



Protecting the Common Waters of the Great Lakes Basin  
Through Public Trust Solutions

**COMMENTS ON THE DYNAMIC RISK REPORT:  
“DRAFT FINAL REPORT – ALTERNATIVES ANALYSIS FOR THE STRAITS PIPELINE”**

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### **Background**

On August 24, 2016 the MDEQ, MDNR, MAE and AG’s Office, collectively referred to as the State, entered into contract with Dynamic Risk Assessment Systems, Inc. (Dynamic Risk) to conduct an alternatives analysis of Enbridge’s Line 5 pipelines crossing the Straits of Mackinac (Straits). The Alternatives Analysis was to be a systematic comparison of the feasibility, costs, benefits and risks of several alternatives, including a detailed base case on continued operation of the existing two 20” Straits pipelines. Dynamic Risk was not charged with recommending a preferred alternative. Instead, the overall purpose was to provide the State, Enbridge and the public with information that could be used to help guide decisions about the future of the pipelines. The “*Draft Final Report - Alternatives Analysis for the Straits Pipeline*”; by Dynamic Risk, hereinafter referred to as Report, was issued for review on June 27, 2017. (1) This review addresses the approach, errors and omissions in the Dynamic Risk Report.

DNV GL was conducting a second study, a risk analysis. The risk analysis study was terminated by the State before completion due to a conflict of interest resulting in a failure to meet the terms of the contract. Not having the risk analysis creates a huge information gap for the State and private citizens on the risk and impacts of an Enbridge Line 5 failure at the Straits. However, FLOW issued a report: *Defining a Worst-Case Release Scenario for the Enbridge Crude Oil Pipelines Crossing the Straits of Mackinac – Line 5*. Flow did not develop quantitative risk and consequence assessments, but the FLOW report provides a worst-case scenario (WCS) analysis on the potential spills using recognized risk management approaches. (2)

### **Executive Summary**

As noted in the Dynamic Risk Report but not necessarily clear to a non-technical reader, the methodology provides risk comparisons for the different alternatives to a given set of threats; it provides a comparison, not a WCS analysis for each alternative.

A FLOW WCS analysis found that there are two potential worst-cases: 1) catastrophic failure and release and 2) slow undetected leak for an extended period of time. (2)

- Enbridge/PHSMA Worst-Case Discharge = 4,500 bbl.
- FLOW Worst-Case Scenario = 61,000 bbl.
- Flow Undetected Slow-Leak Scenario = would exceed the Flow WCS in 20 days

Dynamic Risk should have provided worst-case information for each alternative studied, not just a comparison of likely failures. This is gap in the Dynamic Risk Report.

Dynamic Risk did not collect or use primary data. A key justification in hiring consultants is their ability to reach out to the business community and private citizens and gather primary data. Lack of primary data is a fatal flaw in the report as forecasts and projected evolution of the transportation system cannot be credibly analyzed.

**Dynamic Risk’s decision to prematurely drop the analysis of Alternative #2 - Utilize existing alternative pipeline infrastructure is a major failure in meeting the goals in the contractual agreement with the State.** A forecast should have provided on the potential evolution of the pipeline network given a projected decommissioning date. This is a normal task performed by consulting companies, providing forecasts

Low probability events for Alternative #5 were not considered. These events could be catastrophic at the Straits but generally not issues with other pipeline systems (see numerous reports by Dr. Edward Timm).

Leaks under the detection threshold of the SCADA and material balancing systems were not considered. These “smaller leaks” have historically been discovered by private citizens and could occur of long extended periods in Northern Michigan.

Alternative 6 – Decommission Line 5 at the Straits Determine Viability of Continued NGL Deliveries to Rapid River and Michigan Crude Oil Shipments at Lewiston was quickly dismissed without consideration of other possible options that would require capital expenditures and a practicable time to implement. Primary research should have been conducted and a forecast provided on the system evolution 18 to 24 months into the future.

## **Issues Identified in the Dynamic Risk Report**

### **State’s Comments on the Draft Report**

In the “*State’s Statement Regarding Draft of Alternatives Analysis*”, the State commented: “*The State project team indicated that the discussion of “worst case” spills in the draft report was unclear and suggested the need to explain and clarify how it had done so across the various alternatives, particularly with regard to Alternative 5, continued operation of the Straits Pipelines.*” This issue is still problematic. In FLOW’s discussion with private citizens, they still believe that they are reading about worst-case scenarios (WCS). A strong cautionary statement needs to be made upfront and repeated throughout the report similar to the Dynamic Risk

statement on page 1-7.

