

Changes to the Economic Costs and Benefits of the Keystone XL Pipeline for South Dakota

Written Expert Testimony Prepared

by

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on behalf of
The Rosebud Sioux Tribe

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 - HP14-001



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Table of Contents

- 1 Mandate..... 1
- 2 Notification Regarding Rebuttal Testimony 1
- 3 Notification Regarding Incomplete Information Provided by
Keystone 1
- 4 Introduction and Methodology 2
 - 4.1 Key Questions Before the PUC..... 2
 - 4.2 Economic Cost-Benefit Analysis 4
- 5 Changes in Findings of Fact affecting economic benefits 7
 - 5.1 Changes in Findings of Fact affecting economic benefits related to property tax:
Findings of Fact 107 7
 - 5.2 Changes in Findings of Fact affecting economic benefits related to employment
impact: Findings of Fact 107 and 109..... 9
 - 5.3 Conclusion on Changes in Findings of Fact affecting economic benefits..... 13
- 6 Changes in Findings of Fact affecting economic costs related
to oil spills..... 14
 - 6.1 Finding of Fact 50: HCAs and Spill Risk Assessment 14
 - 6.1.1 Keystone's Position 14
 - 6.1.2 TGG Concerns..... 16
 - 6.1.3 Conclusion..... 20
 - 6.2 Finding of Fact 32: Environmental Impacts in Table 6 21
 - 6.2.1 Keystone's Position 21
 - 6.2.2 TGG Concerns..... 22
 - 6.2.3 Conclusion..... 25



6.3 Findings of Fact 22, 60 and 90: Addition of 59 PHMSA Special Conditions and Mitigation Recommendations 26

 6.3.1 Keystone's Position 26

 6.3.2 TGG's Concerns 27

 6.3.3 Conclusion 30

7 Permit conditions associated with changes in Findings of Fact affecting economic costs of oil spills 30

 7.1 Permit Conditions 45 to 49: Enforcement and Liability for Damage 31

 7.1.1 Keystone's Position 31

 7.1.2 TGG Concerns 31

 7.1.3 Conclusion 31

8 Evaluation of changes in underlying facts related to economic benefits and costs and permit conditions 31

9 Economic Costs of the Worst-Case Scenario 32

 9.1 Conclusions Related to the Testimony of Richard Kuprewicz Regarding Worst-Case Scenarios 32

 9.2 Approach to Estimate a Range of Costs for a Worst-Case Scenario 34

 9.3 Comparable Crude Oil Pipelines for Recent Spill Costs Estimates 35

 9.3.1 Kinder Morgan's Trans Mountain Expansion Project 35

 9.3.2 Enbridge's Northern Gateway Project 36

 9.3.3 Enbridge's Spill Costs for the Line 6B Rupture in Marshall, MI 37

 9.4 Range of Costs for a Worst-Case Scenario 37

 9.4.1 Kinder Morgan's Trans Mountain Expansion Project Worst-Case Spill Cost per Barrel for TMX in a non HCA 38

 9.4.2 The NEB/JRP's Worst-Case Spill Cost per Barrel for Enbridge Northern Gateway 39

9.4.3 Spill Costs per Barrel for the Enbridge Line 6B Rupture at Marshall, MI 40

10 Adequacy of Keystone's Financial Assurances in the Event of
a Major Spill 41

11 Comparison of Economic Costs and Benefits 45

 11.1 Costs and Benefits for the RST and Tripp County 48

12 Recommendations 48

1 Mandate

Following the filing of the Petition of TransCanada Keystone Pipeline, LP (Keystone) for Order Accepting Certification of Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline (Docket HP14-001), the Rosebud Sioux Tribe (RST) retained the services of The Goodman Group, Ltd. (TGG). Brigid Rowan and Ian Goodman of TGG were retained as experts in order to assist RST with its intervention before the South Dakota Public Utilities Commission (PUC).

Specifically, TGG was retained for the preparation expert testimony on changes to the economic costs and benefits for South Dakota of the South Dakota portion of Keystone XL pipeline (the Project) since the PUC granted Keystone a permit for the construction of the Project on June 29, 2010 (in HP09-001).

2 Notification Regarding Rebuttal Testimony

RST has received an extension to file direct testimony until April 24, 2015, whereas April 2, 2015 was the deadline to file direct testimony for other parties in the case. The deadline for filing rebuttal testimony is April 27, 2015. Given this compressed schedule, we will comment on the direct testimony of other parties within our direct testimony and this small portion can be deemed our rebuttal testimony.

Given the large volume of discovery responses received on April 17, 2015, we wish to notify the PUC that there is possibility that we may also file additional rebuttal testimony after April 24, 2015.

3 Notification Regarding Incomplete Information Provided by Keystone

In the preparation of this direct testimony, TGG has access to a very limited and incomplete amount of information pertaining to Keystone's Petition in the current case for the following reasons:

1. Keystone's Petition (as filed) is brief, with a somewhat convoluted structure (e.g. Appendix C), and lacking extensive explanatory material.

2. Keystone's responses to discovery of parties in the case have been limited, incomplete and slow. Despite our intense efforts to assist counsel in repeatedly explaining and justifying to Keystone why this information was highly relevant to our testimony, Keystone has not provided complete responses to the majority of RST's most important discovery requests, pertaining to the testimony of TGG and Richard Kuprewicz, the other expert retained by RST, whose testimony is complementary to ours. On April 14, 2015, the PUC denied RST's motion to compel Keystone to provide this important missing information. In addition, existing responses in Discovery Rounds 1 and 2 were not shared among all parties until March 30, 2015. At the time of writing, additional Discovery responses to other parties resulting from the April 14, 2015 motion to compel have still not been made available to RST's experts. None of the information that Keystone was compelled to produce was provided to TGG because of the scope of the Protective Order.

3. Keystone's Direct Filed Testimony is very brief, lacking in extensive explanatory material and mainly describes which witnesses are sponsoring specific portions of the Petition.

In light of the PUC's deadline for the RST's direct testimony, we are submitting this report on April 24, 2015; but our expert testimony is heavily constrained by the limited and incomplete amount of information provided by Keystone. Although there was limited information available to TGG, there is sufficient data and facts upon which this Report is based and that the conclusions are drawn from. However, had additional information been provided that would have allowed for TGG to prepare a more thorough and comprehensive Report.

4 Introduction and Methodology

4.1 Key Questions Before the PUC

In its Petition, Keystone maintains that:

the circumstances and factual underpinnings of the Project that led the Commission to issue the facility permit remain valid [...] As Appendix C makes

clear, to the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission's concerns.¹

In this case, the Commission must determine:

1. if Keystone has met the burden of proof to demonstrate that the Project continues to meet the fifty permit conditions set forth in Exhibit A to the Amended Final Decision and Order; Notice of Entry issued on June 29, 2010, in Docket HP09-001;
2. if Keystone has met the burden of proof to demonstrate that [t]o the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission's concerns; and
3. as a corollary of (2), have there been changes in the underlying facts related to the Project, such that the costs of the project for South Dakota now exceed the benefits?

To assist the PUC in determining the answers to above questions, the TGG Direct Testimony (TGG Report) will do the following:

1. Sections 5 and 6 will review the changes in the Findings of Fact and relevant Permit Conditions related to economic costs and benefits of the Project. In our review, we will summarize Keystone's position and describe TGG's concerns if any. For each relevant Finding of Fact reviewed, TGG will analyze whether Keystone has met its burden of proof to demonstrate that the change can be viewed as neutral or positive. For each relevant Permit Condition reviewed, TGG will analyze whether the burden of proof has been met to demonstrate that the Project continues to meet these permit conditions.
2. In its analysis of the Findings of Facts and Permit Conditions, TGG will determine that there have been changes in the underlying facts (that determine both the Findings of Fact and the Permit Conditions). TGG will thus determine that with respect to the Findings of Fact analyzed, Keystone has not met its burden of proof to demonstrate that the changes can be viewed as neutral or positive. Likewise with respect to the relevant Permit Conditions reviewed, TGG will determine that Keystone has not met its burden of proof to demonstrate that the Project continues to these meet Permit Conditions. In some cases, TGG will

¹ HP14-001, Petition for Order Accepting Certification Under SDCL § 49-4 IB-27, pp. 5-6.

demonstrate that changes in the underlying facts result in changes that are negative to the Commissions concerns.

3. Given the analysis in point 2, TGG will then demonstrate that there have been changes in the underlying facts related to the Project, such that the costs of the project for South Dakota may now exceed the benefits under a range of worst-case conditions. Section 9 will analyze the economic costs of a worst-case scenario based on (a) our evaluation of changes in Findings of Fact; (b) recent economic findings related to the costs of worst-case scenarios for crude transportation (and particularly dilbit spills); and, most importantly, (c) the conclusions of direct testimony of Richard Kuprewicz on behalf of RST in this case. Section 11 will compare the economic costs and benefits of the Project both for SD and for the RST tribe.

4.2 Economic Cost-Benefit Analysis

This Report uses an economic cost-benefit analysis to evaluate the costs and benefits of the Project. Economic costs and benefits are defined as costs and benefits that directly affect economic activity and can be somewhat readily (albeit approximately) quantified using market economics. The Report uses economic costs and benefits for the following reasons: (i) these are the elements that can be most readily be estimated and compared; (ii) TGG has a well-developed expertise in the evaluation of economic development costs and benefits (including employment) from various energy options; (iii) the evaluation of the environmental and social costs and benefits is subject to major controversy; (iv) the costs of increased greenhouse gas emissions are beyond the scope of TGG's Report.²

However, given the recent and dramatic declines in crude prices and accompanying changes in crude projections, the approval of Keystone XL is highly likely to enable the development of the tar sands and result in significant increased greenhouse gas emissions, which will affect air quality and the environment not just in Alberta, but in South Dakota and throughout the planet. A February 2, 2015 letter from the EPA with

² We note that the narrow economic definition of costs used in the this Report excludes many environmental impacts such as upstream GHGs, compromised ecosystem services, damage to plant and animal habitat, harm to plant and animal species, and broader human health impacts beyond injuries and death related to an accident. If a more comprehensive definition of costs were taken into account, the costs of the project would be even higher. However, even using this narrow economic definition of the costs, we will show that under Worst-Case Release Scenarios, the cost of a major pipeline rupture can range from US\$1 billion to amounts in excess of \$2 billion for a very high consequence event.

comments on the Department of State's Final Supplemental Environmental Impact Statement (FSEIS) provides strong support for this position.³

Lack of resources and time, as well as the incomplete information provided to us by Keystone (particularly in the discovery process), did not allow us to conduct a comprehensive cost-benefit analysis, nor to determine the probability of a worst-case scenario for a major pipeline rupture. In comparing economic costs and benefits of the Project, we further narrowed the scope to a comparison of an estimate of the economic benefits of the Project with a range of Worst-Case Scenario Costs. This range of Worst-Case Scenario Costs is derived from the conclusions in the Direct Testimony of Richard Kuprewicz (the Accufacts Report) regarding the Worst-Case Release Scenarios. While we are able to provide estimates of the economic benefits of the Project, there is a high

³ See <http://www.epa.gov/compliance/nepa/20140032.pdf>.

Given the recent large declines crude prices and the uncertainty of projections, the EPA is now urging the State Department to revisit its conclusions regarding Keystone XL's contribution to climate change. The construction of Keystone XL under the current crude prices and updated projections is likely to result in increased tar sands production and increased greenhouse gas emissions over what would otherwise occur.

According to the EPA letter, the FSEIS (from January 2014) estimated that:

the incremental greenhouse gas emissions from the extraction, transport, refining and use of the 830,000 barrels per day of oils sands crude that could be transported by the proposed Project at full capacity would result in an additional 1.3 to 27.4 million metric tons of carbon dioxide equivalents (MMTC02-e) per year compared to the reference crudes. [footnote in original: FSEIS, p. ES-15] To put that in perspective, 27.4 MMTC0 2-e per year is equivalent to the annual greenhouse gas emissions from 5.7 million passenger vehicles or 7.8 coal fired power plants. [footnote in original: FSEIS, p. ES-15] Over the 50-year lifetime of the pipeline, this could translate into releasing as much as 1.37 billion more tons of greenhouse gases into the atmosphere. [footnote in original: FSEIS, p. 4.14-46]

Based on projections of the crude prices in January 2014, the FSEIS concluded that if Keystone XL were not approved, tar sands crude would likely reach the market by rail and although rail is more expensive than pipeline, this price differential would not affect the development of the tar sands. Therefore, the FSEIS concluded that while tar sands production significantly increases GHGs, significant emissions would occur with or without the construction of the pipeline.

However, given recent and dramatic declines in crude prices and accompanying changes in crude projections, the EPA's urges the State Department to reconsider this conclusion:

Given the recent variability in oil prices, it is important to revisit these conclusions. While the overall effect of the Project on oil sands production will be driven by long-term movements in the price of oil and not short term volatility, recent large declines in oil prices (oil was trading at below \$50 per barrel last week) highlight the variability of oil prices. The Final SEIS concluded that at sustained oil prices of \$65 to \$75 per barrel, the higher transportation costs of shipment by rail "could have a substantial impact on oil sands production levels- possibly in excess of the capacity of the proposed project." In other words, the Final SEIS found that at sustained oil prices within this range, construction of the pipeline is projected to change the economics of oil sands development and result in increased oil sands production, and the accompanying greenhouse gas emissions, over what would otherwise occur. Given recent large declines in oil prices and the uncertainty of oil price projections, the additional low price scenario included in the Final SEIS should be given additional weight during decision making, due to the potential implications of lower oil prices on project impacts, especially greenhouse gas emissions.

degree of uncertainty and a broad range of potential costs. Despite the impossibility of making a precise determination of the costs (or the risks)⁴ associated with the proposed pipeline, this Report offers useful guidance by comparing an estimate of economic benefits against a range of worst-case scenario costs.

