Enbridge Line 5

Straits of Mackinac, MI

Status Update: Coating Repairs Work Plan

Summary of Activities Completed to Date

Enbridge Energy, Limited Partnership

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Objective

The objective of this Line 5 Coating Repairs Work Plan – Interim Report is to provide a status update summarizing the 2017 coating repair activities that have been completed and those that are still pending. A detailed report with interpretation of results will be provided in 2018.[1]

This report is being provided to the United States Environmental Protection Agency (EPA) prior to the work activities being completed (as per Condition 2) in order, to satisfy the EPA's request for near-term information on the Work Plan activities as opposed to waiting until the final activities are completed.

Introduction

On June 13, 2017 the EPA approved Enbridge's May 18, 2017 Biota Investigation Work Plan (BIWP). This plan included detailed steps to complete biota sampling at various locations along the Dual Pipelines that cross the Straits of Mackinac. The BIWP also highlighted 18 areas of interest that would be investigated by divers.

On August 14, 2017, crews were mobilized to inspect the pipeline coating on Line 5 using work barges, divers, and support teams. At the completion of inspections in December 2017, a total of 23 coating inspection locations associated with the BIWP (i.e. 18 Areas of Interest[2] (AOI) and 5 additional sites) have been examined by divers.

As listed in Table 1, bare metal was found at 3 BIWP locations: EAS-1, EAS-3 and EAS-4. The total area of bare metal as-found was 2.58 sq. ft. Locations EAS-3 and EAS-4 were added in August 2017 after the BIWP was submitted to and approved by the EPA. The exposure of bare metal at these two additional locations was the result of an abandoned communication cable rub during the execution of the 2017 BIWP. The bare metal at EAS-3 and EAS-4 comprises 99.6 % of the total bare metal found at the BIWP locations.

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[1] Enbridge will also supply EPA with any coating inspection status report submitted to the State.

[2] An Area of Interest is a part of the pipeline where, based on visual inspection, (i) the normal (local) Biota is unexpectedly absent or (ii) there is evidence of possible coating damage (e.g., Dislodged Coating and/or potential Holiday).

In addition, calcareous deposits[3] were observed at 6 of the BIWP locations as shown in Table 1. All calcareous deposits were removed (as summarized in Table 1) to confirm the condition of the pipe beneath them and to gather samples to study the deposit chemistry. Removal of the deposits resulted in the exposure of bare pipe.

Enbridge committed to inspecting the pipeline surface at these bare metal locations and to complete coating repairs thereafter. Enbridge submitted the Coating Repairs Work Plan (CRWP) Line 5 Dual Pipelines, Version 3, to the U.S. Environmental Protection Agency (EPA) on September 13, 2017. EPA initially approved the CRWP with conditions on September 14, 2017, and then subsequently modified the conditions on September 20, 2017, to read as follows:

> On September 14, 2017, EPA approved the Work Plan with three conditions. EPA now revises the conditions upon which it approves the Work Plan as follows:
>
> 1. EPA is not approving the use of Modified Method 2 (described on page 4 of the Work Plan) at this time because Enbridge has not yet demonstrated the effectiveness of that Method. Enbridge may not use Modified Method 2 unless EPA provides prior written approval;
>
> 2. within 30 days of Enbridge's completion of the activities required by the Work Plan, Enbridge shall submit to EPA a Final Report, summarizing its activities and identifying and justifying any deviations from the procedures in the Work Plan; and
>
> 3. Enbridge shall implement the Work Plan in accordance with all federal, state, and local regulations and laws, including any permitting requirements.

[3] A layer consisting of calcium carbonate and other salts deposited on the surface. When the surface is cathodically polarized by cathodic protection, this layer is the result of the increased pH adjacent to the protected surface. This layer functions as a barrier against the corrosive environment, leading to a decrease in cathodic protection current demand and more persistent chemical polarization of the pipe surface. A calcareous coating is also known as a calcareous deposit.

