

## Lyons Sara

---

**From:** Thomas Wooden <[REDACTED]>  
**Sent:** Friday, November 5, 2021 1:11 PM  
**To:** Lyons Sara  
**Cc:** Andy Drake; Nathan Atanu  
**Subject:** PLD20LR001 - Enbridge Safety Improvements

[CAUTION] This email originated from outside of the organization. Do not click any links or open attachments unless you recognize the sender and know the content is safe.

Sara:

As you requested, below is a recitation of safety improvements undertaken or continued by Enbridge following the Hillsboro, Kentucky Accident on May 4, 2020. We will be updating the document repository next week with supporting documentation. Please let me know if you have questions regarding any of these safety improvements.

Since the Hillsboro, Kentucky Accident on May 4<sup>th</sup>, 2020, Enbridge has undertaken and/or completed a number of safety improvements, as follows:

### Enterprise Level Changes

- Enbridge Gas Transmission and Midstream (GTM) has created the framework and process documents necessary to implement a transformative approach to asset integrity by shifting its benchmarking away from peer companies and toward other industries with superior safety performance levels. Fundamental to this shift is to prove the integrity of our assets using a quantitative, as opposed to a qualitative, approach to risk assessments. This shift will entail a 3-5 year, iterative transformation of the organization, programs, behaviors, data, and support systems as structured by our Integrated Management System. GTM began this transformation prior to the Hillsboro, KY accident, and has continued to meet milestones toward completion of transformation.
- As part of the program transformation, Enbridge has significantly increased the number of ILI tool runs, and resulting number of anomaly digs, as well as staffing and budget to support the increased level of integrity work.
- Contracted with third party industry expert RCP, Inc. who assessed the effectiveness of Enbridge's Public Awareness Program and its Emergency Response Program. Enbridge implemented recommended changes.

### Geohazard Risk Ranking and Classification, and Work Process Improvements

- Developed a site-specific risk ranking process for classification of land movement sites based on the Enbridge led the Joint Industry Project (JIP) White Paper "*Guidelines for Management of Landslide Hazards for Pipelines*" published by the Interstate Natural Gas Association of America (INGAA) Foundation. The risk ranking process, titled *Unstable Slope and Subsidence Classification and Response Matrix*, looks exclusively at landslide risk and evaluates each site based upon landslide characteristics, pipeline strain demand, and pipeline strain capacity. The matrix format

formalizes the integration of all relevant information to understand the risk of landslides. The classification of landslide risk through the matrix assigns a response risk level ("R-Level") to land movement sites ranging from level 1 (R1) warranting the lowest priority to level 7 (R7) receiving the highest priority for next actions including further assessment, monitoring, and mitigation. To date, Enbridge is monitoring approximately 3,500 Geohazard sites across the Affected Segment<sup>[1]</sup> and 9,500 site groups across Enbridge US Gas Transmission and Midstream (US GTM). Currently, all identified highest risk sites (R6 and R7) have been mitigated across the system.

- Integrated geohazard threat management information and documents into existing information management systems including work management databases and the Geographic Information System (GIS) application.
- Updated existing and developed several new procedures and work instructions. The principles of these procedures and work instructions have been implemented as the Geohazard management program for US GTM. Newly created procedures and work instructions are:
  - Developed PI-05.701 Bending Strain Reporting work instruction which defines the ILLI vendor reporting requirements for consistent reporting for all vendors across all company pipelines (QA/QC);
  - Developed PI-05.702 Inertial Measurement Unit Acceptance Work Instruction to confirm that the data collected through IMU tools is suitable for use for accurate pipe centerline location, accurate anomaly location, processing for bending strain analysis, and analyzing for pipeline movement when comparing two or more individual IMU runs (QA/QC);
  - Developed PI-05.704 Assessing Excavations for Geohazards Work Instruction for assessing planned excavations to evaluate if those excavation will be conducted in areas subject to geohazards and if so, ensure that measures are identified to mitigate potential hazards;
  - Developed PI-05.718 Geohazard Multi-Disciplinary Review Work Instruction to ensure consistent review and decision-making when evaluating geohazard sites.
  - Developed PI-05.719 Land Movement Interacting Anomalies Analysis Work Instruction for addressing interacting anomalies with girth welds subject to land movement;
  - Developed PI-05.720 Tensile Strain Capacity (TSC) Assessment Work Instruction that implements a standardized approach to establish the TSC and tensile strain demand (TSD) of a girth weld; and
  - Developing a procedure for addressing interacting anomalies with girth welds subject to land movement.

