Questions

1. *Will there be any temperature monitoring units placed at the sites of the coating repairs to verify that the temperatures will not drop below the 40°F threshold specified in the work plan and lab simulations?*

   Enbridge Response: Enbridge will measure the water temperature (i) during application of the coating repair and (ii) after removal of the Stricture Banding™. The cure of the coating will be verified using hardness testing as per Section 4.5.2 (Coating Repair Procedure, V2.0).

2. *Will the Stricture Banding™ be removed from all of the repair locations after the hardness is verified?*

   Enbridge Response: Yes, the diver will assess the hardness of the coating repair as per Section 4.5.2 (Coating Repair Procedure, V2.0). If the coating does not indent, the Stricture Banding™ will be removed in its entirety. If the coating does indent, the Stricture Banding will remain in place and the hardness will be re-checked before Stricture Banding™ removal.

3. *Will the composite reinforcement have the epoxy applied on the barge? If so, how will this be transported down to the location of application to ensure the epoxy saturation has not been compromised?*

   Enbridge Response: The X-100 UW epoxy is prepared on the barge and used to impregnate the composite wrap (E-glass fabric). The impregnated fabric is transported down within a plastic bag to the Diver using a downline/retrieval line.

4. *How will the operator ensure that the composite reinforcement will be installed within 45 minutes after surface preparation?*

   Enbridge Response: Not applicable. For our applications, the X-100 UW epoxy is not applied directly to the prepared pipe steel surface. BIO-DUR®563 SW is applied directly to the prepared pipe steel. Moreover, re-rusting or initial settlement of fouling slime is removed prior to application of the BIO-DUR®563 SW as per section 4.1 (Coating Procedure V2.0): "Immediately prior to coating application, the Diver shall remove any flash rust and/or accumulated debris (silt, clay, etc.) using a wire brush or other method approved by the Manufacturer."

5. *How will the operator ensure that the Bio-Dur will be used within 20 minutes of being mixed?*

   Enbridge Response: Time of the mixing the BIO-DUR®563 SW components, time of BIO-DUR®563 SW application and water temperatures are monitored to ensure the pot life of the material is not exceeded.

6. *Will the Stricture Banding™ be required to be perforated?*

   Enbridge Response: The Stricture Banding™ will not be perforated. The primary role of the Stricture Banding™ is to (1) isolate the coating repair from the local lake environment and (2) apply pressure to the coating repair during the curing process.

7. *The Polatrak Cathodic Protection (CP) Gun manufacturer literature stated that two cathodic protection readings are provided and that "The two readouts should give a steady result and should be within 5 mV of each other." The provided External Pipeline Inspection Forms for the noted holidays do not show any two readouts that were within 5 mV of each other. Please explain this discrepancy.*

   Enbridge Response:

   - The instrument was factory calibrated on August 4, 2017 and field validated in accordance with the manufacturer's recommended procedure to be within the 5mV tolerance on August 30, 2017.
   - There are several reasons why two independent measurement circuits can produce

slightly different readings, including: i) contamination of the reference cell(s), current leakage in the measurement circuit (leaky 'waterproof' electrical connections), instrument error, and time related issues such as voltmeter settling period and normal fluctuation in the actual pipe potential over time.

- Enbridge is managing these technical challenges, and is now incorporating daily calibration and periodic replacement of the reference cell electrolyte to improve the quality of the recorded data.

8. *Does the operator intend to collect samples of any of the "white deposits" for laboratory analysis or conducting any other examinations of the pipe or coating surfaces?*
   Enbridge Response: Samples of several "white deposits" have been collected for analysis under the Biota Investigation Work Plan. In addition, Enbridge is removing white deposits where they have been found in connection with the anchor inspections and examining the pipe in the area as per the coating inspection work plan.

9. *What effect will product flowing through the pipeline have on the coating cure rate?*
   Enbridge Response: The effect of product flowing through the pipeline will have a positive effect on the coating cure rate. If the steel temperature is higher than the water temperature, the coating will cure faster at the surface of the pipe steel. The temperature of the product within the line varies seasonally between approximately 50 to 70 °F.

10. *What effect will the water current have on the coating cure rate?*
    Enbridge Response: The water currents will not have an effect on the coating cure rate.

11. *How will debris from the lake floor be controlled so as to not become entrained in the coating, particularly if any excavation is required to fully expose the circumference of the pipe?*
    Enbridge Response: In the event of excavation, the lake floor will be allowed to settle and coating repairs will not take place when strong currents are present. As per section 4.1 (Coating Procedure V2.0), accumulated debris (silt, clay, etc.) will be removed prior to coating.

12. *The laboratory analysis of the coating did not include an application test at the 6:00 (or 180°) position on the pipe. Will any applications at this position be required for these holiday repairs, and if so, are there any adjustments to the procedure that will have to be considered?*
    Enbridge Response: The BIO-DUR®563 SW has a high viscosity and is adherent to the pipe steel and will not require any adjustments to the procedure regardless of the holiday location on the pipe.

13. *In the laboratory analysis of the coating, Table 3 indicates that there were several pull-off strength tests that ended up with "no valid result" or the "sample broke or cracked." Explain this data, and why the invalid results do not impact the expected performance of this coating.*
    Enbridge Response: According to Stress Engineering Services (SES), through the act of cutting the plug and gluing the test apparatus, the sample could be compromised, giving a false reading. All of the invalid tests were a result of sampling methods; the cutter caused the coating to either break or partially separate before the actual adhesion test was conducted. For completeness, SES included all test efforts.

