question that amount as too conservative for a construction project of that magnitude. We asked TransCanada for information supporting that calculation, and none was provided.

Q. How has the recent drought affected the waters the Tribe?

A. Our waters are in danger. The snow melt from the Rocky Mountains is declining annually. Data from stream gages of the U.S. Geologic Survey preliminarily indicate diminished streamflows is a long-term trend, for important tributaries to the Missouri River. I also make reference to Cook et al, *Unprecedented 21st Century Drought Risk in the American Southwest and Central Plains*, J. ADVANCEMENT OF SCIENCE (Feb. 12, 2015), which states,

> In the multi-model mean, all three moisture balance metrics show markedly consistent drying during the later half of the 215[1] century... the consistent cross-model drying trends are driven primarily by the forced response to increased greenhouse gas concentrations, rather than any fundamental shift in ocean-atmospheric dynamics.

Consequently, I remain concerned that the drought is indeed long-term. This jeopardizes our way of life as hunters. Some people call it being an outdoorsman, but to the Lakota, subsistence hunting has always been a way of life, and it remains so today. The long-term

drought affects wildlife. There is less vegetation cover in the riparian areas. Farmers are being forced to take land out of the CRP program to maintain their harvest of hay and feed for livestock, which further diminishes wildlife habitat. Our surface waters are increasing in temperature, resulting in fish kills, on the Standing Reservation – right here in South Dakota. I reference the study by the National Wildlife Federation, *Great Plains: Wildlife in the Grips of Heat Waves and Drought.*

Q. TransCanada has identified the Little Missouri River, Cheyenne River, North Fork of the Moreau River, Bad River and White River s water sources for significant depletions for hydrostatic testing and other construction activities. Are these river systems in South Dakota potentially impacted by long-term drought?

A. Yes.

Q. If Keystone withdraws water from these river systems, is it possible that downstream water users, including Tribal water uses and non-Indian farmers and ranchers, will have adequate water supplies?

A. Yes, in a drought condition, these rivers do not carry unappropriated water in the quantities needed by TransCanada for construction of Keystone XL. TransCanada has not complied with Finding of Fact number 41, in which the temporary water use permitting process was deemed underway.

The treatment of water in the Construction Mitigation and Reclamation Plan (CRMP) reflects the problem with the CRMP generally, from an ecology standpoint. It is too general, too vague. For example, it states, "Throughout construction, the contractor shall maintain adequate flow rates to protect aquatic life and to prevent the interruption of downstream uses." (TransCanada 2008) p. 53. However, no specific steps are identified. Instead, TransCanada identified stream systems throughout South Dakota from which it seeks to divert water, which are already over-appropriated during drought conditions. There is already environmental stress in these riparian habitats. The platitudes in the CRMP are meaningless, in light of the water requirements for construction. Amended Conditions number 13-14 will not be achieved due to the lack of specificity with respect to mitigation in the CRMP.

Q. Will construction of the Keystone Pipeline affect water quality?

A. Yes. We have learned more about the potential impacts of pipeline construction from the release of the U.S. State Department Supplemental Environmental Impact Statement (SEIS) in January, 2014. The SEIS identifies "Construction-related impacts" as including "Temporary increases in total suspended solids (TSS) concentrations and increased sedimentation during stream crossings." (US DOS 2014). The pipeline will cross the Little Missouri and North Fork of the Grand River, which directly flows onto the Standing Rock Reservation. Both of these waters are currently listed as impaired waters under the Clean Water Act, due to high levels of TSS. The 2012 S.D. *Integrated Report for Surface Water Quality Assessment* states, "The Little Missouri River is listed as impaired for TSS... (and) Elevated specific conductance and sodium absorption ratios (SAR) are typical of the entire (Grand River) basin." (S.D. DENR 2012, pp. 96, 111). The construction activities associated with stream crossings will exacerbate the current water quality impairments of these waters of the Standing Rock Sioux Tribe.

The EPA has urged that this issue be addressed, in order to ensure that Indian water rights are not adversely impacted by Keystone XL. I reference the EPA letter dated July 16, 2010, stating "We recommend ... (that the State Department) address the potential impacts to areas where Tribes may have unadjudicated claims to water bodies that could be affected by spills. From the proposed pipeline." Giles July 16, 2010, encl. p. 6. However, this has never been done. Consequently, the project will infringe upon the reserved water rights of Standing Rock and other South Dakota Tribes, in violation of Amended Condition number 1 in the 2010 permit, requiring compliance with all applicable laws.

Q. Would a release of oil from the Keystone Pipeline near the Grand River or Missouri River affect the waters claimed by the Tribe under the Winter Doctrine?

A. Yes, very possibly.

Q. Are you concerned about that?

A. The most direct threat to our water stems from potential spills. Many recommendations for pipeline safety and spill response have been ignored or glossed over. The EPA explained in a letter dated July 16, 2010,

> The potential human health impacts associated with both air emissions from refineries and the potential contamination of drinking water supplies from an oil spill have not been evaluated. We recommend that the State Department prepare a health risk assessment to specifically address these issues as they relate to low income, minority and Tribal communities. (Giles, July 16, 2010, p.6).

For these reasons, the State Department FEIS on the Keystone XL Pipeline was rated as insufficient by the Environmental Protection Agency. (Giles, June 6, 2011).

Q. In the Final SEIS volume on "Potential Releases" the State Department estimated that any spills would likely be minor. So why are you concerned?

A. There have been numerous significant oil spills since TransCanada was awarded its S.D. permit on June 29, 2014. In the last three months there have been significant spills affecting the Missouri River basin – the Bridger Pipeline spill which released 40,000 gallons of crude into the Yellowstone River and shut down the drinking water system in Glendive due to benzene in the water, and 3 million gallons released from a Summit Midstream Partners pipeline near Williston, N.D. From Montana, to Arkansas to Michigan, communities are affected by oil pipelines, especially when heavy tar sands crude is transported.

TransCanada's spill frequency estimates are widely considered by objective commentators to be too conservative. I reference the Congressional Research Service, *Oil Sands and Keystone XL Pipeline: Background and Selected Environmental Issues*, CRS REPORT TO CONGRESS (2012): "the pipeline's operating parameters – temperature and pressures higher than conventional crude pipelines – would yield spill frequencies above historical averages ... Keystone has operated the Keystone mainline pipeline and the Cushing Extension since 2010. Since that time **the Keystone Pipeline has generated 14 unintentional releases."** p. 39; Daniel J. Graeber, *Are Pipeline Spills a Foregone Conclusion*, May 21, 2013, posted at http://oilprice.com/TheEnvironment/Oil-S pills/Are-Pipeline-Spills-a-Foregone-Conclusion. (emphasis added).

Q. Are you familiar with TransCanada's safety record? Explain.

A. From 2011-2013, the Coast Guard National Response Center indicates that TransCanada had 34 reported spills, and was required to contribute $118 million for remediation. The Pipeline and Hazardous Materials Safety Administration has been critical of TransCanada's safety record, denying numerous waiver requests (reference PHMSA letters dated June 27, 2011, June 27, 2011, June 27, 2011, July 26, 2010, July 16, 2010 and May 5, 2010). PHMSA wrote "PHMSA is denying your May 26, 2010 special permit application based on operator compliance issues related to not performing weekly aerial patrols and quarterly ground controls as required." (PHMSA, June 26, 2011). That is a repeated complaint by the federal regulators with TransCanada – a lack of on-going monitoring for leaks.

Safety may be further compromised by the low cost of oil at present. The production of tar sands is jeopardized by high productions costs generally. The decreasing cost of oil enhances the importance of Keystone XL as a cost-effective means of transporting tar sands crude, as compared to rail. So the Keystone XL Pipeline will result in the production of greater amounts of tar sands, and will increase greenhouse gas emissions.

That exacerbates the long-term severe drought currently affecting the northern plains and the Standing Rock Indian Reservation. On November 23, 2003, the Tribe's drinking water intake at Fort Yates for our community drinking water system malfunctioned, due to low water levels caused by drought. Three Standing Rock Reservation communities and 6,000 Tribal members were without potable water for two weeks. Schools were affected, and Tribal elders on kidney dialysis were forced to travel to Bismarck for treatment, 60 miles away. The Standing Rock Sioux Tribe already suffers the effects of long-term drought and climate change.

Meanwhile, companies like TransCanada may compromise on safety, due to lower revenues. This could pose further adverse effects on our water. In any event, TransCanada can no longer demonstrate the capability to comply the Findings of Fact number 43-45 in the Final Order, HP 09-001, with respect to spill frequency estimates. It also fails to meet Finding number 52 regarding the threat of contamination to surface water.

Q. You testified that as Water Resources Director you assist with emergency management on the Standing Rock Reservation. Are you satisfied with TransCanada's Emergency Response Plan?

A. TransCanada is hiding it. They will not release a copy of a Facility Response Plan for the Keystone XL Pipeline, as required in the Clean Water Act and in Finding of Fact number 51. The PUC order also requires TransCanada to engage in training for local emergency response personnel in Finding of Fact number 51, and that has not occurred. TransCanada is unable to certify to the PUC that important findings have been complied with.

Q. Have you ever seen an oil pipeline emergency response plan?

A. Yes. The Kinder Morgan Canada, Inc. Emergency Response Plan for the Puget Sound Pipeline System, wholly unredacted, 1s posted at (ecy.wa.gov/programs/spills/preparedness /cplan/Kinder _Morgan_Plan_Review_ 4_7_08.pdf&ke yword=kinder). The Washington State Department of Ecology also makes public and posts on- line a HazMat Spill Contractors List and Approved Primary Response Contractors list - information that TransCanada has refused to disclose for the Keystone XL Pipeline. This is all standard emergency response cooperation. However, TransCanada will not provide this information to the South Dakota PUC as required in Finding of Fact number 52, or to the Standing Rock Sioux Tribe.

Q. Do you know why Washington State has emergency response plans for the release of oil from pipelines and lists of available contractors and equipment, but TransCanada refuses to provide this information in proceedings before the South Dakota Public Utilities Commission?

A. No, TransCanada is totally unjustified in keeping Tribal, state and local emergency responders in the dark.

Q. As Director of the Water Resources Department, if an oil company initiated a dialogue or consultation with the Standing Rock Tribal government, in the ordinary course of business, would this be the type of meeting you would be informed of, and participate in?

A. Yes.

Q. Do you know Lou Thompson is?

A. No.

Q. Did you ever meet Lou Thompson?

A. No.

Q. Do you know Sarah Metcalf is?

A. No.

Q. Did you ever meet Sarah Metcalf?

A. No.

Q. Is there anything else you would like to say to the Public Utilities Commission?

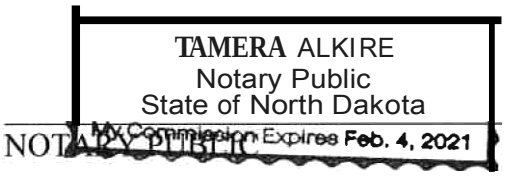
A. The State Department released the Final Supplemental EIS in January, 2014. This document casts a pall over any further approval of the Keystone XL Pipeline. I reference the EPA letters dated June 6, 2011, rating the draft study as inadequate (Giles 2011); and February 2, 2015, EPA found that "Over the 50-year lifetime of this pipeline, this could translate into releasing as much as 1.37 billion more tons of greenhouse gases into the atmosphere." (Giles 2015). The *Fifth Assessment Climate Change Synthesis Report* by the United Nations Intergovernmental Council on Climate Change (2014) comprises new information on the need to mitigate greenhouse gas emissions, which was not available to the PUC in 2010, and which requires a denial of the certification of the Keystone XL Permit.

Errol Doug Crow Ghost Jr.

STATE OF NORTH DAKOTA)

SIOUX COUNTY)

SUBSCRIBED and SWORN to before me this ___ day of April, 2015.



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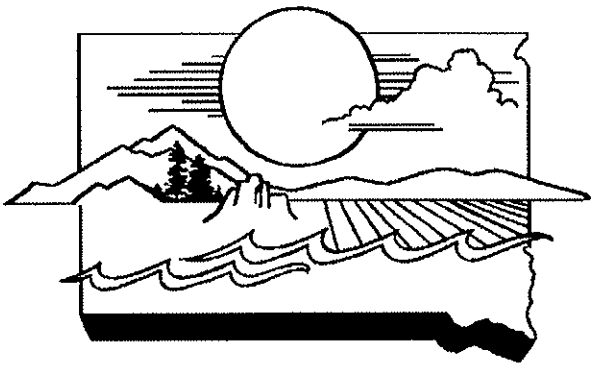
My Commission Expires _____

THE 2012 SOUTH DAKOTA INTEGRATED REPORT FOR SURFACE WATER QUALITY ASSESSMENT



Protecting South Dakota's Tomorrow...Today

Prepared By
SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

STEVEN M. PIRNER, SECRETARY

Exhibit 8013

Bad River Basin (Figure 10, Table 24)

The Bad River basin lies in west-central South Dakota between the Cheyenne and White River basins and drains approximately 3,175 square miles. Historically, a main characteristic of the basin has been a general lack of constant river flow. The upper portion of the Bad River receives water from the Badlands and artesian wells in the Phillip area. These wells contribute minimal flow to the upper portion of the Bad River. There are prolonged periods of low flow in the Bad River reach from Midland to the Missouri River.

DENR has assessed four lakes within the basin and also has one water quality monitoring site located on the Bad River. During the 2010 reporting cycle EPA added Lake Waggoner to the 303(d) list for not supporting the designated warmwater fish life and recreation beneficial uses due to chlorophyll-*a*. This listing was based strictly on ad hoc criteria developed by EPA to address narrative standards associated with eutrophication. EPA's methodology and justification for this listing is defined in the 2010 Integrated Report.

The USGS has water quality monitoring sites on the Bad River and on some of the intermittent streams in the basin on Plum Creek, the South Fork Bad River, and an unnamed tributary of Cottonwood Creek. However, the data are very limited, and for most sites, the only parameters that were measured were specific conductance and water temperature.

The Bad River, from the Stanley County line to the mouth, is currently not supporting its designated beneficial uses due to exceedances of TSS. A TMDL was approved for TSS in 2001. The Bad River, from its north and south forks to the Stanley County line has not been assessed. There are no current watershed assessment or implementation projects ongoing in the Bad River Basin.

Grand River Basin (Figure 16, Table 28)

The Grand River basin covers 4,596 square miles in northwest South Dakota and southwest North Dakota. This is a sparsely populated region with a population density of approximately one person per square mile. The major income is derived from agriculture; however, this basin possesses energy resources in commercial quantities.

DENR has assessed five lakes and maintains nine water quality monitoring sites within the Grand River basin.

The USGS data are limited in the Grand River basin; however, USGS data were used for segments of the Grand River, South Fork Grand River, and North Fork Grand River. BOR submitted water quality data for Shadehill Reservoir.

Due to historic uranium mining in the Grand River basin, DENR maintains four water quality monitoring sites that are monitored for uranium and other associated parameters. For this reporting cycle, there are no surface water quality exceedances for uranium or other parameters associated with uranium mining.

Elevated specific conductance, pH, TSS, and sodium adsorption ratios (SAR) are typical of the entire basin. The North Fork watershed drains the southern periphery of the North Dakota badlands which may be a major source of high levels of specific conductance and SAR. The South Fork drainage contains erosive soils, which contribute sediment and suspended solids that often produce high TSS, pH, and SAR levels in the South Fork.

Shadehill Reservoir and the Grand River are considered impaired for irrigation use due to natural limitations imposed by local soil-water incompatibility. High sodium concentration, combined with the clay characteristics of most soils in this region, significantly reduce the acreages suitable for continuous irrigation. This condition is measured by the sodium adsorption ratio (SAR). A SAR value of 10 or greater indicates that a buildup of sodium will break down soil structure and cause serious problems for plant growth.

During the 2010 reporting cycle EPA added Lake Isabel to the 303(d) list for not supporting the designated warmwater fish life and recreation beneficial uses due to chlorophyll-*a*. This listing was based strictly on ad hoc criteria developed by EPA to address narrative standards associated with eutrophication. EPA's methodology and justification for this listing is defined in the 2010 Integrated Report.

There are no on-going assessment or implementation projects occurring within the basin at this time.

DENR has referred TMDL development for all waterbodies in the Grand River basin to EPA. Therefore, TMDL priority and schedule have not been populated in the basin table. DENR is currently in discussions with EPA to determine next steps regarding TMDL development and prioritization for the Grand River Basin.

Cheyenne River Basin (Figures 14 and 15, Table 27)

The portion of the Cheyenne River basin that lies in southwestern South Dakota drains about 9,732 square miles within the boundaries of the state. The area in this basin is very diverse. It includes part of the Black Hills and Badlands, rangeland, irrigated cropland, and some mining areas. The Cheyenne River originates in Wyoming, flows through the southern Black Hills, and enters Lake Oahe near the center of the state.

DENR has assessed 17 lakes and maintains 29 water quality monitoring sites within the Cheyenne basin. Eight monitoring sites are located on the Cheyenne River, three are located on French Creek, and five are located on Rapid Creek. The other sites are located on various other streams in the basin. In addition, available data from DENR watershed assessment projects were also used to determine waterbody support. All DENR data, including WQM, assessment projects, implementation projects, special assessments, and other DENR funded projects, are all labeled as DENR as the basis in the basin tables.

The USGS also maintains a number of water quality monitoring sites located along streams in the Cheyenne River Basin including: Battle Creek, Bear Gulch, Hat Creek, Highland Creek, Rapid Creek, Sunday Gulch, Cheyenne River, and others. The USGS data are limited for most sites and mostly includes specific conductance and water temperature information. Data collected on all USGS sites were analyzed for this report. BOR submitted water quality information for Angostura Reservoir, Deerfield Reservoir, and Pactola Reservoir.

The Cheyenne River basin is home to deposits of natural uranium and historic uranium mining activities. With the increasing price of uranium compounded with rising energy needs, uranium exploration drilling has resumed. DENR maintains five water quality monitoring locations within the basin to monitor for uranium and other associated parameters. For this 2012 reporting cycle, there are no surface water quality exceedances for any parameters associated with past uranium mining or current explorations.

The Cheyenne River water quality continues to be generally poor due to both natural and agricultural sources. The lower Cheyenne drainage, in general, contains highly erodible soils. The landscape contributes considerable amounts of eroded sediment during periods of heavy rainfall. Segments downstream of the Fall River remain nonsupporting for fecal coliform and/or *E.coli* bacteria; however these segments have approved TMDLs.

Water quality in Rapid Creek for reaches above Rapid City meets water quality standards for designated beneficial uses. Rapid Creek segments from Canyon Lake to the Cheyenne River continue to display poor water quality due to excessive fecal coliform and/or *E. coli* bacteria levels. Bacteria TMDLs for these lower reaches were approved in 2010.

The Black Hills region traditionally has some of the best surface water quality in the state. This is due in a large part to a cooler climate and higher precipitation than the surrounding plains as a result of greater elevation and forest cover. Also contributing to the water quality in this region are the local bedrock formations which are much less erodible than the highly erosive and leachable marine shales and badlands on the surrounding plains. However, the Black Hills streams are vulnerable to losses of flow exacerbated by periodic droughts. In addition, high summer ambient air temperature causes elevated water temperature and results in temperature impairments for coldwater fisheries. Grazing of

streamside vegetation, which increases stream bank erosion, water temperature, and nutrient loading, also continues to be a problem in some streams in this area.

There are currently twelve coldwater rivers and streams in the Cheyenne River basin that are on the 303(d) list for not supporting temperature water quality standards. The *Black Hills Regional Stream Temperature Assessment* conducted by RESPEC will be used to re-evaluate the current beneficial use attainment and to determine future impairments based on recommended temperature standards.

The Lower Cheyenne River Assessment project and the French Creek Assessment project were both completed during this reporting period. No other assessment projects are currently ongoing in the Cheyenne River basin. The Spring Creek Implementation Project is the only implementation project being conducted in the Cheyenne River basin.

Little Missouri River Basin (Figure 19, Table 30)

The Little Missouri River basin is a small basin located in the northwestern corner of the state. The river enters the state from southeastern Montana and drains 583 square miles before exiting into North Dakota. The basin's economy is dominated by agriculture with approximately 90% of the land being used for agricultural production. The majority of this land is rangeland due to limited rainfall.

There are no monitored lakes within this basin and DENR has one water quality monitoring station located on the Little Missouri River.

The USGS provided water quality data from a station on the Little Missouri River at Camp Crook.

The Little Missouri River is listed as impaired for TSS. There are currently no watershed assessment or implementation projects in the basin.

White River Basin (Figure 27, Table 37)

The White River basin is the most southern of the five major drainages in South Dakota that enters the Missouri River from the west. The total drainage area of the basin in the state is 8,246 square miles. Agriculture dominates the basin's economy, with the majority of the land used as rangeland or cropland.

DENR maintains six water quality monitoring sites within this basin. Four of the six monitoring sites are located on the White River, one is located on Cottonwood Creek, and the other is located on the Little White River.

The USGS has water quality monitoring sites in the basin, including sites on the White River, Little White River, Black Pipe Creek, Lake Creek, Rosebud Creek and others. The data are limited, and the only parameters that were measured were specific conductance and water temperature.

DENR has increased sampling parameters to include uranium, and others associated with uranium mining, at an ambient monitoring location on the White River near Oglala. This location was selected due to in-situ uranium mining upstream in Nebraska and the naturally occurring uranium in the highly erodible soils in the White River basin. Support determinations were based on all parameters; however, there were no surface water quality exceedances for uranium or other parameters associated with uranium mining.

The White River basin receives the majority of the runoff and drainage from the western Badlands. The exposed Badlands are a major natural source of both suspended and dissolved solids to the river. Severe erosion and leaching of soils occurs in the Badlands and throughout the entire length of the basin. Site specific water quality standards for total suspended solids (TSS) were established by DENR in 2009 for the White River and Little White River. The White River is listed as impaired for SAR, fecal coliform, and *E. coli.*

Assessment projects have been completed for the White River, Little White River, and Cottonwood Creek watersheds. There are currently no on-going implementation projects in the White River basin.

Oil Sands and the Keystone XL Pipeline: Background and Selected Environmental Issues

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Prepared for Members and Committees of Congress

Exhibit 8014

Properties of Oil Sands-Derived Crudes Compared to Other Crudes

Crude oil is a complex mix of hydrocarbons, ranging from simple compounds with small molecules and low densities to very dense compounds with extremely large molecules. Three key properties of crude oils include the following:

- **API Gravity.** API[33] Gravity measures the weight of a crude oil compared to water. It is reported in degrees (°) by convention. API gravities above 10° indicate crude oils lighter than water (they float); API gravities below 10° indicate crude oils heavier than water (they sink). Although the definition of "heavy" crude oil may vary, it is generally defined by refiners as being at or below 22.3° API gravity.[34]
- **Sulfur Content.** Sulfur content in crude oil is an indication of potential corrosiveness due to the presence of acidic sulfur compounds. Sulfur content is measured as an overall percentage of free sulfur and sulfur compounds in a crude oil by weight. Total sulfur content in crude oils generally ranges from below 0.05% to 5.0%. Crudes with more than 1.0% free sulfur or other sulfur-containing compounds are typically referred to as "sour," below 0.5% sulfur as "sweet."[35]
- **Total Acid Number.** Total Acid Number (TAN) measures the composition of acids in a crude which can gauge its potential for corrosion, particularly in a refinery. TAN value is measured as the number of milligrams (mg) of potassium hydroxide (KOH) needed to neutralize the acids in one gram of oil. As a rule-of-thumb, crude oils with a TAN greater than 0.5 are considered to be potentially corrosive due to the presence of naphthenic acids.[36]

Table 1 compares Alberta's different oil sands crudes with other crude oils extracted in the United States and around the world. The data indicate that all oil sands crudes would be considered heavy crudes. Heavy crudes are found throughout the world, including the United States. The data indicate that oil sands crudes resemble other heavy crudes in terms of sulfur content and TAN.

[33] American Petroleum Institute.

[34] U.S. Energy Information Administration, Crude Oil Input Qualities, "Definitions, Sources and Explanatory Notes," web page, July 28, 2011, http://www.eia.gov/dnav/pet/TblDefs/pet_pnp_crq_tbldef2.asp. In the marine tanker industry, heavy grade crudes are defined as crudes with an API below 25.7 , as bitumen emulsions, or as certain viscous fuel oils. See McQuilling Services, LLC, "Carriage of Heavy Grade Oil," Garden City, NY, 2011, http://www.meglobaloil.com/MARPOL.pdf.

[35] JDL Oil and Gas Exploration, Inc., "Crude Oil Basics," web page, July 28, 2011, http://www.jdloil.com/oil_basics.htm.

[36] R.D. Kane and M.S. Cayard, "A Comprehensive Study of Naphthenic Acid Corrosion," Paper No. 02555, Corrosion 2002, http://www.icorr.net/wp-content/uploads/2011/01/napthenic_corrosion.pdf.

Table 1. Selected Global Crude Oil Specifications

Source	Crude Oil Name	°API Gravity	Sulfur (Weight %)	TAN (mgKOH/g)
	Alberta Oil Sands Crude Oils			
- Dilbits	Access Western Blend	21.9	3.94	1.70
	Cold Lake	20.9	3.78	0.97
	Peace River Heavy	20.8	4.97	2.49
	Seal Heavy	20.5	4.64	1.86
	Smiley Coleville	20.0	2.98	0.97
	Wabasca Heavy	20.3	4.10	1.03
	Western Canadian Select	20.6	3.46	0.92
- DilSynBit	A bian Heavy	19.1	2.42	0.51
	Selected Heavy Crude Oils			
Western Canada	Western Canadian Blend	20.7	3.16	0.71
U.S. (California)	Hondo Monterey	19.4	4.70	0.43
	Kern River	13.4	1.10	2.36
Venezuela	Pilon	16.2	2.47	1.60
	Bachaquero	13.5	2.30	2.63
	Tia Juana Heavy	12.3	2.82	3.90
	Laguna	10.9	2.66	2.82
	Boscan	10.1	5.40	0.91
Mexico	Maya	21.5	3.31	0.43
Italy	Tempa Rossa	20.4	5.44	0.05
United Kingdom	Captain	19.2	0.70	2.40
Indonesia	Duri (Sumatran Heavy)	20.8	0.20	1.27
	Selected Medium and Light Crude Oils (> 22.3° API)			
U.S. (Alaska)	Alaskan North Slope	32.1	0.93	0.12
U.S. (Texas)	West Texas Intermediate	40.8	0.34	0.10
U.S. (Gu f of Mexico)	Hoops Blend	31.6	1.15	1.07
	Thunderhorse	28.3	0.64	0.47
	Poseidon Heavy-sour	29.7	1.65	0.41
	Mars Heavy-sour	28.9	2.05	0.51
	Southern Green Canyon Heavy-Sour	28.4	2.48	0.17
Nigeria	Bonga	30.2	0.25	0.55
Norway	Statfjord	28.3	0.64	0.47
Dubai	Dubai Fateh Heavy	30.8	2.07	0.05
Saudi Arabia	Arabian Heavy	27.5	2.95	0.40
	Arabian Light	33.7	1.96	0.05

Sources: Canadian crude data from Crude Quality Inc., Canadian Crude Quick Reference Guide, Updated June 2, 2011, at http://www.crudemonitor.ca; Other crude oil data from: Capline, Crude Oil Assays, at http://www.cap inepipe ine.com; BP Crude Assays, at http://www.bp.com; ExxonMobil, at http://www.exxonmobil.com/crudeoil/about_crudes_region.aspx; "Benchmark West Texas Intermediate Crude Assayed," *Oil and Gas Journal*, 1994; McQuilling Services, LLC, "Carriage of Heavy Grade Oil," Garden City, NY, 2011, http://www.meglobaloil.com/MARPOL.pdf; Hydrocarbon Pub ishing Co., *Opportunity Crudes Report II*, Southeastern, PA, 2011, p. 5, http://www.hydrocarbonpublishing.com/ReportP/Prospectus-Opportunity%20Crudes%20II_2011.pdf.

Notes: The crude oils listed above are not an exhaustive list, nor do they represent a specific percentage of global consumption. The crudes listed above are selected examples of different crude oils from around the world. Multiple crude oils from Venezuela are included to indicate the range of parameters in different heavy crude oils.

Section 2: Keystone XL Pipeline—Overview

As originally proposed by TransCanada in September 2008,[37] the Keystone XL pipeline would involve two major segments (**Figure 6**). The first segment—approximately 850 pipeline miles in the United States[38]—would cross the U.S.-Canadian border into Montana, pass through South Dakota, and terminate in Steele City, Nebraska. The second segment—approximately 480 miles and labeled as the "Gulf Coast Project" in **Figure 6**—would connect an existing pipeline in Cushing, Oklahoma with locations in southern Texas.[39]

As discussed below, the Department of State (DOS) announced its denial of the Keystone XL permit in January 2012. In February 2012, TransCanada announced that it would proceed with development of the southern pipeline segment as a separate proposal. As this segment is within the United States, it does not require a Presidential Permit (discussed below). Thus, the revised permit, which TransCanada submitted on May 12, 2012, only applies to the first segment that connects Canada with the United States.