The Report does not attempt to quantify the probability of a worst-case spill. Attempts to quantify such probabilities are controversial at best. However the Direct Testimony of Richard Kuprewicz warns that “[t]he proposed routing in South Dakota places the proposed pipeline at **undue risk of rupture with massive release of oil**, even with the proposed valving suggested under Special Conditions No. 32.” (p. 1, emphasis added). The Accufacts Report also warns about the Space Shuttle Syndrome: the erroneous belief that low risk is no risk. According to Mr. Kuprewicz (p. 10):

“In Oil Spill Response plans, it is often problematic that low probability release events such as rupture are unwisely accepted as “no probability” events, resulting in poor planning and staging of equipment, which in turn undermines the effectiveness of such plans when they are actually needed.

Experience has taught us that worst-case scenarios can and do occur and have been occurring with alarming frequency since 2010, starting with the US\$1.2 billion rupture of Enbridge's Line 6B in Marshall, MI. While the Report has not quantified the probability of a worst-case scenario, we have focused on quantifying the costs for a credible range of worst-case scenarios, based on (a) Richard Kuprewicz' analysis of the Worst-Case Release Scenarios for the Project; and (b) TGG's expertise on relevant and recent unit spill costs estimates for comparable crude oil pipelines.

We have also focused on Worst-Case Scenario Costs because this is our core area of disagreement with Keystone in regard to spill costs/risks. Our main concern is not the costs of smaller (or even mean or average) spills. Instead, we are most concerned about the costs of worst-case scenarios that are possible given that the Project crosses over 200 miles of South Dakota land, deemed by FEMA, as High Landslide Hazard Areas (see RST Exhibit 4: Landslide Hazard Areas), as well as several major water bodies and the environmentally sensitive Ogallala aquifer formation (see Accufacts Figure 1: South Dakota Elevation Profile with Valves and Additional Information).

Cost benefit analyses typically have limitations on the scope of the costs and benefits that are analyzed. This Report's analysis is no exception. However, even a narrow

⁴ It is also impossible to make a precise determination of the broader environmental and human health impacts (notably from increased GHGs) that do not fit into a narrow economic definition of costs.

comparison of economic benefits estimates against a range of worst-case scenario costs is sufficient to inform decision-making about the following:

1. The third question set out above to the Commission: have there been changes in the underlying facts related to the Project, such that the costs of the project for South Dakota now exceed the benefits (under a range of worst-case scenarios)?
2. Can the Keystone evaluation of the changes to the costs and benefits (which implicitly assumes that the benefits of the Project exceed the costs) be relied upon? (Keystone claims that “[t]o the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission’s concerns.”)
3. And therefore is the Project in the public interest of the citizens of South Dakota and the Rosebud Sioux Tribe?

Section 5 reviews changes in Findings of Fact affecting the economic benefits of the Project, including the employment benefits and property tax benefits. Section 6 reviews changes in Findings of Fact affecting economic costs related to oil spills. Section 7 examines Permit Conditions associated with changes in Findings of Fact affecting economic costs of oil spills and whether the Project continues to meet these conditions.

Section 8 evaluates the changes in the Findings of Fact and permit conditions related to economic costs and benefits. Section 9 evaluates the economic costs of a worst-case scenario involving a pipeline malfunction. Finally, Section 11 summarizes comparison of the costs and benefits for the citizens of South Dakota and the RST and answers the three questions posed in this section.

5 Changes in Findings of Fact affecting economic benefits

This Section reviews the Findings of Fact listed in Appendix C of Keystone’s application (and further discussed in related Discovery responses) affecting the economic benefits of the Project.

5.1 Changes in Findings of Fact affecting economic benefits related to property tax: Findings of Fact 107

Keystone’s Position



Finding 107 concludes:

Socio-economic evidence offered by both Keystone and Staff demonstrates that the welfare of the citizens of South Dakota will not be impaired by the Project. Staff expert Dr. Michael Madden conducted a socio-economic analysis of the Keystone Pipeline, and concluded that the positive economic benefits of the project were unambiguous, while most if not all of the social impacts were positive or neutral. S-2, Madden Assessment at 21.

Keystone' Application in Docket HP09-001 (Ex TC-1, at 6.1.5, p. 89) concludes:

If the pipeline was in service on January 1, 2008, and assessed at its expected cost of construction, Keystone would have paid approximately \$10.3 million in ad valorem property taxes in the 9 counties and 13 school districts transited by the pipeline. In addition, because of the increase in the school districts' assessed valuations, state aid to education payments would be reduced by approximately \$5.2 million, with a corresponding savings to the State Education Foundation Payment Fund.

Keystone's Tracking Table of Changes attached to the Petition in this docket (HP14-001) as Appendix C (Appendix C) refers to Finding 107 and indicates the following:

The increase cost of the Project reflected in updated Finding 23 is likely to result in increased tax revenue to the affected counties.

In answer to RST IR 6e, Keystone has confirmed that "[t]here are no present plans to prepare new estimates of the ad valorem property taxes that will be levied against the Keystone XL pipeline.

Regarding Base Keystone, in HP07-01, Keystone had estimated that the first full year of operations of the base Keystone project would produce state-wide taxes of approximately **\$6.5 million**.⁵

However, "Keystone paid **\$653,194 in ad valorem property taxes for 2009; \$2,954,846 for 2010; \$3,145,207 for 2011; \$3,435,037 for 2012; and \$3,934,669 for 2013** in the counties transited by the Keystone base pipeline."⁶

RST IR 6d (Round 2) asked Keystone to explain in detail if and how Keystone's methodology for estimating the revised Keystone XL property taxes will take into

⁵ Response 59 to Bold Nebraska IR No. 1

⁶ Response 107 (b) to Paul Seamans' IR No. 1

account the actual experience with property taxes for the Base Keystone in order to improve the accuracy of the Keystone XL property tax estimates. Keystone did not provide clear or complete answer to this question.

TGG Concerns

Even with the updated increase in the cost of the Project, the tax revenues may have been overstated (as was the case with Base Keystone), such that it is impossible to assess the change in the property tax benefits from the Project.

Conclusion

The main benefit of the Project for SD is in the form of annual property taxes, which were forecast in 2009 to be at \$15-\$17 million in total for the counties crossed by Keystone XL.

Given that (a) Keystone has not provided revised estimates property taxes from the Project and (b) Base Keystone property taxes were significantly overstated, Keystone has not met its burden of proof to show that the increased cost of the Project is likely to result in increased tax revenue to the affected counties.

Nonetheless, as discussed in Section 9, Keystone may have somewhat overstated the benefits of the Project; but even using Keystone's estimates, the benefits for SD are quite small. As such, our main area of disagreement with Keystone is in regard to Project costs, rather than Project benefits.

5.2 Changes in Findings of Fact affecting economic benefits related to employment impact: Findings of Fact 107 and 109

Keystone's Position

Finding 107 concludes:

Socio-economic evidence offered by both Keystone and Staff demonstrates that the welfare of the citizens of South Dakota will not be impaired by the Project. Staff expert Dr. Michael Madden conducted a socio-economic analysis of the Keystone Pipeline, and concluded that the positive economic benefits of the project were unambiguous, while most if not all of the social impacts were positive or neutral. S-2, Madden Assessment at 21.

Based specifically on Keystone's Application in Docket HP09-001, Finding 109 concludes:

The Project will bring jobs, both temporary and permanent, to the state of South Dakota and specifically to the areas of construction and operation.
Ex TC-1 at 6.1.1, pp. 85-86.

Keystone's Application in Docket HP09-001 (Ex TC-1, at 6.1.1, pp. 85-86; see also p. 35) estimated that 1,100 to 1,400 construction workers would be employed for the South Dakota section of the pipeline, but also acknowledged that only 10-15% could be hired locally, with the remaining portion (85-90% or more) consisting of non-local personnel.

Keystone's Tracking Table of Changes attached to the Petition in this docket (HP14-001) as Appendix C (Appendix C) refers to Finding 107, but provides no update in regard to the Project's employment impacts. In effect, Keystone's position is that there are no relevant changes in the underlying facts concerning employment impacts.

TGG Concerns

Subsequent to Docket HP09-001, there has been substantial analysis (and controversy) regarding Keystone XL employment impacts. Based on the information now available, it is clear that the Project will bring very few jobs, either temporary or permanent, to the state of South Dakota and specifically to the areas of construction and operation.

Project Construction

The Department of State's Final Supplemental Environmental Impact Statement (FSEIS) estimates employment impacts for construction of Keystone XL.⁷ Based on the FSEIS analysis and assumptions, building the Project would result in only about 65 direct on-site construction jobs per year for 2 years for South Dakota residents.⁸

⁷ FSEIS, Vol. 3: Chapter 4, 4:10 Socioeconomics, pp. 4.10-1-4.10-21, <http://keystonepipeline-xl.state.gov/documents/organization/221186.pdf>. The employment impacts estimated by the FSEIS are broadly consistent with those estimated by the co-authors of this report (Rowan and Goodman) in an earlier report: Pipe Dreams? Jobs Gained, Jobs Lost by the Construction of Keystone XL, September 2011, revised January 2012, co-authored with Lara Skinner and Sean Sweeney of the Cornell Global Labor Institute.
http://www.thegoodman.com/pdf/150306231254_TGG20120123_GLI_KeystoneXL_PipeDreams.pdf

The employment impacts estimated by the FSEIS for building Keystone XL are based on the entire project budget from start to finish, and thus include jobs that have already ended. The employment estimates in the Pipe Dreams study take into account that a sizable portion of the Keystone XL project budget has already been spent, such that now proceeding to build the project will have relatively small job impacts.

⁸ The FSEIS estimates that on-site construction requires 3500 workers in South Dakota. These numbers are for peak/seasonal workers, not average annual jobs (An average annual job [aka a person-year of (footnote continued on next page)

Moreover, subsequent to Docket HP09-001, economic conditions have changed substantially, such that South Dakota benefits less from any jobs relating to the Project. Unemployment is now very low in South Dakota (and neighboring states).⁹ So to the extent that the Project does result in some jobs located in South Dakota, these jobs may be filled with workers from outside the state (and region), and/or will displace other South Dakota jobs and economic activity.¹⁰

Compared with the current context, economic conditions in the period of Docket HP09-001 were much weaker (and unemployment much higher) in South Dakota, regionally, and especially nationally. The analysis of the Project's economic benefits in Docket HP09-001 was influenced by the then current weak economic conditions.¹¹

(footnote continued from previous page)

employment] consists of one position that is filled for 1 year). The FSEIS assumes that the average peak/seasonal construction job lasts only 4.5 months, equivalent to 0.375 average annual jobs. Thus, 3500 peak/seasonal on-site construction jobs in South Dakota is equivalent to about 1300 average annual jobs. These jobs are spread over a 2 year construction period, so about 650 jobs per year for 2 years in South Dakota. The FSEIS assumes that only 10% of these workers come from within the state. FSEIS, Vol. 3: Chapter 4, 4:10 Socioeconomics, pp. 4.10-13-4.10-17.

⁹ In March 2015, the unemployment rate is 3.5% in South Dakota and similar or lower in neighboring states. <http://data.bls.gov/map/MapToolServlet>

¹⁰ In the context of tight labor market conditions, the employment resulting from pipeline projects is less beneficial and also tends to be substantially overestimated; for additional discussion of the nexus between labor market conditions and employment from pipeline projects, see our recent study on the "Economic Costs and Benefits of the Trans Mountain Expansion Project (TMX) for BC and Metro Vancouver" http://www.thegoodman.com/pdf/TGG20150204_SFU_EconCostBen_TMX.pdf pp. 15-16, 18-19. These caveats relating to tight labor market conditions are especially relevant in regard to employment estimated for a wider range of economic spin-offs, as opposed to direct on-site construction jobs.

In addition to direct on-site construction jobs, the FSEIS also estimates jobs for a wider range of spending and spin-offs. For South Dakota, it is estimated there are 1700 direct average annual jobs. This estimate includes only the 10% of on-site construction jobs filled by workers from South Dakota, but also includes other direct jobs, such as building and operating construction camps. Also, for South Dakota, it is estimated there are 1800 indirect and induced average annual jobs from building Keystone XL. So total employment estimated for South Dakota is 3500 average annual jobs. This is equivalent to 0.62% of 2010 South Dakota employment (the comparison provided in the FSEIS). The job impacts from building Keystone XL would be spread over at least a 2 year construction period, and they might actually take place spread over 3 years. Thus, the job impacts estimated in the FSEIS for South Dakota are in the order of 0.2-0.3% of total South Dakota jobs, for 2-3 years. But in the context of tight labor market conditions, actual job impacts may be substantially lower than would be indicated by the FSEIS estimates.

¹¹ The Madden Assessment (Staff Ex. S-2, pp 3, 7) provides extensive discussion of how the analysis of the Project's economic benefits was influenced by the then current weak economic conditions:

An objective assessment of the likely impact in some sectors can be accomplished by historically researching the actual impact experienced during the construction of the first Keystone pipeline project nearing completion at the present time in 2009. [...] For the years of 2008 and 2009, this type of comparison is complicated by the fact that the national economic slowdown took place at the same time that increased economic activity produced by the pipeline project increased. Much of the likely pipeline economic

(footnote continued on next page)

Project Operations

The FSEIS also confirms that Project operations would not be a significant contributor to employment.¹²

The largest economic impacts of pipelines occur during construction rather than operations. Once in place, the labor requirements for pipeline operations are relatively small. Keystone states that 35 to 50 jobs, some of which may be located in Canada, would be required for annual operations, including routine inspections, maintenance, and repair (exp Energy Services Inc. 2012). Most of the U.S. jobs would be located along or near the proposed pipeline route. Based on the estimate of 35 to 50 total operational jobs, the employment and earnings impacts in the United States stemming from operations of the proposed Project would be negligible.

