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June 18, 2021

Ben Callan
Wisconsin Department of Natural Resources
Chief, Integration Services Section
Environmental Analysis & Sustainability Program
101 South Webster Street
Madison, WI 53707-7921

Re: WDNR Water Resources Application for Project Permits – Data Request Response

Dear Ben:

Enbridge Energy, Limited Partnership ("Enbridge") has prepared the enclosed information (provided electronically) in response to the Department of Natural Resources ("DNR"), which is in the process of preparing an Environmental Impact Statement ("EIS") for the proposed Line 5 Wisconsin Segment Relocation Project. The DNR has identified additional supporting data and clarifications needed from Enbridge Energy related to the development of the EIS and provided a data request to Enbridge on February 1, 2021.

Enbridge provided responses to the DNR on March 2, 2021. The attached document provides additional information specific to DNR Data Request Question #4 regarding spill analysis and potential spill impacts to High Consequence Areas ("HCA"). Per DNR request, Enbridge is providing additional information related to the natural gas liquids component of the products shipped through Enbridge's Line 5 pipeline which was identified in the March 2, 2021 response to be available at the end of Q2. New information and/or updated information to the March 2, 2021 response is shown in red text.

If you have questions about the information presented in the attached materials, please contact me at (218) 390-9254.

Sincerely,

Joe McGaver, PE
Technical Manager Environment
Enbridge Energy, Limited Partnership

Enclosures:

- Digital copy of updated Data Request Question #4 Response

cc: w/o enclosures: Adam Mednick, Wisconsin Department of Natural Resources
Bill Sande, U.S. Army Corps of Engineers

February 1, 2021 WDNR L5WSRP Data Request Response
Additional Response – June 2021

Data Request Question #4:
Per Enbridge's response to question #17 submitted on 12/11/20 – Provide the following information regarding spills analysis and potential spill impact areas as required to be performed as part of Enbridge's Integrity Management Program (IMP) under 49 C.F.R. § 195.452. Responses should be provided in a fashion that allows the question to be answered without revealing confidential or proprietary information (similar to how section 4.8 of the EIR provided information on the IMP without revealing trade secrets the IMP contained).

a. Confirm whether a spill and impact analysis has been conducted to determine which segments of the proposed relocated pipeline route would affect High Consequence Areas (HCAs) or Unusually Sensitive Areas (USAs), as defined in 49 C.F.R. § 195.6, in the event of a spill. If this analysis has not yet been completed, confirm when it would be conducted.
b. Summarize the nature of the spill and impact analysis performed under Enbridge's IMP, including:
   i. the type of spill(s) and maximum potential volume considered (i.e. leak size, guillotine rupture (i.e. how were release volumes calculated)).
   ii. if there are any breakout tanks, and if and how they were included in the spills analysis.
   iii. the types and sources of data used to model spills along with the parameters used to estimate the maximum potential spill volume.
   iv. the type of model(s) employed, with references if possible, along with the estimated length of time a leak is detected until pumping is stopped.
   v. assumptions made (e.g. stream velocity, effect of depth of cover, etc.).
   vi. the types and sources of data used to identify HCA's and USA's beyond those provided by National Pipeline Mapping System (NPMS).
   vii. state is an Emergency Flow Restriction Devise (EFRD) analysis was conducted on the reroute.
   viii. indicate the location on a map where the pipeline could leak into HCAs and/or USAs with the maximum drain-down volume.
   ix. indicate locations on a map of where HCA's and/or USA's could be impacted by the worst case release.
c. Summarize how the proposed 41-mile reroute of Line 5 would compare to the existing 12-mile segment of Line 5 in terms of:
   i. the total length of pipeline segments identified as affecting HCAs and USAs in the event of a spill, by HCA type as well as in aggregate, as it would be reported on Part L of the PHMSA Hazardous Liquid Annual Report Form (F7000-1.1).
   ii. the total number of HCAs that could be directly affected in the event of spills, by HCA type as listed 49 C.F.R. § 195.450 (e.g., High Population Areas, Other Populated Areas, and Unusually Sensitive Areas (Drinking Water and Ecologically Areas).
   iii. the total number of HCAs that could be indirectly affected in the event of spills, by HCA type as listed 49 C.F.R. § 195.450 (e.g., High Population Areas, Other Populated Areas, and Unusually Sensitive Areas (Drinking Water and Ecologically Areas).
   iv. the maximum and average estimated volume of releases impacting HCAs for the existing segment and the reroute.