The Keystone XL pipeline would have the capacity to deliver 830,000 barrels per day (bpd), a substantial flow rate compared to other U.S.-Canada import pipelines (**Table 3**).The 36-inch-diameter pipeline would require a 50-foot-wide permanent right-of-way along the route. Approximately 95% of the pipeline right-of-way would be on privately owned land, with the remaining 5% almost equally state and federal land. Private land uses are primarily agricultural—farmers and cattle ranchers. Above ground facilities associated with the pipelines include pump stations (with associated electric transmission interconnection facilities), mainline valves, and delivery metering facilities.

The Keystone XL pipeline and the "Gulf Coast Project" would combine with two existing pipeline segments to complete TransCanada's Keystone Pipeline System. This system is depicted in **Figure 6**. These existing segments include:

- The Keystone Mainline: A 30-inch pipeline with a capacity of nearly 600,000 bpd that connects Alberta oil sands to U.S. refineries in Illinois. The U.S. portion runs 1,086 miles and begins at the international border in North Dakota. The Keystone Mainline began operating in June 2010.
- The Keystone Cushing Extension: A 36-inch pipeline that runs 298 miles from Steele City, Nebraska to existing crude oil terminals and tanks farms in Cushing, Oklahoma. The Cushing Extension began operating February 2011.

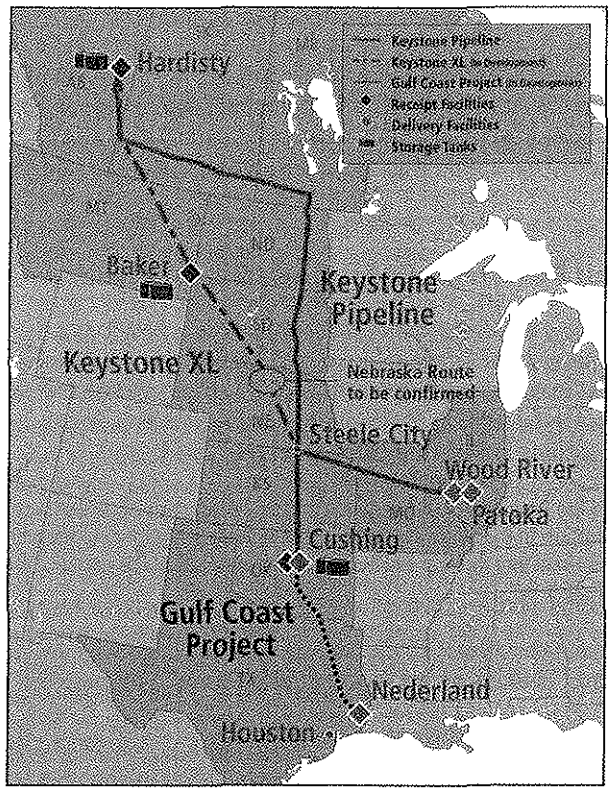
[37] The original application and related documents are available at the Department of State Keystone XL website, at http://keystonepipeline-xl.state.gov/archive/index.htm.

[38] 1,183 miles from its origin in Alberta, Canada. See U.S. Department of State, *Final Environmental Impact Statement for the Proposed Keystone XL Project*, August 2011.

[39] An additional 50-mile segment would connect to additional locations in Texas. For further details, see U.S. Department of State, *Final Environmental Impact Statement for the Proposed Keystone XL Project*, August 2011.

Figure 6. The Keystone Pipeline System

Completed and Proposed Segments of the Keystone and Keystone XL Pipelines



Source: TransCanada.

Federal Requirements to Consider the Pipeline's Environmental Impacts

When considering a Presidential Permit application, the DOS must conduct an environmental review of its actions pursuant to the National Environmental Policy Act (NEPA, 42 U.S.C. §4321 et seq.). This process highlighted many environmental impacts associated with the construction, operation, and maintenance of the pipeline system and associated facilities.

Issues that arose and environmental impacts identified during DOS efforts to process TransCanada's application for a Presidential Permit ultimately resulted in the denial of its permit application. With TransCanada's May 4, 2012 reapplication for a permit to construct the Keystone XL pipeline project, the Presidential Permit process and NEPA compliance process begin anew.

Generally, federal agencies have no authority to control siting of oil pipelines, even interstate pipelines.[40] Instead, the primary siting authority for oil pipelines generally would be established

[40] This is in contrast to interstate natural gas pipelines, which, under Section 7(c) (15 USC §717f(c)) of the Natural Gas Act, must obtain a "certificate of public convenience and necessity" from the Federal Energy Regulatory Commission.

under applicable state law (which may vary considerably from state to state).[41] However, in accordance with Executive Order 13337, a facility connecting the United States with a foreign country, including a pipeline, requires a Presidential Permit from DOS before it can proceed.[42]

Key elements of the Presidential Permit process, including DOS efforts to identify environmental impacts associated with the TransCanada's 2008 permit application are discussed below. Included in that discussion are relevant activities and requirements associated with DOS compliance with NEPA and its obligation to determine whether the proposed pipeline would serve the national interest.

Presidential Permit Requirements for Cross-Border Pipelines

A decision to issue or deny a Presidential Permit application is based on a determination that the proposed project would serve the "national interest." This term is not defined in the Executive Orders. In the course of making that determination, DOS may consider a wide range of factors such as the project's potential impacts to the environment, economy, energy security, foreign policy, and others. Regarding its determination, DOS has stated:

> Consistent with the President's broad discretion in the conduct of foreign affairs, DOS has significant discretion in the factors it examines in making a National Interest Determination . The factors examined and the approaches to their examination are not necessarily the same from project to project.[43]

However, the Department has identified the following as key factors it considered in making *previous* national interest determinations for oil pipeline permit applications:

- Environmental impacts of the proposed projects;
- Impacts of the proposed projects on the diversity of supply to meet U.S. crude oil demand and energy needs;
- The security of transport pathways for crude oil supplies to the United States through import facilities constructed at the border relative to other modes of transport;
- Stability of trading partners from whom the United States obtains crude oil;

[41] Federal laws and regulations address other matters, including worker safety and environmental concerns. See CRS Report R41536, *Keeping America's Pipelines Safe and Secure Key Issues for Congress*, by Paul W. Parfomak and CRS Report RL33705, *Oil Spills in U.S. Coastal Waters Background and Governance*, by Jonathan L. Ramseur.

[42] This authority was originally vested in the U.S. State Department with the promulgation of Executive Order 11423, "Providing for the performance of certain functions heretofore performed by the President with respect to certain facilities constructed and maintained on the borders of the United States," in 1968. Executive Order 13337, "Issuance of Permits With Respect to Certain Energy-Related Facilities and Land Transportation Crossings on the International Boundaries of the United States," of April 30, 2004, amended this authority and the procedures associated with permit review for energy-related projects, but did not substantially alter the exercise of authority or the delegation to the Secretary of State in E.O. 11423. Due to the particular significance to Presidential Permit issuance for pipelines, provisions in E.O 13337 will be cited in this report. For further information on the Executive Order authority and related issues, see CRS Report R42124, *Proposed Keystone XL Pipeline Legal Issues*, by Adam Vann et al.

[43] The U.S. State Department, *Final Environmental Impact Statement for the Keystone XL Project*, August 2011, "Introduction" (as amended September 22, 2011), p. 1-4, available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/index.htm#.

- Relationship between the United States and various foreign suppliers of crude oil and the ability of the United States to work with those countries to meet overall environmental and energy security goals;
- Impact of proposed projects on broader foreign policy objectives, including a comprehensive strategy to address climate change;
- Economic benefits to the United States of constructing and operating proposed projects; and
- relationships between proposed projects and goals to reduce reliance on fossil fuels and to increase use of alternative and renewable energy sources.[44]

DOS may consider additional factors to inform its national interest determination for a given project. However, pursuant to E.O. 13337, for each permit application it receives for an energy-related project, DOS must request the views of the Attorney General, Administrator of the Environmental Protection Agency (EPA), and Secretaries of Defense, the Interior, Commerce, Transportation, Energy, and Homeland Security (or the heads of those departments or agencies with relevant authority or responsibility over relevant elements of the proposed project). DOS may request the views of additional federal department and agency heads, as well as additional local, state, or tribal agencies, as it deems appropriate for a given project. DOS must also invite public comment on the proposed project.

If, after considering the views and assistance of various agencies and the comments from the public, DOS finds that issuance of a permit would serve the national interest, then a Presidential Permit may be issued. Specific to the Keystone XL pipeline, in its May 2012 Presidential Permit application, TransCanada states

> The project will serve the national interest of the United States by providing a secure and reliable source of Canadian crude oil to meet the demand from refineries and markets in the United States, by providing critically important market access to developing domestic oil supplies in the Bakken formation in Montana and North Dakota, and by reducing U.S. reliance on crude oil supplies from Venezuela, Mexico, the Middle East, and Africa. The project will also provide significant economic and employment benefits to the United States, with minimal impacts on the environment.[45]

It is during the NEPA process that DOS will determine the degree to which the proposed pipeline project may impact the environment, as well as identify potential mitigation measures or protections necessary to reduce the potential for adverse environmental impacts. When the NEPA process is complete, DOS may use that assessment of environmental impacts, with other factors, to determine if the project does, in fact, serve the national interest.

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[44] Ibid.

[45] TransCanada Keystone Pipeline, L.P., "Application of TransCanada Keystone Pipeline L.P. for a Presidential Permit Authorizing the Construction, Operation, and Maintenance of Pipeline Facilities for the Importation of Crude Oil to be Located at the United States-Canada Border," U.S. Dept. of State, May 4, 2012, pp. 1-2, available at http://www.keystonepipeline-xl.state.gov/.

Identification of Environmental Impacts During the NEPA Process[46]

The DOS review of a Presidential Permit application explicitly requires compliance with multiple federal environmental statutes.[47] Environmental requirements identified within the context of the NEPA process has drawn considerable attention.

Pursuant to NEPA, in considering an application for a Presidential Permit, DOS must take into account environmental impacts of a proposed facility and directly related construction. In complying with NEPA, federal agencies must prepare an Environmental Impact Statement (EIS) for projects determined to have "significant" environmental impacts. DOS concluded that issuance of a Presidential Permit for the proposed construction, connection, operation, and maintenance of the Keystone XL Pipeline and its associated facilities at the United States border may have a significant impact on the environment within the meaning of NEPA.[48] As a result, DOS prepared an EIS to identify the reasonably foreseeable impacts from the proposed Keystone XL pipeline.[49] Similarly, an EIS will likely be required for the pipeline project for which the May 4, 2012 permit application was filed.

EIS preparation is done in two stages, resulting in a draft and final EIS. NEPA regulations require the draft EIS to be circulated for public and agency comment, followed by a final EIS that incorporates those comments.[50] The agency responsible for preparing the EIS, in this case DOS, is designated the "lead agency." In developing the EIS, DOS must rely on information provided by TransCanada. For example, TransCanada's original permit application included an Environmental Report which was intended to provide the State Department with sufficient information to understand the scope of potential environmental impacts of the project.[51]

In preparing the draft EIS, the lead agency must request input from "cooperating agencies," which include any agency with jurisdiction by law or with special expertise regarding any environmental impact associated with the project.[52] The original Keystone XL permit process involved 11 federal cooperating agencies, including the Environmental Protection Agency (EPA),

[46] For more detailed NEPA information, see CRS Report RL33152, *The National Environmental Policy Act (NEPA) Background and Implementation*, by Linda Luther.

[47] DOS is explicitly directed to review the project's compliance with the National Historic Preservation Act (16 U.S.C. §470f), the Endangered Species Act (16 U.S.C. §1531 et seq.), and Executive Order 12898 of February 11, 1994 (59 *Federal Register* 7629), concerning environmental justice.

[48] U.S. Department of State, "Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Scoping Meetings and Notice of Floodplain and Wetland Involvement and to Initiate Consultation under Section 106 of the National Historic Preservation Act for the Proposed TransCanada Keystone XL Pipeline," 74 *Federal Register* 5020, January 28, 2009.

[49] In preparing an EIS associated with a Presidential Permit application, NEPA regulations promulgated by both the Council of Environmental Quality (CEQ) and the State Department would apply to the proposed project. CEQ regulations implementing NEPA (under 40 C.F.R. §§1500-1508) apply to all federal agencies. NEPA regulations applicable to State Department actions, which supplement the CEQ regulations, are found at 22 C.F.R. §161.

[50] For information regarding NEPA requirements, see CRS Report RL33152, *The National Environmental Policy Act (NEPA) Background and Implementation*, by Linda Luther.

[51] Documents submitted by TransCanada for its initial 2008 Presidential Permit application, now archived by DOS, are available at http://keystonepipeline-xl.state.gov/archive/proj_docs/index.htm.

[52] 40 C.F.R. §1508.5. Also, Executive Order 13337 directs the Secretary of State to refer an application for a Presidential Permit to other specifically identified federal departments and agencies on whether granting the application would be in the national interest.

as well as state agencies. **Table A-1** (in the **Appendix**) provides a list of various agencies and their roles in the pipeline permitting process.

In addition to its role as a cooperating agency, EPA is also required to review and comment publicly on the EIS and rate both the adequacy of the EIS itself and the level of environmental impact of the proposed project.[53] EPA's role in rating draft EISs for the Keystone XL pipeline project had a significant impact on the NEPA process for TransCanada's 2008 Presidential Permit application.

The State Department released its draft EIS for the proposed Keystone XL Pipeline project for public comment on April 16, 2010.[54] On July 16, 2010, EPA rated the draft EIS "Inadequate."[55] EPA found that potentially significant impacts were not evaluated and that the additional information and analysis needed was of such importance that the draft EIS would need to be formally revised and again made available for public review. DOS issued a supplemental draft EIS on April 15, 2011.[56] In addition to addressing issues associated with EPA's inadequacy rating, the supplemental draft EIS addressed comments received from other agencies and the public. On June 6, 2011, EPA sent a letter to the State Department that rated the supplemental draft EIS as having "Insufficient Information" and having "Environmental Objections" to the proposed action.[57] EPA acknowledged that DOS had "worked diligently" to develop additional information in response to EPA's comments on the draft EIS, but additional analysis was needed on several points, including potential oil spill risks and lifecycle greenhouse gas emissions associated with the proposed project.

In its June 6, 2011 letter, EPA refers to agreements with DOS that certain deficiencies identified in the supplemental draft EIS would be addressed in the final EIS. On August 26, 2011, DOS did issue the final EIS for the proposed Keystone XL Pipeline (hereafter referred to as 2011 FEIS).[58] Although DOS addressed stakeholder comments, including those of EPA, in its 2011 FEIS,[59] it is unknown whether EPA made any additional comments to DOS during the 90-day public review period marking the national interest determination (discussed below). Regardless, EPA will have

[53] Rating the EIS takes place after the draft is issued. The EIS could be rated either "Adequate," "Insufficient Information," or "Inadequate." EPA's rating of a project's environmental impacts may range from "Lack of Objections" to "Environmentally Unsatisfactory." In rating the impact of the action itself, EPA would specify one of the following: "Lack of Objections," "Environmental Concerns," "Environmental Objections," or "Environmentally Unsatisfactory." The federal agency would then be required to respond to EPA's rating, as appropriate. For more information, see the U.S. Environmental Protection Agency's "Environmental Impact Statement (EIS) Rating System Criteria" at http://www.epa.gov/compliance/nepa/comments/ratings.html.

[54] EISs prepared by DOS for TransCanada's 2008 Presidential Permit application, now archived by DOS, are available at http://keystonepipeline-xl.state.gov/archive/dos_docs/index.htm.

[55] U.S. Environmental Protection Agency's July 16, 2010, letter to the U.S. Department of State commenting on the draft EIS for the Keystone XL project is available at http://yosemite.epa.gov/oeca/webeis.nsf/%28PDFView%29/20100126/$file/20100126.PDF.

[56] See footnote 54.

[57] U.S. Environmental Protection Agency's June 6, 2011 letter to the U.S. Department of State commenting on the supplemental draft EIS for the Keystone XL project is available at http://yosemite.epa.gov/oeca/webeis.nsf/%28PDFView%29/20110125/$file/20110125.PDF?OpenElement.

[58] U.S. Department of State, *Final Environmental Impact Statement for the Proposed Keystone XL Project*, August 26, 2011 (with portions amended September 22, 2011), available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/index.htm.

[59] 2011 final EIS, "Appendix A, Responses to Comments and Scoping Summary Report," available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/vol3and4/appendixa/index.htm.

an opportunity to comment on NEPA documentation prepared for TransCanada's May 2012 permit application.

Identification of Environmental Impacts During the National Interest Determination

Generally, the NEPA review is considered complete when (or if) the federal agency issues a final Record of Decision (ROD), formalizing the selection of a project alternative. However, for a project subject to a Presidential Permit, issuance of a final EIS marks the beginning of a 90-day public review period during which DOS gathers additional information necessary to make its national interest determination. For previous Presidential Permits, a ROD and National Interest Determination were issued as the same document.[60]

Issuance of the ROD and National Interest Determination involve distinctly different, yet interrelated requirements. Under NEPA, DOS must fully assess the environmental consequences of an action and potential project alternatives *before* making a final decision. NEPA does not prohibit a federal action that has adverse environment impacts; it requires only that a federal agency be fully *aware of* and *consider* those adverse impacts before selecting a final project alternative. That is, NEPA is intended to be part of the decision-making process, not dictate a particular outcome.

The DOS's national interest determination, however, does dictate a particular outcome—approval or denial of a Presidential Permit. Issuance of a Presidential Permit is predicated on the finding that the proposed project would serve the national interest. While NEPA does not prohibit federal actions with adverse environmental impacts, a project's adverse environmental impacts may lead the DOS to determine that the project is not in the national interest.

Table 2 summarizes milestones in the national interest determination for TransCanada's initial permit application.[61]

[60] U.S. Department of State, *Department of State Record of Decision and National Interest Determination, TransCanada Keystone Pipeline, LP Application for Presidential Permit*, February 25, 2008.

[61] A more comprehensive timeline is provided in CRS Report R41668, *Keystone XL Pipeline Project Key Issues*, by Paul W. Parfomak, Linda Luther, and Adam Vann.

Oil Spills

A primary environmental concern of any oil pipeline is the risk of a spill. The impacts of an oil spill depend on multiple factors, including: the type of oil spilled and the size and location of the spill.[75] Location is generally considered the most important factor, as highlighted by DOS:

> The greatest concern would be a spill in environmentally sensitive areas, such as wetlands, flowing streams and rivers, shallow groundwater areas, areas near water intakes for drinking water or for commercial/industrial uses, and areas with populations of sensitive wildlife or plant species.[76]

Location-specific concerns played a key role in DOS's November 2011 decision to obtain additional information before making its national interest determination for TransCanada's 2008 Presidential Permit application. Regarding its decision, DOS stated:

> [P]articularly given the concentration of concerns regarding the environmental sensitivities of the current proposed route through the Sand Hills area of Nebraska, the Department has determined it needs to undertake an in-depth assessment of potential alternative routes in Nebraska.[77]

In part as a result of DOS's decision, TransCanada announced that it would work with the Nebraska Department of Environmental Quality to identify a potential pipeline route avoiding the Nebraska Sand Hills (**Table 2**).

Pipeline integrity concerns—whether real or perceived—were magnified by a 2010 oil sands crude pipeline spill in Michigan. On July 26, 2010, a 40-year old pipeline, operated by Enbridge, released approximately 800,000 gallons of oil sands crude oil[78] into Talmadge Creek, a waterway that flows into the Kalamazoo River (Michigan).[79] The National Transportation Safety Board (NTSB) issued a synopsis of its upcoming investigatory report in July 25, 2012.[80] The synopsis did not include a probable cause analysis, but it concluded that internal corrosion was not a factor in the incident.

Based on experience with pipelines historically, the Keystone XL pipeline will likely lead to some number of oil spills over the course of its operating life, regardless of design, construction, and safety measures. However, the frequency, volume, and location of spills are unknown. Some contend that proponents of the pipeline understate oil spill risks; others contend that pipeline opponents overstate the risks.

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[75] See CRS Report RL33705, *Oil Spills in U.S. Coastal Waters Background and Governance*, by Jonathan L. Ramseur.

[76] 2011 FEIS, "Executive Summary," p. ES-9, available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/vol1/index.htm.

[77] U.S. Department of State, "Keystone XL Pipeline Project Review Process: Decision to Seek Additional Information," Media Note, PRN 2011/1909, Office of the Spokesperson, November 10, 2011.

[78] See the Enbridge response website "Frequently Asked Questions" at http://www.response.enbridgeus.com/response/main.aspx?id=12783#Type_of_oil.; and *Tar Sands Pipelines Safety Risks* (citing a conference call with Enbridge CEO).

[79] For more up-to-date information, see EPA's Enbridge oil spill website at http://www.epa.gov/enbridgespill/index.html.

[80] See http://www.ntsb.gov/news/events/2012/marshall_mi/index.html. The final report is expected in the Fall of 2012 (personal communication with the NTSB, March 19, 2012).

A key question for policymakers is whether the Keystone XL proposed pipeline is different from other pipelines. For example, would the project impose a greater or lesser risk of an oil spill than another oil pipeline?

Oil Sands Crudes—Characteristics

Some environmental groups have argued that the pipeline would pose additional oil spill risks due to the material being transported.[81] They have asserted that diluted bitumen (Dilbit) poses particular concerns of volatility and corrosivity that may pose additional risks to the pipeline's integrity. Whether or not these issues warrant concern is debatable. Regardless, the concerns led Congress to enact provisions in P.L. 112-90 calling for further study. These issues are discussed below.

Volatility

According to a 2011 environmental groups' report, "at high temperatures, the mixture of light, gaseous condensate, and thick, heavy bitumen, can become unstable."[82] It is uncertain what constitutes a high temperature in this context. For example, would the temperature be within the range of the pipeline's operating parameters? Regardless, some have questioned this conclusion.[83]

One of the citations in the 2011 report that is cited as support for the above statement is an "expert viewpoint"[84] that does not specifically address pipeline transportation, but seems to discuss behavior of oil sands in the reservoir. The other is a study modeling liquid-column separation in oil pipelines—perhaps a relevant issue (discussed below)—but this study does not appear to distinguish between different crude oil types.[85]

Related to the assertion of volatility, the 2011 report highlights a process—described as liquid-column separation—that could potentially occur in pipelines when changes in pipeline pressure causes some of the natural gas liquid component to change into a gas bubble. According to the report, when these gas bubbles burst they release high pressure that can damage a pipeline (a process described as cavitation). The report states that "instability of DilBit can render pipelines particularly susceptible to ruptures caused by pressure spikes."[86]

However, DOS countered this assertion stating that it:

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[81] Anthony Swift et al, *Tar Sands Pipelines Safety Risks*, Joint Report by Natural Resources Defense Council, National Wildlife Federation, Pipeline Safety Trust, and Sierra Club, February 2011 (hereafter *Tar Sands Pipelines Safety Risks*); see also Anthony Swift et al, *Pipeline and Tanker Trouble The Impact to British Columbia's Communities, Rivers, and Pacific Coastline from Tar Sands Oil Transport*, Joint Report by Natural Resources Defense Council, Pembina Institute, and Living Oceans Society, November 2011 (hereafter *Pipeline and Tanker Trouble*).

[82] *Tar Sands Pipelines Safety Risks*.

[83] See Crude Quality Inc., *Report regarding the U.S. Department of State Supplementary Draft Environmental Impact Statement*, May 2011; and Energy Resources Conservation Board, Press Release, "ERCB Addresses Statements in Natural Resources Defense Council Pipeline Safety Report," February 2011.

[84] As cited by *Tar Sands Pipelines Safety Risks*: Expert Viewpoint (John Shaw, University of Alberta) – Phase Behaviors of Heavy Oils and Bitumen," Schlumberger Ltd., 2011. The cited website no longer leads to this source, but CRS located the material using the Internet "Wayback Machine," at http://web.archive.org.

[85] Changjun Li et al., *Study on Liquid-Column Separation in Oil Transport Pipeline*, American Society of Civil Engineers, International Conference on Pipelines and Trenchless Technology 2009.

[86] *Tar Sands Pipelines Safety Risks*.

> contacted the author [that NRDC cited to support the above statement]... to address this concern and determined that it would not be valid to infer from this research that dilbits are any more or less stable than other crude oils, or that they are more likely to cause pressure spikes during transport in pipelines or otherwise pose an increased risk to pipeline safety.[87]

Corrosivity

Some argue that DilBit pipelines may be more likely to fail than other crude oil pipelines because the bitumen mixtures they carry are "significantly more corrosive to pipeline systems than conventional crude."[88] Three DilBit properties of particular interest are acidity, sulfur content, and solids content, all of which may influence the overall corrosiveness of a given blend of crude oil. The 2011 report also focuses on these specific DilBit properties and their potential influence on pipeline corrosion, asserting:

> Compared to "conventional" crudes, DilBit blends are thicker and more acidic, and contain more sulfur, chloride salts, and quartz sand particles. These characteristics create a "combination of chemical corrosion and physical abrasion [that] can dramatically increase the rate of pipeline deterioration."[89]

To what extent these claims may be correct is the subject of debate. Alberta's Energy Resources Conservation Board (ERCB), among other stakeholders, has rejected the claims from the 2011 report, stating that "there is no reason to expect this product to behave in any substantially different way than other oil...."[90] Additional background on the specific DilBit characteristics of concern may offer a greater understanding of the corrosion mechanisms at issue, but not necessarily resolve the debate.

Total Acid Number

As indicated in **Table 1** (above) Canadian DilBit total acid numbers (TANs) range between 0.92 to 2.49. This range is generally higher than lighter crude oils, but comparable with other heavy oils. It is well-established that the presence of naphthenic acids in high TAN crudes can considerably increase corrosion potential in the parts of refinery distillation units operating at high temperature—above 400°F.[91] However, pipeline transportation of DilBit is expected to occur at much lower temperatures: the maximum operating temperature for Keystone XL is 150°F. Moreover, DilBit pipeline corrosion rates may not have a direct correlation with TAN values. There is evidence of more than 1,000 napthenic acid varieties with varying corrosivity, which may comprise a single TAN number.[92] TAN values depend upon the specific content and types of

[87] 2011 FEIS, "Potential Releases," p. 3-13.45, available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/vol2/env/index.htm.

[88] *Tar Sands Pipelines Safety Risks.*

[89] *Tar Sands Pipelines Safety Risks.*

[90] Canadian Energy Resources Conservation Board (ERCB), "ERCB Addresses Statements in Natural Resources Defense Council Pipeline Safety Report," Press release, Calgary, Alberta, February 16, 2011.

[91] Dennis Haynes, *Naphthenic Acid Bearing Refinery Feedstocks and Corrosion Abatement*, Presentation to the AIChE Chicago Symposium, 2006, p. 7; Bruce Randolph, James Scinta, Eric Vetters, et al., *Challenges in Processing Canadian Oilsands Crude – A US Refiners' Perspective,* Canadian Crude Quality Technical Association, June 25, 2008.

[92] See Anne Shafizadeh et al., "High Acid Crudes," Presentation to the Crude Oil Quality Group New Orleans Meeting, January 30, 2003, http://www.coqa-inc.org/20030130High%20Acid%20Crudes.pdf.

compounds in specific crudes—which may vary significantly from crude to crude.[93] Some testing of pipeline steels has shown that Canadian oil sands crudes exhibit "very low corrosion rates" despite high TAN numbers, in part because they contain other "inhibitor" compounds that reduce the corrosivity of the bitumen.[94] Therefore, it is uncertain whether refiners' experiences with corrosion from high TAN crudes can be directly extended to DilBit transmission pipelines.

Sulfur Content

Another factor in crude oil corrosivity is sulfur content. Crude oils sent to U.S. refineries typically contain 0.5% to 2.5% sulfur.[95] As indicated in **Table 1**, DilBits have sulfur content substantially above this range—between 3% and 5%. In sour crudes (> 1% sulfur content), sulfur is present as hydrogen sulfide (H_2S),[96] which can combine with water to form sulfuric acid (H_2SO_4), a strongly corrosive acid. Like napthenic acid corrosion (discussed above), sulfidic corrosion is a high temperature phenomenon, beginning above 500°F.[97] In pipelines, H_2S can also interact with napthenic acids, carbon dioxide (CO_2) and solids, complicating the possible corrosion processes at work. Research and refiner experience suggest that sulfuric and napthenic acid corrosivity can be inhibited or augmented by the presence of specific sulfur compounds depending upon the chemical characteristics of those compounds (e.g., how readily they decompose into H_2S), whether they are in liquid or vapor phase, and other factors.[98] In some cases, H_2S can form a protective sulfide coating that actually prevents corrosion.[99] Thus, as in the case of TAN levels, sulfur content in crude oil may not accurately reflect corrosivity, notwithstanding the common use of sulfur content to indicate sulfidic corrosion potential in refinery equipment.[100] For these reasons, the direct application of sulfidic corrosion experience in refineries to lower temperature crude oil pipelines may be inconsistent with chemical processes involved.