The FSEIS does not specify how many of these operational jobs would be located in South Dakota. But based on information in Docket HP09-001, there would be only 6 employees to operate and maintain the pipeline in South Dakota.¹³

the operational phase of the project is clearly minor with respect to the regional economy. Only 6 employees assigned to two locations will be required to operate and maintain the pipeline in South Dakota.

Meanwhile, as noted by the FSEIS, pipeline spills could adversely impact activities important to the South Dakota economy, including agriculture and tourism.¹⁴

(footnote continued from previous page)

impact was therefore offset by reduced activity by other spending units.[...]the new Keystone XL project is programmed to begin quite soon after the completion of the first project [...] It should be reiterated that the one year time period analyzed here was also associated with a dramatic deterioration in economic conditions nationally with similar, but less severe reductions in economic activity in South Dakota. It is likely that recessionary slowdowns that occurred because of the national economy were mitigated substantially in these and other counties located near the pipeline project.

¹² FSEIS, Vol. 3: Chapter 4, 4:10 Socioeconomics, p. 4.10-32 <http://keystonepipeline-xl.state.gov/documents/organization/221186.pdf>.

¹³ Staff Ex. S-2, Madden Assessment, p. 2, which cites Response to Staffs First Data Request, May 1, 2009, #1.7. <https://puc.sd.gov/commission/dockets/hydrocarbonpipeline/2009/hp09-001/101409.pdf>

¹⁴ FSEIS, Vol. 3: Chapter 4, 4:10 Socioeconomics, p. 4.10-32 <http://keystonepipeline-xl.state.gov/documents/organization/221186.pdf>. The co-authors of the source cited by the FSEIS (Skinner and Sweeney 2012), together with the co-authors of this report (Rowan and Goodman), were co-authors of the Pipe Dreams study regarding Keystone XL employment impacts (see footnote 7).

The economic effects of pipeline oil spills historically have included impacts to agriculture, tourism, and a variety of other industries (Skinner and Sweeney 2012).

As discussed in the Madden Assessment cited in Finding 107, tourism and hunting are major activities in South Dakota, including in the vicinity of the Keystone XL pipeline, with upland bird hunting in Tripp County of particular importance and proximity to the Project.¹⁵

Conclusion

The Project could have some benefits for South Dakota in terms of employment, but these benefits are very small and mostly very short-term. Subsequent to Docket HP09-001, economic conditions have changed substantially, such that South Dakota benefits less from any jobs relating to the Project. Moreover, pipeline spills could adversely impact activities important to the South Dakota economy, including agriculture, tourism, and hunting.

5.3 Conclusion on Changes in Findings of Fact affecting economic benefits

The main benefit of this Project for South Dakota is US\$15-\$17 million dollars in estimated annual property taxes (which may increase by a heretofore unquantified amount with increased costs for the Project). Keystone has certainly not met its burden of proof to demonstrate that the increased cost of the Project is likely to result in increased tax revenue to the affected counties.

The Project could have some benefits for South Dakota in terms of employment, but these benefits are very small and mostly very short-term. Since the permit for construction was granted in 2010, unemployment has dropped, such that South Dakota benefits less from any jobs relating to the Project. Keystone has certainly not met its burden of proof to demonstrate that changes in the case of employment impacts are positive or neutral to the Commissions concerns.

As explained above, Keystone may have somewhat overstated the benefits of the Project; but even using Keystone's estimates, the benefits for SD are quite small. As

¹⁵ Staff Ex. S-2, Madden Assessment, pp. 14, 16-17.

such, our main area of disagreement with Keystone is in regard to Project costs, rather than Project benefits.

6 Changes in Findings of Fact affecting economic costs related to oil spills

This Section reviews changes in Findings of Fact listed in Appendix C of Keystone's application (and further discussed in related Discovery responses) related to pipeline safety and oil spill response, which could affect the economic costs of the Project.

6.1 Finding of Fact 50: HCAs and Spill Risk Assessment

6.1.1 *Keystone's Position*

Updated Finding of Fact 50 (Appendix C)

According to Keystone's Tracking Table of Changes attached to the Petition as Appendix C (Appendix C), Finding of Fact 50 has been updated as follows: “[t]he total length of Project pipe with the potential to affect a High Consequence Area (“HCA”) is 19.9 miles. A spill that could affect an HCA would occur no more than once in 250 years.” The total length of the HCA reported in the Amended Final Decision and Order was 34.3 miles and a “spill that could affect an HCA would occur no more than once in 250 years.”

RST and other parties tried to determine approximate HCA locations crossed by the Project, but Keystone repeatedly responded that “[t]he location of High Consequence Areas is confidential and Keystone is required by PHMSA to keep this information confidential.”¹⁶

Re-Updated Finding of Fact 50 (in Testimony of Heidi Tillquist)

According to the direct testimony of Heidi Tillquist (pp. 2-3) from April 2, 2015 Finding of Fact 50 has been updated again, as follows (emphasis added):

The design and route changes have not affected the overall conclusion of the spill frequency analysis to which I testified in connection with the permit

¹⁶ Keystone Response to RST 1g (Round 2)

application. With respect to Finding No. 50, the minor route changes have caused slight changes resulting in a reduced probability of a spill occurring within High Consequence Areas. As a result, the statement that **a spill that could affect an HCA would occur no more than once in 250 years would now be altered to no more than once in 460 years, based on 15.8 miles of HCAs** crossed in South Dakota. The 2009 Keystone XL Risk Assessment, which is Appendix P to the Final Supplemental Environmental Impact Statement, and its conclusions remain valid. The 2009 Keystone XL Risk Assessment, which is Appendix P to the Final Supplemental Environmental Impact Statement, and its conclusions remain valid.

In summary, Keystone is now claiming that the length of HCAs along the Project corridor is 15.8 miles; and a spill affecting an HCA would occur no more than once in 460 years (compared to the Appendix C estimate of once in 250 years).

Basis of Risk Assessment for the Project

In the Updated Direct Testimony of Heidi Tillquist¹⁷ (the witness for Keystone, in both HP09-001 and HP14-001, testifying to the risk assessments related to the Keystone XL Pipeline, including spill frequency), Ms. Tillquist states that the estimate of spill frequency in an HCA (no more than one spill in 250 years) is based on her estimation of spill frequencies (no more than one spill in 7,400 years for any given mile of pipe). Moreover, “[i]f a spill did occur, the volume is likely to be relatively small (i.e., 3 barrels or less) and would likely be contained within the pipeline trench.”¹⁸

In her Direct Examination during the HP09-001 hearing,¹⁹ Ms. Tillquist further describes how the spill frequency of one spill in 7,400 years for any given mile of pipe was derived and used to calculate other spill frequencies for the Project in SD.²⁰ The spill frequency was derived using a historical risk assessment based on data collected by PHMSA from

¹⁷ HP09-001, TC-12, Q10 and Q24.

¹⁸ Ibid, Q10.

¹⁹ HP09-001, Transcript 110209, vol 1, pp. 128-132, p. 148

²⁰ Taking the frequency occurrence of one spill in 7,400 years for any given mile of pipe, she converts this frequency to one spill every 24 years for South Dakota (presumably by dividing 7400 by the 313 miles of pipeline in SD). Similarly, 7400 divided by 34.3 miles of HCA indicates a frequency occurrence of one spill every 216 years. But Ms Tillquest and Appendix C reported one spill every 250 years in HCAs (as per the Final Amended Decision and Order), so it is possible that there were some adjustments made (presumably based on Ms Tillquest’s judgment). Any adjustments made were seemingly not explained/documentated in Keystone’s submissions, so are not readily reviewable. Similarly, 7400 divided by 15.8 miles of HCA (the most recent HCA mileage update) indicates a frequency occurrence of one spill every 468 years. Ms Tillquest’s Prefiled Testimony reports one spill every 460 years in HCAs (which is very close to 468 years).

2002 to “the present,” which we assume to be 2008 or 2009.²¹ Moreover, the PHMSA database is based on hazardous liquids, including both crude and refined products.

In her direct testimony in this case (cited above), Ms. Tillquist maintains that Appendix P of the FSEIS (Pipeline Risk Assessment and Environmental Consequence Analysis by Keystone from July 2009) remains valid. We note that Appendix A attached to Appendix P, Analysis of Incident Frequencies and Spill Volumes for Environmental Consequence Estimation for the Keystone XL Project, was prepared by AECOM, Ms. Tillquist’s employer. The AECOM analysis confirms that maximum spill volumes in the Risk Assessment also based on historical PHMSA data (2002-2008 or 2002-2009).

According to Appendix P:

Examination of the current PHMSA dataset (2002 to present) indicates that the majority of actual pipeline spills are relatively small. Fifty percent of the spills consist of 3.0 barrels or less. In 85 percent of the cases, the spill volume was 100 barrels or less. In over 95 percent of the incidents, spill volumes were less than 1000 barrels. Oil spills of 10,000 barrels or larger occurred in 0.5 percent of cases. These data demonstrate that most pipeline spills are small and larger releases of 10,000 barrels or more are extremely uncommon. (p. 3-3)

Table 3-2 (p. 3-3) illustrates the frequencies that oil spills of different volumes are predicted to occur over a 10 year interval. A spill volume between 1,000 barrels and 10,000 barrels is projected to occur 0.1 times in 10 years while a spill volume greater than 10,000 barrels is projected to occur 0.01 times in 10 years.

6.1.2 TGG Concerns

Length and Location of HCAs

Regarding the miles of pipeline crossing HCAs in SD, Keystone has provided two different updates during the course of the current case (from 34.3 miles to 19.9 miles (Appendix C) to 15.8 miles (RST IR 5 and Prefiled Testimony of Heidi Tillquist). Moreover, the FSEIS, Appendix P, indicates that this number is 14.9 miles.

RST IR 5 (Round 2) to Keystone asked the following questions based on Finding of Fact 50:

References:

²¹ Ibid, pp 130 and 148.

- (i) Finding 50, Appendix C
- (ii) Response 50 (b) to Paul Seamans' IR No. 1
- (iii) Final Supplemental EIS, Appendix P, Pipeline Risk Assessment and Environmental Consequence Analysis by Keystone, p. 4-20, Table 4-12, July 6, 2009.²²

Preamble:

According to ref (i), "[t]he total length of Project pipe with the potential to affect a High Consequence Area ("HCA") is 19.9 miles." This distance has changed since the Final Decision and Order in June 2010 when "[t]he total length of Project pipe with the potential to affect a High Consequence Area ("HCA")" was evaluated at 34.3 miles.

According to ref (ii), the decrease from 34.3 miles to 19.9 miles is due to the adjustment of the pipeline route, in which the route was deviated away from HCA areas.

According to ref (iii), in the July 2009 evaluation, miles of pipeline in HCAs in SD were 14.9 miles (Total). All of these miles (14.9 miles) were in Ecologically Sensitive Areas, and none of these miles (0 miles) were in Populated Areas or Drinking Water Areas.

Requests:

- a) Please explain the increase in HCA mileage from the 2009 evaluation (14.9 miles of HCAs (ref (iii)) to the 2010 evaluation (34.3 miles of HCAs (ref (i))).

In response to 5a, Keystone indicated:

Keystone has determined that the 34.3 miles referenced in question 5a) included overlaps between HCAs. The 19.9 miles shown in the certification table was a typographical error. Since the time the 14.9 mile calculation was completed, the Cheyenne River crossing was adjusted because of HDD access issues and for construction and engineering reasons, resulting in a slight increase in total HCA mileage. The current HCA calculation is 15.8 miles. The 15.8 miles are

²² <http://keystonepipeline-xl.state.gov/documents/organization/221241.pdf>

ecologically sensitive areas and do not encompass populated areas or drinking water areas.

The determination of HCAs should be an essential component of integrity management and an oil spill response plan. It is not reassuring that Keystone keeps changing its determination of HCAs. These changes and the lack of disclosure of the HCA locations raise concerns as to whether sufficient attention is being given to these sensitive areas in terms of pipeline safety and oil spill response planning.

Despite our repeated efforts to determine the location of HCAs along the pipeline route, Keystone has refused to provide these locations. At the time of writing, these locations continue to be unavailable to RST's experts.

We therefore had no other choice but to research likely HCA areas based on information in the FSEIS. Given the mileposts for the Ogallala Aquifer in Southern Tripp County provided in the FSEIS, which add up to a total of 30 miles, we also question whether the HCA mileage is being understated.²³

Why Risk Assessment Based on Historical Data is Not Appropriate

Of much greater concern, however, is the use of a historical risk assessment, particularly one based on a 2002-2009 PHMSA data set for hazardous liquid pipeline spills. This data set has very little relevance for assessing the risk of a major rupture on the Project. Keystone XL in SD is a large diameter high-pressure pipeline transporting crude (mainly dilbit), with substantial distance crossing steep slopes in a landslide hazard area. According to the Accufacts Report, "the most likely event that could cause a rupture in South Dakota appears to be a landslide associated with natural hazards" (p. 6). As discussed in the Accufacts Report, summarized in Section 9.1, the Worst-Case Scenario for the Project is a full bore rupture with massive release of crude caused by a breakaway landslide in areas of steep elevation change.

Mr. Kuprewicz' testimony authoritatively criticizes reliance on historical databases (such as PHMSA's) for risk assessments, particularly for a pipeline with the characteristics of Keystone XL in South Dakota. The Accufacts Report (pp. 4-6) makes a strong case that the risk assessment for a specific pipeline should be undertaken using its elevation profile, supplemented by other key information (valve types and locations, MOP per

²³ See FSEIS, Vol 2: Chapter 3, 3.3 Water Resources, p. 3.3-15. It appears that the pipeline crosses the Ogallala Formation over a distance of 30 miles in Tripp County, which (by itself) is greater than the most recent HCA mileage figure of 15.8 miles. This apparent discrepancy is especially notable, given that the pipeline also crosses HCAs outside of Tripp County. As discussed above, in response to RST IR 5a (Round 2), Keystone indicated that the total HCA mileage had increased to 15.8 miles owing to adjustments in the Cheyenne River crossing (which is outside of Tripp County).

pipe segment, hydraulic profile, identification of massive land movement, location of HCAs).