*“**Role of Risk Analysis** The risk analyses conducted within this study are regarded as objective assessments of credible threats to existing or new infrastructure. They are not intended to represent a worst case spill. They are intended to provide a consistent means for looking into and comparing risks of different operations.”*

As noted in the Dynamic Risk Report but not necessarily clear to a non-technical reader, the methodology provides risk comparisons for the different alternatives to a given set of threats; it provides a comparison, not a WCS analysis for each alternative.

### **FLOW’s Report on Worst-Case Scenario Analysis**

The first steps in conducting a risk analysis are to define the scope of the system and identify worst-case and alternate release scenarios. If the consequences are unacceptable for the WCS, regardless of the likelihood, then implementing an acceptable alternative and termination of the existing operation is the only option. In addition, extraordinary safety and emergency response measures are normally required in the interim, until the alternative implemented and the existing operation terminated.

The FLOW WCS analysis found two potential worst-cases: 1) catastrophic failure and release and 2) slow undetected leak for an extended period of time.

**Enbridge/PHSMA Worst-Case Discharge = 4,500 bbl**

**FLOW Worst-Case Scenario = 61,000 bbl**

**Flow Undetected Slow-Leak Scenario = would exceed the Flow WCS in 20 days**

### **Worst-Case Scenarios are Not Available for Alternatives**

The Dynamic Risk Report does not provide WCS scenarios for each alternative to enable a maximum risk comparison to the base case (Alternative #5). Worst-case information for each alternative is important, not just a comparison of likely failure mechanisms. This is a gap in the Dynamic Risk Report.

### **Lack of and Failure to Collect Primary Data**

A key justification in hiring consultants is their ability to reach out to the business community and private citizens and gather **primary data**. Alternative #2 – Utilize existing alternative pipeline infrastructure, as well as the other alternatives can only be effectively analyzed through the use of primary data. Stated in the Dynamic Risk Report:

*“1.6.2. Primary Data The Study is based on existing information with no primary data gathering or public input on social impacts. A number of the assessments should thus be*

*regarded as screening exercises - . . . . . “ (1)*

Obtaining and analyzing primary data is vital for a proper analysis of Alternative #2 - Alternatives Remote to the Straits Crossing creating a major flaw in the Report.

### **Inadequate Systems Analysis and Failure to Forecast System Evolution**

The Dynamic Risk analysis should have started with: primary research followed by a comprehensive pipeline network analysis and then a forecast on how the pipeline network would evolve over time when constraints are placed on it, such as a planned decommissioning of Line 5. Instead, the “up-front work” was limited and a “deep-dive” with quantitative risk assessment methodology was undertaken. Their analysis focused on impacts resulting from immediate actions and not a planned industry response using an “as soon as practicable approach”; that is, rapid action is needed but with reasonable time to adjust. **The failure of the Dynamic Risk analysis to forecast the evolution of the system led to the premature rejection and inadequate analysis of key alternatives.**

The above analysis failure creates a major flaw in the Dynamic Risk conclusions for Alternative # 2 - Alternatives Remote to the Straits crossing, which FLOW believes to be the most feasible and lowest risk alternative. Dynamic Risk should have assumed a time constraint such as; decommission Line 5 in 18 to 24 months, then forecasted the changes to the pipeline network made by industry players to meet market goals. Unfortunately, Dynamic Risk prematurely rejected Alternative # 2, a primary alternative demanded by the State, non-government organizations and private citizens for comprehensive analysis. From the DRAS Report page, MS-2:(1)

#### ***“Alternatives Remote to the Straits Crossing***

*Some alternatives to the Straits Crossing were eliminated during the early stages of analysis. For example, there were limited options for using existing pipeline infrastructure (Alt 2) due to limited capacity on existing assets, whether they are owned by Enbridge or other parties. Even in cases under consideration, it was highly probable that either a new build pipeline or alternative transportation such as rail would be required to manage capacity. Therefore, the option of using existing pipeline infrastructure was removed from further detailed analyses. . .*

*. . . Feasibility of Alternatives - All alternatives with the exception of Alternative 2 (utilization of existing pipeline infrastructure to transport Line 5 products) were found to be feasible . . . . . “*