[93] Canadian Crude Quality Technical Association, TAN Phase III Project, Meeting Minutes of June 23, 2009, http://www.ccqta.com/docs/documents/Projects/TAN_Phase_III/TAN%20Phase%20III%20March%202009%20Minutes.pdf.

[94] Rena Liviniuk, et al., "Organic Acid Structure – A Correlation With Corrosivity," AM-09-20, Presented to the National Petrochemical and Refiners Association, Annual Meeting, March 22-24, 2009, San Antonio, TX, p. 9.

[95] U.S. Energy Information Administration, "Crude Oil Input Qualities: Sulfur Content, Annual," Internet table, June 29, 2011, http://www.eia.gov/dnav/pet/pet_pnp_crq_a_EPC0_YCS_pct_a.htm.

[96] H_2S is generated at temperatures greater than 392 F (200 C) through a reaction between carbon-containing and sulfur-containing compounds in the crude. Thus, H_2S can be generated during the oil sands thermal extraction process. See: G.G. Hoffmann, et al., "Thermal Recovery Processes and Hydrogen Sulfide Formation," Presented at the Society of Petroleum Engineers International Symposium on Oilfield Chemistry, San Antonio, Texas, February 14-17, 1995.

[97] H.M. Shalaby, "Refining of Kuwait's Heavy Crude Oil: Materials Challenges," Workshop on Corrosion and Protection of Metals, Arab School for Science and Technology, Kuwait, December 3-7, 2005, p. 5; http://www.arabschool.org/pdf_notes/20_REFINING_OF_KUWAITS_HEAVY_CRUDE_OIL.pdf.

[98] Ibid., p.6; Heather Dettman, et al, "Refinery Corrosion: The Influence of Organic Acid and Sulphur Compund Structure on Global Crude Corrosivity," Presentation to the 5th NCUT Upgrading and Refining Conference 2009, Edmonton, Alberta, September 14 - 16, 2009; Dennis Haynes, 2006, p. 8.

[99] Gregory R. Ruschau, and Mohammed A. Al-Anez, *Oil and Gas Exploration and Production*, Appendix S, Corrosion Prevention, p. S6, in: CC Technologies Laboratories, Inc., *Corrosion Costs And Preventive Strategies In The United States*, Report to the U.S. Federal Highway Administration, Office of Infrastructure Research and Development, Report FHWA-RD-01-156, September 2001, http://www.corrosioncost.com/pdf/oilgas.pdf.

[100] H.M Shalaby, 2005, p. 6.

Abrasive Solids

Solids suspended in crude oil have the potential to accelerate corrosion in pipelines either by settling out (forming corrosive conditions beneath them) or through abrasion. Abrasion has been raised as a particular concern for DilBit pipelines because DilBit may contain significantly more solids than conventional crudes.[101] These solids, it is argued, might wear away the interior walls of a pipeline and exacerbate wall loss from acidic corrosion. Some have compared this process to sandblasters.[102] However, CRS is not aware of publically available research that has examined whether the conditions exist for significant internal abrasion of DilBit pipelines. Crude oils with high solids content are also generally filtered to meet the quality specifications set by pipelines and refiners. Thus DilBit blends may have solids content higher than other types of crudes, but still within an acceptable range for pipeline and refinery operations.

Keystone XL Pipeline Operating Parameters

Multiple parties submitted comments to DOS, highlighting the Keystone XL pipeline operating parameters as a particular concern.[103] The 2011 environmental groups' report claims that "the risks of corrosion and the abrasive nature of DilBit are made worse by the relatively high heat and pressure."[104]

The report asserts the pipeline will be operating at temperatures "up to 158° F," which is substantially higher than conventional crude pipelines, which, according to the report, operate at less than 100° F.[105] TransCanada has stated that "oil in a line like this comes into our pipeline between 80-120°F, and it stays within that temperature range during transport."[106] In the 2011 FEIS, DOS states that the maximum operating temperature of the proposed pipeline would not exceed 150° F. It is uncertain whether this 150° F mark is an upper bound that might be approached on rare occasions, or whether the operating temperature would typically hover near this maximum. Either way, it is below the maximum operational temperature cited by some environmental groups.

According to the report, conventional crude pipeline pressure is 600 pounds per square-inch (PSI), while diluted bitumen requires a pipeline pressure of 1,440 psi[107] A subsequent 2011 report lists this figure as 2,130 psi.[108] Regardless, the 2011 FEIS lists the Keystone XL operating pressure as 1,308 psi.

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[101] Baker Hughes Inc., *Planning Ahead for Effective Canadian Crude Processing*, Sugar Land, TX, 2010, p. 4, http://www.bakerhughes.com/assets/media/whitepapers/4c2a3c8ffa7e1c3c7400001d/file/28271-canadian_crudeoil_update_whitepaper_06-10.pdf.pdf&fs=1497549.

[102] *Tar Sands Pipelines Safety Risks.*.

[103] See 2011 final EIS, "Appendix A, Responses to Comments and Scoping Summary Report," available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/vol3and4/appendixa/index.htm.

[104] *Tar Sands Pipelines Safety Risks.*

[105] *Tar Sands Pipelines Safety Risks.*

[106] TransCanada, "TransCanada's Keystone XL Pipeline – Know the Facts," fact sheet, May 2011, http://www.transcanada.com/docs/Key_Projects/know_the_facts_kxl.pdf.

[107] *Tar Sands Pipelines Safety Risks.*

[108] *Pipeline and Tanker Trouble.*

The degree to which the Keystone XL pipeline's operating parameters differ from other oil pipeline operating parameters is beyond the scope of this report. In general, the Keystone XL operating parameters are different, because diluted bitumen (and heavy crude oils) are more viscous (resistant to flow) than conventional crude oil. According to a 2011 review of heavy crude transportation:

> Pipelining of heavy oil presents problems like instability of asphaltenes, paraffin precipitation and high viscosity that cause multiphase flow, clogging of pipes, high-pressure drops, and production stops.[109]

The same review describes several options that may be used "to resolve or improve pipelining of heavy and extra-heavy crude oil." These options include dilution with other substances and increasing/conserving the oil's temperature. Both of these options would reduce viscosity and both seem to be part of the Keystone XL proposed operations.

DOS states that the proposed pipeline would satisfy the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations (49 CFR Part 195) that apply to hazardous liquid pipelines. In addition, Keystone agreed to implement 57 additional measures developed by PHMSA. In consultation with PHMSA, DOS determined that incorporation of those conditions:

> would result in a Project that would have a degree of safety over any other typically constructed domestic oil pipeline system under current code and a degree of safety along the entire length of the pipeline system similar to that which is required in High Consequence Areas (HCAs) as defined in 49 CFR 195.450.[110]

The *degree* to which the additional 57 measures mitigate risk is debatable. For instance, the primary author of the 2011 environmental groups' report argued that only 12 of these conditions actually differ in some way from minimum requirements.[111]

Oil Pipeline Spill Data from Alberta

Many stakeholders have argued a comparison of oil spill data from Alberta and the United States indicates that internal corrosion has led to substantially more oil spills in the Alberta pipeline system than the U.S. system.[112] They reason that this difference is likely related to high proportion of oil sands crudes, which have been in the Alberta system since the 1980s. In contrast, the first dedicated oil sands crudes pipeline in the United States, the Alberta Clipper, began operating in 2010.[113]

DOS rejected this assertion, stating:

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[109] Rafael Martinez-Palou et al., "Transportation of Heavy and Extra-Heavy Crude Oil by Pipeline: A Review," *Journal of Petroleum Science and Engineering*, Vol. 75, pp. 274-282, January 2011.

[110] 2011 FEIS, "Project Description," p. 2-23, available at http://keystonepipeline-xl.state.gov/archive/dos_docs/feis/vol1/index.htm.

[111] Anthony Swift, "Clinton's Tar Sands Pipeline 'Safety Conditions' are Smoke and Mirrors," August 19, 2011, at http://switchboard.nrdc.org.

[112] 2011 FEIS, Appendix A (see footnote 59).

[113] *Tar Sands Pipelines Safety Risks*.

> [T]here is no evidence that the transportation of oil sands derived crude oil in Alberta has resulted in a higher corrosion related failure rate than occurs in the transportation of the variable-sourced crude oils in the U.S. system.[114]

Further, DOS pointed out that a comparison of the oil spill data is problematic for various reasons. In particular, the scopes of the data collected in each nation are different. Canadian data includes smaller spills and spills from certain pipelines not covered by PHMSA regulations. To address these discrepancies in data collection, PHMSA prepared a comparison of pipeline incidents of similar scopes between the two databases. This comparison was part of the 2011 FEIS and is provided below in **Table 4**.

Table 4. PHMSA Comparison of Oil Pipeline Incidents in Alberta and United States

2002 - 2010

Crude Oil Pipeline Failures U.S. and Alberta \ (2002-2010)		
U.S. Crude Oil Pipeline Incident History[a]		
Incident/Failure Case	**Failures/Year**	**Failures per 1,000 Pipeline Miles per Year**
Corrosion - External	9.8	0.19
Corrosion - Internal	22.1	0.42
All Failures	89.3	1.70
Alberta Crude Oil Pipeline Incident History[b]		
Corrosion - External	2.3	0.21
Corrosion - Internal	3.6	0.32
All Failures	22.0	1.97

Source: Reproduced by CRS; original table from 2011 FEIS, , p. 3.13-38 (Table 3.13.5-4).

Notes: The following notes are included in the table in the 2011 FEIS:

a. PHMSA includes spill incidents greater than 5 gallons. U.S. had 52,475 miles of crude oil pipelines in 2008.

b. Alberta Energy and Utility Board Report, includes spills greater than and less than 5 bbls. Alberta had 11,187 miles of crude oil pipelines in 2006.

This comparison indicates that internal corrosion failures (per 1,000 miles of pipeline) were approximately 30% higher in the U.S. system (0.42 vs. 0.32). Regardless, such comparisons are challenging, if not impossible, considering the range of potential factors—pipeline age, enforcement, etc.—that may affect the underlying data. For this reason, the above comparison might be described as preliminary.

Keystone XL Spill Frequency Estimates

Spill frequency estimates for the Keystone XL project have been a subject of debate. During the NEPA process, Keystone submitted a spill frequency estimate of 0.22 spills per year. The company derived this estimate by using historical databases from PHMSA and then applying

[114] 2011 FEIS, "Potential Releases," p. 3.13-38 (see footnote 87).

project-specific factors, such as regulatory requirements, material strength, and technological advances.

However, some questioned Keystone's modified estimate, arguing that the pipeline's operating parameters—temperatures and pressures higher than conventional crude pipelines—would yield spill frequencies above historical averages, rather than below.[115]

Subsequent to Keystone's estimate, the DOS estimated that a spill over 50 barrels would occur between 1.2 to 1.8 times per year; spills of any size would occur between 1.8 to 2.5 times per year.[116]

Another potential source of data is the pipeline operating history of Keystone. Keystone has operated the Keystone Mainline pipeline and the Cushing Extension since 2010. Since that time the Keystone pipeline has generated 14 unintentional releases. DOS cites personal communication with PHMSA staff, who stated that these incidents are "not unusual start-up issues that occur on pipeline and are not unique."[117] Regardless, this figure is considerably higher than the Keystone XL spill frequency estimates DOS included in its 2011 FEIS.

Spill Size Estimates

Citing the PHMSA significant incident database,[118] DOS indicates that between 1990 and 2010, the average spill size for onshore hazardous liquid pipelines, which includes both oil and other materials, was less than 1,000 barrels (42,000 gallons).[119] Using this database, CRS calculated the exact average spill to be 918 barrels (38,556 gallons). Per the spill size classification included in the 2011 FEIS, the average spill would be considered a "large spill."[120]

One may question whether this database is the best tool for predicting spill size from the Keystone XL pipeline. The database includes oil and other hazardous liquids; pipelines of varying sizes and pressures; and pipelines of varying ages. A more refined comparison may offer policymakers a better prediction of possible spill size, but the PHMSA database is not immediately amenable to a more tailored assessment.

In its 2011 FEIS, DOS seems to suggest that "very large spills" (defined as greater than 5,000 barrels or 210,000 gallons) would require a dramatic event. According to DOS:

> A very large spill from the pipeline would likely require the occurrence of an event that would shear the pipeline such as major earth movement resulting from slides, major earth movement resulting from an earthquake, major flood flows eroding river banks at non-HDD

[115] See John Stansbury, *Analysis of Frequency, Magnitude and Consequence of Worst-Case Spills from the Proposed Keystone XL Pipeline*, Submitted as a comment to the supplemental draft EIS and later cited in the 2011 FEIS.

[116] 2011 FEIS, "Potential Releases," pp. 3.13-18 – 3.13-21 (see footnote 87).

[117] 2011 FEIS, "Potential Releases," p. 3.13-11 (see footnote 87).

[118] The significant incident database represents a subset of all incidents. To qualify as "significant" an incident must result in one of the following: (1) a fatality or injury requiring in-patient hospitalization; (2) $50,000 or more in total costs, measured in 1984 dollars; (3) a highly volatile liquid release of 5 barrels or more or other liquid releases of 50 barrels or more; or (4) a liquid releases resulting in an unintentional fire or explosion.

[119] 2011 FEIS, "Potential Releases," p. 3.13-15 (see footnote 87).

[120] Ibid.

> crossings, mechanical damage from third-party excavation or drilling work, or vandalism, sabotage, or terrorist actions.[121]

This assertion will be tested when the NTSB releases its investigation results for the July 2010 Enbridge oil spill.[122] That spill was a "very large spill," releasing over 800,000 gallons into the Kalamazoo River in Michigan.

Regardless, an average spill can require substantial cleanup efforts in certain locations. The July 2011 ExxonMobil spill into the Yellowstone River was approximately 42,000 gallons. The EPA is overseeing this oil spill response. In August 2011, over 1,000 personnel were engaged in cleanup and shoreline assessment efforts.[123] As of February 2012, the federal government has assigned $3.8 million from the Oil Spill Liability Trust Fund to address response activities.[124] This figure would not capture the expenses from the responsible party.

Environmental Impacts of Spills of Oil Sands Crude

Some contend that the distinct chemical composition of oil sands crude (e.g., DilBit) would pose a greater environmental risk from an oil spill than other crudes.[125] CRS is not aware of an authoritative study that has examined this assertion. Although parallels may be drawn between the possible behavior of conventional crudes and DilBit, studies are scarce regarding spills of heavy crudes with the specific composition of Canadian heavy crudes.

The behavior of crude oil spills and the fate of crude oil in the subsurface have been studied extensively around the world for a wide range of conventional crudes and other petrochemicals in both experimental settings and actual spills (e.g., Bemidji, Minnesota in 1979).[126] These include studies of specific chemical components that may be present in DilBit (e.g., benzene).[127] Based on extensive experience with other crudes and DilBit constituents, analysts may claim

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[121] Ibid.

[122] Although a synopsis of this report was made available July 10, 2012, NTSB has not released the final report. See http://www.ntsb.gov/news/events/2012/marshall_mi/index.html.

[123] See EPA Update on Yellowstone River Oil Spill (Silvertip Pipeline), August 12, 2011, at http://www.epa.gov/yellowstoneriverspill/.

[124] Personal communication with U.S. Coast Guard, February 14, 2012.

[125] Swift et al, p. 7.

[126] See, for example, work compiled by the U.S. Geological Survey about the 1979 crude oil spill near Bemidji, MN, which contaminated a shallow aquifer: U.S. Geological Survey, "Crude Oil Contamination in the Shallow Subsurface: Bemidji, Minnesota," Internet page, July 20, 2011, http://toxics.usgs.gov/sites/bemidji_page.html. See also: M. Whittaker, S.J.T. Pollard, and T.E. Fallick, "Characterisation of Refractory Wastes at Heavy Oil-Contaminated Sites: A Review of Conventional and Novel Analytical Methods," *Environmental Technology*, Vol. 16, No. 11, November 1, 1995, pp. 1009-1033; S Khaitan et al., "Remediation of Sites Contaminated by Oil Refinery Operations," *Environmental Progress*, Vol. 25, No. 1, April 2006, pp. 20-31.

[127] See, for example: Lisa M. Geig et al., "Intrinsic Bioremediation of Petroleum Hydrocarbons in a Gas Condensate-Contaminated Aquifer," *Environmental Science and Technology*, vol. 33, no. 15 (1999), pp. 2550-2560; Paul E. Hardisty, et al., "Characterization of LNAPL in Fractured Rock," *Quarterly Journal of Engineering Geology & Hydrogeology*, Vol. 36, No. 4, November 2003, p. 343-354; J.L. Busch-Harris, e al., "In Situ Assessment of Benzene Biodegradation Potential in a Gas Condensate Contaminated Aquifer," Proceedings of 11th Annual International Petroleum Environmental Conference, Albuquerque, NM, October 12-15, 2004; John A. Connor, et al., "Nature, Frequency, and Cost of Environmental Remediation at Onshore Oil and Gas Exploration and Production Sites," *Remediation*, Vol. 21, No. 3, Summer 2011, pp. 121-144; Bruce E Rittmann, et al., *Natural Attenuation for Groundwater Remediation*, National Academy Press, 2000.

considerable confidence in models of DilBit behavior around groundwater. For example, the Energy Resources Conservation Board has stated that "DilBit should behave in much the same manner as other crude oils of similar characteristics."[128]

All spilled oil begins to "weather" or separate into different components over time. In general, heavier oils, like DilBit, are more persistent and may present greater technical challenges in oil removal operations than lighter crude oils. For a land spill, the heavier and more viscous components (i.e., the asphaltenes) would likely remain trapped in soil pores above the water table. It is also likely that the lighter constituents would partly evaporate and not be transported down through the soil with the heavier components.

However, if an oil spill reached the water table, some of the more soluble portions would likely dissolve into the groundwater and be transported in the direction of regional groundwater flow. The ultimate extent, shape, and composition of a groundwater contaminant plume resulting from a DilBit spill would depend on the specific characteristics of the soil, aquifer, and the amount and duration of the accidental release.

The heavier components of a DilBit spill would be difficult to remove from the soil during cleanup operations, and may require wholesale soil removal instead of other remediation techniques.[129] These challenges may come at a higher cost. In an oil spill model prepared for EPA, the model estimates that spills of heavy oil will cost nearly twice as much to clean up as comparable spills of conventional crude oil.[130]

Crude oils may contain multiple compounds that present toxicity concerns. DOS stated that "based on the combination of toxicity, solubility, and bioavailability, benzene was determined to dominate toxicity associated with potential crude oil spills."[131] Benzene and other BTEX compounds (benzene, toluene, ethyl benzene, and xylene) are generally in greater proportions in the lighter crude oils and particularly in refined products like gasoline.[132] In its 2011 FEIS, DOS compared the BTEX content of crude oil derived from oil sands (DilBit and DilSynBit) with conventional crude oils from Canada. The BTEX content of oil sands crudes ranged from 5,800 parts per million (ppm) to 9,100 ppm. The BTEX contents of conventional crude oils ranged from 5,800 ppm to 29,100 ppm.[133]

Other toxic compounds of concern in crude oils are polycyclic aromatic hydrocarbons (PAHs). Generally, PAHs are more toxic than BTEX and evaporate at a slower rate, but they are less soluble in water. The National Research Council's *Oil in the Sea* report stated that with

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[128] Canadian Energy Resources Conservation Board (ERCB), "ERCB Addresses Statements in Natural Resources Defense Council Pipeline Safety Report," Press release, Calgary, Alberta, February 16, 2011.

[129] One such other method is "pump and treat," which involves cleaning soil and groundwater contamination by pumping and capturing the contaminated groundwater, then treating it at the surface to remove the contaminants. The same technique may be used to extract soil gas vapor from contaminated soil above the water table. For more information, see Environmental Protection Agency, *Basics of Pump-and-Treat Ground-Water Remediation Technology*, EPA/800/8-90003, March 1990.

[130] Dagmar Etkin, *Modeling Oil Spill Response and Damages Costs*, Proceedings of the 5th Biennial Freshwater Spills Symposium, 2004, at http://www.environmental-research.com.

[131] 2011 FEIS, "Potential Releases," p. 3.13-80 (see footnote 87).

[132] For a comprehensive discussion, see National Research Council, *Oil in the Sea III Inputs, Fates, and Effects*, National Academies of Science, February 2003.

[133] 2011 FEIS, "Potential Releases," Table 3.13.5-6, p. 3.13-45 (see footnote 87).

weathering/evaporation and the resulting loss of BTEX, PAHs become more important contributors to the remaining oil's toxicity.[134]

Unlike BTEX, the 2011 FEIS does not include a comparison of PAH concentrations across different crude oils. DOS states that PAH concentrations of crude oils that would be transported in the Keystone XL pipeline are unknown, because this information is proprietary.[135] Some commenters, including EPA, took issue with this during the EIS review process.[136]

Heavy metals may also be a concern. A 2011 NRDC report states that Dilbit contains quantities of heavy metals, particularly vanadium and nickel, that are "significantly larger" than conventional crude oil.[137] Assuming conventional oil means lighter crudes, this statement is largely correct.[138] However, the heavy metal concentrations in DilBit are similar to some other heavy crude oils, such as Mexican and Venezuela crudes that are processed in Gulf Coast refineries.[139] Most, if not all, of this crude oil arrives in the United States via vessel.[140]

Further Study

DOT officials acknowledge that they have not performed any specific studies nor reassessments of pipeline safety risks that might be unique to DilBit.[141] In addition, DOS points out that "a focused, peer-reviewed study of the potential corrosivity/erosivity of WCSB oil sands derived crude oils relative to other crude oils has not yet been conducted."[142]

Some in Congress have called for a review of DOT pipeline safety regulations to determine whether new regulations for Canadian heavy crudes are needed to account for any unique properties they may have. Accordingly, P.L. 112-90 requires PHMSA to review whether current regulations are sufficient to regulate pipelines transmitting "diluted bitumen," and analyze whether such oil presents an increased risk of release (§16).

Oil Sands Extraction Concerns

Opponents of the Keystone XL pipeline and oil sands development often highlight the environmental impacts that pertain to the region in which the oil sands resources are extracted. In general, these local/regional impacts from Canadian oil sands development may not directly

[134] National Research Council, 2003, p. 126.

[135] 2011 FEIS, "Potential Releases," p. 3.13-31 (see footnote 87).

[136] See footnote 57 regarding EPA's June 6, 2011 comments.

[137] Anthony Swift, Susan Casey-Lefkowitz, and Elizabeth Shope, *Tar Sands Pipelines Safety Risks*, Natural Resources Defense Council (NRDC), February 2011.

[138] Based on a comparison of crude oil assays from sources listed in Table 1.

[139] 2011 FEIS, "Potential Releases," Table 3.13.5-7 (see footnote 87).

[140] Although a considerable percentage of oil imports come from Mexico (e.g., approximately 12% of crude oil imports in 2010), the EIA states that "Mexico does not have any international pipeline connections, with most exports leaving the country via tanker from three export terminals in the southern part of the country." EIA, Country Analysis Briefs, at http://www.eia.gov/cabs/Mexico/Full.html.

[141] The Honorable Cynthia L. Quarterman, Administrator, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Testimony before the U.S. House Committee on Energy and Commerce, Subcommittee on Energy and Power, Hearing on "The American Energy Initiative," June 16, 2011.

[142] 2011 FEIS, "Potential Releases," p. 3.13-43 (see footnote 87).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 06 2011

ASSISTANT ADMINISTRATOR
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Dear Mr. Fernandez and Dr. Jones:

In accordance with our authorities under the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) NEPA regulations, and Section 309 of the Clean Air Act, EPA has reviewed the Supplemental Draft Environmental Impact Statement (SDEIS) for TransCanada's proposed Keystone XL Project ("Project").

EPA reviewed the Draft Environmental Impact Statement (DEIS) for this project and submitted comments in July of 2010. At that time EPA rated the DEIS as "Inadequate-3" because potentially significant impacts were not evaluated and additional information and analyses were necessary to ensure that the EIS fully informed decision makers and the public about potential consequences of the Keystone XL Project. Since that time, the State Department has worked diligently to develop additional information and analysis in response to EPA's comments and the large number of other comments received on the DEIS. The State Department also made a very constructive decision to seek further public review and comment through publication of the SDEIS, to help the public and decision makers carefully weigh the environmental costs and benefits of transporting oil sands crude from Canada to delivery points in Oklahoma and Texas. The consideration of the environmental impacts associated with constructing and operating this proposed pipeline is especially important given that current excess pipeline capacity for transporting oil sands crude to the United States will likely persist until after 2020, as noted in the SDEIS.

While the SDEIS has made progress in responding to EPA's comments on the DEIS and providing information necessary for making an informed decision, EPA believes additional analysis is necessary to fully respond to our earlier comments and to ensure a full evaluation of

Exhibit 8024

the potential impacts of proposed Project, and to identify potential means to mitigate those impacts. As EPA and the State Department have discussed many times, EPA recommends that the State Department improve the analysis of oil spill risks and alternative pipeline routes, provide additional analysis of potential impacts to communities along the pipeline route and adjacent to refineries and the associated environmental justice concerns, together with ways to mitigate those impacts, improve the discussion of lifecycle greenhouse gas emissions (GHGs) associated with oil sands crude, and improve the analysis of potential impacts to wetlands and migratory bird populations. We are encouraged by the State Department's agreement to include some of these additional analyses in the Final Environmental Impact Statement (Final EIS). We have noted those agreements in this letter, and look forward to working with you to develop these analyses for the Final EIS.

Pipeline Safety/Oil Spill Risks

EPA is the lead federal response agency for responding to oil spills occurring in and around inland waters. As part of that responsibility, we have considerable experience working to prevent and respond to oil spills. Pipeline oil spills are a very real concern, as we saw during the two pipeline spills in Michigan and Illinois last summer. Just in the last month, the Keystone Pipeline experienced two leaks (in North Dakota and Kansas), one of which was brought to the company's attention by a local citizen. These leaks resulted in shut-downs and issuance of an order to TransCanada from the Pipeline and Hazardous Materials Safety Administration (PHMSA), requiring that corrective measures be taken prior to the subsequently approved restart of operations. PHMSA's Order of June 3, 2011 for the Keystone Pipeline – which also carries Canadian oil sands crude oil and is operated by the same company as the proposed Keystone XL Project – was based on the hazardous nature of the product that the pipeline transports and the potential that the conditions causing the failures that led to the recent spills were present elsewhere on the pipeline. These events, which occurred after EPA's comment letter on the DEIS, underscore the comments about the need to carefully consider both the route of the proposed Keystone XL Pipeline and appropriate measures to prevent and detect a spill.

We have several recommendations for additional analyses that relate to the potential for oil spills, as well as the potential impacts and implications for response activities in the event of a pipeline leak or rupture. We recommend and appreciate your agreement that the Final EIS use data from the National Response Center, which reports a more comprehensive set of historical spill events than the Pipeline and Hazardous Material Safety Administration's incident database, to assess the risk of a spill from the proposed pipeline. With respect to the spill detection systems proposed by the applicant, we remain concerned that relying solely on pressure drops and aerial surveys to detect leaks may result in smaller leaks going undetected for some time, resulting in potentially large spill volumes. In light of those concerns, we also appreciate your agreement that the Final EIS consider additional measures to reduce the risks of undetected leaks. For example, requiring ground-level inspections of valves and other parts of the system several times per year, in addition to aerial patrols, could improve the ability to detect leaks or spills and minimize any damage.

The SDEIS indicates that there may be a "minor" increase in the number of mainline valves installed to isolate pipeline segments and limit impacts of a spill, compared to what was

originally reported in the DEIS (SDEIS, pg. 2-4). However, no detailed information or decision criteria are provided with regard to the number of valves, or their location. In order to evaluate potential measures to mitigate accidental releases, we appreciate your agreement to provide additional information in the Final EIS on the number and location of the valves that will be installed and to evaluate the feasibility of increasing the number of valves in more vulnerable areas. For example, it may be appropriate to increase the number of valves where the water table is shallow, or where an aquifer is overlain by highly permeable soils, such as the Ogallala aquifer. We also recommend consideration of external pipe leak detection systems in these areas to improve the ability to detect pinhole (and greater) leaks that could be substantial, yet below the sensitivity of the currently proposed leak detection systems. In addition, while we understand that valves are not proposed to be located at water crossings that are less than 100 feet wide, we recommend that the Final EIS nevertheless consider the potential benefits of installing valves at water crossings less than 100 feet wide where there are sensitive aquatic resources.

Predicting the fate and transport of spilled oil is also important to establish potential impacts and develop response strategies. While the SDEIS provides additional information about the different classes of crude oils that may transported, we recommend the Final EIS evaluate each class of crude that will be transported, how it will behave in the environment, and qualitatively discuss the potential issues associated with responding to a spill given different types of crude oils and diluents used.