If the above information is available, it is best to do a site-specific risk assessment for a given Project. This is why RST's experts have been so insistent on obtaining complete responses our discovery requests (particularly IR 1 (Round 2), and most particularly the request for an elevation profile).

There are a number of reasons why Keystone's risk assessment approach, characterized by the use of a historical risk assessment (based on an older PHMSA data set) is highly inappropriate for evaluating the risks of the Project:

1. The entire data set (2002-2009) predates the recent growth in North American crude oil production, the accompanying increase in terrestrial transport of more hazardous non-conventional crudes, as well as the unfortunate advent of very large spills, starting with a 20,000 barrel dilbit spill in Marshall, MI and into the Kalamazoo River in 2010.
2. TGG's main concern is not with lower-volume spills. Keystone claims that median spills are only 3 barrels. This figure may be understated, but TGG agrees that the majority of pipeline spills are small. Our main concern is not with smaller (or median or even average) spills. Instead, we are most concerned about worst-case scenarios that are possible given that the Project runs through over 200 miles of landslide hazard areas with steep slopes. The risk assessment, based on 2002-2008 data would predict that a large-volume spill is extremely rare: "A spill volume between 1,000 barrels and 10,000 barrels is projected to occur 0.1 times in 10 years while a spill volume greater than 10,000 barrels is projected to occur 0.01 times in 10 years."²⁴
3. Even if more recent historical PHMSA data were used for the purposes of the risk assessment, PHMSA data is unreliable and inaccurate for the purposes of a risk assessment. Most of the data is provided by industry, which tends to underreport spills, particularly the serious ones, which are of greatest concern. In a 2009

²⁴ We note, however, that Base Keystone spilled 14 times in 2011 (its first year of operation), the highest number of spills recorded on a new pipeline. And the two largest spills totaled over 17,300 gallons (412 barrels). This amount was much greater than the historical risk assessment would have predicted. See June 3, 2011 Letter from PHMSA to TransCanada regarding a Corrective Action Order issued by PHMSA with respect two significant failure incidents in Base Keystone's first year of operation. http://blog.nwf.org/wp-content/blogs.dir/11/files/2011/06/320115006H_CAO_06032011.pdf. See also Biello, David, "Does Tar Sand Oil Increase the Risk of Pipeline Spills?," Scientific American, April 4, 2013, p. 3. <http://www.scientificamerican.com/article/tar-sand-oil-and-pipeline-spill-risk/>

report, PHMSA has criticized the quality of its own data and concluded the following (emphasis added):²⁵

*“Most of our data collection relies on third-party reporting from regulated companies. This is convenient, and it goes directly to the source. It also introduces **serious biases and gaps in the data we collect.** Despite the best intentions and professionalism, the regulated industry has an institutional bias (and probably a liability aversion) in determining the causes, circumstances, and consequences of failures. Accident investigations—the limited number that we do—have shown some significant differences between what a company reports and an objective view of these events. Reports from companies also reflect large numbers of blanks and “unknown” data, particularly in the most serious cases—exactly where it is most critical that we have good data. **Our collection of system data (as in the annual reports from pipeline operators) is further constrained by the need to minimize reporting burden on the industry, so much of the data are aggregated to a level that cannot be used in risk evaluation.**”*

Keystone has all the information it needs (elevation profile, water body crossings, HCA locations, hydraulic profile, MOP per pipe segment) to undertake a site-specific risk assessment for the Project. Instead, in its current Petition, it chooses to rely on outdated and unreliable historical data.

6.1.3 Conclusion

At first glance it would appear that the change in Finding of Fact 50 is positive. The mileage of the HCAs along the Project decreased from 34.3 miles to the most recently updated estimate of 15.8 miles. And the risk assessment for the HCAs has changed such that a spill that could affect an HCA, which was previously forecast to occur no more than once in 250 years, is now forecast to occur no more than once in 460 years.

However, Keystone has not met burden of proof to show that change in underlying facts is positive. The inordinate secrecy surrounding disclosure of HCA locations has not provided parties in the case to make a proper risk assessment. In this information vacuum with HCA mileage that have changed several times, it is impossible to assess whether the decrease in the stated HCA mileage is positive or to evaluate the safety of the pipeline or the oil spill response plan.

²⁵ Kowalewski, Rick, Senior Policy Advisor, PHMSA, A Data Quality Assessment *Evaluating the major safety data programs for pipeline and hazardous materials safety*, November 10, 2009, p. C-12.

With respect to the change in the risk assessment for the HCAs (now forecast to occur no more than once in 460 years), TGG had to review the Tillquist Direct Testimony and Direct Examination, as well as Appendix P of the FSEIS in order to understand how this risk assessment was derived. For all the reasons discussed above, this risk assessment is highly inadequate given that a number of underlying facts have changed, as well as our understanding of these facts:

1. The risk assessment is based on an outdated historical PHMSA data set (2002-2009) that predates the recent growth in North American crude oil production, the accompanying increase in terrestrial transport of more hazardous non-conventional crudes, as well as the unfortunate advent of very large spills.
2. PHMSA itself has been highly critical of the quality of its own data and its use in risk assessments.
3. It is considered best practice to conduct a specific risk assessment based on the elevation profile and other key information.
4. Number 3 is particularly true in the case of the particular Project, which is at “undue risk of rupture with massive release of oil” due to the proposed routing in South Dakota “in areas of steep elevation changes containing high risk geohazards associated with possible massive landslide.” (Accufacts Report, p. 1). The outdated PHMSA data set has very little relevance for assessing the risk of a major rupture on the Project.

In light of the above, a number of the underlying facts have changed since 2010 such that the risk assessment itself provides the illusion of safety (see Accufacts Report, pp. 6-7) and is **highly negative to the Commission’s concerns**.

6.2 Finding of Fact 32: Environmental Impacts in Table 6

6.2.1 *Keystone's Position*

According to Finding of Fact 32 (in Appendix C), in the Amended Final Decision and Order, “Table 6 to the Application summarizes the environmental impacts that Keystone's analysis indicates could be expected to remain after its Construction Mitigation and Reclamation Plan (CMR Plan) are implemented. Ex TC-1, pp. 31-37.” And according to the update, “Table 6 is still applicable.”

6.2.2 TGG Concerns

TGG has a number of concerns about various aspects of Table 6 that are no longer applicable (given that the underlying facts or the understanding of underlying facts on which the Table is based have changed). Our concerns relate to the Table's focus on infrequent and small spills which can easily be cleaned and remediated; the contention that certain geological hazards (swelling soils and slope instability) are low to moderate risk; the claim that emergency response teams could clean up a spill to water, which is based on the mistaken and outdated understanding that the crude would float.

Focus on Infrequent and Small Spills that can Easily be Cleaned Up and Remediated

In its review of environmental impacts related to the majority of resources listed (Soils and Agriculture Production, Water Resources, Vegetation, Wildlife, Aquatic Resources, Sensitive Species, Land Use, Cultural Resources), Keystone concludes the following:

Pipeline incidents are infrequent and if a spill occurred, the volume would likely be 3 barrels or less. Keystone would initiate its ERP and emergency response teams would contain and clean up the spill. Appropriate remedial measures would be implemented to meet federal and state standards [related to the resource].²⁶

With respect to Cultural Resource impacts, Table 6 concludes that “[p]ipeline incidents are infrequent and if a spill occurred, the volume would likely be 3 barrels or less.”²⁷

As explained above, TGG's main concern is not with median spills of 3 barrels. TGG agrees that the majority of pipeline spills are small. Our main concern is not with smaller (or median or even average) spills. Instead, we are most concerned about worst-case scenarios that are possible given that the Project runs through over 200 miles of landslide hazard areas with steep slopes. As such, we are concerned with serious impacts of a major rupture on Soils and Agriculture Production, Water Resources, Vegetation, Wildlife, Aquatic Resources, Sensitive Species, Land Use, Cultural Resources. And with a larger worst-case spill scenario, it become much more difficult and expensive “to contain and clean up the spill” or to implement “appropriate remedial measures.”

Again this tendency to focus on infrequent and small spills is supported by the use of an outdated historical risk assessment approach. And the assumption of an extremely low risk of a major spill may lead Keystone to mistakenly believe (or claim) that its oil spill

²⁶ HP09-001, TC-1, pp. 31-36

²⁷ HP09-001, TC-1, p. 36

response plan is adequate and that it can readily contain, clean up and remediate a spill.

Geological Hazards Underestimated

With respect to Soils and Agricultural Production, Table 6 concludes that “[c]ertain geologic hazards (swelling soils, slope instability) present low to moderate impact risk in limited areas that will be mitigated by appropriate pre-construction site assessment and design.”²⁸

This conclusion is based on Section 5.3.6. Again, according to historical PHMSA data:

Slope instability poses a threat of ground movement responsible for approximately 1 percent of liquid pipeline incidents (PHMSA 2008). Keystone will monitor slope stability during routine surveillance. Areas where slope stability poses a potential threat to the pipeline will be incorporated into Keystone’s Integrity Management Plan.²⁹

This section then forms the basis for Finding of Fact 79 (in the Amended Final Decision and Order):

79. Slope instability poses a threat of ground movement responsible for approximately 1 percent of liquid pipeline incidents (PHMSA 2008). Keystone will monitor slope stability during routine surveillance. Areas where slope stability poses a potential threat to the pipeline will be incorporated into Keystone's Integrity Management Plan. If ground movement is suspected of having caused abnormal movement of the pipeline, federal regulations (49 CFR Part 195) require Keystone to conduct an internal inspection. Consequently, damage to the pipeline would be detected quickly and spills would be averted or minimized. Ex TC-1, 5.3.6, p. 44

Keystone has acknowledged that slope instability presents a “present low to moderate impact risk in limited areas,” which can be mitigated by pre-construction site and design. Moreover, “damage to the pipeline would be detected quickly and spills would be averted or minimized.”

Again, Keystone is focusing on the low probability of an incident related to slope instability, based on PHMSA historic data. And the assumption of an extremely low risk of such an incident may lead Keystone to mistakenly believe (or claim) that its oil spill

²⁸ HP09-001, TC-1, p. 31

²⁹ HP09-001, TC-1, Operation Impacts, p. 44

response plan is adequate and that it can readily contain, clean up and remediate a spill.

The Direct Testimony of Richard Kuprewicz warns about the perils of underestimating the geohazards along the Project route. Mr. Kuprewicz also warns about the danger of relying on historical data rather than performing a specific risk assessment for the Project. This is discussed in much more detail in the Accufacts Report and summarized in Section 9.1.

The Accufacts Report emphasizes that “[t]he proposed routing in South Dakota is in areas of steep elevation changes containing high risk geohazards associated with possible massive landslide.” (p. 1) The Worst-Case Scenario for the Project is a full bore rupture with massive release of crude caused by a breakaway landslide in areas of steep elevation change.

See RST Exhibit 10: SD Elevation Profile with Valves and Additional Information and RST Exhibit 4: Landslide Hazard Areas for graphic illustrations of the geological hazards for this Project.

Assumption that Crude Floats

As with the other resources reviewed in Table 6, Keystone maintains that a spill to water can be contained, cleaned up and remediated.³⁰ The Water Resources section of Table 6 is based partly on assumptions in Section 5.4.3.2. This section is further explained in Q14 of Heidi Tillquist’s Updated Prefiled Testimony (emphasis added).³¹

If surface waters were affected despite Keystone’s efforts, crude oil would spread downstream or across a waterbody. **Crude oil floats on the water’s surface providing the opportunity for Keystone to detect, contain, and clean up the crude oil before long-term environmental impacts occur.**

The majority of crude to be transported in Keystone XL will be dilbit. Scientific understanding of how dilbit interacts with water has evolved considerably since the development of Table 6 in 2009. In 2010, a rupture on Enbridge’s Line 6B in Marshall, MI, resulted in a catastrophic 20,000 barrel dilbit spill, which involved a very large discharge into the Kalamazoo River. Following extensive review of this spill, the US EPA expressed concerns in 2013 regarding the additional impacts of tar sands crude spills (versus conventional oil), with a particular concern about spills on waterways.

³⁰ HP09-001, TC-1, p. 32

³¹ HP09-001, TC-12, Q14

According to the EPA, in its review of the State Department's Keystone XL Draft Supplemental Environmental Impact Statement (DSEIS):

Pipeline Safety

We have learned from the 2010 Enbridge spill of oil sands crude in Michigan that spills of diluted bitumen (dilbit) may require different response actions or equipment from response actions for conventional oil spills. These spills can also have different impacts than spills of conventional oil. [...] The Enbridge spill involved a 30-inch diameter pipeline [...], and 20,000 barrels of oil sands crude were released. In that spill, oil sands crude sank to the bottom of the Kalamazoo River, mixing with the river bottom's sediment and organic matter, making the oil difficult to find and recover. After almost three years of recovery efforts, EPA recently determined that dredging of bottom sediments will be required to protect public health and welfare and the environment. This determination was based in large part on demonstrations that oil sands crude associated with the Enbridge spill will not appreciably biodegrade. We recommend that the Final EIS more clearly acknowledge that in the event of a spill to water, it is possible that large portions of dilbit will sink and that submerged oil significantly changes spill response and impacts. We also recommend that the Final EIS include means to address the additional risks of releases that may be greater for spills of dilbit than other crudes.³²

In light of the Line 6B spill, there is now substantial evidence that dilbit can sink in water making a dilbit spill to water significantly more difficult to clean up. Table 6, which was prepared prior to the experience of the Marshall, MI rupture, assumes dilbit floats. And consequently, Table 6 understates risk of the Project to water resources.