Data Request Question #4(a) Response:
Yes, analysis to determine which segments could impact a High Consequence Area (HCA) has been completed for the proposed relocated pipeline route. This includes segments that directly intersect an HCA, as well as segments that could potentially impact an HCA via liquid transport mechanism, determined through liquid spill plume dispersion modeling. Enbridge considers 5 types of High Consequence Areas in their analysis: High Population Areas ("HPA"), Other Populated Areas ("OPA"), Commercially Navigable Waterways ("CNW"), Drinking Water USAs ("DW"), and Ecological USAs ("ESA").

The liquid spill plume model uses conservative assumptions about release scenario, the amount of product released, and the conditions of the surrounding terrain to create a worst-case "footprint" of potential impact; represented as individual spill plumes every 100 meters down the pipe and at all water crossings. These plumes are then spatially compared against the HCA polygons in ESRI ArcGIS to determine if there are any intersects. In addition to the liquid spill plumes, Enbridge also uses a fixed 850-foot buffer around pipeline assets to represent potential of liquid spray. If an intersection exists between the spill plume/spray buffer and the HCA polygons, the corresponding segment of pipe is identified as an "HCA Could-Affect" segment.

A release of liquid product into a waterway generally represents the greatest risk of product traveling a long distance away from the pipeline in the event of a pipeline rupture, as well as the greatest threat to drinking water resources. By comparison, a release of NGL product would very quickly convert from liquid to gaseous phase, and not have the same potential for traveling downstream down waterways. A second, vapor-based model is used to model this dense cloud-like behavior and resulting HCA Could-Affect segments. This modeling is performed using the DNV-GL PHAST Risk software, and makes the conservative assumptions that all product contained between sectionalizing valves will contribute to the NGL vapor cloud, and that the cloud becomes unhazardous once the concentration of the cloud has reached 50% of the lower flammability limit. This analysis was completed in May 2021, and resulted in three additional transport HCA Could-Affect segments compared to the previous response in March 2021.

Data Request Question #4(b)(i) Response:
Enbridge's Intelligent Valve Placement (IVP) methodology is conservative in so far as it assumes scenarios that are less likely and more impactful than would actually occur. Therefore, Enbridge employs a worst-case guillotine release. The IVP model assumes a complete rupture of the line occurring while the line is operating at full design throughput until the valves are closed. The model further assumes it takes a full 10 minutes for a control center operator to detect the rupture and initiate the shut-down of the pipeline prior to initiating valve closure. This assumption is conservative as Enbridge's leak detection systems and control center monitoring process are capable of detecting such a full-bore rupture almost instantaneously. Moreover, the pipeline rupture detection alarms create an immediate shutdown without intervention by human personnel. Automatic valve closure takes 3 minutes from initiation. The methodology also makes a conservative assumption that the released flow would be full design rate during the 3 minutes valve closure. The potential released volume of product until valves are closed is calculated (called "initial volume-out") based upon these assumptions. Once the valve is fully closed, the fluid remaining on the upstream and downstream segments of the pipeline start draining. The "drain-out volume" is calculated using the elevation profile and line diameter. The "total volume-out" is calculated by adding the initial volume-out and the drain-out volume. This very conservative analysis results in much larger modelled releases than would be

expected under normal operating conditions. The location of valves therefore greatly impacts the drain-out volume and total volume-out. Thus, Enbridge uses IVP modeling as a design methodology to determine where valves should be placed.