With regard to the chemical nature of the diluents that are added to reduce the viscosity of bitumen, the SDEIS states "the exact composition may vary between shippers and is considered proprietary information" (SDEIS, pg. 3-104). We believe an analysis of potential diluents is important to establish the potential health and environmental impacts of any spilled oil, and responder/worker safety, and to develop response strategies. In the recent Enbridge oil spill in Michigan, for example, benzene was a component of the diluent used to reduce the viscosity of the oil sands crude so that it could be transported through a pipeline. Benzene is a volatile organic compound, and following the spill in Michigan, high benzene levels in the air prompted the issuance of voluntary evacuation notices to residents in the area by the local county health department. Similarly, although the SDEIS provides additional information on the potential impact of spills on groundwater, we recommend that the Final EIS improve the risk assessment by including specific information on the groundwater recharge areas along the pipeline route, recognizing that these areas are more susceptible to groundwater contamination from oil spills.

We appreciate that the SDEIS provides additional information about the feasibility of alternative pipeline routes that would reduce the risk of adverse impacts to the Ogallala aquifer, by re-routing the pipeline so it does not cross the aquifer. Many commenters, including EPA, expressed concerns over the potential impacts to this important resource during the review of the DEIS. If a spill did occur, the potential for oil to reach groundwater in these areas is relatively high given shallow water table depths and the high permeability of the soils overlying the aquifer. In addition, we are concerned that crude oil can remain in the subsurface for decades, despite efforts to remove the oil and natural microbial remediation.

However, the SDEIS concludes that the alternative routes that avoid the Ogallala aquifer are not reasonable, and consequently does not provide a detailed evaluation of the environmental impacts of routes other than the applicant's proposed route. The SDEIS indicates that no other alternatives are considered in detail because, in part, they do not offer an overall environmental advantage compared to other routes. In support of this conclusion the SDEIS presents a limited analysis of the potential environmental impacts of the alternative routes and offers qualitative judgments about the relative severity of impacts to different resources, e.g., considering potential impacts from spills to the Ogallala aquifer less important than impacts to surface waters from a spill associated with an additional crossing of the Missouri River. We think this limited analysis does not fully meet the objectives of NEPA and CEQ's NEPA regulations, which provide that agencies rigorously explore and objectively evaluate reasonable alternatives. CEQ guidance states that reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense.[1] Recognizing the regional significance of these groundwater resources, we recommend that the State Department re-evaluate the feasibility of these alternative routes and more clearly outline the environmental, technical and economic reasons for not considering other alternative routes in more detail as part of the NEPA analysis.

Oil Spill Impacts on Affected Communities and Environmental Justice Concerns

The communities facing the greatest potential impact from spills are of course the communities along the pipeline route. We are concerned that the SDEIS does not adequately recognize that some of these communities may have limited emergency response capabilities and consequently may be more vulnerable to impacts from spills, accidents and other releases. This is particularly likely to be true of minority, low-income and Tribal communities or populations along the pipeline route. We appreciate your agreement to address this issue in the Final EIS by clarifying the emergency response capability of each county along the pipeline route using the plans produced by Local Emergency Planning Committees. We also appreciate your agreement to identify potential mitigation measures in the Final EIS based on this information. We look forward to working with your staff to identify data sources and approaches for addressing these issues.

As part of this analysis, we are concerned that the SDEIS may have underestimated the extent to which there are communities along the pipeline with less capacity to respond to spills and potentially associated health issues, particularly minority, low-income or Tribal communities. We appreciate your agreement to re-evaluate in the Final EIS which communities may have such capacity issues by adopting the more commonly-used threshold of 20% higher low-income, minority or Tribal population compared to the general population, instead of the 50% used in the SDEIS.

With respect to data on access to health care, we are encouraged that the SDEIS provided critically important information on medically underserved areas and on health professional shortage areas. We will provide recommendations on methods to present this data to make it

[1] 40 CFR 1502.14; "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 18026 (1981) - Question 2a: Alternatives Outside the Capability of Applicant or Jurisdiction of Agency.

more meaningful to reviewers and will work with your staff as you move towards publishing a Final EIS.

The SDEIS does recognize that minority, low-income or Tribal populations may be more vulnerable to health impacts from an oil spill, and we appreciate the applicant's commitment to provide an alternative water supply "if an accidental release from the proposed Project that is attributable to Keystone's actions contaminates groundwater or surface water used as a source of potable water or for irrigation or industrial purposes..." (SDEIS, pg. 3-154). Further, the SDEIS states that impacts would be mitigated by the applicant's liability for costs associated with cleanup, restoration and compensation for any release that could affect surface water (SDEIS, pg. 3-154). We believe that this mitigation measure should also apply for releases that could affect groundwater. Finally, we recommend that the Final EIS evaluate additional mitigation measures that would avoid and minimize potential impacts through all media (i.e., surface and ground water, soil, and air) to minority, low-income and Tribal populations rather than rely solely on after-the-fact compensation measures. Some examples of additional mitigation include developing a contingency plan before operations commence for emergency response and remedial efforts to control the contamination. This would also include providing notification to individuals affected by soil or groundwater contamination, ensuring the public is knowledgeable and aware of emergency procedures and contingency plans (including posting procedures in high traffic visibility areas), and providing additional monitoring of air emissions and conducting medical monitoring and/or treatment responses where necessary.

Environmental and Health Impacts to Communities Adjacent to Refineries

We are also concerned with the conclusion that there are no expected disproportionate adverse impacts to minority or low-income populations located near refineries that are expected to receive the oil sands crude, particularly because many of these communities are already burdened with large numbers of high emitting sources of air pollutants. It is not self-evident that the addition of an 830,000 barrels per day capacity pipeline from Canada to refineries in the Gulf Coast will have no effect on emissions from refineries in that area. We recommend that the Final EIS re-examine the potential likelihood of increased refinery emissions, and provide a clearer analysis of potential environmental and health impacts to communities from refinery air emissions and other environmental stressors. As part of this re-evaluation, we encourage the State Department to provide more opportunities for people in these potentially affected communities to have meaningful engagement, including additional public meetings, particularly in Port Arthur, Texas, before publication of the Final EIS. Public meetings in these potentially affected communities provide an opportunity for citizens to present their concerns, and also for the State Department to clearly explain its analysis of potential impacts associated with the proposed project to the people potentially affected.

Lifecycle GHG Emissions

We appreciate the State Department's efforts to improve the characterization of lifecycle GHG emissions associated with Canadian oil sands crude. The SDEIS confirms, for example, that Canadian oil sands crude are GHG-intensive relative to other types of crude oil, due primarily to increased emissions associated with extraction and refining.

The SDEIS also includes an important discussion of lifecycle GHG emissions associated with oil sands crude and provides quantitative estimates of potential incremental impacts associated with the proposed Project. For example, the SDEIS (pg. 3-198) states that under at least one scenario, additional annual lifecycle GHG emissions associated with oil sands crude compared to Middle East Sour crude are 12 to 23 million metric tons of CO_2 equivalent (CO_2-e) at the proposed Project pipeline's full capacity (roughly the equivalent of annual emissions from 2 to 4 coal-fired power plants).[2] While we appreciate the inclusion of such estimates, EPA believes that the methodology used by the State Department and its contractors to calculate those estimates may underestimate the values at the high-end of the ranges cited in the lifecycle GHG emissions discussion by approximately 20 percent. We will continue to work with your staff to address this concern as you move towards publishing a Final EIS.

Further, in discussing these lifecycle GHG emissions, the SDEIS concludes "on a global scale, emissions are not likely to change" (SDEIS, pg. 3-197). We recommend against comparing GHG emissions associated with a single project to global GHG emission levels. As recognized in CEQ's draft guidance concerning the consideration of GHG emissions in NEPA analyses, "[T]he global climate change problem is much more the result of numerous and varied sources, each of which might seem to make a relatively small addition to global atmospheric GHG concentrations."[3]

Moreover, recognizing the proposed Project's lifetime is expected to be at least fifty years, we believe it is important to be clear that under at least one scenario, the extra GHG emissions associated with this proposed Project may range from 600 million to 1.15 billion tons CO_2-e, assuming the lifecycle analysis holds over time (and using the SDEIS' quantitative estimates as a basis). In addition, we recommend that the Final EIS explore other means to characterize the impact of the GHG emissions, including an estimate of the "social cost of carbon" associated with potential increases of GHG emissions.[4] The social cost of carbon includes, but is not limited to, climate damages due to changes in net agricultural productivity, human health, property damages from flood risk, and ecosystem services due to climate change. Federal agencies use the social cost of carbon to incorporate the social benefits of reducing CO_2 emissions into analyses of regulatory actions that have a marginal impact on cumulative global emissions; the social cost of carbon is also used to calculate the negative impacts of regulatory actions that increase CO_2 emissions.

Finally, we continue to be concerned that the SDEIS does not discuss opportunities to mitigate the entire suite of GHG emissions associated with constructing the proposed Project. We appreciate your agreement to identify practicable mitigation measures in the Final EIS for

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[2] http://www.epa.gov/cleanenergy/energy-resources/calculator.html

[3] "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," (February 18, 2010)

[4] "Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866;" Interagency Working Group on Social Cost of Carbon, United States Government, February 2010. Presents four estimates of estimated monetized damages associated with a ton of CO_2 released in 2010 ($5, $21, $35, $65) ($2007); these estimates grow over time and are associated with different discount rates.

GHG emissions associated with operation of the pipeline in the United States. As part of that analysis, we recommend consideration of opportunities for energy efficiency and utilization of green power for pipeline operations. In addition, we recommend a discussion of mitigation approaches for GHG emissions from extraction activities that are either currently or could be employed to help lower lifecycle GHG emissions to levels closer to those of conventional crude oil supplies. We recommend that this discussion include a detailed description of efforts ongoing and under consideration by producers, as well as the government of Alberta, to reduce GHG emissions from oil sands production.

Wetlands Impacts

EPA co-administers the Clean Water Act Section 404 regulatory program, which regulates the discharge of dredged or fill material into waters of the United States, including wetlands. While we appreciate that the U.S. Army Corps of Engineers is responsible for day-to-day processing of permit applications, our review of aerial photography recently posted on the Project's website indicates that the DEIS may have underestimated the extent of ecologically valuable bottomland hardwood wetlands in Texas. We appreciate your agreement to evaluate these wetland estimates in the Final EIS and to display the location of the bottomland hardwood wetlands with maps and aerial photography. Given their ecological importance, we recommend the same evaluation be done for prairie pothole wetlands that may be impacted by the proposed Project. EPA also recommends that the Final EIS discuss whether it is possible to make further pipeline route variations to avoid both bottomland hardwood and prairie pothole wetlands.

Our review of the aerial photography also indicates that there may be numerous wetland crossings that would impact more than 0.5 acres of wetlands, which is the upper threshold for impacts under the US Army Corps of Engineers' (Corps) nationwide general permit for utility line crossings in waters of the United States. In that light, and recognizing that there will be several hundred acres of wetlands affected along the entire pipeline route, we recommend that the Corps review the proposed wetland impacts as a single project requiring an individual Clean Water Act Section 404 permit. Consolidating each of these crossings into one individual permit review would also provide for more transparency as to the project impacts and allow for more effective mitigation planning, as well as compliance monitoring of the entire project.

Finally, we appreciate your agreement to provide a discussion of potential mitigation measures for project activities that permanently convert forested wetlands to herbaceous wetlands. We continue to recommend providing a conceptual wetland mitigation plan in the Final EIS, including a monitoring component that would, for a specified period of time, direct field evaluations of those wetlands crossed by the pipeline (and mitigation sites) to ensure wetland functions and values are recovering. We also recommend that the Final EIS evaluate the feasibility of using approved mitigation banks to compensate for wetlands impacts.

Migratory Birds

The SDEIS includes a summary of regulatory and other programs aimed at protecting migratory bird populations that may be affected by oil sands extraction activities in Canada. However, we recommend that the Final EIS provide additional information that would address

potential impacts to specific migratory species, with an emphasis on already-vulnerable species, and we appreciate your agreement to provide that information in the Final EIS. Data found in the North American Breeding Bird Survey (a partnership between the U.S. Geological Survey's Patuxent Wildlife Research Center and the Canadian Wildlife Service's National Wildlife Research Center), which monitors bird populations and provides population trend estimates, should be helpful. We also recommend that the Final EIS discuss mitigation measures that are either currently or could be employed for identified impacts.

Conclusion

Based on our review, we have rated the SDEIS as "Environmental Objections - Insufficient Information (EO-2)" (see enclosed "Summary of Rating Definitions and Follow-up Actions"). As explained in this letter, we have a number of concerns regarding the potential environmental impacts of the proposed Project, as well as the level of analysis and information provided concerning those impacts. Our concerns include the potential impacts to groundwater resources from spills, as well as effects on emission levels at refineries in the Gulf Coast. In addition, we are concerned about levels of GHG emissions associated with the proposed Project, and whether appropriate mitigation measures to reduce these emissions are being considered. Moreover, the SDEIS does not contain sufficient information to fully assess the environmental impacts of the proposed Project, including potential impacts to groundwater resources and communities that could be affected by potential increases in refinery emissions.

We look forward to continuing to work with you to strengthen the environmental analysis of this project and to provide any assistance you may need to prepare the Final EIS. In addition, we will be carefully reviewing the Final EIS to determine if it fully reflects our agreements and that measures to mitigate adverse environmental impacts are fully evaluated. We look forward as well to working with you as you consider the determination as to whether approving the proposed project would be in the national interest under the provisions of Executive Order 13337.

Please feel free to contact me at (202) 564-2400, or have your staff contact Susan Bromm, Director, Office of Federal Activities, at (202) 564-5400, if you have any questions or would like to discuss our comments.

Sincerely,

Cynthia Giles

Cynthia Giles

Enclosure

Summary of Rating Definitions and Follow-up Action

Environmental Impact of the Action

LO--Lack of Objections
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO--Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 16 2010

ASSISTANT ADMINISTRATOR
FOR ENFORCEMENT AND
COMPLIANCE ASSURANCE

Mr. Jose W. Fernandez
Assistant Secretary
Economic, Energy, and Business Affairs
U.S. Department of State
Washington, DC 20520

Ms. Kerri-Ann Jones
Assistant Secretary
Oceans and International Environmental and Scientific Affairs
U.S. Department of State
Washington, DC 20520

Dear Mr. Fernandez and Ms. Jones:

The Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (Draft EIS) for the Keystone XL project pursuant to our authorities under the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

We appreciate the substantial efforts by the State Department to solicit broad expert and public input to analyze the potential environmental impacts of the Keystone XL project, and believe the Draft EIS provides useful information and analysis. However, we think that the Draft EIS does not provide the scope or detail of analysis necessary to fully inform decision makers and the public, and recommend that additional information and analysis be provided. The topics on which we believe additional information and analysis are necessary include the purpose and need for the project, potential greenhouse gas (GHG) emissions associated with the project, air pollutant emissions at the receiving refineries, pipeline safety/spill response, potential impacts to environmental justice communities, wetlands and migratory birds.

Project Purpose and Need/Alternatives

We are concerned that the Draft EIS uses an unduly narrow purpose and need statement, which leads to consideration of a narrow range of alternatives. The Draft EIS considers issuance of a cross-border permit for the proposed project and to a limited extent, the no-action alternative (i.e., denying the permit). By using a narrow purpose and need statement, the Draft EIS rejects other potential alternatives as not meeting the stated project purpose. While we recognize that an objective of the applicant's proposal is to construct a pipeline to transport oil sands from Canada to Gulf Coast refineries in the United States, we believe the purpose and need to which the State

Exhibit 8025

Department is responding is broader. Accordingly, EPA recommends that the State Department frame the purpose and need statement more broadly to allow for a robust analysis of options for meeting national energy and climate policy objectives.

In evaluating the need for the project and its alternatives, we also recommend that the discussion include consideration of different oil demand scenarios over the fifty-year project life. This would help ensure that the need for the project is clearly demonstrated. The Draft EIS uses one demand scenario that indicates that with permit denial, the demand for crude oil would continue at a rate such that U.S. refineries "would continue to acquire crude oil primarily from sources other than Canada to fulfill this demand and/or find alternative methods of delivery of Canadian oil sands." We recommend that this discussion be expanded to include consideration of proposed and potential future changes to fuel economy standards and the potential for more widespread use of fuel-efficient technologies, advanced biofuels and electric vehicles as well as how they may affect demand for crude oil.

In addition, we are concerned that the Draft EIS does not fully analyze the environmental impacts of the no-action and other alternatives, making a comparison between alternatives and the proposed project more difficult. EPA believes it is important to ensure that the differences in the environmental impacts of non-Canadian crude oil sources and oil sands crude be discussed. Alongside the national security benefits of importing crude oil from a stable trading partner, we believe the national security implications of expanding the Nation's long-term commitment to a relatively high carbon source of oil should also be considered.

GHG Emissions

The Draft EIS estimates GHG emissions associated with construction and operation of the pipeline itself and the refining process, although not the GHG emissions associated with upstream oil sands extraction intended for this pipeline or downstream end use. In order to fully disclose the reasonably foreseeable environmental impacts on the U.S. of the Keystone XL project, we recommend that the discussion of GHG emissions be expanded to include, in particular, an estimate of the extraction-related GHG emissions associated with long-term importation of large quantities of oil sands crude from a dedicated source. This would be consistent with the approach contemplated by CEQ's recent Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions (February 18, 2010).

Extraction and refining of Canadian oil sands crude are GHG-intensive relative to other types of crude oil. Our calculations indicate that on an annual basis, and assuming the maximum volume of 900,000 barrels per day (bpd) of pipeline capacity, annual well-to-tank emissions from the project would be 27 million metric tons carbon dioxide equivalent ($MMTCO_2e$) greater than emissions from U.S. "average" crude.[1] Accordingly, we estimate that GHG emissions from Canadian oil sands crude would be approximately 82% greater than the average crude refined in the U.S., on a well-to-tank basis. To provide some perspective on the potential scale of

[1] 900,000 bpd * (181 kgCO2e/bbl – 99 kgCO2e/bbl) *365 = 27 $MMTCO_2e$/yr. Based on average 2005 crude oil lifecycle GHG emissions estimates in EPA's Renewable Fuel Standard (RFS2) final rule (75 FR 14669); also see DOE/NETL. 2009. Petroleum-Based Fuels Life Cycle Greenhouse Gas Analysis - 2005 Baseline Model.

emissions, 27 million metric tons is roughly equivalent to annual CO_2 emissions of seven coal-fired power plants.[2]

Based on our review, there is a reasonably close causal relationship between issuing a cross-border permit for the Keystone XL project and increased extraction of oil sands crude in Canada intended to supply that pipeline. Not only will this pipeline transport large volumes of oil sands crude for at least fifty years from a known, dedicated source in Canada to refineries in the Gulf Coast, there are no significant current export markets for this crude oil other than the U.S. Accordingly, it is reasonable to conclude that extraction will likely increase if the pipeline is constructed. While we recognize that other pipeline projects are currently being planned that might bring additional pipeline capacity for oil transport should the Keystone XL project not be constructed, these other proposed pipelines appear to still be in the planning stages, and whether and when they will be approved or constructed appears uncertain. We also note that the Draft EIS discusses end use GHG emissions from combustion of refined oil, indicating they would not differ from those of conventional crude. Because they are easily calculated and are of interest to the public in obtaining a complete picture of the GHG emissions associated with the proposed project, it might be helpful to provide a quantitative estimate of these emissions.

In addition, we recommend that the State Department expand the discussion of alternatives or other means to mitigate the emissions. The analysis in the Draft EIS focuses primarily on carbon sequestration benefits that might accrue from re-vegetation measures proposed as mitigation for wetland losses associated with the pipeline. We believe there are a number of other mitigation opportunities to explore, including control of fugitive emissions, pumping station energy efficiency, and use of renewable power, where appropriate. In addition, we recommend that the State Department consider project alternatives that could significantly reduce extraction-related GHG emissions. For example, these alternatives could include a smaller-capacity pipeline or deferring the project until current efforts to reduce extraction-related GHG emissions through carbon capture and storage, improved energy efficiency, or new extraction technologies are able to lower GHG emissions to levels closer to those of conventional crude.

Air Quality Impacts - Refinery Emissions

We appreciate the efforts to predict pollutant emissions from refineries processing crude oil from the proposed project, and recognize that it is likely that some of the oil sands crude from the project would replace declining feedstock at existing refineries, and that some of the oil sands crude would supply newly upgraded or expanded facilities. We also agree with the Draft EIS's conclusion that there may be increases in air emissions from refineries in the area, and we recommend that additional information and analyses be presented to substantiate the conclusion that these increases "would not likely be major (Draft EIS, pp. 3.14-36)." Further, we recommend that additional information be provided concerning potential impacts from emissions associated with events such as start up, shut down, and malfunctions, which are not addressed by existing permits and which may have substantial adverse impacts.

[2] See, http://www.epa.gov/cleanenergy/energy-resources/calculator.html (translating 27 $MMTCO_2e$ to annual coal plant CO_2 emissions).

Pipeline Safety/Spill Response

We believe that additional efforts to evaluate potential adverse impacts to surface and ground waters from pipeline leaks or spills, including potential adverse impacts to public water supplies and source water protection/wellhead protection areas, are necessary.

First, we note that in order for the bitumen to be transported by the pipeline, it will be either "diluted with cutter stock (the specific composition of which is proprietary information to each shipper) or an upgrading technology is applied to convert the bitumen to synthetic crude oil." (Draft EIS, pp. 3.13-18). Without more information on the chemical characteristics of the dilutent or the synthetic crude, it is difficult to determine the fate and transport of any spilled oil in the aquatic environment. For example, the chemical nature of the dilutent may have significant implications for response as it may negatively impact the efficacy of traditional floating oil spill response equipment or response strategies. In addition, the Draft EIS addresses oil in general and as explained earlier, it may not be appropriate to assume this bitumen oil/synthetic crude shares the same characteristics as other oils. This is especially of concern in light of the Draft EIS's statement that "Some characteristics could not be described or distilled from assay data for the example oils for this EIS, including viscosity profiles, proportion of volatile and semi-volatiles compounds, the amount or proportion of PAHs, and toxicity to aquatic organisms based on bioassays." (Draft EIS, pp. 3.13-19)

We recommend that a more complete chemical/physical profile of the oil and details describing the processing activities be provided in order to accurately predict the potential impacts to aquatic environment from a spill event. We are also concerned that while the Draft EIS discusses the impacts of oil in general on dissolved oxygen in waters in the event of a spill, it does not emphasize the primary effect of an oil spill, i.e., acute toxicity to the aquatic environment or address the chronic impacts of the undefined polynuclear aromatic hydrocarbons (PAH). We recommend further information be provided regarding both acute and chronic impacts.

We are concerned that the Draft EIS only uses what the Department of Transportation's Office of Pipeline Safety (OPS) considers a "serious or significant" spill to assess risks, and did not estimate the number of spills that may have caused harm to the waters of the U.S. under the Oil Pollution Act. EPA recommends also using historical data regarding oil spills that caused harm using EPA's regulations (40 CFR 110) and that were required to be reported to the National Response Center. The risk assessment should also address spills from pipeline-related pump stations, breakout tanks and construction activities. In order to better assess the risks of spills, we also recommend that additional information be provided concerning the frequency of pipeline inspections and the methods for inspection by the OPS and Keystone.

We recommend that additional information be provided to describe the means by which small pipeline leaks would be detected (including those leaks that will not be detected by the proposed Supervisory and Control Data Acquisition System) and the time frames over which a small leak may occur prior to detection and control, as well as the potential volume of oil that would be released before shut-off could occur. We also recommend that information be

provided to describe what methods would be employed to patrol the pipeline in search of a possible leak, especially at times of severe weather.

We are concerned that the Draft EIS only provides a summary of the procedures likely to be included in yet to be developed Emergency Response Plan, and does not provide information about potential Facility Response Plans. We recommend that detailed information regarding these plans, including draft versions of the plans, be provided. More specifically, we also recommend that the draft plans (including the draft Spill Prevention Control and Countermeasure (SPCC) plans, include strategies for responding to bitumen that is mixed with a dilutent, which may affect its behavior in water, as described above.

We recommend that more information be provided on proposed measures to reduce the risk of spills in "high consequence areas (HCA)" (49 CFR 195.450) (i.e., populated areas, designated zones around public drinking water intakes, and unusually sensitive ecologically resource areas). In particular, we recommend that the State Department and OPS work with Keystone to ensure that the Integrity Management Plans for these HCAs would be completed before the pipeline would begin operation.

In order to further reduce the risks of damage to water resources, we recommend including an analysis of the feasibility of increasing the number of mainline valves, which can shut down the pipeline in the event of an emergency, particularly where the pipeline would cross perennial streams or drinking water source aquifers.

We also recommend that a description be provided of Keystone's financial assurances for potential liability in the event of a spill, including potential bond amounts that would be necessary to protect both human health and the environment.

In addition, we recommend that the State Department more clearly outline the issues associated with the request for a special permit from OPS to operate portions of the pipeline at a greater pressure than allowed under current regulations. We recommend that the sulfur content of the oil sands crude be specifically considered in making the decisions on the pipeline wall thickness. Finally, we recommend that the State Department and the OPS work together to develop one NEPA analysis for all of the permits required for the project, including OPS's special permit.

Environmental Justice

We are concerned that the Draft EIS does not fully identify and address the potential for disproportionately high and adverse human health and environmental effects on minority, low-income and Tribal populations. Foremost, we believe the methodology for defining minority, low-income and Tribal populations may have underestimated the extent of these vulnerable populations in the project area. When examining the presence of minority and low-income populations that are potentially affected by the proposed project, the Draft EIS compared the percentage of minority and low-income residents in the counties along the proposed pipeline route with State-level percentages. First, we suggest that in addition to using county-level data, census tract data be used to determine the presence of minority, low income and Tribal

populations in the project area that may be potentially impacted Second, we recommend comparing this community level data to national U.S. population data in order to ensure that the minority and low-income populations are properly identified. EPA believes that this approach will ensure that the presence of minority and low-income populations are not artificially "diluted" (as discussed in EPA Guidance for Consideration of Environmental Justice in Clear Air Act Section 309 Reviews (1999): pp. 12-13) and that the characteristics of the potentially affected communities are identified in order to evaluate potential impacts from the proposed action. We also note that the Draft EIS does not evaluate the environmental justice issues associated with potential impacts to communities in Port Arthur, Texas, where numerous industrial facilities, including chemical plants and a hazardous waste incinerator, are contributing to the residents' overall exposure to contaminants.

In addition, we believe that the potential human health impacts associated with both air emissions from refineries and the potential contamination of drinking water supplies from an oil spill have not been fully evaluated. We recommend that the State Department prepare a health risk assessment to specifically address these issues as they relate to low income, minority and Tribal populations.

Wetlands

The Draft EIS identifies 746 acres of aquatic resources that would be affected by pipeline construction and operations, but does not identify impacts associated with ancillary facilities and connected actions, including staging areas, work camps and storage locations. We recommend that additional information be developed to ensure that a complete estimate of potential impacts is provided. In addition, we recommend that the potential impacts of converting forested and scrub-shrub wetlands to herbaceous wetlands be evaluated, as well as appropriate mitigation measures to address these impacts. In general, the EIS should identify how wetland impacts would be avoided and minimized, to the maximum extent practicable, and how unavoidable wetland impacts would be compensated for through wetland restoration, creation, or enhancement.

Migratory Birds

EPA also recommends that the State Department assess the potential impacts to migratory bird populations in the U.S. from oil sands extraction activities associated with the proposed project. An estimated 30% of North America's landbirds breed in the boreal forests of Canada and Alaska (Saving Our Shared Birds: Partners in Flight Tri-National Vision for Landbird Conservation. Cornell Lab of Ornithology: Ithaca, NY: 2010). As recognized by this recently released study, sponsored in part by the U.S. Fish and Wildlife Service, effects on bird populations in the boreal forest can be felt throughout the birds' migratory range, including wintering grounds in the United States. While we appreciate that the Keystone has agreed to develop a "Migratory Bird Mitigation Plan" in consultation with U.S. Fish and Wildlife Service, it appears that this plan would only address potential impacts from construction activities in the U.S.

Conclusion

The additional information and improved analyses specified above are necessary to ensure the information in the EIS is adequate to fully inform decision makers and the public about the potential environmental consequences of the Keystone XL project. Given these concerns, we have rated the Draft EIS as Category 3-Inadequate Information. As with all projects that have not addressed potentially significant impacts, this proposal is a potential candidate for referral to CEQ. We recommend that the additional information and analysis be circulated for full public review in a revised Draft EIS. Additional detailed comments are also enclosed, as well as a "Summary of Rating Definitions and Follow-up Actions."

Thank you for the opportunity to comment on the Keystone XL Draft EIS. As a cooperating agency, EPA looks forward to continuing to work with the State Department as it revises the Draft EIS to respond to the comments received. Please feel free to contact me at (202) 564-2440, or have your staff contact Susan Bromm, Director, Office of Federal Activities, (202) 564-5400, if you have any questions or would like to discuss our comments.

