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Via Email and Overnight Federal Express

Ms. C. Heidi Grether
Director
Michigan Department of Environmental Quality
Constitution Hall
525 West Allegan Street
Lansing, MI 48933

Ms. Valerie Brader
Executive Director
Michigan Agency for Energy
P.O. Box 30221
Lansing, MI 48909

Re: Response to Follow-Up Questions Concerning Enbridge's Forthcoming Application to Install Screw Anchor Supports on the Line 5 Dual Pipelines at the Straits of Mackinac

Dear Director Grether and Executive Director Brader:

I am writing in response to the questions raised concerning Enbridge's forthcoming joint application to MDEQ and the US Army Corps of Engineers ("Corps") to install additional screw anchor supports along the Line 5 Dual Pipelines' crossing of the Straits of Mackinac. Specifically, I have enclosed answers to each of the questions raised by Mr. Matthew Goddard in his email to Enbridge dated April 4, 2017.

I understand that the enclosed information has been requested to provide you with background information concerning historical supports on the Dual Pipelines, and Enbridge's decision to install additional anchors at this time. I further understand that the enclosed information will help assist in your review of Enbridge's joint application, and will help to respond to questions that may arise from Enbridge's forthcoming application. As you are aware, Enbridge will submit its joint application to MDEQ next week after you have had a chance to review the enclosed information.

We look forward to any comments or questions you might have regarding the enclosed responses.

Sincerely,

ENBRIDGE ENERGY, LIMITED PARTNERSHIP
By Enbridge Pipelines (Lakehead) LLC
Its General Partner

Bradley F. Shamla
Vice President, U.S. Operations

Enclosure

1. **Grout bags (How many in total have been installed? Of these, how many have been replaced with anchors? How many that haven't been replaced are left, are they deteriorating and how quickly? If any of these grout bags that are not replaced deteriorate, would Enbridge be out of compliance?)** [Based on subsequent conversations, this question is understood to refer not to total number of grout bags but to total number of spots along the line that have been secured with grout bags.]

   There are only three locations where grout bags are still used as actual pipe supports today. These were put in place to remediate span length issues. Installation of the screw anchor supports at all three locations to replace the grout bags was planned in 2016 as part of the 18 additional anchor installs. These screw anchor supports will be installed in 2017 pending permit approval. In the unlikely event that grout bag supports were to deteriorate to the point of not supporting the pipeline, the corresponding spans could exceed 75 feet until the screw anchors could be installed. Even if spans exceed 75 feet due to a deterioration of grout bags, there would be no impact to the integrity of the pipeline prior to the installation of additional screw anchors as the total span length would be well below 140 ft.

2. **What is the basis for the "proactive" criteria and how high is our level of confidence that these 22 anchors are proactive enough to prevent us from needing to continue to apply a permit request every two years?**

   The basis for the assessment is an examination of the lake bed erosion trends observed over the many years of operation. Enbridge continues to believe that our ability to predict growth of spans is reliable. However, due to the dynamic nature of the lake bed, there could be further changes in span length that are not currently expected that could result in a future decision to seek to install additional screw anchors. Enbridge is committed to continuing to work with the State of Michigan to assess, and if necessary mitigate, any changes that may be observed in the future. The proactive model used for the 2016 pipeline inspection to determine required anchor installs is addressed below in Response 3.

3. **Provide some more information on the 4 anchors that are being requested in addition to the 18 that were in last year's application**
   - **Why the additional four – these were identified with new information gathered while installing the anchors in November**
     - **What changed in 6 months? i.e. lake bed, modelling assessment, etc.**
     - **By what technique did we get info on the additional four (ROV AUV or human visual observation?)**

   The 2016 underwater inspection data was further examined following the completion of the anchor installation work in November 2016. As a result of this further review, it was suggested that four (4) additional screw anchor supports be added to the 18 that were in last year's application and will be included in the 2017 permit application for the Line 5 screw anchor support installation project.

   The four additional anchors were added to the work plan for 2017 after Enbridge took an even more conservative look at the possibility for additional scour at the pipeline touchdown

locations. Though the ends of these new spans go into deeper cover and the likelihood of scour causing span growth beyond 75 feet is quite low, it was decided to apply the additional conservatism at these locations and to install screw anchor supports as the spans were within seven feet of the easement limit.

Enbridge is committed to continuing to work with the State of Michigan to monitor, assess, and if necessary, mitigate any changes that may be observed in the future. Further, additional screw anchor support installs may be required in the future as discussions continue with the EPA on Consent Decree requirements regarding the Line 5 Straits crossing.

4. **What is the typical span clearance depth underneath the pipe (4 – 6 ft?)? Maximum? Minimum? Average? Has Enbridge calculated the percentage of the pipeline that is supported by anchors vs lake bed?**

   The average span clearance depth underneath the pipe is about 1.35 ft, the maximum span clearance depth underneath the pipe is 4 ft and the minimum span clearance depth underneath the pipe is 0.5 ft.

   The estimated percentage of the pipeline that is supported by anchors on both crossings is approximately 14% of the whole crossing length.

5. **At what water depth are the anchors? Specifically, how many are at the bottom where higher currents are present, and how many are up along the banks.**

   There are 29 anchors at water depth >200 ft and 100 anchors at water depth <200 ft.

6. **Need to confirm VIV assessment is considering multiple current directions and velocities.**

   Four (4) current profilers were deployed to collect the current data, two (2) near the pipeline at the East crossing and two (2) near the pipeline at the West crossing. The current profilers were placed about 2 ft off the lake bottom. In the current velocity calculation, the average current over the elevations of 2 ft – 6 ft above the bottom was used where good quality current data was collected. Currents below 2 ft were calculated using known equations.

   Vortex induced vibration (VIV), if it occurs, mainly causes the pipe to vibrate in the vertical direction. As such, only the portion of the current that flows across the pipeline (or is perpendicular) contributes to VIV. According to the assessment, a current velocity of 2.3 ft/sec is the transition velocity above which the VIV would become less critical. The VIV allowable span length is a function of the current velocity. As the current velocity increases, the VIV allowable span length decreases. At a current velocity of 2.3 ft/sec, the VIV allowable span length is about 140 ft. A critical span length analysis showed that in order to cause VIV for a 75 ft long span at the Straits, the current velocity would have to be in the order of about 9.8 ft/sec or about 6.7 mph. Note that the maximum velocity of the current by the four (4) current profilers was about 2.75 ft/sec or 1.88 mph.

7. **Kurt B. had commented on March 13 that Enbridge would be moving to an annual inspection schedule – is this accurate?**

   This is not accurate. Kurt Baraniecki's comments to the Michigan Pipeline Safety Advisory Board on March 13 were related to in-line inspections. Enbridge is committed to annual inline inspections to detect metal loss and geometry features beginning in 2017 as required by the Congressional mandate in the 2016 PIPES Act. Our current plans are to continue with biannual AUV and ROV external inspections with the next inspections scheduled for 2018.