To reduce the risk of impact to HCAs, Enbridge revises the pipeline design by placing proposed valves and recalculating the total volume-out with the purpose of minimizing the release impacts to the public, environments, and watercourse crossings. The process examines the pipeline segment by segment on an iterative basis until the lowest reasonably practicable release volume between valves is achieved along the pipeline. The valve locations are influenced by a number of factors, including topography, location of flood plains, and the presence of HCAs. Once this primary draft analysis is completed, valve locations are modified within their local vicinity to account for local factors such as availability of land, availability of power, accessibility, environmental impacts, and wetland avoidance. The IVP approach was designed to identify optimal valve locations that will protect major watercourse crossings and HCAs in the unlikely event of a pipeline rupture. The valve placements reduce both the impact of a rupture and its remediation requirement.

Data Request Question #4(b)(ii) Response:
The Project does not intend to change the flow rates, delivery locations, or crude batching methodology for Line 5. While Enbridge's terminals and some pump stations have breakout tanks for temporary storage of crude oil and liquids, the relocation does not connect to a terminal or pump station; therefore, no breakout tankage is included in the spill analysis.

Data Request Question #4(b)(iii) Response:
The IVP analysis is done using the following information:

- Centerline, elevation profile, line size and thickness: provided by the project team.
- Line throughput: the line's known maximum scheduled flow rate.
- Existing remote-operated valve locations: known from the existing line information.

Upon gathering the listed information, volume-out calculation is performed following the methodology explained in section 4b-i.

Data Request Question #4(b)(iv) Response:
Spill plume modeling was performed by the consultant RPS, using their proprietary OILMAPLand software. OILMAPLand is a specialized extension of the ESRI ArcGIS platform that simulates site-specific oil and chemical releases, based on the volume of the release, characteristics of the product, topography, hydrography, and land cover of the modeled location.

To represent the environment in the vicinity of the release point, digital elevation models ("DEM") from the USGS are used for the topography of the area, the USGS National Hydrography Dataset Plus ("NHDPlus") for the location and characteristics of moving and static waterways, and the USGS National Land Cover Database ("NLCD") to indicate land cover type.

As noted above, for volume-out calculations, it is assumed that it takes 10 minutes for a control center operator to detect the rupture and initiate the shut-down of the pipeline prior to initiating valve closure. This assumption is conservative as Enbridge's leak detection systems and control center monitoring process are capable of detecting a full-bore rupture almost instantaneously. Valve closure takes 3 minutes from initiation. The methodology also makes a conservative assumption that the released flow would be the full design rate during the 3 minutes valve closure. This very conservative analysis results in much larger modelled releases than would be expected under normal operating conditions.

Data Request Question #4(b)(v) Response:
As a conservative measure, the liquid spill plume model assumes that open, moving water will be present in all stream segments identified by the USGS' NHDPlus dataset. Water velocity data within the NHDPlus dataset are calculated based on the mean annual flow of individual stream segments.

The OILMAPLand model also assumes that product from a release begins at the surface (i.e. no product is lost to depth of cover soil absorption or overland travel soil absorption), conservatively giving the spill plume the maximum initial volume to then travel downhill/downstream.

Data Request Question #4(b)(vi) Response:
In addition to the HCA/USA polygons distributed by the NPMS, Enbridge includes operator-identified HCA/USA polygons in their analysis. These additional polygons are collected from a variety of sources, including state, tribal, or municipal-level departments/agencies, and operator knowledge of the area. If data received from these additional sources is received as point features, they are delineated into a polygon consistent with the NPMS' process.

Specific to the area of this relocation project: there are several Drinking Water USAs based on data received from the Wisconsin DNR's Bureau of Drinking Water & Groundwater, an operator-identified Other Populated Area (OPA), and an expanded Commercially Navigable Waterway (CNW) polygon covering Lake Superior (Enbridge conservatively identifies the full extent of the Great Lakes as CNWs, beyond the shipping lanes identified in the NPMS).

Specifically, Enbridge has also worked with tribal nations in determining HCAs that may not be otherwise captured.

Data Request Question #4(b)(vii) Response:
A thorough IVP analysis has been conducted to place EFRDs (*i.e.*, mainline block valves) on the re-route. Upon collecting the information listed in section 4b(iii), volume-out is calculated for the re-route following the methodology explained in section 4b(i). Using the volume profile, the valve placement analysis is consequently performed with the purpose of reducing the impacts of a release event to the HCAs, watercourse crossings, wetlands, and other sensitive areas near the pipeline. The valve placement analysis is performed on each segment of the line on an iterative basis until the lowest reasonably practicable release volume between valves is achieved along the pipeline.