Sincerely,

Cynthia Giles

Enclosures

cc: Stephen D. Mull, Executive Secretary, U.S. Department of State
Michelle DePass, Assistant Administrator, Office of International and Tribal Affairs, EPA

U.S. Environmental Protection Agency
Detailed Comments – Keystone XL Project Draft EIS

Greenhouse Gas Emissions

We appreciate the inclusion of estimates of GHG emissions from the pipeline construction and operation. With regard to GHG emissions from refining, we recognize that incremental GHG emissions will depend on the feedstock being replaced, and we appreciate the efforts to provide an estimate in the Draft EIS. Given the potential large volumes of emissions, we recommend that the State Department explain in more detail the reasons for the very large range (i.e., 1.3 to 17.2 million tons of CO_2) of the estimate, and provide complete citations for the data and analyses used (i.e., the BP Whiting data, the Natural Resources Defense Council analysis, and the University of Toronto study). In addition, we recommend that the State Department provide information that would allow decision makers to understand the total, as well as incremental, GHG emissions expected from refining the oil sands.

Air Quality Impacts

EPA recommends that the revised Draft EIS provide additional information and analysis regarding potential emissions of pollutants at the receiving refineries and other associated facilities. EPA is prepared to assist the State Department in this analysis; as a first step, we recommend compiling the following information:

1) Describe the expected composition (crude slate) of the oil sands crude that will be transported through the pipeline, including sulfur and nitrogen content.

2) Describe whether the oil sands crude is pre-processed in Canada before shipment, and if so, describe the expected pre-processing and the expected characteristics of the crude before and after the pre-processing.

3) Indicate which of the following refineries are anticipated to have direct access to the proposed project, have contracted to receive the oil sands crude and in what quantities.

ConocoPhillips, Ponca City, OK
Sinclair/Holly, Tulsa, OK
Sunoco/Holly, Tulsa, OK
Valero, Ardmore, OK
Wynnewood Refining, Wynnewood, OK
Motiva, Port Arthur, TX
Total, Port Arthur, TX
Valero, Port Arthur, TX
ExxonMobil, Beaumont, TX
Pasadena Refining, Pasadena, TX
Houston Refining, Houston, TX
Valero, Houston, TX
Deer Park Refining, Deer Park, TX

ExxonMobil, Baytown, TX
BP, Texas City, TX
Marathon Oil, Texas City, TX
Valero, Texas City, TX
Calcasieu, Lake Charles, LA
CITGO Lake Charles, LA
ConocoPhillips, Lake Charles, LA

4) Indicate which of the refineries listed above are expected to receive oil sands crude from the proposed project but do not currently appear to have agreements in place.

5) Indicate whether the refineries that receive the oil sands crude from the project are expected to use it to replace existing supplies; if so, provide available information on the current crude slate utilized at these refineries, including sulfur and nitrogen content.

6) Indicate how many U.S. refineries already receive oil sands crude and whether they have been required to apply for new or modified permits; if so, indicate what type of refinery upgrades have been required and how have emissions been affected after they began processing the oil sands crude oil.

We also recommend that the revised Draft EIS provide information as to whether any new storage capacity would be required in Port Arthur or at the Moore Junction in Harris County, and whether any additional air permits for processing the crude oil would be required in Beaumont/Port Arthur, Texas and in Harris County, Texas. We recommend that the potential for air quality impacts associated with increased emissions from storage and processing be addressed in the revised Draft EIS.

With regard to air quality impacts from construction activities, while these emissions may be temporary, we do not believe it is appropriate to conclude that the construction activities would not significantly affect local or regional air quality without a full analysis. We appreciate the inclusion of an emission inventory for construction and operation of the proposed project; however, since the Draft EIS does not present an air quality impact analysis of these potential emissions, the potential for localized impacts or impairment on Class I areas is not clear. We note that the cumulative 3-year construction emissions depicted in Table 3.12.1-9 are significant (e.g., 1,142 tons NOx), but since these figures are presented at project-wide scale, the potential impacts to the individual Class I and Sensitive Class II areas are not apparent. We recommend that the revised Draft EIS provide emissions information on a more useful scale, such as per spread (the Draft EIS states that the project will be built in 17 spreads) and make clear what distance and time the emissions are spread over. EPA recommends that the revised Draft EIS include a detailed emissions control plan to address concerns related to the potential impacts of particulate matter emissions, as well as diesel emissions. The existing fugitive dust control plan presented in the Draft EIS contains some reasonable types of emission controls, such as water trucks; however, the level of detail currently provided may not ensure protection of air quality. We also recommend that the emissions control plan identify when mitigation measures would take effect, the duration of mitigation measures, and how compliance with the plan would be ensured.

We recommend that the revised Draft EIS clarify the time period used to quantify the estimated emissions associated with the electrical pumps that will be used at the pump stations – see Table 3.12.1-10 (Estimated Direct Emissions for the Project).

Pipeline Safety/Spill Response

It is critical that surface and ground water protection, particularly protection of public water supplies and source water protection/wellhead protection areas, receive high priority in the NEPA analysis and decision making. In many areas of potential project routing, the shallow alluvial ground water systems may be the only sources of potable water for public and rural domestic use. All appropriate precautions and actions to reduce the probability of a spill or leak occurring, to reduce the magnitude of a spill or leak, and to otherwise mitigate the adverse consequences of such an event, should be taken.

Additional comments, specific to Section 3.13 of the Draft EIS (*OIL SPILL RISK ASSESSMENT AND ENVIRONMENTAL CONSEQUENCE ANALYSIS)*, are provided below.

Section 3.13 Introduction

Footnote 1: The Federal Water Pollution Control Act and the Clean Water Act use the term "discharge" when referring to oil spills. Suggest adding "discharge" or "oil discharge" to terms that equate to a release. Additionally, oil products may be present in any water used to hydrostatically test the pipeline prior to being placed in service. We recommend that the revised Draft EIS provide information on the potential impacts, if any, from discharges of hydrostatic testing water, which may be used to pressurize the pipeline.

Section 3.13.1.3 Industry Standards

The revised Draft EIS should include the applicable standards from the list presented in 49 CFR 195.3 that are specific to breakout tanks.

Section 3.13.2.2 TransCanada Company-Specific Oil Pipeline Operating History

To properly characterize the operating history with respect to environmental impacts (and specifically to waters of the U.S.), we recommend that there be a discussion of enforcement cases/actions related to pipeline oil discharges (or pipeline related pump stations or construction activities) which caused harm, as defined by 40 CFR 110, and were required to be reported to the National Response Center. We recommend that the revised Draft EIS presents oil spills (discharges) in the context of both Department of Transportation (DOT) and EPA enforcement of oil spill cases.

Section 3.13.3.3 Construction Spills

We recommend that the revised Draft EIS clarify that there are a significant number of requirements in 40 CFR 112 in addition to the requirement for containment at

Summary of Rating Definitions and Follow-up Action

Environmental Impact of the Action

LO--Lack of Objections
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO--Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

SPCC regulated facilities. In addition, we recommend that the revised Draft EIS clarify that the construction operations may require the development of SPCC plans per 40 CFR 112, and that a discussion of the reporting procedures for oil discharges under 40 CFR 110 for these construction activities be provided. Finally, please use 40 CFR 112 as the correct citation for EPA's regulation that applies for spill prevention.

Section 3.13.4 Impacts Related to Oil Spills

We recommend that analysis of the potential of impacts of oil spill discharges be revised to reflect information available in Natural Resource Damage Assessments (NRDAs) conducted by Federal Trustees in response to major pipeline incidents. The current discussion in the Draft EIS is limited with regard to actual documented impacts, and we suggest these NRDAs, several of which have been generated in response to major oil spills from pipelines, be reviewed and used as a source for information regarding the environmental impacts from pipeline oil spills.

Section 3.13.4.5 Keystone Actions to Prevent, Detect, and Mitigate Oil Spills

Spill Response Procedures

We recommend that the revised Draft EIS clarify that the SPCC plans only apply to the non-transportation related equipment and activities at pump stations and breakout tank farms and to pipeline construction activities. The SPCC plan employs measures to prevent spills and mitigate spills on the facility grounds in order to prevent oil discharges to waters of the US. The pipeline itself is regulated by DOT and response preparedness is addressed by the plans required by DOT under 49 CFR 194. It should be noted however, these plans should be shared with EPA response personnel (On Scene Coordinators) in the EPA Regions because EPA is typically the federal responder to inland pipeline spills and responsible for inland area planning required in the National Contingency Plan, 40 CFR 300. Finally, non-transportation related equipment and activities at pump stations/breakout tank farms may require the submission and some cases, approval, of a Facility Response Plan (FRP) as required under 40 CFR 112.20. In addition, the spill reporting procedures in the Draft SPCC plan should be expanded to include procedures to report to federal and local responders, in addition to the NRC and state responders.

Spill Response Equipment

As mentioned earlier, without the actual data explaining the oil's chemical and physical characteristics, the efficacy of traditional "floating oil" spill response equipment is in question. Again, this reflects the importance of obtaining all relevant information related to the bitumen oil/synthetic crude's chemical and physical characteristics.

Section 3.13.4.6 Types of Oil Spill Impacts

Chemical and Toxicological Impacts

Because the exact composition of the PAH content of the oil is not documented, it is difficult to determine any long-term risks from a spill to the aquatic environment. In addition, there is no analysis of impacts to downstream water intakes (both industrial and municipal), nor recognition that oil spills reaching these intakes may impact fire-fighting capabilities at the facility or municipality.

Environmental Justice

EPA believes that additional work is needed to better identify and address potential adverse effects of the proposed project on low-income, minority and Tribal populations, and we offer the following summary comments.

Air Emissions: EPA recommends that the revised Draft EIS analyze whether minority, low income and Tribal populations, may be exposed to greater risks from air emissions from the project, with a specific focus on emissions from refineries receiving oil sands. We recommend that the revised Draft EIS include a health risk assessment to address these issues.

Drinking Water: We recommend additional analysis of whether minority, low income and Tribal populations may be especially vulnerable to drinking water contamination from oil spills because they often obtain their drinking water from private wells or small public water supply systems for which monitoring and treatment of contaminants may be limited or non-existent. In performing this analysis, we recommend that the same "region of influence" be used to evaluate potential impacts for both public and private water supplies.

Local Emergency Response Capacity: We recommend that information and data produced for Local Emergency Response Planning Committees, created pursuant to the Emergency Response Planning and Community Right to Know Act, be evaluated to determine available response capacity of those counties that have meaningfully greater minority, low income and Tribal populations.

Access to Medical Services: EPA is concerned that access to medical facilities for minority, low-income and Tribal populations may not have been fully evaluated; these populations may be especially vulnerable to human health impacts of oil spills due to their lack of access to medical care, combined with potential health disparities. EPA recommends that the revised Draft EIS evaluate these potential impacts and means to minimize or mitigate the impacts in those counties that are designated as medically underserved areas.

Public Involvement: We recommend that as the State Department continues the NEPA process it ensure that efforts are taken to provide meaningful opportunities for public involvement, including measures to address populations that are linguistically or culturally isolated, and ensuring full accessibility of NEPA documents to minority, low income and Tribal populations. Translation of selected documents may be important for public involvement and also for developing mitigation measures in those areas where a significant percentage of the

households speak a language other than English at home. We also recommend that the revised Draft EIS provide a summary of the efforts taken to inform and involve low income, minority and Tribal populations. In addition, we recommend that an Enhanced Public Participation Plan be developed that would provide up-to-date information to communities during project construction and operation.

Additional Issues Related to Impacts on Tribes

EPA recommends that the State Department provide additional information regarding its efforts to consult with Tribal governments, along with measures to address issues raised by non-federally recognized Tribes. We also recommend that impacts to Tribal populations and communities that are associated with their conditions of poverty be further evaluated, including potential impacts due to subsistence consumption of fish, wildlife and vegetation that may be contaminated by oil spills, potential endangerment of drinking water sources, and language/cultural barriers which may impede capacity for public involvement in developing mitigation measures.

The Draft EIS discussion of impacts to Tribes is limited to an identification and count of the number of counties with a higher percentage of Native Americans than the state percentage, and a section on archaeological resources, historic resources (buildings, structures, objects, and districts), and properties of religious and cultural significance, including Traditional Cultural Properties (TCPs). The Draft EIS does not address potential impacts to Tribal members and communities along the pipeline, or to Tribal culture and traditional practices. We recommend a more rigorous analysis of potential for impact to Tribes be included in a revised Draft EIS.

For example, in some areas, impacts may be compounded by the presence of poverty and the high percentage of Native Americans. Coal, Hughes, Okfuskee, Seminole, and Pontotoc Counties in Oklahoma have both high percentages of Native American residents (in contrast with the state's percentage) and high poverty levels. Nacogdoches County in Texas also has a high percent of Native Americans compared with the State, as well as a relatively high poverty level. In these areas, a large portion of the population may rely on hunting, fishing, gathering and other means of subsistence due to both tradition and necessity. They may be disproportionately impacted by spills that reach waters and impact fisheries, or affect areas where food is traditionally obtained.

We recommend that the revised Draft EIS clarify the extent of Indian country lands potentially impacted by the proposed project, including Tribal trust and allotted Tribal member land. We also recommend that the revised Draft EIS address the potential impacts to areas where Tribes may have unadjudicated claims to water bodies that could be affected by spills from the proposed pipeline (e.g., Clear Boggy and its tributaries in Coal County, Oklahoma).

Finally, we recommend that additional information be provided regarding potential impacts to the Arbuckle Simpson aquifer in Oklahoma, which is located east of the proposed pipeline route. In particular, we recommend including specific information regarding the distance of the pipeline to the aquifer, the direction of groundwater flow in the area, and the potential for a plume from an underground leak to reach the aquifer.

Wetlands

Pursuant to 33 CFR 332.4 and 40 CFR 230.94, *Compensatory Mitigation for Losses of Aquatic Resources (Mitigation Rule)*, a compensatory mitigation plan must be submitted and approved by U.S. Army Corps of Engineers (USACE) before issuance of an individual CWA Section 404 permit. EPA recommends that the USACE/EPA regulations that address compensatory mitigation for losses of aquatic resources be reviewed, and that compensatory mitigation consistent with these regulations (73 Fed. Reg. 19594, April 10, 2008, http://www.usace.army.mil/CECW/Pages/final_cmr.aspx) be developed that will adequately compensate for potential losses of wetland functions and services from pipeline construction and operation along the entire route be included in the revised Draft EIS. Additionally, we recommend that the revised Draft EIS include a conceptual wetland monitoring plan that would, throughout a period of time (normally five years), direct field evaluations of those wetlands crossed by the pipeline to assure wetland functions and values are recovering. The monitoring plan should also include the wetland mitigation sites. EPA prefers wetland mitigation take place in areas as close to the project site as practicable (i.e., in close proximity and, to the extent possible, the same watershed) in order to replace lost functions and services.

The Draft EIS states "Implementation of measures in Keystone's Construction, Mitigation and Reclamation (CMR) Plan (Appendix B) would avoid or minimize most impacts on wetlands associated with construction and operation activities, and would ensure that potential effects would be primarily minor and short term." Impacts to forested wetlands are long-term and would be considered permanent. We recommend that Keystone work with each EPA Region and USACE district to determine what kind of compensation would be required for the permanent conversion of forested wetland to herbaceous wetland, and Keystone continue to work with the EPA Regions and the USACE Districts to develop a Wetland Mitigation Plan for review and consideration in the revised Draft EIS.

We recommend that the revised Draft EIS provide additional information on the proposed widths of construction zones and right-of-ways for all wetland crossings, along with a clearer explanation of which wetland areas will be re-vegetated and which will not allow re-establishment of scrub-shrub and forested wetlands. In addition, we recommend including a clearer explanation of which wetlands are considered "of special concern and value" and which are considered "standard," as well as the management implications of those designations.

Of particular importance are impacts to prairie pothole wetlands and bottomland hardwood forested wetlands, as these resources are of generally high ecological importance and difficult to replace on the landscape. Whenever practicable, potential impacts to prairie pothole wetlands should be avoided using horizontal directional drilling (HDD) techniques, rather than trenching.

We recommend that the revised Draft EIS provide additional information on the status of the efforts to avoid locating specific mainline valves in wetland areas.

The Draft EIS indicates that there are nine forested wetland crossings in Oklahoma and 78 in Texas, and a total of 261 acres of forested wetlands will be affected during construction

and 137 acres will be affected by pipeline operation. However, these estimates do not include the number of acres disturbed by associated access roads or construction camps; we recommend that these estimates be revised to include all potential impacts.

We also recommend that the revised Draft EIS address compliance with E.O. 11990 (Protection of Wetlands), including the requirement to ensure mitigation of unavoidable impacts to all wetlands and waters of the U.S. on Federal lands and facilities.

Equal mitigation commitments should be made for connected actions, including transmission lines. EPA agrees with the suggestions provided on page 3.4-12 of the Draft EIS, and recommends that these suggestions be applied to all wetlands, including both non-jurisdictional and jurisdictional. These additional measures include a request that pre- and post-construction monitoring plans be developed for depressional wetlands of the prairie pothole region, and that wetlands that no longer pond water after the pipeline is installed should receive additional compaction, replacement, or at the landowner's or managing agency's discretion, compensatory payments should be made for drainage of these wetlands. Recommendations are also included that Keystone should develop a plan to compensate for permanent wetland losses in areas of concern to the National Park Service and Texas Parks and Wildlife.

Water Resources

We recommend that further commitments to protect sensitive waterbodies be provided. The Draft EIS states that 341 perennial waterbodies would be crossed during the construction of the proposed project, and that four techniques would be used to cross perennial waterbodies: the open-cut wet method, the dry flume method, the dry dam-and-pump method, or, horizontal directional drilling (HDD). For each perennial waterbody crossing, a site specific engineering and geomorphologic analysis would determine the best method to use to avoid and reduce aquatic impacts. Based on available information, we understand that the open-cut wet method has the greatest potential for water quality impacts. Open-cut wet trench methods with a flowing river often require a wide ditch since the side walls of the ditch are likely to be unstable in alluvial material, and this often results in discharge of substantial quantities of sediment into the river. Such methods generally result in increased sediment production and transport, and increased risks of adverse effects to water quality and aquatic life. Directional drilling beneath waterbodies or constructing waterbody crossings using coffer dams and pumping to keep the construction work area dry are considered less damaging techniques than wet trench crossings. EPA recommends the revised Draft EIS evaluate potential impacts to water quality, aquatic species, riparian and wetland habitat from the various water crossing methods to determine which method would be both practicable and environmentally preferable.

To ensure protection of drinking water supplies, we recommend that private water wells within 1 mile of the pipeline be identified, rather than within 100 feet, as currently described in the Draft EIS. We recommend that Keystone be required to notify state source water protection officials and private well owners before construction would begin in a Source Water Protection Area (SWPA) or wellhead protection area. Pipeline routing alternatives that avoid Sole Source Aquifers, SWPAs, and wellhead protection zones are preferred; if the pipeline route is unable to avoid these areas, EPA recommends that specific mitigation measures be developed, including

installation of double lining, corrosion protection, cathodic protection, water quality monitoring, and state-of-the-art leak detection methods.

If public or private wells would be located within 100 feet of the proposed pipeline route, we recommend that Keystone be required to sample the wells for appropriate petroleum indicator compounds as part of baseline monitoring, and additional monitoring, as appropriate. We also recommend that water quality monitoring would need to be made available for well and/or spring owners, upon request. Moreover, we recommend that Keystone would mitigate impacts to wells that may occur during construction or by pipeline spills/leaks, by transporting potable water to the affected site, drilling a new well, or other appropriate measures. Applicable mitigation measures should be described in the revised Draft EIS.

EPA also notes that the Ogallala Aquifer is a critical resource that may be affected by the proposed project, as it is the drinking water source for almost 80% of Nebraska's residents, as well as a multi-state agricultural industry. We recommend that the revised Draft EIS provide additional information as to the potential for adverse impacts to this resource.

We are pleased that Keystone proposes to use horizontal directional drilling (HDD) for crossing the Niobrara River in Nebraska. However, we recommend that the revised Draft EIS include a discussion of the Niobrara River's status as a National Scenic River (http://www.nps.gov/niob/index.htm) and how the proposed crossing would not conflict with its status as a National Scenic River.

We appreciate the information provided in Appendix E-4 ("Waterbodies within 10 Miles Downstream of Proposed Water Crossings"). Based on our review of this appendix, we note that that there are numerous proposed water crossings that are located upstream of water supply reservoirs. We recommend that the revised Draft EIS include an analysis of potential impacts to these reservoirs in the event of a spill. There are also many points where the potential alignment of the pipeline will cross stream or river segments which are not attaining the state Water Quality Standards and thus a Total Maximum Daily Load (TMDL) has been prepared; special considerations should be applied to prevent contributing to pollutant loads when crossing these sensitive resources.

The Draft EIS states (p. 3.3-29) that the Lower Brule to Witten 230-kV transmission line would have "negligible effects on water resources" - we recommend that additional information be provided to support this conclusion.

Ancillary Facilities

Due to the large number of potential ancillary facilities, including 50 permanent access roads, 30 new pump stations, 74 mainline valves, two crude oil delivery sites and a tank farm, disclosure of the location of these facilities and evaluation of site-specific impacts should be provided to the maximum extent possible. EPA notes, for example, that impacts to wetlands from ancillary facilities and access roads outside of the 110-foot ROW have not yet been identified and assessed. While EPA recognizes that the exact locations of all the ancillary facilities required for support of construction and operation of the pipeline have not yet been

determined, their omission may result in underestimation of potential impacts of the proposed project. The locations, lengths, and designs for ancillary facilities should be identified and described as clearly and completely as possible in the revised Draft EIS to allow understanding of all site-specific impacts.

Additionally, the Draft EIS does not clearly describe where the right of way (ROW) would be reduced to protect "certain sensitive areas, which may include wetlands, cultural sites, shelterbelts, residential areas, or commercial/industrial areas" (Draft EIS, p. 2-3). EPA recommends that the revised Draft EIS clearly define, using maps and/or a table with milepost numbers, where the reduced ROW would be implemented. This information should be summarized in each of the resource chapters of Chapter 3 – Environmental Analysis to enable the reader to easily understand when extra protection would be provided to sensitive resources.

Hazardous Materials Sites

We recommend that the revised Draft EIS identify any Hazardous Materials Sites that may be located within the proposed ROW or other areas associated with the project, and include plans for minimizing potential impacts from accidental disturbance during construction. The response plans should include measures to minimize impacts to communities from removal of any potential hazardous materials.

BEFORE THE PUBLIC UTILITY COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN RE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP
FOR A PERMIT TO CONSTRUCT KEYSTONE XL PIPELINE

DOCKET NO. HP 14-001

REBUTTAL TESTIMONY BY KEVIN E. CAHILL, Ph.D.
on behalf of STANDING ROCK SIOUX TRIBE

APRIL 28, 2015

Exhibit 8029

Q. State your name and occupation.

A. My name is Kevin E. Cahill. I serve as Project Director / Senior Economist for ECONorthwest, an economics, finance, and planning consulting firm with offices in Portland and Eugene, Oregon, Seattle, Washington, and Boise Idaho. I am also a Research Economist for the Sloan Center on Aging and Work at Boston College, in Chestnut Hill, Massachusetts.

Q. Summarize your education and professional background.

A. My resume is attached as Appendix A to the REBUTTAL EXPERT REPORT OF ECONOMIST KEVIN E. CAHILL, PH.D., ON BEHALF OF THE STANDING ROCK SIOUX TRIBE.

I earned my Ph.D. in Economics from Boston College in 2000, after receiving my M.A. in Economics from Boston College in 1997, and my B.A. with honors in Mathematics and Economics from Rutgers College in 1993. Since earning my Ph.D., I have worked as a research economist both in academia (Sloan Center at Boston College, 2005-present; Center for Retirement Research, Boston College, 2003) and as a consultant providing expert reports and testimony. I specialize in applied microeconomics – including but not limited to the economics of aging, health and labor economics – applied econometrics and statistical methods and public policy. I have conducted extensive research and analysis related to patterns of labor force withdrawal, occupational changes with age and related economic issues and statistical analyses.

Q. Summarize your publications.

A. My resume lists my academic papers and publications. This includes co-authoring a forthcoming essay entitled *Evolving Patterns of Work and Retirement*, to be published in THE HANDBOOK OF SOCIAL SCIENCES (8th Edition), as well as nearly 50 published academic articles, papers and professional and expert reports. My publications have addressed a wide range of labor and health economic issues ranging from *Linking Shifts in the National Economy with Changes in Job Satisfaction, Employee Engagement and Work-Life Balance*, in 56 JOURNAL OF BEHAVIORAL AND EXPERIMENTAL ECONOMICS (2015), to *Did the 9/11 Compensation Fund Accurately Assess Economic Losses* in TOPICS IN ECONOMIC ANALYSIS AND POLICY, Vol. 6, Issue 1 (2006).

Q. Describe any professional honors or awards you have received.

A. My professional activities, honors and awards are listed on my resume. They include the 2011 Lawrence R. Klein Award for Best MONTHLY LABOR REVIEW article in 2011, and Teaching Excellence Award, Boston College, Graduate School of Arts and Sciences, 1998.

Q. Describe any professional presentations you have given at professional or academic conferences.

A. I have made many professional presentations, on a wide variety of topics related to applied microeconomics and public policy. They are listed on my resume. My presentations range from *How Might the Affordable Care Act Impact Retirement Transitions?* Presentation at the 89th Annual Conference of the Western Economic Association International, Denver, CO June 28, 2014, to *The Role of the Economist in Assessing Damages for Defendants*, Presentation at Liberty Mutual Group, Marlton, NJ March 18, 2005.

Q. Do you have a leadership role in any professional associations?

A. My leadership roles and professional memberships are listed on my resume. I am a founding Editorial Board member of WORK, AGING AND RETIREMENT. I serve as an At-Large Vice President of the National Association of Forensic Economics. I am a member of the American Economics Association and the Gerontological Society of America, among other professional organizations.

Q. Describe your experience providing expert witness testimony in legal proceedings.

A. My experience providing expert witness testimony in legal proceedings is described on my resume. I have provided expert witness testimony in over a dozen court proceedings, ranging from opinions on economic loss and damages in state court contract claims, to the apportionment of damages across purchaser and product groups in federal anti-trust litigation.

Q. On whose behalf are you testifying today?

A. I am providing rebuttal testimony on behalf of the Standing Rock Sioux Tribe, to rebut testimony presented by the Staff of the Public Utilities Commission, namely the direct testimony of Kimberly Lorrene McIntosh and Brian Walsh.

Q. Are you familiar with the petition by TransCanada for re-certification under SDCL §49-41B-27 of its permit to construct the Keystone XL Pipeline in South Dakota?

A. Yes. Appendix B to my report outlines the documents that I have read and analyzed regarding the Keystone Pipeline, the Keystone XL Pipeline and the re-certification of the South Dakota permit. My review included many of the documents filed with the Public Utilities Commission in HP 14-001, the pre-filed testimony of key witnesses of the Commission Staff, as well as the U.S. Department of State *Final Supplemental Environmental Impact Statement on the Keystone XL Pipeline Project*.

Q. Is the Final SEIS relevant to this certification proceeding?

A. Yes, it is definitely relevant. It is my understanding that under the statute, "the utility must certify to the Public Utilities Commission that (it) continues to meet the conditions upon which the permit was granted." The Amended Conditions require compliance with applicable health and safety and environmental laws, including the National Environmental Protection Act of 1969 (NEPA). It is also my understanding that NEPA requires that projects affecting the quality of the human environment, such as the Keystone XL Pipeline, undergo a rigorous environmental review. The Department of State released the FSEIS in January, 2014. I respectfully strongly recommend that the PUC evaluate the FSEIS in determining whether the Keystone XL Pipeline continues to comply with all applicable health and safety laws.

Q. Did you evaluate the efficacy of the FSEIS as a complete and accurate review of the impacts of the Keystone XL Pipeline?

A. Under the Council on Environmental Quality regulations, "Environmental impact statements shall be prepared using an inter-disciplinary approach which will insure the integrated use of the natural and social sciences." 40 CFR §1502.6. Accordingly, the FSEIS contains a chapter on the Socioeconomic Impacts of the Keystone XL Pipeline. As a labor and health

economist and applied econometrician, I evaluated the socioeconomic impacts analysis in the FSEIS.

Q. Explain further.

A. I shall elaborate by reference to the pre-filed testimony of Brian Walsh, on behalf of the Commission staff. Mr. Walsh gave the opinion that pursuant to "the recommendations in the FSEIS, risks to South Dakota's natural resources is minimized." (p. 2, lines 22-23). As a labor and health economist and applied econometrician with extensive experience analyzing the economic consequences of risk, I can attest that Mr. Walsh is incorrect. The application in the FSEIS of the Impact Analysis for Planning (IMPLAN) economic forecasting model contains no quantitative analysis of non-positive socioeconomic impacts of either construction or operation of the Keystone XL Pipeline. The State Department wrote, "The economic effects of the potential pipeline spills are beyond the scope" of the FSEIS (FSEIS, p. 4.10-32). That statement, and other significant shortcomings, demonstrates the inadequacy of the FSEIS under NEPA. Mr. Walsh's assertion that the FSEIS protects the natural resources of South Dakota ignores the fact that extremely important data on negative socioeconomic factors were not factored into the IMPLAN model. My report analyzes the deficiencies in the FSEIS in more detail.