The North American pipeline network has undergone a major evolution in the past 5 years with pipeline replacements, expansions, flow reversals, service conversions, interconnections, company acquisitions and divestments and etc. The evolution is projected to continue at a rapid pace with the new U.S. energy strategy. The Dynamic Risk analysis tries to fit Line 5 shipments into existing available capacity in other pipelines, finding that it all does not fit, Dynamic Risk drops further consideration of Alternative #2. FLOW believes that by setting a decommissioning date, 18 to 24 months in the future, industry will use this constraint to prioritize North American

needs, modify routing to the Gulf and West Coasts to meet export goals and begin implementation pipeline projects currently on-hold pending a decision on Line 5's fate. In addition, new pipeline projects are underway to expand the use of Pennsylvania, Ohio and West Virginia shale crude oil and NGL's, which compete with the Western U.S. and Canada sources further reducing the justification for the use of Line 5.

**Dynamic Risk's decision to prematurely drop the analysis of Alternative #2 is a major failure in meeting the goals in the contractual agreement with the State.** Instead of just looking at the current situation, a forecast should have provided on the potential evolution of the pipeline network. This is a normal task performed by consulting companies, providing forecasts and feasibility studies for their clients. Perhaps the wrong consulting company was selected?

### **Alternatives Analysis by Chapter**

As noted above, the lack of a DNV GL risk analysis report creates a major gap in identifying the risk of Line 5 at the Straits. The Dynamic Risk Report does not provide worst-case release and consequence analyses, as this work was not within the scope of Dynamic Risk's project. However, the Report should include:

- Low probability events for Alternative #5 that could be catastrophic at the Straits but not generally issues with other pipeline systems (see numerous reports by Dr. Edward Timm).
- Leaks under the detection threshold of the SCADA and material balancing systems. These leaks historically have been discovered by private citizens and could occur of long extended periods in Northern Michigan.

### **Alternative 5 – Maintain the Existing Straits Pipelines**

From the Report:

*“Analysis of the Existing Straits Crossing As a base case for comparison to alternatives to the Straits Crossing, an operational quantitative risk analysis, considering likelihood and consequences of failure, was completed for the existing Straits Crossing (Alternative 5). This base case forms the basis to which all other alternatives were compared. The risk analyses conducted within this study and for each alternative are regarded as objective assessments of credible threats to existing or new infrastructure, and were based on an evaluation of threats, defined as the potential causes and failure mechanisms associated with spills. Three measures of risk were presented; Health and Safety Risk, Economic Risk, and Environmental Risk. These risk analyses are intended to provide a consistent means for comparing risks of alternatives. (Pages MS-1, 2]*

FLOW recognizes this is a base case analysis for comparison purposes. Additional clarification is required at the beginning of this section as many readers interpret the findings to be a “most-

likely worst-case scenarios.” This base case is a detailed analysis of likely threats, failure probabilities and resulting consequences and readers need to be cautioned that the findings are not worst-case scenarios and also not directly comparable to the “Enbridge / PHMSA worst-case discharge” which is based on different assumptions. (2)

#### **Alternatives #4a – New Pipeline and Trench**

#### **Alternative #4b – New Pipeline and Tunnel**

A new pipeline and trench would reduce the risk compared to existing Line 5 operations but not entirely eliminate critical threats and the Risk of a failure to the Straits. A new pipeline in a tunnel would provide significant risk reduction.

- The capital estimate for a new pipeline and tunnel under the Straits appears to be extremely low \$150M.
- The tunnel should be engineered to meet “secondary containment criteria” equivalent to onshore facility best-practice criteria as required by the EPA and oil pollution control regulations. The tunnel should also allow visual inspection.
- A tunnel does not mitigate the extreme risk posed by Line 5 upstream and downstream of the Straits, which crosses several environmentally sensitive rivers and wetlands runs adjacent to the Great Lakes and Saginaw Bay. It can be predicted that in the near future, requests for permits would be submitted to the State to replace major portions of the 30” pipeline for “maintenance” as well as actions to increase capacity and ship diluted bitumen (Dilbit, tar sands crude).

#### **Alternative 6 – Decommission Line 5 at the Straits Determine Viability of Continued NGL Deliveries to Rapid River and Michigan Crude Oil Shipments at Lewiston**

The analysis of this alternative is inadequate and falls short for the same reasons as outlined earlier for Alternative #2. Primary research should have been conducted and a forecast provided on the system evolution 18 to 24 months into the future.

FLOW recognizes that in practice, flow rates are too low to independently operate the upstream and downstream segments without flow through the Straits. The U.P. propane demand and shipments of crude oil from Lewiston are too low; Line 5 is over-sized. However, to assume that *“no alternative infrastructure is constructed . . . analysis provides a qualitative first level impact assessment . . . .”* is a failure in the Report and invalidates the comparison to other Alternatives where in-depth analyses were conducted.