14. *The manufacturer data sheet specifies that hand held power tools are inadequate to use for large repairs. Additionally, the evaluation of the coating by the laboratory references a NACE 2 Finish ("Near-white metal abrasive blast cleaning"). As referenced in Section 3.1 of the application procedure, it states that "The repair area shall be abraded using either wet abrasive blasting or pneumatic power wire wheel brush." Section 3.1 further states that "The method shall be capable of providing a surface profile of 2.5 – 5 mils." Please provide an explanation of how*

any pipe surface preparation method used will appropriately abraded the pipe surface to both the coating manufactures specifications and the techniques used by the laboratory while ensuring the integrity of the pipeline.

Enbridge Response: Using the surface preparation procedure provided to the State of Michigan, the marine contractor has documented that the surface is appropriately abraded and has confirmed the surface profiles using replica tape. Coating Repair Procedure V3.0 has been updated to provide clarity to Section 3.1 and include the quality control step for the replica tape measurements.

15. *Segment EAS-3 had a CP reading of -848 mV CSE. Please describe how this level of CP is in compliance with 49 CFR 195.571.*

    Enbridge Response: The CP potentials at this site represent an average of readings in a bare metal area measuring approximately 0.93 ft2. It should be noted that the coating damage at this location occurred on August 26, 2017, and the CP readings reported in the EAS-3 Inspection Form were recorded on August 29, 2017. Cathodic Protection polarization is a time dependent process, and it is expected that a newly bared metal area of this size will not immediately meet the requirements of 49 CFR 195.571. CP potentials at this site will be repeated during the recoating program (both before and after the coating repair is made), and such readings will be evaluated in accordance with paragraphs 6.2.2, 6.2.3, 6.2.4, 6.2.5 and 6.3 in NACE SP 0169 which is incorporated by reference in 49 CFR 195.571.

16. *Please provide further information regarding modified Method 2 for repairing EAS-4. Per EPA's Coating Work Plan approval letter, does Enbridge plan to demonstrate modified Method 2 to determine viability? If not, how does Enbridge plan to proceed with repairing EAS-4 without excavation of the lake bed?*

    Enbridge Response: Enbridge has conducted a field test of the Modified Method 2 (MM2) that was witnessed by the independent third party representing the EPA. After completion of the field test, the pipe with the MM2 coating repair was shipped to Stress Engineering Services for analysis and comparison to Method 1 and Method 2. Concurrently, Enbridge is also submitting to the State of Michigan applications for permits to allow for full circumferential excavation of EAS-4 in case MM2 is not approved.

<u>Comments</u>

1. *Hardness testing should be performed at representative locations of the repair, such as near the transition to the existing repair and in the middle of the repair to determine uniform curing has occurred.*

   Enbridge Response: Enbridge has completed a field test using Method 1 to verify time to cure. After 7 days at approximately 42°F, hardness testing of the test pipe was completed at representative locations of the repair, such as near the transition to the existing repair and in the middle of the repair to determine uniform curing has occurred. The Shore D values ranged from 73 to 86, which satisfies the manufacturer's standard for hardness.

2. *Regarding deviations from the coating repair work plan, notifications will also need to be made to the MDEQ if certain criteria are met that significantly alter the procedure and work plan.*

   Enbridge Response: All deviations will be reported to the MDEQ as part of Enbridge's final reporting related to the Coating Repair Work Plan.

3. *Page 4 of the Coatings Repair Work Plan specifies wall thickness measurements that will be taken by the diver prior to recoating the pipeline. This section should explicitly call out that any pits will be measured and recorded.*

   Enbridge Response: Enbridge will incorporate this request into the Coating Repair Work Plan

(Version 4) in the section where UT measurements are to be taken: "Visually inspect the exposed bare steel for corrosion. If deposits are present they will be removed and the underlying metal surface inspected for corrosion related impacts. If localized corrosion is found, the depth of the corrosion will be measured. Any bare metal exposed by the surface preparation (i.e. by removal of loose coating material) shall also be visually inspected for corrosion by the Diver."

4. *Page 5 of the Coatings Repair Work Plan specifies that "Shore D measurements will be completed to confirm a value of 60 or greater." The manufacturer data sheet specifies "Low temperature curing at approximately 40°F will require approximately 7 days. Post cured Shore D scale hardness 70+". The plan should require that a Shore D hardness of 70, not 60, to be a successful application.*
   Enbridge Response: Enbridge will update the Coating Repair Procedure V3.0 with this requested change of a Shore D hardness of 70. It bears note, however, the Manufacturer has reconfirmed that Shore D of 60 is sufficient for removal of Stricture Banding.

5. *As referenced in Section 2.2 of the application procedure, the operator should provide a copy of all of the coating manufactures training materials given to the contractors to the MDEQ.*
   Enbridge Response: Enbridge will provide the certificates from Manufacturer's Training and Operator Qualification (OQ) for the coating repair work to the MDEQ as part of the final report due to the EPA 30 days after completion of the work.

6. *As referenced in Section 4.2.2 of the application procedure, the operator should specify how the BIO-DUR application will be applied to the pipe.*
   Enbridge Response: Enbridge has updated the Coating Repair Procedure V3.0 with the additional information requested. Section 4.2.2 will now read "The diver shall apply the BIO-DUR epoxy filler using a gloved hand or other method approved by the Manufacturer so that the bare steel is completely covered and the repair area is flush with the adjacent parent coating."