Q. Do you have any other reasoned opinions on the pre-filed testimony in this docket?

A. Yes. The pre-filed testimony of Kimberly Lorrene McIntosh highlights the same misconceptions. Her opinion that any oil spill may be totally remediated "given sufficient time and resources" and the natural environment totally protected notwithstanding the operation of an oil pipeline (p. 4) lacks grounding in reality. The relevant issue is given *limited* resources and time, can petroleum spills, in particular those that can be expected from the Keystone Pipeline, be remediated such that the expected benefits of the pipeline are greater than the expected costs to the residents and businesses in South Dakota.

Q. Do you have any opinion on the impacts of the Keystone XL Pipeline on the Standing Rock Sioux Tribe?

A. The Tribe receives negligible, if any, economic benefits from this project. According to the State Department, "Keystone estimates that only approximately 10 percent of

the construction workforce would be hired from the four proposed project area states." (FSEIS, p. 4.10-2). The purported benefits associated with operations are even more negligible. So the state of South Dakota as a whole would receive little or no economic benefit from the Keystone XL Pipeline, and the net economic impact could very well be negative. The economic impacts associated with the environmental risks of the project have not been adequately evaluated for the Tribe, or for South Dakota generally, so it is not possible to ascertain the net quantitative impacts at this time.

Q. Do you have anything else to add?

A. I respectfully request that the Public Utilities Commission accept my REBUTTAL EXPERT REPORT OF ECONOMIST KEVIN E. CAHILL, PH.D., ON BEHALF OF THE STANDING ROCK SIOUX TRIBE into evidence and give it due consideration in this proceeding.

Dated this 28 day of April, 2015

By: _____
Kevin E. Cahill

STATE OF IDAHO)
:
COUNTY OF ADA)

KAREN L. PATTERSON
NOTARY PUBLIC
STATE OF IDAHO

SUBSCRIBED and SWORN to before me this 28th day of April, 2015

_____
NOTARY PUBLIC exp. 04.05.19

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE PETITION OF TRANSCANADA KEYSTONE PIPELINE, LP FOR ORDER ACCEPTING CERTIFICATION OF PERMIT ISSUED IN DOCKET HP09-001 TO CONSTRUCT THE KEYSTONE XL PIPELINE	PETITION FOR ORDER ACCEPTING CERTIFICATION UNDER SDCL §49-41B-27 DOCKET HP14-001

REBUTTAL EXPERT REPORT OF ECONOMIST KEVIN E. CAHILL, PH.D. ON BEHALF OF THE STANDING ROCK SIOUX TRIBE

April 28, 2015

Rebuttal Expert Report of Economist Kevin E. Cahill, PhD on Behalf of the Standing Rock Sioux Tribe

I. INTRODUCTION

A. Summary of Opinions

1. Economics is the study of the efficient allocation of scarce resources. Decision making in the face of scarcity is simply a fact of life and, because resources are scarce, it is necessary to choose how to produce, distribute, and consume those resources. To allocate resources efficiently economists generally agree that it is important to consider not just the benefits of decisions, but also the costs.
2. Ms. McIntosh ignores this fundamental reality of economics when she states that "I do not believe there are any petroleum spills that can not [sic] be remediated given sufficient time and resources."[1] I don't think anyone would argue that Ms. McIntosh's response is not accurate. While accurate, it is not meaningful, and in many respects it is nonsensical from an economic standpoint. The relevant issue is given *limited* resources and time, can petroleum spills, in particular those that can be expected from the proposed Keystone oil pipeline, be remediated such that the expected benefits of the oil pipeline are greater than the expected costs to the residents and businesses in South Dakota and other jurisdictions along the route of the proposed pipeline.
3. The socioeconomic analyses conducted to date are grotesquely insufficient in this regard. They are incomplete, inadequate and fail to employ professional methods and standards for conducting such analyses. The quantitative analyses that I have reviewed in this matter as they pertain to socioeconomic impacts, including the State Department's Final Supplemental Environmental Impact Statement for the Keystone XL Project (FSEIS), have all been conducted in the absence of any quantitative assessment of potential negative socioeconomic impacts.[2] Not surprisingly, when socioeconomic costs are assumed to be zero and socioeconomic benefits are assumed to be positive, the conclusion is a positive socioeconomic impact. Such an approach is inconsistent with commonly-accepted principles and practices in the field of economics.

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[1] Pre-filed Testimony of Kimberly Lorrene McIntosh on Behalf of the Commission Staff. 2009. Before the Public Utilities Commission, State of South Dakota, Keystone XL Project, Docket HP09-001 (September), p. 4.

[2] United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, January 2014.

4. This fundamental flaw applies to two recent analyses in particular that I have reviewed, and their resulting conclusions regarding socioeconomic impacts are grossly insufficient as a result. First, in its FSEIS, the State Department uses the Impact Analysis for Planning (IMPLAN) economic forecasting model to conduct a large part of its socioeconomic impact analysis. The IMPLAN methodology is a valid technique in some cases; however, the State Department's application of the IMPLAN model in this case contains no quantitative analyses of non-positive socioeconomic impacts of either construction or operations of the Keystone oil pipeline. Nowhere in the entire 11-volume report's socioeconomic assessment is there any mention of the prospect of jobs lost in the State of South Dakota in future years. The reason is due to the fact that negative impacts are simply impossible given the IMPLAN methodology used by the State Department. As a result, in no way does the State Department analysis reflect the net socioeconomic impact of the Keystone oil pipeline on the State of South Dakota.
5. The State Department's justification for not including the implications of pipeline spills in its socioeconomic analysis is that it did not have the resources to do so. In the State Department's words, "The economic effects of potential pipeline spills are beyond the scope of this operations assessment."[3] One has to wonder what the actual economic implications of a spill involve if simply estimating the costs of a spill is too much work for an agency with an annual budget of more than $50 billion.
6. The IMPLAN methodology that the State Department uses, therefore, naively assumes a positive impact and then portends to calculate just how positive. This methodology is seriously flawed, as any spill from the Keystone oil pipeline will have at least some negative impact on the local, if not state, economy. The State Department's socioeconomic estimates, in contrast, use the following dollar value for negative impacts: $0.
7. The State Department fails to conduct even the most rudimentary assessment of impact on Quality of Life (QoL) and productivity – a survey of individuals who have experienced the negative implications of oil spills due to the construction and operations of oil pipelines.
8. The State Department fails to conduct any kind of real-world comparables analysis as part of its socioeconomic assessment, such as the socioeconomic implications of oil spills on local

[3] FSEIS, p. 4.10-32.

economies – including jobs lost – to evaluate the economic impact of an unplanned release of oil. Such an analysis could include places where the construction of an oil pipeline or comparable project was performed recently.

9. While the SEIS implicitly assumes a zero dollar value for negative socioeconomic impacts and ignores other well-known methods to quantify costs, the SEIS is very explicit about the miniscule positive socioeconomic benefits to the State of South Dakota and the Standing Rock Sioux Tribe. Further, according to the SEIS, "Because of the specialized nature of the work, Keystone estimates that only approximately 10 percent of the construction workforce would be hired from the four proposed Project area states."[4] Apparently South Dakota's own workers are not good enough for this work. Further, neither the construction nor the operations of the Keystone oil pipeline will have any meaningful impact on the estimated 37.2 percent employment rate of the Standing Rock Reservation.[5]
10. The second document is a risk analysis of the proposed Keystone oil pipeline conducted by a research team hired by TransCanada Keystone Pipeline, LP.[6] This report spans a full 36 single-spaced pages and includes potentially-valuable information about the source of spills (corrosion, natural forces, excavation damage, other outside force damage, material and/or weld failures, equipment, and incorrect operation) and the costs associated with each cause. The authors use the term "total cost" to describe costs, however, the term "socioeconomic" is not mentioned once in the entire report and neither is the word "jobs" (as in jobs lost), an interesting juxtaposition with the SEIS that touts socioeconomic benefits almost entirely in terms of jobs created.
11. Any decent economic analysis contains a summary of high-level findings. The TransCanada Keystone Pipeline, LP risk assessment does not. In fact, the word "dollar" and the symbol "$" are completely absent from the report summary. One has to wonder what the point of this study is if: 1) the entire methodology section is grounded with an expected cost risk equation, and 2) the main conclusion is silent about what these expected costs are.

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[4] FSEIS, Section 4.10 (Socioeconomics), January 2014, p. 4.10-2.
[5] United States Department of the Interior. 2014. *2013 American Indian Population and Labor Force Report*. Washington, D.C. Available at: http://www.bia.gov/cs/groups/public/documents/text/idc1-024782.pdf.
[6] McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. (2013). Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute.

12. The authors even acknowledge their inability to identify costs in any meaningful way and conclude that they are unable to conduct even a rudimentary cost-benefit analysis. It is very concerning that those most knowledgeable about spills are unable to attempt a straightforward cost-benefit assessment.
13. Even more egregious, when examining the extent to which the spills in their database are indicative of the proposed Keystone oil pipeline, the authors limit their comments to biases that operate in favor of their client. The authors are silent about well-known biases that operate in the other direction, such as the pressure under which the pipeline will operate and the caustic nature of the tar sands oil. The fact that the authors are silent about biases that go against their client's interests calls into question their entire analysis and makes one wonder what else they are not telling the reader.
14. The evidence presented by TransCanada's research team runs counter to an independent study – most notably, one not funded by TransCanada, but also not funded by the intervenors in this case – conducted by Professor John Stansbury from the University of Nebraska – Lincoln. Economists are oftentimes faced with this type of situation, where experts in a particular field disagree. The response of a well-trained economist is to conduct what is known as a sensitivity analysis. Simply put, you perform your calculations using different scenarios and show how the results change when the underlying assumptions change. Clearly there are differences of opinion among experts with respect to the consequences of an oil spill. None of the socioeconomic impact analyses I have seen include any kind of sensitivity analysis with respect to these obvious differences of opinion among qualified experts.
15. Simply put, the socioeconomic impact analyses of the Keystone oil pipeline are a statement about the expected socioeconomic benefits of the project – marginal in the case of South Dakota – in the absence of any costs or risks. As a PhD economist I find it inexplicable why the quantitative portion of the socioeconomic cost analysis in the SEIS completely ignores the cost side of this cost-benefit analysis. A balanced and well-informed socioeconomic impact analysis would, at an absolute minimum, at least attempt to model the potential negative implications of the construction and operating impacts of the Keystone oil pipeline to arrive at net impacts.
16. Because of these shortcomings, Mr. Walsh is incorrect when he asserts in his pre-filed testimony that pursuant to "the recommendations in the FSEIS, risks to South Dakota's

natural resources is minimized."[7] As noted above, and as explained in detail below, the application in the FSEIS of the IMPLAN economic forecasting model contains no quantitative analysis of non-positive socioeconomic impacts of either construction or operation of the Keystone XL Pipeline. Minimized does not imply minimal and certainly does not imply zero, as the State Department assumes in its IMPLAN analysis.

17. In further regard to Ms. McIntosh, she also provides other testimony regarding a generic or non-specific "petroleum spill" or "hydrocarbon spill." Such generic or sweeping statements ignore the specifics of the Keystone pipeline, or the risks associated with the corrosive and toxic nature of the tar sands oil that would flow through the pipeline.

18. This report is structured as follows. The remainder of this section presents my qualifications, assignment, compensation and materials considered. Section II contains a summary of the relevant background information in this case as it pertains to my rebuttal report. Section III presents and comments on the pretrial testimony of Ms. McIntosh. Section IV follows up on my comments regarding Ms. McIntosh's testimony with an assessment of the IMPLAN methodology used by the State Department to assess socioeconomic impact. Section V follows up on my comments regarding Ms. McIntosh's testimony and Mr. Walsh's testimony with an assessment of the empirical analysis contained in the SEIS and TransCanada's risk assessment. Section VI follows up on my comments regarding Ms. McIntosh's testimony by noting some obvious inconsistencies in the SEIS analysis and TransCanada's assessments of risk. Section VII comments on how Ms. McIntosh trivializes the potential costs of the Keystone oil pipeline. Section VIII summarizes the main points of this report.

B. Qualifications

19. My name is Kevin E. Cahill, Ph.D. I hold a B.A. in both economics and mathematics from Rutgers College and an M.A. and Ph.D. in economics from Boston College, with a focus in applied econometrics and labor economics. I am currently a project director and senior economist at ECONorthwest, a Northwest-based economic consulting firm, and a research economist with the Center on Aging & Work at Boston College ("the Center"). I have been

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[7] Pre-filed Testimony of Brian Walsh on Behalf of the Commission Staff. 2015. Before the Public Utilities Commission, State of South Dakota, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification of Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket HP14-001 (April), p. 2.

with ECONorthwest since April 2012. I have been affiliated with the Center since its inception in 2005. Prior to joining ECONorthwest, I was a manager at Analysis Group, an economics and financial consulting firm headquartered in Boston, Massachusetts. While at Analysis Group, I worked as an economist on a variety of litigation-related cases involving contract disputes, antitrust issues and improper marketing, and the calculation of damages in such cases. My casework at Analysis Group also included an assessment of competition in the pharmaceutical benefit manager industry, an analysis of topping bids in mergers and acquisitions, and an assessment of age discrimination claims within cash balance pension plans.

20. In addition to my consulting work, I conduct economic analyses related to public policy. My research focuses on applied microeconomics with a concentration in the economics of aging. My work has been published in academic journals, including *The Gerontologist*, *Research on Aging*, *Monthly Labor Review*, *Topics in Economic Analysis and Policy*, *Current Medical Research and Opinion*, *Journal of Managed Care Pharmacy*, *Expert Opinion on Pharmacotherapy*, as well as by the Center for Retirement Research, the Center on Aging & Work, and the U.S. Bureau of Labor Statistics.
21. Prior to joining Analysis Group, I served as the associate director for research at the Center for Retirement Research at Boston College, as an economist and expert witness with Tinari Economics Group, and as an associate at Abt Associates, Inc., a for-profit public policy research firm based in Cambridge, Massachusetts. I am a member of the American Economics Association and I am currently vice president at-large on the Board of the National Association of Forensic Economists.
22. I have previously testified in deposition and at trial. My expert opinions pertained to lost profits to business, lost earnings, including fringe benefits and pensions, and other economic losses.
23. Although I hold positions with ECONorthwest in Portland, Oregon and with Boston College in Chestnut Hill, Massachusetts, I currently reside in Boise, Idaho and have been a resident of Boise since March 2010. Prior to living in Boise, Idaho, I was a resident of Marshfield, Massachusetts.

24. My professional and academic qualifications, publications in the past ten years, and testimony in the past four years are described in my curriculum vitae, which is attached as Appendix A.

C. Assignment

25. I have been asked by counsel for the Standing Rock Sioux Tribe to rebut the testimony offered by Brian Walsh and Kimberly Lorrene McIntosh as it pertains to the socioeconomic impacts of the Keystone oil pipeline.[8]
26. To the extent relevant to my rebuttal comments, I have also been asked by counsel for the Standing Rock Sioux Tribe to: (1) review TransCanada's Petition for Order Accepting Certification under SDCL §49-41B-27 and the FSEIS issued by the State Department; (2) assess the methodology used by the State Department to determine the socioeconomic impact on the citizens of South Dakota; and (3) comment on the extent to which the claims by the State Department reflect current conditions and knowledge with respect to the true socioeconomic impact of the Keystone oil pipeline on the citizens of South Dakota and the Standing Rock Sioux Tribe.
27. I would like to note that I feel an incredible pride in our country. I am deeply appreciative of the fact that I live in a country where civilians can offer without fear of retribution opinions on an analysis conducted by a government agency that pertains to such a high-profile project as the Keystone oil pipeline.
28. I am willing to testify under oath as to the opinions expressed in this report.
29. I may offer additional opinions if additional relevant information becomes available.

D. Compensation

30. I have been compensated for my time on this matter at my standard hourly rate for litigation-related work through ECONorthwest. This rate is $300 per hour. None of my compensation is based on the outcome of the Keystone oil pipeline. The time that I have spent on this matter was conducted through ECONorthwest and is unrelated to my work with the Center.

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[8] Pre-filed Testimony of Kimberly Lorrene McIntosh on Behalf of the Commission Staff. 2009. Before the Public Utilities Commission, State of South Dakota, Keystone XL Project, Docket HP09-001 (September); Pre-filed Testimony of Brian Walsh. 2015. Before the Public Utilities Commission, State of South Dakota, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket HP14-001 (April).

31. Under my direction, staff at ECONorthwest assisted with the preparation of this report. Staff at ECONorthwest were compensated for their time on this matter according to their standard hourly rate for litigation-related work through ECONorthwest.

32. Should other parties involved in this case request further analyses from me, they will be billed through ECONorthwest at my hourly rate for litigation-related consulting services. This rate is currently $300 per hour. Any follow-up work that I deem requires the assistance of ECONorthwest staff will also be billed at ECONorthwest's standard hourly rates for litigation-related consulting services.

E. Materials Considered

33. I have reviewed documents provided by counsel for the Standing Rock Sioux Tribe and other documents that are publicly available. A list of these documents is contained in Appendix B.

II. BACKGROUND

34. The Public Utilities Commission of the State of South Dakota (PUC) is considering an application by TransCanada Keystone Pipeline, LP (Applicant) for certification under SDCL §49-41B-27 to site and build the Keystone XL hydrocarbon pipeline project (the Keystone oil pipeline) through western South Dakota. The Applicant sought and obtained a permit from the PUC in 2010 to build and operate the Keystone oil pipeline on June 29, 2010.[9] My understanding is that, while permits are perpetual, if construction does not start within four years of approval, then an applicant must certify that a project continues to meet the conditions of the initial permit.[10] In this case, the Applicant must certify to the PUC that the Keystone oil pipeline continues to meet the conditions of SDCL §49-41B-27.[11]

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[9] Petition for Order Accepting Certification under SDCL §49-41B-27. In re: The Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project before the Public Utilities Commission of the State of South Dakota, September 15, 2014 (TransCanada Keystone Oil Pipeline Petition).

[10] SDCL 49-41B-27 states: "Construction, expansion, and improvement of facilities. Utilities which have acquired a permit in accordance with the provisions of this chapter may proceed to improve, expand, or construct the facility for the intended purposes at any time, subject to the provisions of this chapter; provided, however, that if such construction, expansion and improvement commences more than four years after a permit has been issued, then the utility must certify to the Public Utilities Commission that such facility continues to meet the conditions upon which the permit was issued." (Source: South Dakota Legislature, Legislative Research Council, http://legis.sd.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=49-41B-27, accessed April 13, 2015.)

[11] TransCanada Keystone Oil Pipeline Petition.

35. The Applicant, through their attorneys, have submitted a petition and supporting documents that they believe "provides the necessary basis for the Commission to find that the Project continues to meet the conditions upon which the June 2010 permit was issued." As such, they have requested that the PUC accept certification of the Keystone oil pipeline through western South Dakota.[12]

36. In January 2014 the United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs (State Department) issued a Final Supplemental Environmental Impact Statement (FSEIS) for the Keystone oil pipeline in order to "assess the potential impacts associated with the proposed Project and its alternatives."[13] The State Department states that the FSEIS includes several changes from the initial EIS, dated November 2008, including "an expanded analysis of potential oil releases; expanded climate change analysis; updated oil market analysis incorporating new economic modeling; and expanded analysis of rail transport as a part of the No Action Alternative scenario."[14] The State Department does not include its socioeconomic impact analysis among its highlighted list of changes.

37. According to the SEIS, construction for the Keystone oil pipeline will "contribute approximately $3.4 billion to the U.S. GDP" and "[c]onstruction spending would support a combined total of approximately 42,100 jobs throughout the United States."[15] Further, the FSEIS states that "[a]bout 12,000 jobs, or 29 percent of the total 42,100 jobs, would be supported in Montana, South Dakota, Nebraska, and Kansas, approximately 3,900 (or 1,950 per year if construction took 2 years) would comprise of direct, temporary, construction workforce in the proposed Project area."[16]

38. Regarding operations, the FSEIS states that the Keystone oil pipeline will "require approximately 50 total employees in the United States: 35 permanent employees and 15 temporary contractors" and that "[t]he total estimated property tax from the proposed Project

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[12] Petition for Order Accepting Certification under SDCL §49-41B-27. In re: The Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project before the Public Utilities Commission of the State of South Dakota, September 15, 2014 (p. 6).

[13] United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, Executive Summary, January 2014, p. ES-1.

[14] FSEIS, p. ES-1.

[15] FSEIS, p. ES-20.

[16] FSEIS, p. ES-20.

in the first full year of operations would be approximately $55.6 million spread across 27 counties in three states."[17]

III. MS. MCINTOSH'S STATEMENTS ARE ECONOMICALLY NONSENSICAL

39. Economics is the study of the efficient allocation of scarce resources. Decision making in the face of scarcity is simply a fact of life and, because resources are scarce, it is necessary to choose how to produce, distribute, and consume those resources. To allocate resources efficiently economists generally agree that it is important to consider not just the benefits of decisions, but also the costs.

40. In her pre-filed testimony, Ms. McIntosh is asked, "Are there spills that cannot be remediated?"[18] In response, she states, "I do not believe there are any petroleum spills that can not [sic] be remediated given sufficient time and resources."[19] I don't think anyone would argue that Ms. McIntosh's response is not accurate. While accurate, it is not meaningful, and in many respects it is nonsensical from an economic standpoint. The relevant issue is given *limited* resources and time, can petroleum spills, in particular those that can be expected from the proposed Keystone oil pipeline, be remediated such that the expected benefits of the oil pipeline are greater than the expected costs.

41. A socioeconomic cost analysis has been conducted by the State Department as part of the FSEIS. I have reviewed this analysis and others pertaining to this case to assess if Ms. McIntosh's statements, even if corrected to be economically meaningful, would be considered valid among qualified professionals in the field of economics. As I explain in the following sections, the answer is no. In particular, the socioeconomic analysis contained in the FSEIS is in no way an accurate reflection of the net socioeconomic impact of the Keystone oil pipeline.

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[17] FSEIS, p. ES-20.

[18] Pre-filed Testimony of Kimberly Lorrene McIntosh on Behalf of the Commission Staff. 2009. Before the Public Utilities Commission, State of South Dakota, Keystone XL Project, Docket HP09-001 (September), p. 4.

[19] Pre-filed Testimony of Kimberly Lorrene McIntosh on Behalf of the Commission Staff. 2009. Before the Public Utilities Commission, State of South Dakota, Keystone XL Project, Docket HP09-001 (September), p. 4.

IV. THE CURRENT SOCIOECONOMIC ANALYSES ARE FUNDAMENTALLY FLAWED FROM A METHODOLOGICAL STANDPOINT

42. The methodology that the State Department uses for assessing socioeconomic impact of the Keystone oil pipeline examines "the potential impacts to socioeconomic resources associated with the construction and operation of the proposed Project and connected actions, and discusses potential mitigation measures that would avoid or minimize the potential impacts."[20] The State Department explains that "[e]conomic activity is defined as the production of goods and services required to meet the demand for construction of the proposed Project. Funds spent by Keystone would trigger production activity, which could be expressed in terms of employment and earnings."[21]

43. The State Department then concludes that the relevant research question is to estimate the magnitude of the (positive) ripple effects throughout the economy, including direct and indirect impacts, as well as induced impacts, described as "the spending of earnings that would be received by employees working for either the construction contractor or for any supplier of goods and services required in the construction process."[22] The State Department's promise to discuss "potential mitigation measures that would avoid or minimize potential impacts" is oddly relegated to another section of the report,[23] and is not used to inform the State Department's economic calculations in any way.

44. The State Department is rather explicit about its abdication of its responsibility to assess negative impacts, claiming it does not have the resources to do so. In the State Department's words, "The economic effects of potential pipeline spills are beyond the scope of this operations assessment."[24] One has to wonder how a government agency with an annual budget exceeding $50 billion does not have the resources to quantify the negative impacts associated with an oil spill.

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[20] FSEIS, p. 4.10-1.

[21] FSEIS, p. 4.10-13-4.

[22] FSEIS, p. 4.10-14.

[23] The State Department states, "Section 4.13.5, Potential Impacts, discusses the potential impacts of a spill on socio-economic resources." FSEIS, p. 4.10-10.

[24] FSEIS, p. 4.10-32.

A. The IMPLAN Model Does Not Take into Account the Impact of Potential Oil Spills

45. The State Department uses the Impact Analysis for Planning (IMPLAN) economic forecasting method, a straightforward input-output model. As described by the US Department of Agriculture, "IMPLAN provides quick estimates of staffing and program impacts to state and local economies for strategic planning."[25] The key component of the IMPLAN model is the multiplier that it generates (i.e., the number that is used to inflate the number of jobs that the researcher inputs to get the number of additional indirect and induced jobs).

46. The assumptions used in calculating this multiplier are crucial. As it turns out, besides State Department staffing, there is nothing in the FSEIS to suggest that the State Department's application of the IMPLAN model has anything to do with the Keystone pipeline per se. To state the obvious, the State Department's economic forecasting model should take into account the fact that the model is being used to assess the impacts of an oil pipeline and, as such, should consider the negative implications on socioeconomic activity that come with it.

B. The IMPLAN Model Does Not Allow for Negative Impacts

47. The economic impact analysis conducted by the State Department is seriously flawed because the IMPLAN model does not consider the possibility that the Keystone oil pipeline could have a negative impact on population and employment (numbers), housing (numbers), schools (numbers), and tax revenue. A serious economic analysis would, at a minimum, (1) acknowledge the possibility of negative impacts and (2) attempt to address them in the socioeconomic analysis. The State Department does Step 1, but then, mysteriously, ignores all of this information for the purposes of quantifying socioeconomic impacts.

48. In fact, the State Department's analysis contains what at first appears to be a fairly comprehensive list of potential social and economic impacts that they include in their analysis. Specifically, the following is a list of the impacts considered by the State Department: "[o]verburdening of the local housing stock because of demand generated by the temporary and permanent workforces; substantial burden on public service providers serving the proposed Project area, such that they would need to expand their service capacities to meet those

[25] US Department of Agriculture, National Resources Conservation Service, "IMPLAN Model/NRCS Economics," http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/alphabetical/econ/?&cid=nrcs143_009748.

demands; substantial changes to local social or economic activities, including changes in employment and income levels resulting from the proposed Project construction and operations; substantial changes in economic impacts, including output and spending; substantial effects to potential environmental justice populations; substantial changes in fiscal revenues, including tax receipts, of local jurisdictions; substantial changes in private property values; and substantial effects to transportation resources."[26]

49. Most glaringly, the list includes nothing about oil spills. As noted earlier the socioeconomic impacts of oil spills is not quantified and is not included among the State Department's impacts.

50. Regarding the State Department's assessment of the impact of "substantial changes in private property values," the State Department is apparently most concerned about the impacts associated with construction on "short-term visual, noise, and land disturbance effects."[27] Regarding operations, the State Department concludes that the impacts could even be *positive*: "Based on the literature search, the Final EIS stated that residential and agricultural properties located on or adjacent to pipeline easements could have property values worth more or less than comparable nearby properties that were not encumbered by pipeline easements."[28] One has to wonder why the Standing Rock Sioux Tribe–and numerous intervenors–would be opposed to something that has the potential to *increase* property values. The answer is obvious–it wouldn't. It is only through the State Department's omission of oils spills that they reach such a perverse conclusion.

51. The State Department concludes that, "The largest economic impacts of pipelines occur during construction rather than operations."[29] The construction process is a mere two years. The bulk of time is associated with operations, and here the State Department's refusal to examine the socioeconomic costs of a spill is paramount. Regarding operations, the State Department concludes: "[t]he 35 new permanent employees associated with the proposed Project would have a negligible impact on housing in the Project area;"[30] "Once in place, the labor requirements for

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[26] FSEIS, p. 4.10-10.

[27] FSEIS, p. 4.10-31.

[28] FSEIS, p. 4.10-35. The State Department concludes: "The Final EIS concluded it did not appear that operation of the proposed Project would have a major impact on residential and agricultural property values. The analysis in this Final SEIS does not change this conclusion." It is unclear what kind of "analysis" with respect to property values was done as part of the FSEIS.

[29] FSEIS, p. 4.10-32.

[30] FSEIS, p. 4.10-32.

pipeline operations are relatively small;"[31] "[t]he Final EIS … concluded that it was not likely that proposed Project operation would disproportionately adversely impact such populations during normal operation of the proposed Project;"[32] and "[t]he operational workforce … would result in negligible impacts on public services based on the law enforcement agencies, fire departments, and medical facilities in the proposed Project area."[33] In contrast, the State Department concludes that "The impact [of operations] to local property tax revenue receipts would be substantial for many counties."[34] If the benefits were so high relative to the costs, one has to wonder why so much effort has been undertaken by the intervenors to express concerns about the Keystone oil pipeline. The obvious answer is that the State Department's analysis is in no way an accurate assessment of the socioeconomic impact of the Keystone oil pipeline on the citizens of South Dakota.

52. The question that the State Department should have asked is: what is the *net impact* of the proposed Keystone oil pipeline on the socioeconomics of the community? How were businesses in these areas impacted? How were individuals in these areas impacted? How were property values impacted? Did individuals have to move out of the area as a result of the spill? How was wildlife affected? And, most importantly, what was the *dollar value* associated with each of these events? Only until such an assessment is done, can the true socioeconomic impact of the Keystone oil pipeline be understood.