6.2.3 Conclusion

TGG concludes that various elements in Table 6 reviewed above are no longer applicable because the underlying facts (and the broad understanding of the underlying facts) have changed. Keystone has failed to mention any of these changes in the current application and has certainly not met its burden of proof to show that the changes are neutral or positive to the Commission's concerns. TGG concludes in fact that the changes in Table 6 are **negative** to the Commission's concerns.

³² EPA, Comments of EPA on the Department of State's Keystone XL Draft Supplement Environmental Impact Statement (DSEIS) (footnotes in original omitted), US Environmental Protection Agency, April 22, 2013.

6.3 Findings of Fact 22, 60 and 90: Addition of 59 PHMSA Special Conditions and Mitigation Recommendations

6.3.1 Keystone's Position

Findings 22, 60, and 90 refer to Keystone's implementation of 59 PHMSA Special Conditions as set forth in the Final Supplemental EIS, Appendix Z.³³ According to Appendix Z, pp. 95-107, Keystone has also committed to implement mitigation recommendations from the Battelle and Exponent risk assessment reports, including specifically addressing several issues in its Emergency Response Plan and Oil Spill Response Plan (and its risk analysis that is used in the development of those plans).

RST asked Keystone to explain what (if anything) Keystone has committed to in regard to implementation of mitigation recommendations from the Battelle and Exponent risk assessment reports, and how this affects Findings 22, 60, 90, and any other Findings. In response, Keystone replied "Keystone will implement additional mitigation measures included in Appendix Z."³⁴

Similarly, according to Appendix Z, pp. 107-108, Keystone has also committed to a number of measures beyond the spill cleanup measures described on pp 95-107, including specifically addressing several issues in its Emergency Response Plan and Oil Spill Response Plan (and the detailed risk analysis used in developing those plans).

Similarly, RST asked Keystone to explain what (if anything) Keystone has committed to in regard to additional spill cleanup measures, and how this affects Findings 22, 60, 90, and any other Findings. Keystone replied "Keystone will implement additional mitigation measures included in Appendix Z."³⁵

Finally, Keystone has refused to provide any further information to explain more specifically how Keystone plans to implement the 59 Special Conditions recommended by PHMSA (summarized in Appendix Z, Table 4, pp. 70-95).

³³ See <http://keystonepipeline-xl.state.gov/documents/organization/221252.pdf>.

³⁴ Keystone Response to RST IRs 4d (Round 2)

³⁵ Keystone Response to RST IRs 4e (Round 2)

6.3.2 TGG's Concerns

Lack of Specificity in Application of Recommendations from Appendix Z

Appendix Z contains many conditions and mitigation measures that, if implemented appropriately, would result in improvements in the safety of the Project from a perspective of integrity management and oil spill response. However, Keystone's Petition provides no indication of how the 59 Special Conditions and the mitigation measures from the Battelle and Exponent reports would be specifically applied to this Project. In response to RST's very specific information requests³⁶ regarding how the recommendations from the Battelle and Exponent reports contained in Appendix Z would be specifically applied to this Project, Keystone has stated that "Keystone will implement additional mitigation measures included in Appendix Z."

RST has attempted to seek more specificity from Keystone in response to how the 59 Special Conditions and the mitigation measures from the Battelle and Exponent reports would be specifically applied to this Project. In letter to Keystone's lawyers, following up on the incomplete responses to RST's IRs to Keystone, RST provided examples as to how Keystone could better specify how these recommendations will be implemented:

The answer provided is incomplete as you only answer part of the interrogatory by referring to Appendix Z, without attempting to specify how TransCanada will actually implement the 59 special conditions or the mitigation recommendations in the Battelle and Exponent reports (contained in Appendix Z). The response does not address how the implementation of the mitigation measures in Appendix Z will affect Findings 22, 60, 90 and any other relevant findings. A more complete answer would involve Keystone describing with specificity how it is going to apply the 59 special conditions and the mitigation recommendations in Battelle and Exponent to the Project in South Dakota and how the application of these new conditions is going to result in changes that are "either neutral or positive to the Commission's concerns."

For example, the answer provided does not address how Keystone plans to implement Special Condition 6 "Monitoring for Seam Fatigue from Transportation." Specifically, how does Keystone plan to avoid Double Submerged Arc Weld cracking introduced during transportation and installation along the pipeline? Additionally, does Keystone have plans to implement other measures to avoid DSAW cracking introduced during transportation and installation along the pipeline? Related to Special Condition 22 "Pressure Test

³⁶ Keystone Response to RST IRs 4d and 4e (Round 2)

Level,” will Keystone conduct a pre-in-service hydrotest at a minimum of 100% SYMS for 8 hours? And following the test, will Keystone ensure no marked pipe permanent expansion? Special Condition 16 sets out conditions for the inspection of welds. Can Keystone confirm that Special Condition 16 implies that Keystone will radiologically inspect every girth weld, even if not required by regulation and that the weld inspection records will be maintained for the life of the pipeline?³⁷

To assist Keystone in providing a more complete response, RST also suggested that:

Keystone elaborate on which conditions and mitigation measures in Appendix Z that are the most important of the numerous additional conditions and mitigation measures and have the largest impact in supporting your claim that the changes are either neutral or positive to the Commission’s concerns. A complete answer will help us evaluate the basis of your claim that the changes are “either neutral or positive to the Commission’s concerns.”³⁸

To date RST has not received any more specific responses to these information requests. If Keystone had filed an additional schedule explaining how the most important of the additional conditions and mitigation measures are to be applied to the Project, RST's experts would be able to evaluate if these recommendations are being implemented in such a way as to result in improvements in the safety of the Project from a perspective of integrity management and oil spill response.

Spill Response in Sensitive Areas (Notably Tripp County)

If implemented appropriately, the 59 Special Conditions would improve the Integrity Management (IM) of the Project and help to prevent failure. However, TGG's review of the Battelle and Exponent recommendations provides no specificity of how an oil spill response would be implemented, particularly in HCAs and HSAs. The Project crosses the High Plains Aquifer in southern Tripp County very close to RST's lands (less than half a mile in a number of places³⁹) and a spill in this environmentally sensitive area could reach the aquifer and result in contamination of RST lands, water sources and potentially drinking water resources. In Permit Condition 35, the PUC stipulates that:

Keystone shall identify the High Plains Aquifer area in southern Tripp County as a hydrologically sensitive area in its Integrity Management and Emergency

³⁷ Letter to Woods Fuller Shultz and Smith, PC In the Matter of the Application by TransCanada Keystone Pipeline, LP HP14-001 Concerns with Keystones Responses to Second Set of Interrogatories and Request for Production of Documents from Rappold Law Office, March 25, 2015.

³⁸ See footnote 37.

³⁹ Keystone response RST IR 20e (Round 2).

Response Plans. Keystone shall similarly treat any other similarly vulnerable and beneficially useful surficial aquifers of which it becomes aware during construction and continuing route evaluation.

It is not at all clear from Appendix Z (nor from the rest of Keystone's Petition) how the mitigation recommendations from the Battelle and Exponent risk assessment reports would specifically improve Keystone's Emergency Response Plan (ERP) and Oil Spill Response Plan (OSRP). In order to evaluate the adequacy of the ERP/OSRP in environmentally sensitive areas (and particularly in southern Tripp county where RST lands and water could be at risk from a spill), more details would have to be provided regarding how the mitigation recommendations would be implemented. Keystone must elaborate how it would enhance its ERP/OSRP in order to provide a more rapid and effective response in the event of a release. This will also be discussed in Section 7, which reviews relevant permit conditions related to economic costs of an oil spill.

Danger of an Illusion of Enhanced Safety from Appendix Z

Some of the 59 special conditions and the mitigation measures, if not implemented appropriately can create an illusion of enhanced safety, which is dangerous. For instance, the last two special conditions respectively require the implementation of a Quality Management System (QMS) and a Third Party Independent contractor.⁴⁰ Properly implemented, these would be very positive and constructive conditions. However, TGG is concerned that the conditions could also create an illusion of safety depending on the independence of the QMS and third party.

If Keystone believes that the risk of spill is almost zero, and that a major rupture is a near impossibility (as discussed in the Accufacts Report), the company will not be adequately prepared in the case of unlikely errors and failures, which could result in a large pipeline release. And as recent history has shown, unforeseen bad accidents can

⁴⁰ According to Appendix Z, p. 95.

In addition to the 57 Special Conditions listed above, two additional Special Conditions include:
1. Keystone would develop and implement a Quality Management System that would apply to the construction of the entire Keystone XL project in the U.S. to ensure that this pipeline is— from the beginning—built to the highest standards by both Keystone personnel and its many contractors;
and

2. Keystone would hire an independent Third Party Inspection Company (TPIC) to monitor the construction of the Keystone XL project. PHMSA must approve the TPIC from among companies Keystone proposes. Keystone and PHMSA would work together to develop a scope of work to help ensure that all regulatory and technical EIS conditions are satisfied during the construction and commissioning of the pipeline project. The TPIC would oversee the execution and implementation of the DOS-specified conditions and the applicable pipeline safety regulations and would provide monitoring summaries to PHMSA and Keystone concurrently. Keystone would address deficiencies or risks identified in the TPIC's assessments.

and do happen with increasing frequency are larger and larger volumes of unconventional crudes are transported throughout North America. So if Keystone underestimates and/or downplays the risks of a major accident, it may have an adequate ERP/OSRP in place. Given that Keystone's unwillingness to answer to our IRs 4d and 4e regarding how specifically the conditions and mitigations measures in Appendix Z are being implemented, TGG is unable to evaluate to what extent the special conditions and mitigation measures may simply be window dressing, which can create an illusion of safety for Keystone, for the Commission and for the public.⁴¹

6.3.3 Conclusion

By not providing specific details on how the 59 Special Conditions and the mitigation measures from the Battelle and Exponent reports would be implemented in the Project, Keystone has not met its burden of proof to demonstrate that "[t]o the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission's concerns."

7 Permit conditions associated with changes in Findings of Fact affecting economic costs of oil spills

The Final Amended Decision and Order in HP09-001 was based on the Findings of Fact and required Keystone to meet 50 Permit Conditions. As TGG has demonstrated above, a number of the Findings of Fact have changed since the Decision was made and some of these underlying facts are negative to the Commission's concerns. In particular, the Risk Assessment determination based on outdated historical data (PHMSA 2002-2009) is no longer relevant. Our evaluation of the changes in the underlying facts will be further explored in Section 8. Although the changes in Findings of Fact are most relevant, there are also several Permit Conditions related The Enforcement of Liability for Damage (Permit Conditions 45 to 49) that Keystone may be unable to meet in a worst-case scenario, which could overwhelm Keystone's financial assurances.

⁴¹ See the Accufacts Report (p. 7 especially) for a more detailed discussion of the dangers of an illusion of safety and the Space Shuttle Syndrome: the erroneous belief that low risk is no risk.

7.1 Permit Conditions 45 to 49: Enforcement and Liability for Damage

7.1.1 Keystone's Position

Keystone maintains that it can continue to meet all of the Permit Conditions, including those associated with liability for damage.

7.1.2 TGG Concerns

As discussed in Section 10, given that under Worst-Case Release Scenarios, the cost of a major pipeline rupture can range from US\$1 billion to amounts in excess of \$2 billion for a very high consequence event, TGG has some serious concerns about the adequacy of Keystone's financial assurances. Moreover, Keystone has failed to provide adequate answers to RST IRs 9-12 (Round 2), which sought to evaluate its level of financial assurances and ability to cover the costs of a Worst-Case Release Scenario.

7.1.3 Conclusion

Keystone has failed to demonstrate how it would continue to meet these Permit Conditions. TGG's opinion is that the underlying facts related to these Permit Conditions have changed given they are based on an inadequate and outdated risk assessment. And the changes in the underlying facts related to these Permit Conditions are negative to the Commission's concerns. TGG's concerns about Keystone's financial assurances is discussed in much more detail in Section 10.

8 Evaluation of changes in underlying facts related to economic benefits and costs and permit conditions

The evaluation of changes in underlying facts related to economic benefits and costs and permit conditions is summarized below.

Finding of Fact (FF) or Permit Condition (PC)	TGG on Impact to PUC's concerns (+, neutral or -)	Has Keystone met burden of proof to show positive impact
FF107 Property Tax	Possibly neutral or slightly positive	No
FF107/109 Employment	Slightly negative	No
FF50 HCA & Spill Risk Assessment	Highly negative	No
FF32 Table 6 Env't Impacts	Negative	No

FF22/60/90 59 Special Conditions and Mitigation in Appendix Z	Generally positive, but no specific information on how applied to the Project	No
PC 42 – 45 Liability	Negative	No

For the Findings of Fact associated with economic costs and benefits, Keystone has failed in all cases to meet its burden of proof to demonstrate that these are positive or neutral to the Commissions concerns. TGG has evaluated these Findings of Fact and found the ones associated with the small benefits to be slightly negative in the case of employment and neutral or possibly slightly positive in the case of property taxes. However, in the case of Findings of Fact related to economic costs (FF 50 and 32 related to HCA Length and Risk Assessment and Table 6, Environmental Impacts, respectively) are negative to very negative. In the case of Findings of Fact associated with the 59 Special Conditions and mitigation measures in FSEIS Appendix Z, these are generally positive, but Keystone has failed to provide any specific information about how these measures would be implemented for the Project. Finally, with respect to Permit Conditions 42-45 related to Liability for Damage, Keystone has failed to demonstrate how it would continue to meet these conditions. As discussed in Section 10, given that under Worst-Case Release Scenarios, the cost of a major pipeline rupture can range from US\$1 billion to amounts in excess of \$2 billion for a very high consequence event, TGG has some serious concerns about the adequacy of Keystone’s financial assurances.