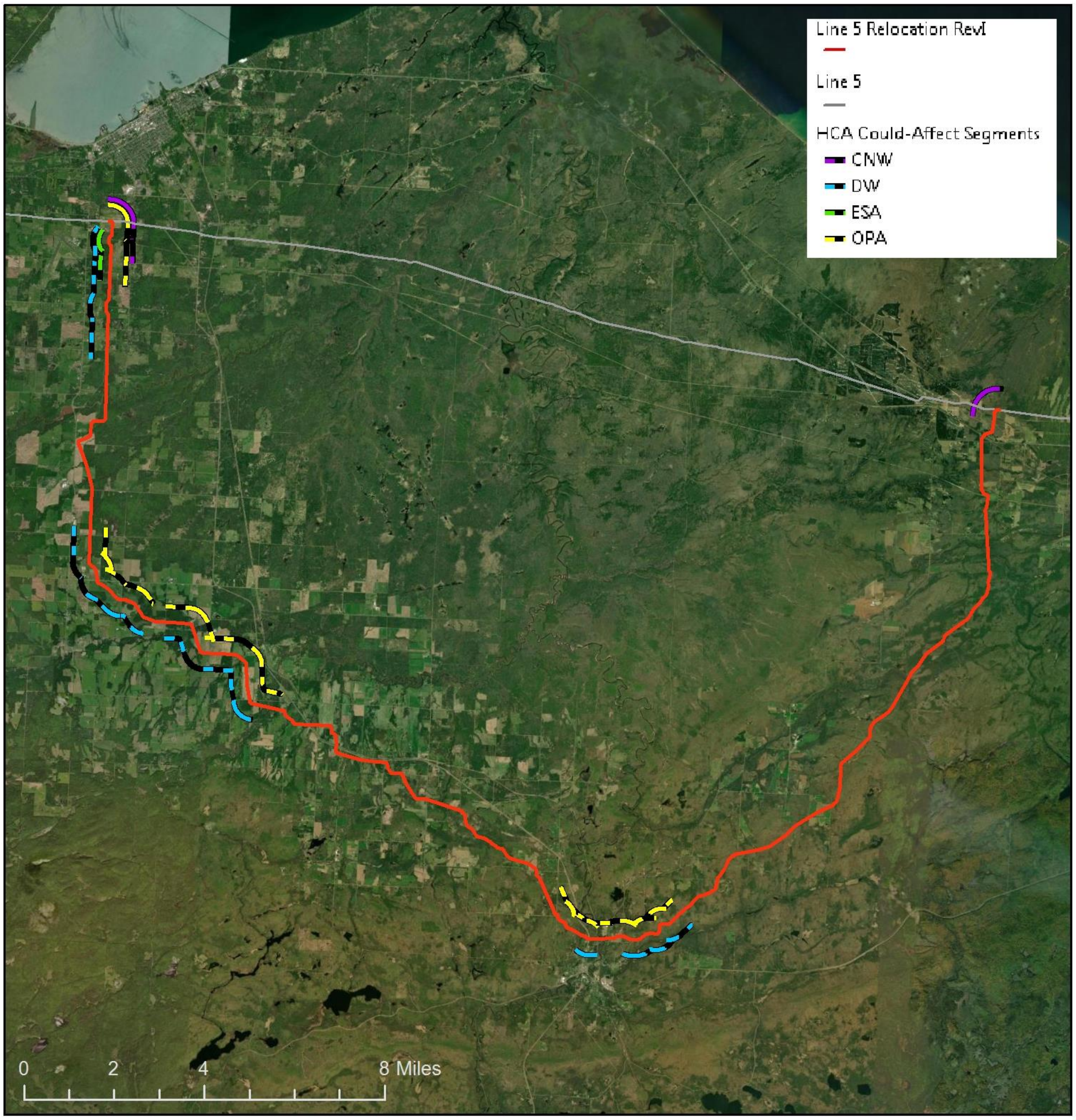
Upon completion of IVP analysis, Enbridge conducts a field verification of recommended valve locations. Field verification will evaluate the impact of construction to the environment, including the following factors: valve site access, constructability, power, and land availability. Final valve locations were adjusted due to constructability issues and environmental impacts identified during field verification.