V. THE CURRENT SOCIOECONOMIC ANALYSES ARE GROSSLY INSUFFICIENT FROM AN EMPIRICAL STANDPOINT

53. This section presents an assessment of the State Department's empirical analysis of the socioeconomic impact of the Keystone oil pipeline on four project area states–South Dakota, Montana, Nebraska, and Kansas–as well as the rest of the country.[35] The State Department socioeconomic analysis covers impacts associated with construction and operations of the Keystone oil pipeline. The socioeconomic categories included in the analysis are: population,

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[31] FSEIS, p. 4.10-32.

[32] FSEIS, p. 4.10-32.

[33] FSEIS, p. 4.10-32.

[34] FSEIS, p. 4.10-34.

[35] FSEIS, p. 4.10-2. As described in footnote one of the FSEIS, "The proposed Project pipeline would go through Montana, South Dakota, and Nebraska, with two additional pump stations in Kansas. There would also be a pipe yard and rail siding located in North Dakota."

housing, local economic activity, environmental justice, public services, tax revenue, property values, and traffic and transportation. The State Department's socioeconomic impact analysis with respect to these categories is based on the IMPLAN methodology discussed above. In doing so, the State Department starts with existing conditions (e.g., current population) and estimates the effect of adding people and jobs to the baseline condition. The impact on property values is considered independently from the other socioeconomic considerations, as is the risk associated with an oil spill. The result is that risk burden of an oil spill and the costs associated with any that occurs is not taken into account when estimating impacts on population, housing, the local economy, and public services.

A. The FSEIS Analysis Inexplicably Separates Oil Spills and Property Values from Other Socioeconomic Considerations

54. The State Department applies its IMPLAN model to estimate impacts to population, housing (number of units), and public services. The State Department then discusses, almost as an aside, the estimated number of residents impacted by the risk burden of a potential oil spill and the impact that a spill will have on property values, among other outcomes, including quality of life for those living and working in the affected area. The State Department's IMPLAN analysis, on the other hand, implies that an oil spill has no quantifiable negative socioeconomic impact on the local economy.

B. The FSEIS Analysis Ignores Impacts on Quality of Life

55. The State Department fails to conduct even the most rudimentary assessment of the impact on Quality of Life (QoL) and productivity – a survey of individuals who are currently subjected to the risk of an oil spill. The socioeconomic impact analysis presented in the State Department report is almost entirely hypothetical, as if real-world outcomes did not exist. In fact, not only do real-world examples exist, they are plentiful. Moreover, it is very easy to obtain data on quality of life – you simply ask people. Individual surveys are a very basic part of research. An entire industry focuses on surveys, as most anyone with a telephone can attest.

56. Examples of relevant questions to ask residents in areas that already experienced an oil spill are as follows. "Compared to your living situation prior to the oil spill, has your quality of life been enhanced, has it remained the same, or has it been adversely impacted?" "On a

scale of one to ten, where one is no impact and ten is extreme impact, how would you rate the impact of the oil spill on your quality of life?" "On a scale of one to ten, where one is not at all valuable and ten is extremely valuable, how valuable would it be to you to eliminate the oil spill that you were subjected to?" "In the last week, in what ways were you affected by the oil spill?" "[For those who responded at least once to the previous question] On a scale of one to ten, where one is none and ten is completely, to what extent did these episodes interrupt your daily life?" "Would you say that the oil spill had a negative impact on your quality of life? Yes or No."

57. An important note for a serious analysis is that these questions should be asked of all residents in the surrounding area, not just those who the State Department believes a priori are directly impacted by the oil spill. Such an approach would enable an assessment of the breadth of the socioeconomic impact of an oil spill.

58. If the State Department was serious about the impact of an oil spill on residents in the State of South Dakota, the State Department should simply ask people who would be most affected, such as members of the Standing Rock Sioux Tribe. One has to wonder why, as part of the FSEIS, the State Department has not presented the results of any interviews with those individuals who will, on a daily basis, bear the risk of a potential oil spill and then the costs if one occurs.

C. The FSEIS Analysis Ignores Impacts on Productivity

59. The State Department in its analysis of the impacts of operations on local economic activity claims that employment and earnings impacts of the Keystone oil pipeline will be "negligible."[36] While I agree that the potential positive impacts of the Keystone oil pipeline will be negligible, I strong disagree that this implies that the overall impact will be negligible. The economic costs of an oil spill on local economic activity can be near devastating.[37] The State Department considers none of these effects in their quantitative analysis.

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[36] FSEIS, p. 4.10-32.

[37] One notable example is the BP Gulf of Mexico spill. A report by Oxford Economics on the impact of the 2010 BP spill estimates the negative economic effect on solely the tourism sector of the coastal areas affected by the spill of $22.7 billion over the three years following the spill. *See:* Oxford Economics. Not dated. *Potential Impact of the Gulf Oil Spill on Tourism.* p.2

60. Even if no spill occurs in the near term, the risk of a spill is enough to influence local economic activity. To measure this potential impact, the survey described above could be easily supplemented to ask individuals about the impact of the risk of an oil spill. For example, "If the Keystone oil pipeline project moves forward, will that influence any of your decisions to live, work, and invest in your local community?" "[For those who responded yes to the previous question] On a scale of one to ten, where one is none and ten is a lot, what impact does the risk of a spill have on your plans to live, work, and invest in your local community?"
61. While there may be questions about the reliability of data concerning the magnitude of any impact on productivity and willingness to remain a productive citizen in one's local economy, one would certainly be able to ascertain from a survey if there was no impact. People would just say so.
62. Again, one has to wonder why, as part of the FSEIS, the State Department has not talked to anyone who has experienced the risk of an oil spill.

D. The FSEIS Analysis Erroneously Assumes No Harm for Living with the Risk of an Oil Spill

63. The State Department assumes that the socioeconomic impact on quality of life is zero for living with the risk of an oil spill. While the State Department identifies short and long-term health risks associated with exposure to an oil spill, it does nothing to attempt to determine if the risk of these health conditions—or even the presence of the conditions themselves—has any effect on economic productivity or quality of life. Just as it ignores the possibility of negative socioeconomic effects from the construction and operation of the proposed Keystone pipeline, the State Department ignores the possibility of negative impacts on productivity and quality of life associated with living with the risk of an oil spill.
64. If the State Department were serious about socioeconomic impact, the survey mentioned above would be asked of people who are subjected to potential oil spills. Only then can the State Department's assumptions about the risk of living with a potential oil spill be validated.

E. The FSEIS Analysis Fails to Conduct an Analysis of Relevant Real-World Benchmarks

65. The State Department fails to conduct any kind of real-world analysis of socioeconomic impacts to cities that have already been subjected to something like the proposed Keystone

oil pipeline. Such an analysis is common in economics and is fairly straightforward to conduct, mainly because the relevant data is widely available. The U.S. Census Bureau and the U.S. Bureau of Labor Statistics publish very detailed historical socioeconomic information about cities, counties, states, and regions. These data can be used to examine changes over time with respect to a variety of economic characteristics.

66. Further, an analysis of existing locations subject to potential oil spills can be done two ways, each of which would shed light on the possible impact to South Dakota. The first way is to examine socioeconomic data from cities that experienced a change such as the proposed Keystone oil pipeline and compare these data to analogous data from some other comparable city. A second way to conduct the analysis is to use information prior to the intervention as a benchmark. That is, for the city to serve as its own "control," obviously taking into account other changes over time using multivariate regression analysis. Each method is valuable and each method is common in the field of economics.

F. The FSEIS Analysis Shows Minimal Socioeconomic Benefits to South Dakota or the Standing Rock Sioux Tribe

67. While the FSEIS implicitly assumes a zero dollar value for negative socioeconomic impacts and ignores other well-known methods to quantify costs, the SEIS is very explicit about the miniscule positive socioeconomic benefits to the State of South Dakota or the Standing Rock Sioux Tribe. With respect to the construction of the Keystone oil pipeline, less than 10 percent (8.3%) of the direct and induced jobs would be held by residents of South Dakota, so more than 90 percent of the short-term (<2 years) job benefits associated with Keystone oil pipeline construction are outside of South Dakota. Further, according to the SEIS, "Because of the specialized nature of the work, Keystone estimates that only approximately 10 percent of the construction workforce would be hired from the four proposed Project area states."[38] Apparently South Dakota's own workers are not good enough for this work.

68. Operations of the proposed Keystone project are estimated to create 50 jobs across the entire country (35 on a permanent basis). In March 2015, total employment in South Dakota was 419,200. This means the proposed Keystone project will increase long-term total

[38] United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, Section 4.10 (Socioeconomics), January 2014, p. 4.10-2.

employment in South Dakota by no more than 0.012 percent (0.000119 = 50 / 419,200).[39] Actual increases in employment in South Dakota will be even lower (zero for all practical purposes) because not all jobs created by the proposed Keystone project will be located in South Dakota. Further, neither the construction nor the operations of the Keystone oil pipeline will have any meaningful impact on the estimated 37.2 percent employment rate on the Standing Rock Reservation.[40]

69. Because of the shortcomings described above with respect to the socioeconomic analysis contained in the FEIS, Mr. Walsh is incorrect when he asserted in his pre-filed testimony that pursuant to "the recommendations in the FSEIS, risks to South Dakota's natural resources is minimized."[41] Simply put, the application in the FSEIS of the IMPLAN economic forecasting model contains no quantitative analysis of non-positive socioeconomic impacts of either construction or operation of the Keystone XL Pipeline. Minimized does not imply minimal and certainly does not imply zero, as the State Department assumes in its IMPLAN analysis.

VI. THE CURRENT SOCIOECONOMIC ANALYSES ARE INCONSISTENT WITH TRANSCANADA'S OWN RISK ANALYSIS

70. In June 2013 a group of researchers under contract from TransCanada Keystone Pipeline, LP published a risk analysis of the proposed Keystone oil pipeline.[42] This report spans a full 36 single-spaced pages and includes potentially-valuable information about the source of spills (corrosion, natural forces, excavation damage, other outside force damage, material and/or weld failures, equipment, and incorrect operation) and the costs associated with each cause. The authors use the term "total cost" to describe costs, however, the term "socioeconomic" is not mentioned once in the entire report neither is the word "jobs" (as in jobs lost), an

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[39] U.S. Bureau of Labor Statistics. 2015. "Total Nonfarm Employment." *State and Metro Area Employment, Hours, & Earnings.* < http://www.bls.gov/sae/data.htm>

[40] United States Department of the Interior. 2014. *2013 American Indian Population and Labor Force Report.* Washington, D.C. Available at: http://www.bia.gov/cs/groups/public/documents/text/idc1-024782.pdf.

[41] Pre-filed Testimony of Brian Walsh on Behalf of the Commission Staff. 2015. Before the Public Utilities Commission, State of South Dakota, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification of Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket HP14-001 (April), p. 2.

[42] McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. (2013). Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute.

interesting juxtaposition with the SEIS that touts socioeconomic benefits almost entirely in terms of jobs created.

71. Any decent economic analysis contains a summary of high-level findings. This risk assessment does not. The reader is promised at the beginning that, "an attempt is made to select reasonably conservative values for the incidence costs that make up the risk profile for these individual system elements;"[43] however, these results are scattered throughout the document and missing from the summary. In fact, the word "dollar" and the symbol "$" are completely absent from the summary. One has to wonder what the point of this study is if: 1) the entire methodology section is based on an expected cost risk equation, and 2) the main conclusion is silent about what these expected costs are.

72. One explanation for the lack of an answer is that, for whatever reason, the authors do not want the reader to know what it is. Another explanation is that the authors themselves are not capable of this level of analysis (as far as I can tell, none of the authors have a doctorate in economics). Either way, the authors wave their hands and report the following as one of their "key findings": "Given the tremendous uncertainty in incident costs, both the pipeline operator, TransCanada and the regulators have a great deal of incentive to make the special regulatory conditions imposed on the pipeline effective."[44] This statement is completely vacuous because the reader is left with no idea about the magnitude of the incentive. The magnitude of the incentive, or the expected cleanup cost, is absolutely critical to any worthwhile analysis because this is the foundation for the cost side of the cost-benefit analysis. Lest it gets overlooked, the cost to TransCanada to cleanup a spill is just a subset of the overall cost, including damage to private property, potential job loss, and of course, diminished quality of life for those living in the area.

73. The authors even acknowledge that their inability to identify costs in any meaningful way render them unable to conduct their own cost-benefit analysis, even with respect to the much smaller issue of risk-reduction strategies. "While total damage or incident cost can be a good consequence measure, the inability to model the component costs (e.g., damage to property, emergency response, environmental damage) and generate the total cost from them means

[43] McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. (2013). Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute, p. 4.
[44] McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. (2013). Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute, p. 35.

that risk reduction strategies that would lower the component costs cannot be valued."[45] It is concerning that those most knowledgeable about spills from TransCanada's perspective – TransCanada hired this particular researcher team to conduct the analysis – are unable to attempt a straightforward cost-benefit assessment.

74. Interestingly, John Stansbury from the University of Nebraska – Lincoln, conducted his own independent analysis of worst-case spills from the proposed Keystone oil pipeline. Professor Stansbury concludes: "According to TransCanada, significant spills … are expected to be very rare … However, TransCanada made several assumptions that are highly questionable in the calculation of these frequencies. The primary questionable assumptions are: (1) TransCanada ignored historical data that represents 23 percent of historical pipeline spills, and (2) TransCanada assumed that its pipeline would be constructed so well that it would have only half as many spills as the other pipelines in service, … even though they will operate the pipeline at higher temperatures and pressures and the crude oil that will be transported through the Keystone XL pipeline will be more corrosive than the conventional crude oil transported in existing pipelines."[46]
75. Economists are faced with this kind of sometimes-contradictory evidence from experts in other fields fairly frequently. The response of a well-trained economist is to conduct what is known as a sensitivity analysis. Simply put, you perform your calculations using different scenarios and show how the results change when the underlying assumptions change. Clearly there are differences of opinion among experts with respect to the consequences of an oil spill. But inexplicably, none of the socioeconomic impact analyses that I have seen take these differences of opinion into account. Further, not only do the socioeconomic analyses not take these differences of opinion into account, the SEIS analyses assert that no differences exist because the socioeconomic impact of a spill is assumed to be nonexistent.
76. Finally, in additional to the internal flaws of the SEIS and TransCanada's risk assessment, the two documents contradict each other. While the risk assessment is silent about what expected costs are in the summary section, the report does state that, "While [variation]

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[45] McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. (2013). Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute, p. 36.
[46] Stansbury, J. Undated. Analysis of Frequency, Magnitude, and Consequence of Worst-Case Spills from the Proposed Keystone XL Pipeline. Research Report. Lincoln, Nebraska.

makes cost a difficult metric to quantify consequences, the average cost of an incident should be a viable measure, as it conveys risk in spite of the scatter."[47] The SEIS, in contrast, values the consequences of a spill at zero dollars as opposed to the average cost of an incident.

VII. MS. MCINTOSH'S TESTIMONY TRIVIALIZES THE POTENTIAL COSTS OF THE KEYSTONE OIL PIPELINE

77. Ms. McIntosh makes a number of generic statements regarding pipeline spills or spill cleanups that ignore the specific risks that residents, businesses and government entities would face from the Keystone pipeline and the tar sands oil that the pipeline would transport. For example, in response to the question, "What kind of remediation activities are conducted in response to a hydrocarbon spill in soil?"[48] Ms. McIntosh responds, "Evacuation and off-site disposal/treatment of impacted soil, excavation and onsite treatment of impacted soil and in-situ soil vapor extraction."[49] A generic response to a generic question trivializes the threat posed by the Keystone pipeline and spills of tar sands oil. For example, from an economics standpoint, a spill of tar sands oil in Michigan required a massive clean-up effort that cost over $1.2 *billion* dollars that still continues more than four years after the spill.[50]

78. The magnitude of the Michigan spill helps illustrates just how insufficient Ms. McIntosh's responses are. Ms. McIntosh states that the South Dakota Department of Environment and Natural Resources (DENR) has the resources to "oversee the assessment and cleanup of a crude oil release from existing crude oil pipelines and has the resources to oversee a release from the Keystone XL pipeline, if one should occur. …"[51] In response to another question about the funds available for such efforts by the DENR, she replies that as of June 2009, a few months just prior to her testimony, the relevant fund contained approximately $2.8

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[47] McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. (2013). Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute, p. 35.

[48] Pre-filed Testimony of Kimberly Lorrene McIntosh On Behalf of the Commission Staff. September 2009. Before the Public Utilities Commission State of South Dakota. Keystone XL Project Docket HP09-001. (McIntosh Testimony). Page 3.

[49] McIntosh Testimony, page 3.

[50] Ellison, G. 2014. "New price tag for Kalamazoo River oil spill cleanup: Engridge says $1.21 billion." *The Grand Rapids Press*.

[51] McIntosh Testimony, page 5.

million.[52] In the context of Ms. McIntosh's testimony, $2.8 million sounds like a sizable amount. In the context of the Michigan tar sands spill, however, the $2.8 million reported by Ms. McIntosh would cover *less than 1 percent* of the cost of the Michigan spill (0.2% = $2.8 million / $1,200 million).[53]

79. Further, Ms. McIntosh's response to a question about what happens if an oil spill contaminates a property owner's potable water well and cleanup efforts cannot remediate the contamination is also insufficient.[54] Ms. McIntosh provides no specific information regarding the extent to which such events have happened in the past or the risks of such an event posed by the Keystone pipeline or tar sands oil. Questions begged by Ms. McIntire's response include: "Why didn't the State Department's EIS consider analyses of such events?;" "How often have such events happened in South Dakota?;" How often have such events happened from spills of tar sands oil?;" "How do such events affect property values?;" "What if property owners and those responsible for the remediation disagree over the effectiveness of the cleanup; and, if so, what are the potential litigation costs, how much time does such litigation take, and what if a jury or court awards no damages?;" "What happens if none of the alternative water-supply options are feasible?" Answers to these questions are fundamental to any socioeconomic cost assessment, yet these considerations are not taken into account in any meaningful way by Ms. McIntosh or the FSEIS.
80. Ms. McIntosh's responses could have benefited from reference to the risk assessment of the Keystone pipeline and spills of tar sands oil. Unfortunately, Keystone released the results of their risk analysis in 2013, years after Ms. McIntosh's testimony. However, even if Ms. McIntosh had access to Keystone's risk analysis, the study has obvious deficiencies from an econometrics standpoint that limit its usefulness when considering the risk potential of the pipeline.
81. For example, the general approach to the risk assessment focused on a subset of available information on past spills. That is, the analysis considered a spill's data only if that data

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[52] McIntosh Testimony, page 6.

[53] Ellison, G. 2014. "New price tag for Kalamazoo River oil spill cleanup: Engridge says $1.21 billion." *The Grand Rapids Press*.

[54] "Q: What if you can't achieve remediation of a well? A: The responsible party is required to supply the well owner/user with an alternate source of drinking water. This may require drilling a new well in a different location, drilling a deeper well in a deeper formation or hooking the well user up to rural or city water supply." McIntosh Testimony, page 5.

included specific information on the exact source of the spill. Not all of the entries in the spill database include such details, which means that the data used in the risk assessment is not necessarily representative of spills. The problem with lack of representativeness is that the resulting analysis could be biased. In a standard economic analysis such limitations would be spelled out; here, no such effort was made.

82. Second the analysis appears to give equal weight to all spills, rather than focusing on pipeline and operator details most relevant to the Keystone pipeline and tar sands oil spills. For example, rather than looking exclusively at the history of pipeline spills for all operators, the analysis could have also considered TransCanada's history of pipeline spills. For example, the TransCanada Keystone pipeline in North Dakota and Kansas had 14 spills as of June 2010, the time of a report on the pipeline. The pipeline operator shut the pipeline down for two weeks to replace parts of the pipeline. This frequency of leaks on a relatively recent pipeline begs the question of how does the leak performance of the pipeline compare with the assumptions in the risk assessment of the pipeline?

83. Perhaps more importantly is how the authors address the extent to which the spills in their database are relevant to the proposed Keystone oil pipeline. The authors, interestingly, only comment on the extent to which the bias might be in favor of their client. As any thoughtful reader of the materials in this case can attest, biases also operate in the other direction. For example, the pressure under which the pipeline will operate and the caustic nature of the tar sands oil imply that the costs could be higher for the Keystone oil pipeline in the event of a spill relative to the spills in their dataset. The fact that the authors are silent about biases that go against their client's interests calls into question their entire analysis and makes one wonder what else they are not telling the reader.

VIII. CONCLUSION

84. Ms. McIntosh's testimony ignores the fundamental economic concept of scarcity and trivializes the potential cost of the Keystone oil pipeline. Ms. McIntosh also makes numerous meaningless generic statements about pipeline spills and cleanup costs that ignore the specific risks of the Keystone oil pipeline, and the economic consequences of such risks.

85. As I have attempted to explain in this rebuttal report, from an economics standpoint, the relevant issue is given *limited* resources and time, can petroleum spills, in particular those

that can be expected from the proposed Keystone oil pipeline, be remediated such that the expected benefits of the oil pipeline are greater than the expected costs to the residents and businesses in South Dakota and other jurisdictions along the route of the proposed pipeline. My opinion is that the socioeconomic analyses conducted to date are grotesquely insufficient in this regard.

86. If the State Department and TransCanada are serious about conducting an analysis of the socioeconomic impact of the Keystone oil pipeline, such an analysis, at a minimum, would include: (1) an IMPLAN model that takes into account the impact of potential oil spills; (2) an IMPLAN model that estimates net effects; (3) a survey of individuals currently living in areas that have experienced an oil spill; (4) a survey of individuals currently living in areas at risk of an oil spill; and (5) a comparative analysis of socioeconomic impact based on areas where an oil pipeline was introduced.
87. Without these changes, the socioeconomic analysis as it currently stands does not represent the *net* socioeconomic impact of the Keystone oil pipeline. Instead, the State Department's socioeconomic assessment represents potential economic benefits only. The elephant in the room–the risks and costs associated with pipeline spills–is simply ignored.
88. Given this fundamental shortcoming, and other severe flaws that I have identified in this report, the socioeconomic analyses conducted to date are in no way valid assessments of the net socioeconomic impact of the proposed Keystone oil pipeline. At a minimum the conclusions should be disregarded. More informatively, the expected benefits should be weighed against the expected costs – as opposed to the existing zero-risk, zero-cost method.

Respectfully Submitted,

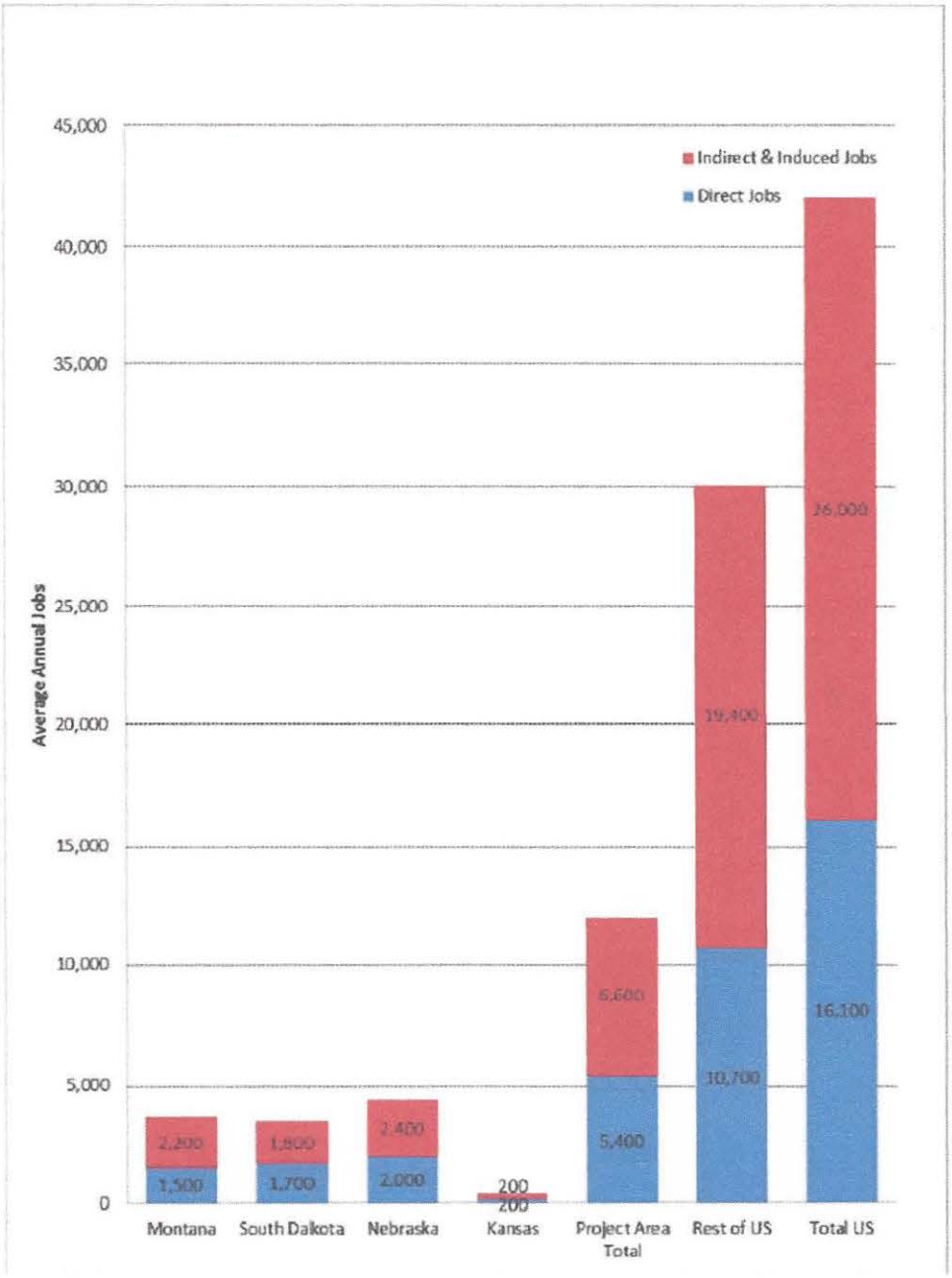
Kevin E. Cahill, PhD

Karen L. Patterson
Notary Public
County of Ada
04.05.19 exp.

KAREN L. PATTERSON
NOTARY PUBLIC
STATE OF IDAHO

IX. EXHIBITS

Exhibit 1: Total Employment Supported by Construction of the Keystone Oil Pipeline



Source: United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, Section 4.10 (Socioeconomics), January 2014, p. 4.10-3.

X. APPENDIX A: Curriculum Vitae

CURRICULUM VITAE

KEVIN E. CAHILL

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Education

Ph.D. Economics, Boston College, Chestnut Hill, MA, 2000
M.A. Economics, Boston College, Chestnut Hill, MA, 1997
B.A. Mathematics and Economics (with honors), Rutgers College, New Brunswick, NJ, 1993

Professional Experience

2012 – present	ECONorthwest: Project Director / Senior Economist
2005 – present	Sloan Center on Aging and Work at Boston College: Research Economist
2005 – 2010	Analysis Group, Inc.: Associate (2005 – 2008); Manager (2009 – 2010)
2004 – 2005	Tinari Economics Group: Economist and Expert Witness
2003	Center for Retirement Research at Boston College: Associate Director for Research
2000 – 2002	Abt Associates, Inc.: Associate

Academic Papers and Publications

Cahill, Kevin E., Jacquelyn B. James, and Marcie Pitt-Catsouphes. *forthcoming*. "The Impact of a Randomly-Assigned Time and Place Management Initiative on Work and Retirement Expectations." *Work, Aging and Retirement*.

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Pitt-Catsouphes, Marcie, Jacquelyn B. James, Stephen Sweet, Kevin E. Cahill, David Snow, Kim DeAngelis, Suzanne Lawler, Maureen O'Keeffe, and Danielle Hartmann. 2013. Schedule optimization at the local level. In R. Disselkamp (Ed.), *Workforce asset management book of knowledge*. Hoboken, NJ: Wiley.

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Cahill, Kevin E., Michael D. Giandrea, and Joseph F. Quinn. 2012. "The Relationship between Work Decisions and Location Later in Life." U.S. Bureau of Labor Statistics Working Paper, 458 (October).

Cahill, Kevin E., Michael D. Giandrea, and Joseph F. Quinn. 2012. "Older Workers and Short-term Jobs: Employment Patterns and Determinants." *Monthly Labor Review*, 135(5), 19-32 (May).

Quinn, Joseph F., Kevin E. Cahill, and Michael D. Giandrea. 2011. "Early Retirement: The Dawn of a New Era?" TIAA-CREF Institute *Policy Brief* (July).

Cahill, Kevin E., Michael D. Giandrea, and Joseph F. Quinn. 2011. "Reentering the Labor Force after Retirement." *Monthly Labor Review*, 134(6), 34-42 (June).