9 Economic Costs of the Worst-Case Scenario

9.1 Conclusions Related to the Testimony of Richard Kuprewicz Regarding Worst-Case Scenarios

The Direct Testimony of Richard Kuprewicz (the Accufacts Report) warns that “[t]he proposed routing in South Dakota places the proposed pipeline at **undue risk of rupture with massive release of oil**, even with the proposed valving suggested under Special Conditions No. 32.” (p. 1, emphasis added).

According to the FSEIS, Keystone XL crosses 338.8 miles of "Locations within LSHR High-Risk Category" (high-risk landslide hazard areas) along the Proposed Project Corridor, **of which the majority, 202.5 miles are in SD**. RST Exhibit 4: Landslide

Hazard Areas provides a dramatic illustration of the extent of the SD routing through high landslide hazard areas.⁴²

RST Exhibit 10: SD Elevation Profile with Valves and Additional Information (the Elevation Profile supplemented by Mr. Kuprewicz) further demonstrates the combination of steep elevation changes in high landslide hazard areas.

The Accufacts Report emphasizes that “[t]he proposed routing in South Dakota is in areas of steep elevation changes containing high risk geohazards associated with possible massive landslide.” (p. 1)

The Worst-Case Scenario for the Project is a full bore rupture with massive release of crude caused by a breakaway landslide in areas of steep elevation change. The Accufacts Report’s quantification of a Worst-Case Release Scenario is as follows (emphasis added):

For a flow rate of 922,000 B/SD, identification and **shutoff of mainline valves** during a rupture **within 15 minutes** (a fairly aggressive and even optimistic response time given my extensive investigation experience) would produce a **worst-case release of slightly over 60,000 barrels** of oil subject to a wide variation given the highly transient calculation nature of rupture dynamics in this challenging steep terrain. Control Room pump shutdown response time is not the most leveraging to this value (i.e. not the most important variable affecting the worst-case discharge), but valve closure time is critical. An increase in Control Room pump shutdown response **by 15 minutes** (not unusual during Control Room emergencies) accounts for approximately **8,000 incremental barrels from pumping (as a sensitive case)**. (p. 8)

The vast majority of RST land along the Keystone XL route is in Tripp County. This county includes some of the most ecologically sensitive land on the Project Route (as it crosses approximately 30 miles of the Ogallala Aquifer as well as the White River). Moreover, the pipeline corridor in the northern half of Tripp County (where it is routed next to Winner, the world pheasant hunting capital) is in a high landslide hazard area. Therefore, Tripp County is doubly threatened by the Project.

⁴² RST Exhibit 4 is a map from the FSEIS showing how the Project crosses over 200 miles of South Dakota land, deemed by FEMA, as High Landslide Hazard Areas. See Ch 3.1 Geology in <http://keystonepipeline-xl.state.gov/documents/organization/221159.pdf>. The relevant map is on p. 3.1-29 and the list of corridors (with mileposts) crossing in High Landslide Hazard Areas in SD and other states is on p. 3.1-31. This list shows 338.8 miles of "Locations within LSHR High-Risk Category" (high-risk landslide hazard areas) along the Proposed Project Corridor, **of which the majority, 202.5 miles are in SD.**

On the subject of RST water supplies and threats to the Ogallala Aquifer, Mr. Kuprewicz concludes the following (emphasis added):

Of the RST water supplies reviewed, I see **the greater potential threat to RST water concerns related to a possible pipeline leak release in the segment spanning the Ogallala Aquifer.** Even a slow rate leak release, while very difficult to identify in a timely manner, would most likely, however, not endanger the RST aquifer water wells located some four miles distance from the pipeline. Release into the non-karst Ogallala Aquifer could be remediated as the spread of contamination would be restricted significantly when the released warmed oil thickens as it cools, slowing underground transport velocities. (p. 3)

[...]

It is my conclusion that on this sensitive segment, undiscovered leaks are the most insidious threats. The pipeline will be operating with primarily heavy crude oils (i.e., dilbit) with pipeline operating temperatures greater than 120 °F. Given the unique sensitivity of dilbit viscosity to temperature, it is my opinion that a leak release of dilbit in this area will cool quickly substantially increasing its viscosity and slowing underground migration until it eventually rises to the surface, where it would eventually be discovered well before it might possibly migrate to critical RST water wells. **Oil Spill Response and remediation for this segment should focus on surrounding the release site with “reverse flow” injection and soil capture and remediation methods to limit its spread and involves removing underground soil contaminated from spill plumes that may be developed. Such a remediation effort would be very expensive and could take considerable time, but it is not a new science.** (p. 7)

Therefore, a slow and undiscovered leak is likely to be the more serious threat to the Ogallala Aquifer and RST water resources. Remediation for such a leak release would time-consuming and expensive and is of special concern for the RST, but this kind of leak is not the Worst-Case Scenario for the Project (which is a massive release of crude caused by a breakaway landslide in areas of steep elevation change). Given that Project crosses High Landslide Hazard Areas in northern Tripp County, including the White River (as shown on the elevation profile in Exhibit 10), RST lands could also be at risk from a Worst-Case Scenario related to a breakaway landslide.

9.2 Approach to Estimate a Range of Costs for a Worst-Case Scenario

Keystone has provided an approximation of the economic benefits of the Project for SD, and TGG has commented on these approximations in Section 5. As discussed in Section 5, Keystone may have somewhat overstated the benefits; but even using Keystone's estimates, the benefits for SD are quite small. As such, our main area of disagreement with Keystone is in regard to Project costs, rather than Project benefits.

In any cost-benefit involving a crude pipeline project, there is a high degree of uncertainty regarding the risks and therefore a broad range of potential costs. Despite the impossibility of making a precise determination of the costs (or the risks) associated with the Project, this Report can offer guidance concerning the magnitude of the costs of a worst-case scenario versus the benefits.

Specifically, our main area of disagreement with Keystone is not related to the costs of smaller (or even average or median) spills, but rather the magnitude of worst-case scenarios that are possible with a pipeline that runs through "areas of steep elevation changes containing high risk geohazards associated with possible massive landslide."⁴³ Using a range of relevant and recent estimates of worst-case scenario spill costs per barrel (based on comparable crude oil pipelines), we determine a range of worst-case scenario costs for the Project in Section 9.4.

9.3 Comparable Crude Oil Pipelines for Recent Spill Costs Estimates

The relevant and recent estimates of worst-case scenario spill costs per barrel are based on the following comparable crude oil pipelines:

1. Kinder Morgan's Trans Mountain Expansion Project
2. Enbridge's Northern Gateway
3. Enbridge's Line 6B (and the spill costs estimates for the Marshall, MI rupture).

9.3.1 Kinder Morgan's Trans Mountain Expansion Project

Canada's National Energy Board (the NEB) is currently reviewing Kinder Morgan's Application for the Trans Mountain Expansion Project (TMX).⁴⁴ TMX is an expansion of the existing Trans Mountain pipeline system between Edmonton, Alberta and Burnaby,

⁴³ Direct Testimony of Richard Kuprewicz, April 23, 2015, p. 1.

⁴⁴ See the National Energy Board website for the TMX Application:
<http://www.neb.gc.ca/pp/ctnflng/mjrpp/trnsmntnxpnsn/index-eng.html>

BC (in the Metro Vancouver area). TMX includes the reactivation of 193 km of existing pipeline and the addition of approximately 987 km of new pipeline through a variety of terrains and long stretches of very remote and unpopulated areas, as well as populated areas (particularly the Lower Mainland and Metro Vancouver). The proposal also involves new and modified facilities, such as pump stations and tanks and the expansion of a marine terminal.

Like the Keystone XL Project, TMX involves a 36” pipeline transporting dilbit from the Alberta tar sands through a variety of terrain, including HCAs and non-HCAs (with considerable distance through remote terrain).

9.3.2 Enbridge’s Northern Gateway Project

In December 2013, after lengthy and highly controversial public hearings, the Joint Review Panel⁴⁵ for the proposed Enbridge Northern Gateway Project recommended that the Canadian Federal Government approve the project, subject to 209 required conditions. In July 2014, the Canadian Federal government approved Northern Gateway, subject to these stringent conditions.⁴⁶

The Enbridge Northern Gateway Project involves the construction of two pipelines and the construction and operation of the Kitimat Marine Terminal. The two pipelines are each approximately 1,170 kilometres in length, from Bruderheim, Alberta to Kitimat, British Columbia. One 914 mm (36 inch) outside diameter line would carry on average 525,000 barrels per day of petroleum products west to Kitimat. The other line, a 508 mm (20 inch) outside diameter pipeline, would carry on average 193,000 barrels of condensate per day east to Bruderheim. Condensate is used to thin petroleum products for pipeline transport.⁴⁷

Like the Keystone XL Project, North Gateway involves a 36” pipeline transporting dilbit from the Alberta tar sands through remote and unpopulated terrain, including HCAs and non-HCAs.

⁴⁵ The Joint Review Panel is an independent body, mandated by Canada’s Minister of the Environment and the National Energy Board. “The Panel will assess the environmental effects of the proposed project and review the application under both the *Canadian Environmental Assessment Act* and the *National Energy Board Act*.” <http://gatewaypanel.review-examen.gc.ca/clf-nsi/bts/jntrvwpl-eng.html>

⁴⁶ Because of these stringent conditions as well as intense public opposition (particularly from BC indigenous groups), it is widely believed that this pipeline will not be built.

⁴⁷ See the Joint Review Panel website for the Northern Gateway project: <http://gatewaypanel.review-examen.gc.ca/clf-nsi/bts/prjct-eng.html>

9.3.3 Enbridge's Spill Costs for the Line 6B Rupture in Marshall, MI

Unlike the two previous examples, Enbridge's Line 6B is an existing pipeline. In July 2010, Line 6B (a 30" pipeline) ruptured and spilled 20,000 barrels of Alberta dilbit into an HCA near the Kalamazoo River in Marshall, MI, a town of 8,000 people.⁴⁸ The crude spilled into hundreds of acres of wetlands, a creek and the Kalamazoo River causing widespread devastation.

Like the Keystone XL Project, Line 6B is a large-diameter pipeline (30" at time of rupture) transporting dilbit from the Alberta tar sands. The spill occurred in a non-urban and ecologically sensitive HCA and resulted in a catastrophic spill to water, which involved a multi-year and very expensive cleanup, which did not recover all of the dilbit.

According to Keystone's latest updates, there are 15.8 miles of non-urban and ecologically sensitive HCAs along the Project route in South Dakota. The Project also crosses a number of major water bodies within High Landslide Hazard Areas. See RST Exhibit 10: SD Elevation Profile with Valves and Additional Information and RST Exhibit 4: Landslide Hazard Areas.⁴⁹

9.4 Range of Costs for a Worst-Case Scenario

An accepted approach to calculate a range of costs for a worst-case scenario uses various spill data to determine a worst-case scenario in terms of volumes spilled, as well as spill costs per barrel for both cleanup and damage.⁵⁰ In other words:

Cost of worst-case scenario = Volume spilled (in bbl) x **Spill cost** (in \$/bbl)
of combined damage and cleanup costs

Volume spilled (in bbl): As cited above, the Direct Testimony of Richard Kuprewicz provides the Worst-Case Release Scenario for the Project: **60,000 barrels** with the optimistic and aggressive assumption of shutoff of mainline valves within 15 minutes.

⁴⁸ When it ruptured in July 2010, Line 6B was a 30" pipeline. Since then, Enbridge has been replacing existing pipe in Line 6B with new pipe (36" pipe in most locations and 30" pipe elsewhere). <http://www.enbridge.com/~media/www/Site%20Images/Projects/Construction/6BENB%20CommUpdate-Oct2012-L09.pdf>

⁴⁹ For more details on the spill costs of Line 6B at Marshall, MI, see Goodman, Ian and Brigid Rowan, "Economic Costs and Benefits of the Trans Mountain Expansion Project (TMX) for BC and Metro Vancouver," November 10, 2014, Rereleased February 4, 2015, pp. 48 and 51. http://www.thegoodman.com/pdf/TGG20150204_SFJ_EconCostBen_TMX.pdf

⁵⁰ For example, this is the approach used by the Joint Review Panel in its Decision of Enbridge Northern Gateway. See <http://www.gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtvlm2-eng.pdf> pp. 362-363. See also footnote 45 for description of the JRP and its relationship with the NEB.

An increase in shutdown response by 15 minutes results in approximately 8,000 incremental barrels from pumping. So the Worst-Case Release Scenario is **68,000** with the assumption of shutoff of mainline valves within 30 minutes. So for the purposes of calculating the Cost of worst-case scenario of the Project, TGG is using the Kuprewicz Worst-Case Release Scenario for the Volume spilled (in bbl): 60,000 barrels (assuming a 15-minute valve shutoff time) and 68,000 barrels (assuming a 30-minute valve shutoff time).

Spill cost (in dollars per barrel or \$/bbl) of combined damage and cleanup costs:

As explained above, to obtain the Spill cost (in dollars per barrel), TGG reviewed the relevant and recent estimates of worst-case scenario spill costs per barrel based on the following comparable crude oil pipelines:

1. Kinder Morgan's Trans Mountain Expansion Project
2. Enbridge's Northern Gateway
3. Enbridge's Line 6B

The range of spill costs (in dollars per barrel) for comparable crude oil pipelines is summarized in RST Exhibit 5. This range is also useful because it provides two spill costs estimates (from Kinder Morgan on TMX spill costs and the Joint Review Panel/National Energy Board on Enbridge Northern Gateway spill costs), as well as one estimate of real-world spill costs based on the Enbridge Line 6B spill at Marshall, MI. We note that the spill cost estimates are in order of increasing costs, with the TMX spill costs provided by Kinder Morgan (the pipeline operator), the Northern Gateway spill cost estimates provided by the NEB (the regulator) and the Enbridge Line 6B spill costs from real-world data.