### **Improvements to Geohazard Monitoring Techniques**

- Implemented a system of Geohazard surveying techniques enabling identification and monitoring of GH sites, including:
  - Enhanced Operations SOPs and activities, including Geohazard identification and monitoring training, increased aerial patrols, regional operations geohazard site visits, out-of-straightness (OOS) surveys.
  - Implemented land movement monitoring techniques including routine site monitoring, site visits, OOS field surveys, high-resolution mid-infrared differential absorption light detection and ranging (LiDAR) technology, and near real-time monitoring via instruments installed on site such as strain gauges, Slope Accel Arrays, and GPS.

- Installed 304 instruments at 32 land movement sites along the Affected Segment and 327 instruments at 46 sites across US GTM. Repeat high-resolution (LiDAR) imagery will be collected to identify changes at land movement sites.
- Implemented monitoring by inertial mapping unit (IMU)/Caliper ILLI assessments on the Affected Segment for bending strain analysis of the lines and to identify land movement sites.
- Developed a preliminary precipitation monitoring system to monitor precipitation within the Appalachian Plateau as part of monitoring land movement sites on the Affected Segment.
- Updating the pipeline centerline mapping within Geographical Information System (GIS) for aerial patrol reference, LiDAR imagery comparison, and field inspection.
- Implemented a multi-year project for ROW vegetation clearing to improve visibility on LiDAR imagery acquisition and field inspections.

### **Recent Assessments, Monitoring Activities and Mitigation Improvements (following Hillsboro, KY Accident)**

- Completed geohazard mitigations at 47 geohazard sites across the Affected Segment and 87 sites total across US GTM.
- Completed multi-disciplinary review sessions for 97 geohazard site groups resulting in requirements for enhanced monitoring, preventive or mitigative action(s) or further investigation which are recorded in Site-Specific Integrity Plans. Multi-disciplinary reviews typically include qualified individuals with backgrounds in geology, geomorphology, fluvial geomorphology, geotechnical engineering, hydrotechnical engineering, civil/structural engineering, pipeline engineering, and pipeline construction specialists, as well as Enbridge's Geohazard Group supervisor.
- Completed 116 IMU ILLI tool runs along the Affected Segment and 240 IMU ILLI tool runs across US GTM.
- Completed 240 Geotechnical field assessments carried out by subject matter experts across the Affected Segment and 700 field assessments across US GTM at land movement sites for evidence of recent landslide movement activity, relative rate of movement, evidence of a slide's depth relative to the pipelines, a slide's proximity relative to the pipeline, and measurement of pipe out-of-straightness (OOS).
- Performed aerial instrumented leakage survey across the entirety of the Affected Segment via LiDAR technology. Enbridge is deploying this technology to the rest of the GTM system.
- Tested and deployed Atlas Wrap technology as a mitigation for reinforcement of girth welds subject to bending strain.

Thank you,

Tom

**Thomas V. Wooden Jr., P.E.**

Vice President – Engineering and Asset Management

**ENBRIDGE**

TEL: [REDACTED] | CELL: [REDACTED]  
5400 Westheimer Court, Houston, TX 77056

[enbridge.com](http://enbridge.com)

**Integrity. Safety. Respect. Inclusion.**

---

<sup>[1]</sup> Affected Segment means approximately 775 miles of Lines 10, 15 and 25 in 12 segments spanning from Kosciusko, MS to Uniontown, PA. Affected Segment is a defined term in PHMSA's Second Amended Corrective Action Order CPF No. 2-2019-1002H.

**NTSB Data Request No. DR57:**

**Explain the purpose of Geohazard Data Integration into the GIS application.**

DR57 Response: Enbridge has updated its GIS application to include landslide susceptibility, mapped geohazard sites, and reported bending strains, and this information is available to all Enbridge employees. Additionally, we are developing enhanced procedures and processes to improve communication and coordination between the field and the geohazard team so that the field can readily identify the location of landslide susceptible areas. Additional requirements apply when work is done in the vicinity of a landslide susceptible area which include contacting the geohazard team to develop safe work procedures to ensure the work improves (or does not diminish) site stability, and to ensure that appropriate approvals are in place prior to initiation of work in the field.

### **NTSB Data Request No. DR61**

**Request:** Provide information regarding safety improvements made by Enbridge Gas Control with respect to rate of change alarms.

### **Response**

Following the Hillsboro, Kentucky accident, Enbridge made modifications to implement rate of change (ROC) limits on the OWSV suction (LN 10,15,25) on 5/6/2020 and had previously instituted discharge ROC limits on 4/12/2017 for all the TETLP 30" compressor stations. In addition, since the accident, TETLP has implemented rate of change limits on the suction of the other compressor stations on the 30" TETLP system.