Propane supply sources would adjust from the western and eastern ends of the Peninsula and it is not unreasonable to assume that rail connections could be added. Propane demand will also continue to decline as natural gas takes more market share in populated areas and a system analysis would also consider alternative supply sources for propane. Newly announced studies

and projects to pipeline NGL's and light crude to Detroit and Canada from the Marcellus and Utica formations in Ohio, West Virginia and Pennsylvania could also supply the U.P with propane via rail to Kincheloe and light crude to Detroit and Ohio refineries via non-Enbridge pipelines.

Gary Street has studied this topic extensively and Dynamic Risk should have provided more analysis on these and other options.

The assessment on transporting Michigan produced crude oil was also inadequate and other options may be feasible given a practicable period of time for implementation. Assuming only trucks shipments will work is not credible. The feeder pipeline network to Lewiston crosses rail lines and is relatively close to vacant brown-field sites. The pipeline network could be modified and a rail loading station installed. Alternatively, the existing Line 5 could be used as a sleeve and a smaller pipeline inserted that would handle the reduced flow. These options obviously require feasibility and economic analyses but they are representative of the options that should have been studied, rather than a premature termination of the analysis, possibly reaching erroneous conclusions.

### **Alternative 2 – Use Existing Infrastructure**

Dynamic Risk prematurely dropped this alternative. This creates a fatal flaw in providing a credible alternative analysis. Quoting from the report:

*“ . . . For example, there were limited options for using existing pipeline infrastructure (Alt 2) due to limited capacity on existing assets . . . . Therefore, the option of using existing pipeline infrastructure was removed from further detailed analyses.”(1)*

The North American pipeline network and business objectives of the key players were only analyzed at today's point in time; the assumption was made that Line 5 shipments either fit into available capacity in other pipelines or did not. This approach is not how the real world works. Dynamic Risk should have: 1) properly defined the pipeline system and scope, 2) assumed a Line 5 decommissioning date say 18 to 24 months into the future, 3) conducted primary research by contacting relevant industry players and 4) forecasted how the system would evolve including a credible forecast on currently planned and possible new infrastructure. Assuming that only current infrastructure is available and not conducting primary research to also consider the many projects that industry players are contemplating or have on-hold pending a Line 5 decision is not a credible analysis for Alternative #2.

### **Alternative 1 – Construct One or More New Pipelines**

A cursory study on this alternative would have been adequate but to provide the appearance of a comprehensive report, a lot of unnecessary work was done. The effort would have been better spent on the more viable alternatives such as #2. Alternative #1 covers three (3) options: 1) northern route through Canada, 2) Central route into Michigan crossing the St. Mary's River and 3) southern route following existing Enbridge assets.

Over the past several years, there have been many incremental pipeline expansions, jumper lines, flow reversals and major new projects. This activity changes as companies adjust their plans to meet market needs and economics. A credible approach, based on primary research would be to determine if export demands could be met via system changes and the use of pipelines to the Gulf and West Coasts of North America. Strategically, priority for existing capacity should go to North American customers and incremental capacity to export markets. However, Line 5 is currently an enabler for Canadian exports with the Great Lakes carrying the risk. Why does the Report apply the downside economic impact to North American customers and not to export customers purchasing heavy crude (Line 78 - Line 9) enabled by Line 5 operation.

### **Alternative 3 – Use Alternative Transportation Methods**

This alternative reviewed the feasibility decommissioning Line 5 and moving materials by truck, rail and barges. (1)

- FLOW agrees that total replacement Line 5 using truck and rail shipments is not a viable option due the large number of shipments required and the higher safety and environmental risk. Replacement with barges is also not a viable option due to winter shutdown and the very high environmental risk. Minimal effort could have been expended on the analysis of these “non-starter” alternatives.
- However, owner/operators use truck and rail shipments integrated with pipelines as a normal industry practice to optimize the transportation network.

### **Alternative 5 – Maintain the Existing Straits Pipelines**

This analysis assumes that abandonment costs for the pipeline would be avoided and that consumer costs would not rise. (1) The analysis does not consider the unacceptable consequences that would result from a WCS. The Dynamic Risk study did not provide a WCS, as it was not within the scope of their work. The WCS that was to have been provided by DNV GL along with an impact assessment should have defined acceptability of Alternative 5 – Maintain the Existing Straits Pipelines.