Diver Training and Certification

In order to support the successful implementation of the coating repairs, the divers were Operator Qualified (OQ).The divers completed the OQ training September 12th, 2017. The results were uploaded to ISNetworld (i.e. Global work compliance safety registry) to verify compliance. A list of the OQ covered tasks are listed in Appendix F of the Coating Repairs Work Plan Line 5 Dual Pipelines Version 3.0 September 13, 2017.

To supplement the OQ certification process, Enbridge had the coating manufacturer perform specific training for the materials and coating applications that was used for the L5 Straits underwater coating repairs. Upon successful completion of the manufacturer's training, the crew members were issued a certificate of completion.

The manufacturer's training consisted of verbal technical training and introduction to the products, their components, and the basic installation procedure. The manufacturer also utilized audio visual presentations of various installations, wet out procedures and technical aspects of the uses of the products. This was followed by a "hands on" application of the filler, the composite, the stricture banding and the pre-cast sleeve.

The marine contractor performed and completed a simulated wet trial on September 20th, 2017 located close to the dock to test the coating repair plan prior to completing the coating repairs.

Scope of the Repairs

As summarized in Table 2, all coating repairs were completed using Method 1 as outlined in the CRWP, Version 3.0. In total, 8 locations have bare metal as-found or created by the removal of the calcareous deposits (see Table 2). At the time of this report, 7 of the 8 locations have been recoated. The one remaining location, EAS-4 will require a State and US Army Corps of Engineers permit in order to allow the removal of lake bed soil from around the bottom of the pipe prior to recoating. The area of this location is 1.64 sq. ft and will continue to be protected with cathodic protection and recoated in 2018 once all permits are granted. Enbridge received the State permit on December 8, 2017.

Deviations to the Coating Repair Procedure

A request was submitted by the execution team to Pipeline Integrity (PI) Coating Specialist on October 17, 2017, and approved by the PI Coating Specialist on October 23, 2017, to revise

Section 3.2.3 and 4.3.6 of the coating repair procedure (Appendix E in the CRWP, Version 3.0) for coating repairs at the location of EAS-3. Enbridge provided the Management of Change (MOC) for this deviation to the EPA on October 27, 2017. At EAS-3, the pipe support anchor impeded the ability to coat over existing adjacent coating to at least 6 inches and impeded the application of the Stricture Banding™ as called for in the approved work plan. Because removal of the pipe support anchor would result in a span in excess of the distance allowed under the existing easement, the language of Section 3.2.3 of the coating repair at EAS-3 was revised to read, "roughening shall extend at least 6 inches from the upstream and downstream edge of the repair area *if possible* and around the entire circumference of the pipe." In addition, Section 4.3.6 was revised to read as follows: the "Stricture Banding™ shall extend at least 4 inches upstream and downstream of the repair if possible. Where it is not possible to extend 4 inches from the repair area, the Stricture Banding™ shall completely cover the composite wrap and extend as far as possible." All deviations were supported by the product manufacturer.

Tables

Table 1: Diver Inspection Results at BIWP Locations

Location	Area of Bare Steel As-Found (sq. ft)	Area of Bare Steel Created by Calcareous Deposit Removal (sq. ft)
EAOI-1	-	0.03
EAOI-5	-	0.01
EAOI-7	-	6.175
EAS-1	0.01	0.88
EAS-2	-	0.14
EAS-3	0.93	-
EAS-4	1.64	-
WAS-1	-	0.4

Table 2: Summary of Coating Repairs Completed at BIWP Locations

Location	Identification	Repair Completed	Coating Repair Method	Area Of Bare Steel Remaining (sq. ft)
Area of Interest #1	**EAOI-1**	Yes	Method 1	0
Area of Interest #5	**EAOI-5**	Yes	Method 1	0
Area of Interest #7	**EAOI-7**	Yes	Method 1	0
Additional Site #1	**EAS-1**	Yes	Method 1	0
Additional Site #2	**EAS-2**	Yes	Method 1	0
East Additional Site[1]	**EAS-3**	Yes	Method 1	0
	EAS-4	Requires Permit, 2018	Method 1	1.64
Additional Site #3	**WAS-1**	Yes	Method 1	0

1 Locations as identified in CRWP Line 5 Dual Pipelines, Version 3.0.