Data Request Question #4(b)(viii) Response:
The map below shows the proposed relocation route, with the segments of pipe that could potentially impact an HCA either directly or indirectly highlighted with color-coded offsets. Due to the sensitive

nature of the HCA data, we are unable to display the HCA polygons themselves on this map (e.g. the location of drinking water intake protection areas, habitat ranges of species at risk, etc.).

Although not indicated on the map, the majority (**94**%) of the HCA segments are indirect/transport could-affects. That is to say that although the pipe itself is not within an HCA polygon, spill plumes modeled from these segments (using maximum calculated volume out) travel downhill or downstream into an HCA polygon. Only a small portion (~1 mile) of the relocation segment directly intersects an HCA. This segment is located near the beginning of the proposed relocation.

Line 5 Relocation RevI - HCA Could-Affect Segments



Data Request Question #4(b)(ix) Response:

The determination of HCA could-affect segments is based on spill plumes modeled using the maximum potential release volume at any given point along the pipe, which represents a worst-case release scenario. Therefore, the terms “worst-case release” and a “maximum drain-down release” scenario are synonymous. The map submitted for 4.b.viii indicates the location of segments of pipe that could impact HCAs as a worst case release scenario from a volume out/spill plume perspective using the maximum calculated drain-down volume.

Data Request Question #4(c)(i) Response:
Please note that the segment being replaced is approximately 20.4 miles, which includes approximately 12 miles of pipeline within the exterior boundaries of the Bad River Reservation. The additional pipeline mileage includes segments of pipeline east and west of the Reservation that will be replaced. The total length of pipeline segments identified as affecting HCAs and USAs in the event of a spill, by HCA type as well as in aggregate, as it would be reported on Part L of the PHMSA Hazardous Liquid Annual Report Form (F7000-1.1),

Proposed reroute (Stn 49,113 to 266,110):

High Population	0
Other Population	**12.05**
USA Drinking Water	**11.00**
USA Ecological Resource	**1.71**
Commercially Navigable Waterways	**1.30**
Total Segment Miles That Could Affect HCAs	**13.90**

Existing Line 5 segment (MP 1155.92 to 1176.37):

High Population	0
Other Population	**11.42**
USA Drinking Water	5.72
USA Ecological Resource	6.95
Commercially Navigable Waterways	3.39
Total Segment Miles That Could Affect HCAs	**15.06**

*Please note that the total HCA mileage is not the sum of the individual type mileage; this is because HCA could-affect segments may impact to multiple HCA types.

Data Request Question #4(c)(ii) Response:
Proposed reroute (Stn 49,113 to 266,110):

- 2 Direct HCA Could-Affect Segments intersecting 2 unique HCA polygons

Existing Line 5 segment (MP 1155.92 to 1176.37):

- 10 Direct HCA Could-Affect Segments intersecting 3 unique HCA polygons

Data Request Question #4(c)(iii) Response:

Proposed reroute (Stn 49,113 to 266,110):
- **31** Transport HCA Could-Affect Segments intersecting 14 unique HCA polygons

Existing Line 5 segment (MP 1155.92 to 1176.37):
- 41 Transport HCA Could-Affect Segments intersecting 10 unique HCA polygons

Data Request Question #4(c)(iv) Response:
Proposed reroute (Stn 49,113 to 266,110):
- Maximum volume within an HCA Could-Affect Segment = 12,681 bbls
- Average volume within an HCA Could-Affect Segment = **8,313** bbls

Existing Line 5 segment (MP 1155.92 to 1176.37):
- Maximum volume within an HCA Could-Affect Segment = 26,684 bbls
- Average volume within an HCA Could-Affect Segment = **15,790** bbls