9.4.1 Kinder Morgan's Trans Mountain Expansion Project Worst-Case Spill Cost per Barrel for TMX in a non HCA

The first row of RST Exhibit 5 illustrates how the approach to calculating the Cost of a Worst-Case Scenario has been used by Kinder Morgan to determine the worst-case scenario costs in a non-HCA (based on Volume Spilled (in bbl) x Spill Cost (in \$/bbl)). In its evidence related to the TMX Project in the current NEB case, Kinder Morgan estimates costs for "credible" worst-case spill are C\$316M in a non-HCA, based on a spill cost per barrel of C\$12,556/bbl⁵¹ (or US\$11,300/bbl).⁵² TGG has selected the spill

⁵¹ https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/2393434/B18-14_-_V7_APPG_CLEANUP_COST_POTEN_OIL_SPILL_-_A3S4W8.pdf?func=doc.Fetch&nodeid=2393434
See pp. 16, 18, and especially, p. 24, Table B.2. On pp. 16 and 18, Kinder Morgan rounds off the results of its high damage cost scenario to a range between C\$100-300 million. However, a closer review of the results of the high damage cost scenario in Table B.2 (p. 24), shows that costs in the high damage cost (footnote continued on next page)

cost per barrel in a non-HCA as the most relevant data point to be conservative. An HCA on TMX would include populated areas; and the non-HCA areas on TMX are most comparable to non-HCA areas in SD.

In our recent study on the “Economic Costs and Benefits of the Trans Mountain Expansion Project (TMX) for BC and Metro Vancouver,” TGG discusses why Kinder Morgan’s estimate of worst-case spill costs per barrel and volume for TMX is far too low and fails to take into account the full-range of worst-case scenarios.⁵³ Nonetheless, we have included this number as a data point (albeit a significant underestimation). Even with a very low estimate of spill costs per barrel (based on historical data sets dating back to the 1970s prior to when the North American crude oil boom got underway), a Worst-Case Release Scenario for Keystone XL of 60,000 (or 68,000) barrels (as per the Kuprewicz testimony) would result in Worst-Case Scenario costs of \$678M and \$768M respectively (as per Tables 2 and 3).

9.4.2 The NEB/JRP’s Worst-Case Spill Cost per Barrel for Enbridge Northern Gateway

The second row of RST Exhibit 5 provides the worst-case spill cost per barrel as determined by the Joint Review Panel (JRP) in its December 2013 Decision on Northern Gateway.⁵⁴ The approach used by the JRP in estimating spill costs per barrel is similar to TGG’s. The JRP considers both the pipeline operator’s estimates (Enbridge) as well as a real-world example (Lake Wabumun spill) and determines a spill cost per barrel mid-way between the two. In TGG’s opinion the NEB/JRP’s unit spill cost for Northern Gateway (C\$22,000 per barrel or **US\$19,800 per barrel**)⁵⁵ can be used as a benchmark for the spill cost per barrel for Keystone XL in SD. As discussed above, Like the Keystone XL Project, North Gateway involves a 36” pipeline transporting dilbit

(footnote continued from previous page)

scenario range from C\$102.9-\$315.9 million with the worst-case HCA spill at C\$170.2 million and the worst-case non-HCA spill at C\$315.9 million, which we have rounded off to C\$316 million in RST Exhibit 5.

⁵² TGG has used an exchange rate of C\$1.00=US\$0.90. Exchange rates are volatile; in recent years, the Canadian dollar has fluctuated from at or above parity with the US dollar to a significant discount. The exchange rate used in this report (to convert C\$ to US\$ to determine spill costs per barrel for each of the comparable crude pipelines) is reasonably representative of actual recent exchange rates.

⁵³ Goodman and Rowan, Economic Costs and Benefits of the Trans Mountain Expansion Project (TMX) for BC and Metro Vancouver,

http://www.thegoodman.com/pdf/TGG20150204_SFU_EconCostBen_TMX.pdf, pp. 58-63.

⁵⁴ See Joint Review Panel Decision of Enbridge Northern Gateway at <http://www.gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtvlm1-eng.pdf> p. 68 and pp. 362-363. See also footnote 45 for description of the JRP and its relationship with the NEB.

⁵⁵ TGG has used an exchange rate of C\$1.00=US\$0.90. See footnote 52.

from the Alberta tar sands through remote and unpopulated terrain, including HCAs and non-HCAs.

9.4.3 Spill Costs per Barrel for the Enbridge Line 6B Rupture at Marshall, MI

The third row of RST Exhibit 5 provides the worst-case spill cost per barrel from the real-world rupture of Enbridge's Line 6B at Marshall, MI.⁵⁶ TGG is aware that the Marshall spill cost per barrel reflects the costs of a very high consequence worst-case scenario, which combined a high-volume spill with very high unit spill costs. We include the unit spill costs at Marshall of \$60,000 per barrel as another data point, which demonstrates how spill costs can escalate dramatically especially with a combination of errors. In TGG's experience, worst-case scenarios are by nature unusual events, which are hard to predict, and typically involve multiple errors. They almost always involve extenuating circumstances - malfunctions and/or defects in combination with detection and response mistakes being made, and typically many mistakes lining up to create very big problems. In the case of the relevant most worst-case scenarios (including Marshall), the public had been assured that accidents of this magnitude would not happen, but they did. And they keep happening.

RST Exhibit 6 provides a range of Worst-Case Scenario Costs for the Project using the Spill Costs per Barrel from the three comparable crude oil pipelines (derived in RST Exhibit 5) and the Kuprewicz Worst-Case Release Scenario of 60,000 barrels (assuming a 15-minute valve shutoff time). As a sensitivity case, RST Exhibit 7 provides a range of Worst-Case Scenario Costs for the Project using the Spill Costs per Barrel from the three comparable crude oil pipelines (derived in RST Exhibit 5) and the Kuprewicz Worst-Case Release Scenario of 68,000 barrels (assuming a 30-minute valve shutoff time).

RST Exhibits 6 and 7 demonstrate the very broad range of Worst-Case Scenario Spill Costs for Keystone XL in South Dakota. At the very low end, using unit spill costs that have been underestimated by Kinder Morgan for TMX and an optimistic valve shutoff time of 15 minutes, a Worst-Case Spill could cost **US\$678 million**. At the very high end, using real-world unit spill costs from the catastrophic rupture at Marshall, a Worst-Case Spill could cost just over **US\$4 billion**.

⁵⁶ In 2013 it was estimated that the damage and cleanup costs for the Marshall spill totaled approximately US\$1.0 billion, but estimates continue to increase. In its 2013 Q3 Earnings Conference Call (on November 3, 2014), Enbridge reported that these costs may escalate to US\$1.2 billion. See <http://www.enbridgepartners.com/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=17511> p. 6. TGG estimates that the final costs will be at least US\$1.2 billion.

As noted above, the NEB's unit spill cost for Northern Gateway (US\$19,800 per barrel) is our benchmark spill cost per barrel for Keystone XL in SD. **Therefore, as shown in RST Exhibit 6, TGG's benchmark Spill Cost is US\$1.19 billion (60,000 barrels x US\$19,800/barrel)**, assuming a 15 minute valve shutoff time. However, costs could be higher due to higher spill volume (notably due to delays in valve shutoff), and/or higher unit spill costs (notably due to problems with spill response, as well as expensive cleanup and remediation).

As shown in RST Exhibit 7, using the sensitivity case spill Worst Case Scenario Release (assuming a 30 minute valve shutoff time), Worst Case Spill Costs could increase due to a delayed Control Room response for valve shutoff.

Using the sensitivity case spill volume (68,000 barrels) and our benchmark spill cost per barrel results in an increase in the Worst Case Spill Cost to **US\$1.35 billion (68,000 barrels x US\$19,800/barrel)**.

As shown in RST Exhibit 6, using the benchmark spill volume (60,000 barrels) and sensitivity case cost per barrel (US\$60,000 per barrel from Marshall) increases spill cost to **US\$3.6 billion (60,000 barrels x US\$60,000 per barrel)**.

As shown in RST Exhibit 7, combining the sensitivity case spill volume (68,000 barrels) and sensitivity case cost per barrel (US\$60,000 barrels from Marshall) yields a spill cost of **US\$4.08 billion**.

It is unlikely (perhaps very unlikely) that a massive release of oil from Keystone XL in SD would have a cost per barrel as high as Marshall. Still, the real world example of Marshall reveals that spill costs can be very high owing to problems with spill response. So while our benchmark **Worst Case Scenario Spill Cost estimate is US\$1.19 billion, a very high consequence event for the Project in SD could cost in excess of US\$2 billion**.

10 Adequacy of Keystone's Financial Assurances in the Event of a Major Spill

As discussed in Section 7, TGG is concerned that Keystone may not be able to fulfill Permit Conditions 45 to 49, which concern the Enforcement of Liability for Damage in the event of a Worst Case Spill Scenario, estimated at approximately US\$1 billion (and in excess of \$2 billion for a very high consequence event).

In a series of IRs (IRs 9-12 (Round 2)), TGG attempted to ascertain the level of financial coverage available to Keystone in the event of a major spill. We were particularly concerned with (i) insurance coverage (including insurance coverage during the construction phase and operating phase, third party liability insurance and other appropriate financial instruments); (ii) the availability of ready cash to cover the initial costs of a spill; (iii) the level of financial backstopping available via parental or other third party guarantees; (iv) Keystone's ability to self-insure if the insurance coverage were overwhelmed in the event of a major spill.

Keystone refused to answer many of these IRs, stating that "the request seeks information that is not relevant and not likely to lead to the discovery of admissible evidence" or claiming the request seeks information that is "confidential and proprietary." With respect to the IRs that were answered, Keystone provided mainly incomplete and confusing answers that raised more questions than they resolved. Despite the repeated efforts of RST's lawyer to obtain this information from Keystone or clarify the answers, Keystone refused to provide complete answers to the majority of our IRs relating to financial assurances.

Far from being irrelevant, these requests seek information that is relevant to the evaluation of Keystone's financial coverage in the event of a major spill. Moreover, this series of IRs was modeled on a very similar series of IRs asked by Canada's National Energy Board to Kinder Morgan in 2014 during its review of the Trans Mountain Expansion Project (discussed in Section 9.3.1).⁵⁷ And unlike Keystone in SD, Kinder Morgan in Canada provided a much fuller response.

⁵⁷ The corporate structure for Trans Mountain (a subsidiary of Kinder Morgan) is somewhat complex and somewhat similar to Keystone. As explained in the response to NEB IR 1.7 (see below):

- Trans Mountain Pipeline ULC owns the existing Trans Mountain pipeline and the Trans Mountain Expansion Project.

- Trans Mountain Pipeline ULC is a wholly owned subsidiary of Kinder Morgan Canada, which is a wholly owned subsidiary of Kinder Morgan.

Specifically, in the Trans Mountain Expansion case, the NEB asked the IRs 1.7 – 1.9 regarding corporate structures and financial assurance, that are very similar to IRs we asked Keystone, notably RST Second Set IRs #9-11. See the following links for the IR responses:

Cover Letter to Trans Mountain response to NEB IR set 1

https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2451003/2454322/B32-1_-_Trans_Mountain_Letter_NEB_IR_No._1_May_1_2014_-_A3W9H7.pdf?nodeid=2462073&vernum=-2

Trans Mountain response to NEB IR set 1, see specifically response to NEB IRs 1.7-1.19

https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/2456419/B32-2_-_Trans_Mountain_Response_to_NEB_IR_No._1_1_of_2_-_A3W9H8.pdf?func=doc.Fetch&nodeid=2456419 pp. 18-30 (PDF pp. 20-32)

Re: response to NEB IR 1.7a, the corporate structure is provided in Attachment 1 to NEB IR No. 1.07a (NEB IR No. 1.07a– Attachment 1)
(footnote continued on next page)

From Keystone's incomplete responses (and a clarification question asked by the PUC during the April 14, 2015 hearing), TGG's understanding of Keystone's level of financial coverage in South Dakota can be summarized as follows:

- Keystone "would look to secure a dedicated general liability insurance policy including sudden and accidental pollution coverage with a limit not less than US\$200 million" during construction. (TC Response to RST IR 10b)
- Keystone "would look to secure a dedicated general liability insurance policy including sudden and accidental pollution coverage with a limit not less than US\$100 million" during operations. (TC Response to RST IR 10c)
- "Keystone XL would have an aggregate third party liability insurance to cover spills in South Dakota and all other states." (TC Response to RST IR 12)
- The level of the aggregate third party liability insurance to cover spills in South Dakota, Montana and Nebraska is \$200 million. During the April 14, 2015 hearing, Keystone's attorney confirmed that he believed that this aggregate \$200 million third party liability insurance is separate from \$100 million general liability insurance policy, which is a dedicated policy for South Dakota.

In summary, a major spill in South Dakota would be covered by a \$100 million general liability insurance policy. Furthermore, there is a \$200 million aggregate third party liability insurance to cover spills in South Dakota, Montana and Nebraska.

Given that a Worst Case Spill Scenario is estimated at approximately US\$1 billion (and in excess of \$2 billion for a very high consequence event), TGG is concerned that this level of insurance coverage is not enough. Furthermore, TGG is also concerned about Keystone's availability of ready cash to cover the initial costs of a major spill, as well as access to financial backstopping via parental and other third party guarantees.

We also have concerns about Keystone's responsibility and willingness to mitigate and compensate for all the potential damages for spills.