### **Economic Feasibility Analysis [TS-3]**

From the Report:

*“For this study, the alternatives described are designed to provide equivalent capacity and deliveries to that of the existing Line 5. In practical terms, this corresponds to total delivery capacity of 540,000 barrels/day (bbl/d), of which 1/6<sup>th</sup> assumed to be NGLs. The project therefore employs a cost-effectiveness analysis to permit a simpler comparison that does not rely on explicitly estimating the benefit streams or revenues from the alternatives. Such a cost-effectiveness analysis is consistent with OMB Circular No. A-4 (2003), which focuses on regulatory analysis of alternatives. It also serves as an appropriate comparative basis for performing subsequent*



*market impact analyses.*“

- The State contracted an alternatives analysis not a regulatory alternatives study and the State is not bound by OMB procedures or assumptions on geographic scope. It is vital that the State and private citizens receive credible forecasts on impacts and economic feasibility. To obtain these forecasts, primary research must be performed and assumptions properly made on the pipeline network and evolution leading to and after Line 5 decommissioning.
- The economic impacts were artificially slanted to affect the State and did not provide information on possible actual impacts and benefits occurring outside of the State. The assessment should have been based on forecasting a future state in time, say 2 years and how optimization would credibly affect Michigan citizens.

### **Socioeconomic Impact Analysis [0, TS-4]**

From the Report:

“. . . . . A county corridor of the Michigan counties . . . . .  
. . . . . A Prosperity Region corridor . . . . .  
. . . . . The State of Michigan . . . . .

- The scope of this analysis was primarily limited to the State. Some of the assumptions in the alternatives would positively and negatively impact other states. These impacts should have been qualitatively assessed as they affect the feasibility to implement the specific alternative.

### **Market Impact Analysis**

From the Report:

*“The project made the analytical assumption that market forces would, in the near term of service interruption, rely on some combination of trucking and rail for transportation. . . . The assessment of larger market impacts of changes in product delivery are more complicated. The project, again, assessed the maximum anticipated impact on Michigan interests. . . . “*

- As previously mentioned, the analysis should have included an analysis given a transition time of 18 to 24 months. The decommissioning can be planned and not an abrupt “emergency shutdown.”
- The report also defines “maximum anticipated impact on Michigan interests” for supply disruption but elsewhere does not determine a maximum impact from a catastrophic spill on Michigan interests.

## Oil Spill Release Modeling

The approach used to establish a list of set specific threats and failure assumptions for the comparison on alternatives is appropriate. A key point that also continues to need emphasis is pointed out: [1, 1-7]

*“The risk analyses conducted within this study are regarded as objective assessments of credible threats to existing or new infrastructure. They are not intended to represent a worst case spill. They are intended to provide a consistent means for looking into and comparing risks of different operations. The risk analyses include:*

- *threat assessments*
- *assessments of potential spill sizes and probabilities of credible spills*
- *detailed modeling of fates for alternatives involving the Mackinac Straits*
- *an assessment of economic, safety and environmental consequences.”*

FLOW continues to encounter individuals who interpret the information as worst-case scenarios.

## Recommended Reading

Niklas Möller and Per Wikman-Svahn , “Black Elephants and Black Swans of Nuclear Safety”, *Ethics, Policy & Environment*, 14:3, 273-278, DOI: 10.1080/21550085.2011.605853, 2011. <http://dx.doi.org/10.1080/21550085.2011.605853>

This article is recommended reading because it provides a broad outline on risk management failures that can be applied to all high hazard industries, including pipelines. It is a short and worthwhile read.

*This leads us to highlight another concept that we believe is important in order to understand and to prevent hazards: the ‘black elephant’, which is similar to a black swan, but like the ‘elephant in the room’ is visible but largely ignored (Gupta, 2009). We define a black elephant as: (i) a high-impact event, that (ii) lies beyond the realm of regular expectations, but (iii) is ignored despite existing evidence.*

## References

1. State of Michigan Pipeline Safety Advisory Board, “*State of Michigan Statement Regarding Draft of Alternatives Analysis, June 29, 2017 and Dynamic Risk, Draft Final Report - Alternatives Analysis for the Straits Pipeline*”, June 27, 2017.
2. Kane, R. J., “*Defining a Worst-Case Release Scenario for the Enbridge Crude Oil Pipelines Crossing the Straits of Mackinac – Line 5*”, Comments submitted by FLOW to the MPSAB, August 2, 2017.