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Giandrea, Michael D., Kevin E. Cahill, and Joseph F. Quinn. 2009. "Bridge Jobs: A Comparison across Cohorts." *Research on Aging*, 31(5), 549-576.

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Cahill, Kevin E., Michael D. Giandrea, and Joseph F. Quinn. 2008. "A Micro-Level Analysis of Recent Increases in Labor Force Participation among Older Workers." Center for Retirement Research at Boston College Working Paper, 8 (February).

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Munnell, Alicia H., Kevin B. Meme, Natalia A. Jivan, and Kevin E. Cahill. 2004. "Should We Raise Social Security's Earliest Eligibility Age?" Center for Retirement Research *Issue in Brief*, No. 18 (June).

Cahill, Kevin E., and Sheila Campbell. 2004. "Basic Investment Theory Explained." Center for Retirement Research *Just the Facts*, No. 9 (January).

Cahill, Kevin E., and Mauricio Soto. 2003. "How Do Cash Balance Plans Affect the Pension Landscape?" Center for Retirement Research *Issue in Brief*, No. 14 (December).

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Marshall, Nancy L., Cindy L. Creps, Nancy R. Burstein, Kevin E. Cahill, Wendy W. Robeson, Sue Y. Wang, Nancy Keefe, Jennifer Schimmenti, and Frederic B. Glantz. 2003. "Massachusetts Family Child Care Today: A Report on the Findings from the Massachusetts Cost and Quality Study." Wellesley Centers for Women, Wellesley, MA.

"401(k) Plans and Retirement Saving: Lessons for Personal Accounts." 2002. Summary document of a presentation by William G. Gale and James M. Poterba prepared for the Social Security Administration (November).

Beecroft, Erik, Kevin E. Cahill and Barbara D. Goodson, 2002. "The Impacts of Welfare Reform on Children: The Indiana Welfare Reform Evaluation." Abt Associates Inc. (December).

Burstein, Nancy, Jean I. Layzer, and Kevin E. Cahill. 2001. "National Study of Child Care for Low-Income Families: Patterns of Child Care Use Among Low-Income Families." Abt Associates Inc. (August).

Wrobel, Marian V., and Kevin E. Cahill. 2001. "An Evaluation of the Choosing Health Program." Abt Associates Inc. (April).

Cahill, Kevin E., 2000. "Heterogeneity in the Retirement Process: Patterns and Determinants of Labor Force Withdrawal among Individuals with Low-Wage and Short-Duration Jobs." Boston College Doctoral Dissertation.

Quinn, Joseph F., Richard V. Burkhauser, Kevin E. Cahill, and Robert Weathers. 1998. "Microeconomic Analysis of the Retirement Decision: United States." The OECD Economics Department Working Paper No. 203, Paris.

Professional Activities, Honors and Awards

2011 Lawrence R. Klein Award for best *Monthly Labor Review* article by joint BLS and non-BLS authors.

Ad hoc referee, *The Gerontologist, Journal of Gerontology: Social Sciences, Journal of Applied Gerontology, Industrial and Labor Relations Review, Population Research and Policy Review, Journal of Population Economics, Research on Aging, Applied Health Economics and Health Policy, Sociology Quarterly, Journal of Aging and Social Policy, Ageing & Society, Atlantic Economic Journal, Social Problems, The Journal of Forensic Economics, Alfred P. Sloan Foundation, Oxford University Press*

Member, Founding Editorial Board of *Work, Aging, and Retirement*, 2014 – present.

At-Large Vice President, Board of Directors, National Association of Forensic Economics, 2013 – present.

American Economics Association, member, 2002 – present.

Gerontological Society of America, member, 2012 – present.

Western Economics Association, member, 2004 – 2008, 2012 – present.

National Association of Forensic Economics, member, 2004 – present.

Eastern Economics Association, member, 2005 – 2010, 2014

Reviewer of grant proposals, Sandell Grant Program, 2002 – 2003.

Doctoral Fellowship, Social Security Administration, Center for Retirement Research, 1999.

Teaching Excellence Award, Boston College Graduate School of Arts and Sciences, 1998.

Michael Mann Summer Dissertation Award, Boston College Department of Economics, 1997.

Graduate Student Fellowship, Boston College Department of Economics, 1995 – 1998.

Henry Rutgers Scholar, Rutgers College, Department of Economics, 1993.

Presentations and Conferences Attended

"Boomers and the Future of Oregon's Economy." Speaker at a jointly-sponsored ECONorthwest–AARP event on leveraging Oregon's 50-plus population, Portland, OR, March 17, 2015.

"The Impact of a Randomly-Assigned Time & Place Management Initiative on Work and Retirement Expectations." Presentation at the 2015 Annual Meeting of the Allied Social Science Associations, Boston, MA, January 4, 2015.

"A Balanced Look at Self-Employment Transitions Later in Life." Presentation at the 67th Annual Scientific Meeting of the Gerontological Society of America (GSA), Policy Series: Self-Employment and Entrepreneurship: The Aging Workforce's 'Encore'?, Washington, DC, November 8, 2014.

"How Might the Affordable Care Act Impact Retirement Transitions?" Presentation at the 89th Annual Conference of the Western Economic Association International, Denver, CO, June 28, 2014.

"Hours Flexibility Preferences and Work/Retirement Decisions." Presentation at the Work and Family Researchers Network (WFRN) 2014 Conference, New York, NY, June 19, 2014.

"Bridge Jobs and the New Era of Retirement." Invited speaker at the Sloan Foundation's Workshop on Measuring, Modeling, and Modifying Late in Life Workplace Dynamics, New York, NY, June 5, 2014.

"The Impact of Hours Flexibility on Retirement Transitions." Presentation at the Pacific Northwest Regional Economics Conference (PNREC) 2014, Portland, OR, May 8, 2014.

"Job Transitions among Today's Older Americans: Challenges and Opportunities." Keynote speaker at AARP's Finding Work at 50+ Event, Beaverton, OR, April 22, 2014.

"Retirement Communities – the Golden Age of Real Estate." Invited panelist at a forum sponsored by the Idaho Business Review, Boise, ID, April 1, 2014.

"Transitions into Self-Employment at Older Ages: 1992 to 2012." Presentation at the 40th Annual Conference of the Eastern Economics Association, Boston, MA, March 8, 2014.

"What Forensic Economists Need to Know about Societal Aging." Presentation at the NAFE Sessions of the 40th Annual Conference of the Eastern Economics Association, Boston, MA, March 8, 2014.

"Preparing for the Aging Boom: Best Practices for Employers." Invited panelist at a forum sponsored by the Vision Action Network and the Washington County Chamber of Commerce Partnership, Portland, OR, January 29, 2014.

"The New Era of Retirement." Presentation at the Osher Lifelong Learning Institute at Boise State University, Boise, ID, January 9, 2014.

"The Impact of Hours Flexibility on Career Employment, Bridge Jobs, and the Timing of Retirement." Presentation at the 2014 Annual Meeting of the Allied Social Science Associations, Philadelphia, PA, January 4, 2014.

"Schedule Matches and Work-life Fit among Older Healthcare Workers." Presentation at the 66th Annual Scientific Meeting of the Gerontological Society of America (GSA), New Orleans, LA, November 21, 2013.

"Self-Employment Transitions among Older Americans." Invited speaker at the AARP Public Policy Institute Roundtable on Crafting a Workforce Development System that Better Meets the Needs of Older Jobseekers and Workers, Washington, DC, November 7, 2013.

"The Uncertainty of Planning for Retirement." Invited guest on Chicago Public Radio, WBEZ's "Morning Shift," Chicago, IL, November 4, 2013.

"The Role of Gender in the Retirement Patterns of Older Americans." Invited speaker at the U.S. Department of Labor's Older Women Workers Roundtable, Washington, DC, September 27, 2013.

"Are Gender Differences Emerging in the Retirement Patterns of the Early Boomers?" Presentation at the 88th Annual Conference of the Western Economic Association International, Seattle, WA, June 30, 2013.

"Getting Older, Getting Hired." Invited guest on WGBH's "Boston Public Radio," Boston, MA, January 22, 2013.

"Employment Experiences of Older Workers in the Context of Shifts in the National Economy." Presentation at the 65th Annual Scientific Meeting of the Gerontological Society of America (GSA), San Diego, CA, November 17, 2012.

"Retirement Patterns and the Macroeconomy, 1992 to 2010: The Prevalence and Determinants of Bridge Jobs, Phased Retirement, and Reentry among Different Cohorts of Older Americans." Presentation at the 2012 Fall Research Conference of the Association for Public Policy Analysis and Management (APPAM), Baltimore, MD, November 9, 2012.

"New Evidence on Self-Employment Transitions among Older Americans with Career Jobs." Presentation at the 87th Annual Conference of the Western Economic Association International, San Francisco, CA, June 30, 2012.

"Work after Retirement: Lessons for Employers and Policymakers from the United States." Invited speaker at Eurofound's "Income from Work after Retirement" Expert Workshop, European Foundation for the Improvement of Living and Work Conditions, Brussels, Belgium, June 15, 2012.

"The Relationship between Work Decisions and Location Later in Life." Presentation at the 2012 Annual Meeting of the Allied Social Science Associations, Chicago, IL, January 7, 2012.

"Building Your Bridge to Retirement'?" Invited guest on AARP's "Inside E Street" for Public Television, Washington, DC, December 7, 2011.

"How Does Occupational Status Impact Bridge Job Prevalence." Presentation at the 2011 Annual Meeting of the Allied Social Science Associations, Denver, CO, January 8, 2011.

"Stepping Stones and Bridge Jobs: Determinants and Outcomes." Presentation at the 2010 Annual Meeting of the Allied Social Science Associations, Atlanta, GA, January 4, 2010.

"Adapting U.S. Retirement Behavior." Discussant at the 2009 Annual Meeting of the Eastern Economic Association, New York, NY, February 27, 2009.

"Retirement Patterns and Determinants among Individuals with a History of Short-Duration Jobs." Presentation at the 2009 Annual Meeting of the Allied Social Science Associations, San Francisco, CA, January 4, 2009.

"The Role of Bridge Jobs in the Retirement Process." Presentation at The Ann Richards Invitational Roundtable on Gender and the Media, Older Workers: Benefits and Obstacles for Women's and Men's Continued Employment, Brandeis University, Waltham, MA, October 24, 2008.

"The Role of Re-entry in the Retirement Process." Presentation at the 2008 Annual Meeting of the Allied Social Science Associations, New Orleans, LA, January 4, 2008.

"A Micro-level Analysis of Recent Increases in Labor Force Participation among Older Workers." Presentation at the Korea Labor Institute Conference on Panel Data, Seoul, Korea, October 25, 2007.

"Bridge Jobs and Retiree Well-being." Presentation at the 2007 Annual Meeting of the Western Economic Association, Seattle, WA, July 2, 2007.

"Self Employment Transitions among Older Workers with Career Jobs," Presentation at the 2007 Annual Meeting of the Eastern Economic Association, New York, NY, February 24, 2007.

"A Micro-level Analysis of Recent Increases in Labor Force Participation among Older Workers." Presentation at the 2006 Annual Meeting of the Western Economic Association, San Diego, CA, July 2, 2006.

"Retirement Patterns and Bridge Jobs among the HRS War Babies." Presentation at the 2005 Annual Meeting of the Western Economic Association, San Francisco, CA, July 7, 2005.

SEAK Annual National Expert Witness Conference, Hyannis, MA, June 16-17, 2005.

"The Social Security Debate: Why Should I Care about Reforms?" Invited guest for a panel discussion on Social Security Personal Accounts, Drew University Economics Department, Madison, NJ, April 12, 2005.

"The Role of the Economist in Assessing Damages for Defendants." Presentation at Liberty Mutual Group, Marlton, NJ, March 18, 2005.

"Was the 9/11 Victim Compensation Fund a Success? A Forensic Economist's View." Presentation at the 2005 Annual Meeting of the Eastern Economic Association, New York, NY, March 5, 2005.

"Recent Evidence on Retirement Patterns and Bridge Jobs." Presentation at the 2005 Annual Meeting of the Eastern Economic Association, New York, NY, March 4, 2005.

"A Retrospective Examination of the 9/11 Victim Compensation Fund Awards: Calculated vs. Actual Economic Loss Awards." Presentation at the 2005 Annual Meeting of the Allied Social Science Associations: Expanding the Frontiers of Economics, Philadelphia, PA, January 8, 2005.

"Are Traditional Retirements a Thing of the Past?" Presentation at the U.S. Bureau of Labor Statistics, Washington, DC, December 16, 2004.

"How Well Prepared Are Massachusetts Families for Retirement?" Presentation at the New England Study Group, Federal Reserve Bank of Boston, Boston, MA, October 12, 2004.

Annual Meeting of the Allied Social Science Associations, San Diego, CA, January 3-5, 2004.

"Securing Retirement Income for Tomorrow's Retirees." Session Chair for the Sandell Grant Program Presentations at the Fifth Annual Conference of the Social Security Retirement Research Consortium, Washington, DC, May 15-16, 2003.

"Retirees Back at Work." Invited guest for "On Point," *National Public Radio*, Boston, MA, March 12, 2003.

"The Changing Retirement Income Landscape." Presentation at the Ethics and Aging Seminar Series at Boston College, Chestnut Hill, MA, February 3, 2003.

"Social Security Reform: The Relationship between Today's Program and Tomorrow's." Discussant at the 55th Annual Scientific Meeting of the Gerontological Society of America, Boston, MA, November 26th, 2002.

"Patterns of Child Care Use among Low-Income Families." Presentation at the National Association for Welfare Research and Statistics (NAWRS) 42nd Annual Workshop: Research, Reauthorization, and Beyond, Albuquerque, NM, August 25-28, 2002.

Annual Meeting of the Allied Social Science Associations, Boston, MA, January 7-9, 2000.

"The Outlook for Retirement Income." Second Annual Conference of the Social Security Retirement Research Consortium, Washington, DC, May 17-18, 2000.

"New Developments in Retirement Research." First Annual Joint Conference of the Social Security Retirement Research Consortium, Washington, DC, May 20-21, 1999.

"AHEAD (Asset and Health Dynamics Among the Oldest Old) Summer Workshop." Survey Research Center, The University of Michigan, Ann Arbor, MI, Summer 1997.

"GSOEP-PSID Summer Workshop." Center for Policy Research, Syracuse University, Syracuse, NY, Summer 1997.

Conference Posters

Cahill KE, James JB, Pitt-Catsouphes M, "How Do Older Healthcare Workers' Preferences for Flexibility Affect Work and Retirement Decisions?" Gerontological Society of America (GSA) 66th Annual Scientific Meeting, November 20-24, 2013.

Wu E, Cahill KE, Bieri C, Ben-Hamadi R, Yu AP, Erder MH, "Comparison of Hospitalization Use and Health Care Costs of Elderly Major Depressive Disorder (MDD) Patients Treated with Escitalopram, Generic SSRIs, and SNRIs," International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 14th Annual International Meeting, May 16-20, 2009.

Cahill, KE, Giandrea MD, Quinn JF, "Retirement Behavior among Individuals with Erratic Work Histories," Gerontological Society of America (GSA) 61st Annual Scientific Meeting, November 21-25, 2008.

Jaff MR, Engelhart L, Rosen E, Yu AP, Cahill KE, "Clinical and Economic Outcomes among U.S. Medicare Beneficiaries with Lower Extremity Peripheral Arterial Disease (PAD)," International Symposium on Endovascular Therapy (ISET), January 20-24, 2008.

Giandrea MD, Cahill KE, Quinn JF, "Self Employment Transitions among Older Workers with Career Jobs," Gerontological Society of America (GSA) 60th Annual Scientific Meeting, November 16-20, 2007.

Lee LJ, Yu AP, Cahill KE, Birnbaum HG, Oglesby AK, Tang J, Qiu Y, "Direct and Indirect Costs among Employees with Diabetic Retinopathy," American Diabetes Association (ADA) 67th Scientific Sessions, June 22-26, 2007.

Yu AP, Cahill KE, Birnbaum HG, Lee LJ, Oglesby AK, Tang J, Qiu, Y, "Direct and Indirect Costs Associated with Photocoagulation and Vitrectomy among Employees with Diabetic Retinopathy," International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 12th International Meeting, May 19-23, 2007.

Wu E, Patel P, Krishnan E, Yu AP, Cahill KE, Tang J, Mody R, "Healthcare Cost of Gout in an Elderly Population: A Claims Database Analysis," American Geriatrics Society (AGS) 2007 Annual Scientific Meeting, May 2-6, 2007.

Wu E, Mody R, Krishnan E, Yu AP, Cahill KE, Tang J, Patel P, "Tighter Control of Serum Uric Acid in Gout is Associated with Lower Morbidity and Health Care Costs," American College of Rheumatology (ACR) Annual Scientific Meeting, November 10-15, 2006.

Expert Reports, Trial and Deposition Testimony

Multnomah County vs. Conway Construction Company, et al., bridge construction damages proceeding, Multnomah County Circuit Court, Oregon, opinion as to plaintiff's economic damages due to the installation of defective bridge decking, testimony taken in trial, February 25, 2015.

KForce vs. Brett Oxenhandler, et al., business damages proceeding, United States District Court, Western District of Washington at Seattle, opinion as to plaintiff's calculation of economic damages, testimony taken in deposition, February 5, 2015.

State of Oregon, ex rel. John Kroger, Attorney General vs. AU Optronics Corporation, et al., TFT-LCD antitrust litigation, United States District Court, Northern District of California at San Francisco, opinion as to the apportionment of damages across purchaser and product groups, testimony taken in deposition, August 11, 2014.

David Sawyer and Joan Sawyer vs. Metropolitan Life Insurance Company, et al., personal injury proceeding, Middlesex County Superior Court, Massachusetts, opinion as to plaintiff's lost earning capacity, testimony taken in deposition, April 16, 2013.

Expert Economic Assessment of the USAF Socioeconomic Impact Analysis for Boise AGS, report submitted to the United States Air Force, March 3, 2012.

Council on American Islamic Relations – New Jersey, Inc., et al. vs. Bergman Real Estate Group, et al., business damages proceeding, Essex County Superior Court, New Jersey, opinion as to plaintiff's lost fundraising revenue, testimony taken in deposition, September 21, 2005.

Garfinkel vs. Morristown Obstetrics and Gynecology Associates, et al., Hon. Stephen F. Smith, Morris County Superior Court, New Jersey, opinion as to defendants' lost profits, testimony taken in trial, June 23, 2005.

Edwards vs. City of New York, wrongful termination proceeding, Hon. Fernando Tapia, New York City Civil Court, Bronx County, New York, opinion as to the loss of earnings, fringe benefits, and pension benefits, testimony taken in trial, June 1, 2005.

Allen vs. Euromarket Designs, Inc., wrongful termination proceeding, Hon. Stephen J. Burnstein, Essex County Superior Court, New Jersey, opinion as to the loss of earnings, testimony taken in trial, April 20, 2005.

Ali vs. Cervelli, personal injury proceeding, Hon. Robert P. Contillo, Bergen County Superior Court, New Jersey, opinion as to the loss of income from the family business and the loss of household services, testimony taken in trial, April 13-14, 2005.

Peskin vs. AT&T Corporation, wrongful termination proceeding, Somerset County Superior Court, New Jersey, opinion as to the loss of earnings, testimony taken in deposition, April 8, 2005.

Garfinkel vs. Morristown Obstetrics and Gynecology Associates, et al., wrongful termination proceeding, Morris County Superior Court, New Jersey, opinion as to defendants' lost profits, testimony taken in deposition, March 16, 2005.

Packard vs. The Bessemer Group, wrongful termination proceeding, Middlesex County Superior Court, New Jersey, opinion as to the loss of earnings and pension benefits, testimony taken in deposition, February 17, 2005.

Durant vs. The Associates, business damages proceeding, Hon. Nicholas J. Stroumtsos, Jr., Middlesex County Superior Court, New Jersey, opinion as to the loss of incremental profit, testimony taken in trial, December 15, 2004.

Durant vs. The Associates, business damages proceeding, Middlesex County Superior Court, New Jersey, opinion as to the loss of incremental profit, testimony taken in deposition, November 22, 2004.

Luisi vs. Luisi, divorce proceeding, Hon. Rachel A. Adams, Richmond County Supreme Court, New York, opinion as to the value of enhanced earning capacity, testimony taken in trial, November 11, 2004.

Newspaper, Periodicals, Blogs and Other Publications

Cahill, Kevin E. 2014. "A New Perspective on Older Workers." *Idaho Business Review* (June).

Cahill, Kevin E., John Tapogna, and Jay Bloom. 2014. "Societal Aging Need Not Mean Slower Growth for Oregon." *The Oregonian* (May).

Cahill, Kevin E., Michael D. Giandrea, and Gene J. Kovacs. 2014. "Self-Employment: The Answer for an Aging Workforce and a Sluggish Economy?" Sloan Center on Aging & Work, AGE*nda* (March).

Cahill, Kevin E., and Jacquelyn B. James. 2013. "A Cost/Benefit View of Occasional Flexibility." Sloan Center on Aging & Work, AGE*nda* (December).

Cahill, Kevin E. and Jacquelyn B. James. 2013. "Small Request, Big Impact: The Importance of Occasional Flexibility in a Healthcare Setting." Sloan Center on Aging & Work at Boston College *Issue Brief* (November).

Cahill, Kevin E., John Tapogna, Rod Gramer, and Diana Lachiondo. 2013. "To What Extent Will Demographic Changes Help Idaho Reach Its Educational Attainment Goals for 2020?" ECONorthwest *Issue Brief* (October).

Cahill, Kevin E., and Gene J. Kovacs. 2013. "Santa Claus, the Easter Bunny, and Traditional Retirement." Sloan Center on Aging & Work, AGE*nda* (May).

Cahill, Kevin E., Jacquelyn James, Marcie Pitt-Catsouphes, and Maureen O'Keeffe. 2012. "Late-Career Flexibility: Beyond Phased Retirement." *HR Pulse Magazine* (December).

Cahill, Kevin E. and Paul Thoma. 2012. "What Does the Aging of Idaho Mean for its Citizens, Employers, and Policymakers?" ECONorthwest *Issue Brief* (September).

Cahill, Kevin E., and Gene J. Kovacs. 2012. "Should You Be Counting on the Social Security Trust Fund?" Sloan Center on Aging & Work, AGE*nda* (September).

Cahill, Kevin E., John Tapogna, Paul Thoma, and Bryce Ward. 2012. "Is Boise Over- or Underperforming Economically?" ECONorthwest *Issue Brief* (August).

Cahill, Kevin E. 2012. "What Ichiro's Departure Says About Loyalty and the Employer-Employee Relationship." *The Seattle Times* (July).

Cahill, Kevin E. 2012. "Thinking about Phased Retirement?" Sloan Center on Aging & Work, AGE*nda* (June).

Sweet, Stephen and Kevin E. Cahill. 2012. "How the Health Care Sector Can Prepare for the Aging of Its Workforce?" Sloan Center on Aging & Work, AGE*nda* (April).

Cahill, Kevin E. and Stephen Sweet. 2012. "Should Older Americans Feel Gloomy About Their Job Prospects?" Sloan Center on Aging & Work, AGE*nda* (March).

Cahill, Kevin E. 2012. "F-35 Opponent Questions Air Force Report." *The Boise Guardian* (February).

Cahill, Kevin E. 2012. "Five Reasons Why Flexible Work Options Are Good Business in a Bad Economy." Sloan Center on Aging & Work, AGE*nda* (February).

Cahill, Kevin E. 2011. "Should Older Workers Step Aside?" *Huffington Post Blog* (featured article) (August) and Sloan Center on Aging & Work, AGE*nda* (December).

Letters to the Editor, *The Wall Street Journal*, 2014 (March), 2013 (November), 2012 (May), 2011 (March), 2006 (November), 2005 (May); *The Idaho Statesman*, 2012 (April).

Quoted and/or cited by: *The Wall Street Journal, The New York Times, U.S. News and World Report, Time, National Public Radio, Reuters, NBC News, The Washington Post, Business Week, Bloomberg, AARP, Investor's Business Daily, The Boston Globe, WBEZ, WRKO Radio, The Seattle Times, Business Insider, The Idaho Statesman, The Boise Guardian, Arbiter Online.*

XI. APPENDIX B: Materials Considered

All Risk No Reward Coalition. Undated. The Keystone XL Tar Sands Pipeline: All Risk and No Reward. www.allrisknoreward.com

Amended Final Decision and Order, Notice of Entry. In the Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project before the Public Utilities Commission of the State of South Dakota, HP09-001, June 29, 2010.

ConocoPhillips and TransCanada. 2008. Keystone XL Project – Construction, Mitigation, and Reclamation Plan, Rev. 1 (November).

Direct Testimony of Daniel Flo on Behalf of the Staff of the South Dakota Public Utilities Commission. 2015. Before the South Dakota Public Utilities Commission, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket 14-001 (April).

Direct Testimony of Heidi Tillquist. 2015. Before the Public Utilities Commission of the State of South Dakota, In the Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project, Docket 14-001 (March).

Ellison, G. 2014. "New price tag for Kalamazoo River oil spill cleanup: Engridge says $1.21 billion." *The Grand Rapids Press*.

Final Decision and Order, Notice of Entry. In the Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project before the Public Utilities Commission of the State of South Dakota, HP09-001, March 12, 2010.

Letter from James E. Moore to Patricia Van Gerpen, Executive Director, South Dakota Public Utilities Commission Re: TransCanada Keystone Pipeline LP, dated September 15, 2014.

Letter from John Smith to Commissioners Johnson, Kolbeck, and Hanson re Draft Permit Conditions dated February 17, 2010.

McSweeney, T.I., Leis, B.N., Mawalkar, S., Harley, M.C., Rine, K.R., & Sanzone, D.M. 2013. Risk Analysis of the Proposed XL Pipeline Route. Battelle Project No. 100007967, Columbus, OH: Battelle Memorial Institute.

Oxford Economics. Not dated. *Potential Impact of the Gulf Oil Spill on Tourism.* p.2 < https://www.ustravel.org/sites/default/files/page/2009/11/Gulf_Oil_Spill_Analysis_Oxford_Economics_710.pdf>

Petition for Order Accepting Certification under SDCL §49-41B-27. In re: The Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project before the Public Utilities Commission of the State of South Dakota, September 15, 2014 (TransCanada Keystone Oil Pipeline Petition).

Pre-filed Testimony of Brian Walsh on Behalf of the Commission Staff. 2009. Before the Public Utilities Commission, State of South Dakota, Keystone XL Project, Docket HP09-001 (September).

Pre-filed Testimony of Brian Walsh on Behalf of the Commission Staff. 2015. Before the Public Utilities Commission, State of South Dakota, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification of Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket HP14-001 (April).

Pre-filed Testimony of Darren Kearney on Behalf of the Commission Staff. 2015. Before the Public Utilities Commission, State of South Dakota, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket HP14-001 (April).

Pre-filed Testimony of Kimberly Lorrene McIntosh on Behalf of the Commission Staff. 2009. Before the Public Utilities Commission, State of South Dakota, Keystone XL Project, Docket HP09-001 (September).

Pre-filed Testimony of Kimberly Lorrene McIntosh on Behalf of the Commission Staff. 2015. Before the Public Utilities Commission, State of South Dakota, In the Matter of the Petition of TransCanada Keystone Pipeline, LP for Order Accepting Certification of Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline, Docket HP14-001 (April).

South Dakota Codified Law §49-41B-27(Source: South Dakota Legislature, Legislative Research Council, http://legis.sd.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=49-41B-27, accessed April 13, 2015.)

South Dakota Public Utilities Commission. 2014. "Amended Final Decision and Order: Appendix C: Tracking Table of Changes."

Stansbury, J. Undated. Analysis of Frequency, Magnitude, and Consequence of Worst-Case Spills from the Proposed Keystone XL Pipeline. Research Report. Lincoln, Nebraska.

Statutory Declaration of Corey Goulet. In re: The Matter of the Application by TransCanada Keystone Pipeline, LP for a Permit Under the South Dakota Energy Conversion and Transmission Facilities Act to Construct the Keystone XL Project before the Public Utilities Commission of the State of South Dakota, September 12, 2014.

TransCanada. 2012. Keystone XL Project – Construction, Mitigation, and Reclamation Plan (redlined version of document dated November 2008) (Rev. 4) (April).

TransCanada Keystone LP. Keystone XL Project: Application to the South Dakota Public Utilities Commission for a Permit for the Keystone XL Pipeline Under the Energy Conversion and Transmission Facility Act, March 2009.

United States Department of Agriculture, National Resources Conservation Service, "IMPLAN Model/NRCS Economics," http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/alphabetical/econ/?&cid=nrcs143_009748.

United States Department of the Interior. 2014. 2013 American Indian Population and Labor Force Report. Washington, D.C. Available at: http://www.bia.gov/cs/groups/public/documents/text/idc1-024782.pdf

United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, Executive Summary, January 2014, p. ES-1 (SEIS).

United States Bureau of Labor Statistics. 2015. "Total Nonfarm Employment." *State and Metro Area Employment, Hours, & Earnings*. < http://www.bls.gov/sae/data.htm>