(footnote continued from previous page)

https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2451003/2454322/B32-4_-_Trans_Mountain_Response_to_NEB_IR_No._1.07a-Attachment_1_-_A3W9I0.pdf?nodeid=2454402&vernum=-2

Re: response to NEB 1.9a, the requested financial projections are provided in Attachment 1 to the response to NEB IR No. 1.09a (NEB IR No. 1.09a – Attachment 1)

https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2451003/2454322/B32-5_-_Trans_Mountain_Response_to_NEB_IR_No._1.09a-Attachment_1_-_A3W9I1.pdf?nodeid=2454323&vernum=-2

In light of a spate of major crude oil transportation disasters since 2010, TGG has concerns about the following questions surrounding Keystone's financial coverage:

1. To what extent will Keystone be forced to internalize the costs of a major pipeline accident/spill?
2. To what extent will the PUC direct Keystone to provide adequate financial assurances as part of its decision in the current application?
3. Given the uncertainty around (1) and (2), to what extent does Keystone have the proper incentives to buy enough insurance (as opposed to self-insuring based on an assumption that the full costs of a major pipeline accident/spill will not be internalized)?
4. To what extent will Keystone's insurance actually operate to internalize the costs of pipeline accident/spill (as opposed to the insurers acting to limit their payment of claims such that costs are not actually internalized)?
5. Even if Keystone were willing to buy adequate insurance, to what extent would such insurance be available at an affordable price?

Given the lack of information provided by Keystone and the limited resources available for this Report, we have not been able to conduct an in-depth review of Keystone's insurance situation, and its legal obligations in compensating for damages. But given our experience with liability issues for pipeline and crude by rail transportation, as well as the high costs of a Worst-Case Scenario, we have concerns about Keystone's capability/responsibility to internalize the costs in the event of a major spill (of \$1 billion or more).

For smaller spills, it is more credible that Keystone could internalize the cost. But for worst-case scenarios (i.e. spills of \$1 billion or more), it is possible (and even likely) that taxpayers will end up paying for some portion of the damages and cleanup (and/or there will be significant residual damages that are not fully mitigated or compensated). And these liability concerns only increase if spill costs escalate into the multi-billion dollar range.

Finally we note that in their final Decision on Enbridge's Northern Gateway (discussed in the previous section), the Joint Review Panel based the financial assurances requirements for Enbridge on their estimated cost of a worst-case scenario of \$700 million (detailed in RST Exhibit 5). According to the Decision:

The Panel based the financial assurances requirements for Northern Gateway on a spill with a total estimated cost of \$700 million and directs Northern Gateway to

develop a financial assurances plan with a total coverage of \$950 million that would include the following components:

- i. Ready cash of \$100 million to cover the initial costs of a spill;
- ii. Core coverage of \$600 million that is made up of stand-alone, third party liability insurance and other appropriate financial assurance instruments, and
- iii. Financial backstopping via parental, other third party guarantees, or no fault insurance of at least \$250 million to cover costs that exceed the payout of components i. and ii.

The financial backstopping would be available to fill the gap if the spill volumes or unit costs were under-estimated or if the payout from the core coverage would be less than 100 per cent. It would also compensate for the limited partnership's defined liability limits.

The instruments in the financial assurances plan and the proceeds from these instruments must be dedicated to covering the cost of a large oil spill or other malfunctions, accidents, and failures during the project's operations. At all times, Northern Gateway must isolate, to the fullest extent possible, the payout proceeds of the instruments in its financial assurances plan from its operations and financial circumstances, including potential insolvency.⁵⁸

TGG suggests that the PUC should also consider basing the financial assurances requirements for Keystone on the estimated Worst-Case Scenario (estimated at approximately US\$1 billion (and in excess of \$2 billion for a very high consequence event). The PUC should also consider similar elements (access to ready cash to cover the initial costs of a spill, core coverage and financial backstopping).

11 Comparison of Economic Costs and Benefits

Section 5 discussed estimates of the key benefits (and changes affecting the benefits) of the Project for SD, including the employment benefits of building and operating the Project, as well property tax benefits.

⁵⁸ See Joint Review Panel Decision of Enbridge Northern Gateway at <http://www.gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtvlm2-eng.pdf> pp. 362-363.

TGG concludes that the benefits of the Project are very small and may have been slightly overstated by Keystone; but even using Keystone's estimates, the benefits for SD are quite small. As such, our main area of disagreement with Keystone is in regard to Project costs, rather than Project benefits.

Regarding the costs of Project, Section 9 concludes that under Worst-Case Release Scenarios, the cost of a major pipeline rupture can range from US\$1 billion to amounts in excess of \$2 billion for a very high consequence event.

As set out in Section 4.2, it is impossible to make a precise determination of the costs (or risks) associated with the proposed pipeline; however, the Report can offer useful guidance by comparing an estimate of the economic benefits against a range of worst-case scenario costs.

We have focused on the costs of worst-scenarios because our core area of disagreement with Keystone in regard to spill costs/risks. Our main concern is not the costs of smaller (or even average or mean) spills because it is more likely that Keystone can pay for these spills (via insurance or even self-insurance). Instead, we are most concerned about the costs of bad to worst-case scenarios that are possible given Mr. Kuprewicz' concerns that the proposed routing in South Dakota places the Project "at undue risk with massive release of oil" (Accufacts, p. 1).

As discussed in Section 10, given the very high costs of a bad to worst-case scenario for Project, we have concerns about Keystone's financial capability, responsibility and willingness to mitigate and compensate for all the potential damages for spills costing \$1 billion or more.

Sections 5 and 9 demonstrate that the benefits of the Project are very small (with the major benefit quantified as \$15-\$17 million in annual property taxes), whereas the worst-case costs of a catastrophic spill are very large (ranging from US\$1 billion to amounts in excess of \$2 billion). The probability of a catastrophic spill have been dismissed (using the Project's irrelevant and outdated historical risk assessment) as so extremely unlikely that it is not given proper consideration by Keystone.

In his Direct Testimony, Mr. Kuprewicz warns about the Space Shuttle Syndrome: the erroneous belief that low risk is no risk. According to Mr. Kuprewicz (p. 10):

"In Oil Spill Response plans, it is often problematic that low probability release events such as rupture are unwisely accepted as "no probability" events, resulting in poor planning and staging of equipment, which in turn undermines the effectiveness of such plans when they are actually needed.

As indicated in Section 4.2, experience has taught us that worst-case scenarios can and do occur and have been occurring with alarming frequency since 2010, starting with the US\$1.2 billion rupture of Enbridge's Line 6B in Marshall, MI.

Based on evaluation of the economic costs and benefits in Sections 5 and 9, TGG concludes that, under a range of worst-case scenarios, the costs of the Project will greatly exceed the benefits for South Dakota: a few tens of millions of dollars in property tax benefits and very small employment benefits versus a range of Worst-Case Scenario Spill Costs starting at \$1 billion and escalating to \$2 billion or more for a very high consequence event.

We note once again that we have limited our cost analysis to environmental and socio-economic impacts that directly affect economic activity, and that can be somewhat readily (albeit approximately) quantified using market economics. The consideration of human health and safety and the broader and cumulative environmental and other socio-economic costs (which excludes many broader environmental and human health impacts (notably from increased GHGs) will further increase the overall costs of the Project. However, TGG has concluded that our narrow comparison of more narrowly defined economic costs and benefits (including a more limited consideration of socio-economic and environmental impacts) is sufficient demonstration that under a range Worst-Case Scenarios, the costs of the Project will greatly exceed the benefits for SD.

In Section 4.2, TGG stated that even a narrow comparison of economic benefits estimates against a range of worst-case scenario costs is sufficient to inform decision-making about the following:

1. The third question set out above to the Commission: have there been changes in the underlying facts related to the Project, such that the costs of the project for South Dakota now exceed the benefits (under a range of worst-case scenarios)?
2. Can the Keystone evaluation of the changes to the costs and benefits (which implicitly assumes that the benefits of the Project exceed the costs) be relied upon? (Keystone claims that “[t]o the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission's concerns.”)
3. And therefore is the Project in the public interest of the citizens of South Dakota and the Rosebud Sioux Tribe?

In answer to Question 1, yes there have been changes in the underlying facts related to the Project, such that the costs of the project for South Dakota now exceed the benefits (under a range of worst-case scenarios). The changes in the underlying facts related to

47



the economic costs and benefits of the Project were discussed at length in Sections 5 and 6 and summarized in Section 8. In particular, as discussed in Section 6.1.3, the risk assessment (based on irrelevant and outdated data) is highly inadequate given that a number of underlying facts have changed since 2010. As such the risk assessment provides an illusion of safety and is highly negative to the Commission's concerns.

This Report demonstrates that the answer to Questions 2 and 3 is an unequivocal no.

11.1 Costs and Benefits for the RST and Tripp County

The ratio of benefits to costs for the RST and Tripp County is particularly poor.

In terms of costs noted in Section 9.1, the vast majority of RST land along the Keystone XL route is in Tripp County. This county includes some of the most ecologically sensitive land on the Project Route (as it crosses approximately 30 miles of the Ogallala Aquifer as well as the White River). Moreover, the pipeline corridor in the northern half of Tripp County (where it is routed next to Winner, the world pheasant hunting capital) is in a high landslide hazard area. Therefore, Tripp County is doubly threatened by the Project.

The Accufacts Report (pp. 3 and 7) warns that a slow and undiscovered leak is likely to be the more serious threat to the Ogallala Aquifer and RST water resources. Remediation for such a leak release would be time-consuming and expensive and is of special concern for the RST, but this kind of leak is not the Worst-Case Scenario for the Project (which involves a massive release of crude caused by a breakaway landslide in areas of steep elevation change). Given that Project crosses High Landslide Hazard Areas in northern Tripp County, including the White River (as shown on the elevation profile in Exhibit 10), RST lands could also be at risk from a Worst-Case Scenario related to a breakaway landslide.

As we have concluded above, the benefits of the Project are very small for South Dakota. And Tripp County and the RST will receive a tiny share of these very small benefits while bearing a disproportionate amount of the risk.

12 Recommendations

In Section 4.1, TGG outlined the key questions before the Commission:

In this case, the Commission must determine:

1. if Keystone has met the burden of proof to demonstrate that the Project continues to meet the fifty permit conditions set forth in Exhibit A to the Amended Final Decision and Order; Notice of Entry issued on June 29, 2010, in Docket HP09-001;
2. if Keystone has met the burden of proof to demonstrate that [t]o the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission's concerns; and
3. as a corollary of (2), have there been changes in the underlying facts related to the Project, such that the costs of the project for South Dakota now exceed the benefits?

In light of the findings in the TGG Report and the Accufacts Report: TGG recommends that the PUC should deny Keystone's petition in the current case because:

1. Keystone has failed the burden of proof to demonstrate that the Project can continue to meet Permit Conditions 45-49 (as discussed in Sections 7.1, 8, and especially 10.
2. TC has failed to meet the burden of proof to demonstrate that "[t]o the extent that there have been changes in the underlying facts, those changes are either neutral or positive to the Commission's concerns."
3. TGG concludes that there have been changes in the underlying facts related to the Project, such that the economic costs of the Project for South Dakota under a range of worst-case scenario conditions greatly exceed the benefits (as discussed in Section 11. **We remind the PUC that the property tax benefits have been quantified at US\$15-\$17 million (and would remain relatively small even if they increase at the same level of the Project costs) and the employment benefits are very small. These benefits are eclipsed by the range of Worst-Case Scenario Spill Costs starting at \$1 billion and escalating to \$2 billion or more for a very high consequence event.**

If despite TGG's strong recommendation to deny Keystone's petition, the PUC chooses to approve the it, TGG recommends that the PUC direct Keystone to do the following:

1. Compel Keystone to provide clear specific information requested in RST IRs 9-12 (Round 2) in order to determine the level of Keystone's financial coverage in the event of a major spill, and whether Keystone is in a position to meet Permit

Conditions 45-49 (related to Liability for Damage).

2. As suggested in Section 10, the PUC should implement specific financial insurance requirements, based on the estimated Worst-Case Scenario Costs for the Project (estimated at approximately US\$1 billion (and in excess of \$2 billion for a very high consequence event). TGG suggests that the PUC should also consider incorporating elements of Canada's Joint Review Panel Decision on Enbridge's Northern Gateway, such as access to ready cash to cover the initial costs of a spill, core coverage and financial backstopping.⁵⁹

3. Implement the four recommendations in the Accufacts Report (p. 9)

First, TransCanada should be compelled to provide clear specific information requested in previous IRs (particularly RST IR 1 (Round 2)) concerning additional information that should be incorporated into Figure 1. This information is essential to assist the PUC in making an informed and prudent decision concerning the Keystone XL routing in highly challenging and sensitive terrain within South Dakota.

Second, further information is warranted to clarify how much of this terrain identified as High Landslide Hazard Area is really at risk to such massive abnormal loading forces. No pipeline, even new modern "robust" steel pipeline, can withstand the massive abnormal loading forces associated with breakaway landslides. Such forces are much greater than those associated with earthquakes. The science of designing for earthquake faults is well developed, but to date no one has been able to design a pipeline that can withstand a massive landslide that usually results in pipeline rupture.

Third, as described above, the PUC should require TC to produce an estimated oil spill outflow versus pipeline milepost graph for the pipeline reflecting full bore rupture within South Dakota, as well as additional similar sensitivity graphs reflecting additional 15-minute valve closure intervals.

Finally, if the high risk of landslide identified in the Final Supplemental Environmental Impact Statement ("FSEIS") is confirmed with

⁵⁹ See Joint Review Panel Decision of Enbridge Northern Gateway at <http://www.gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtlm2-eng.pdf> pp. 362-363 and discussion of the financial assurances portion of the Decision in Section 11..

accompanying risk of a massive oil spill, the pipeline should be rerouted to avoid areas with high risk of landslide. If the PUC does not have the authority to reroute the Project, then it should deny the current Petition. If a new permit application is needed, TC should consider mitigating the landslide risks by rerouting the Project.

4. Ensure the adequacy of staging equipment to respond rapidly and effectively to an oil spill in the Ogallala Aquifer.