

Attachment G: ILI Assessment process

Qualification of Personnel

Lodi Gas Storage, L.L.C. (LGS) uses either qualified, experienced internal personnel or a combination of internal personnel and qualified external vendor resources to review and evaluate integrity assessment results and other integrity information. Qualification criteria for LGS personnel are found in the Integrity Management Plan, Element 12.

Due to the extensive training and expertise required to interpret ILI data, LGS relies on its ILI vendors to provide qualified and experienced personnel for data review and analysis. LGS will only contract with reputable ILI vendors with proven experience in inspection and evaluating pipe with the type of ILI tools specified by LGS. LGS's contractual ILI documents require each ILI vendor to furnish a copy of their written personnel qualification practices as outlined in ANSA/ASNT ILI-PQ-2005 and statements of certification for each analyst reviewing ILI assessment results.

LGS may also use other vendors qualified in the application of industry standards and practices to review assessment results that, combined with other pipe segment data, provide information as to the integrity of the pipe segments. Examples include fatigue life analysis of conditions, anomalies as well as deformation studies on non-routine anomalies. LGS requires that vendor personnel qualifications be submitted for this work.

Review and Evaluation Process

Upon completion of the field activities associated with an ILI assessment, LGS and vendor personnel review the tool run data to ensure that tool run parameters have been successfully met (tool speed, tool sensor performance, amount of data capture, etc.) as compared to the ILI Tool specifications. If the results of this review are unsatisfactory LGS will deny acceptance and require the ILI tool vendor to repeat the tool run or use an alternative assessment method for completing the assessment.

If the tool run is accepted, the ILI vendor proceeds with full data analysis that results in both a preliminary report that highlights any anomalies of an immediate nature that could impact the integrity of the pipe segment, and a final report. The final report provides information on all anomalies detected by the ILI tool that either meet the anomaly detection threshold levels included in the vendor's ILI tool specifications or the level of reporting that has been specified by LGS.

Upon receipt of both the preliminary and final ILI assessment reports, the Gas Integrity Management Team (GIMT) reviews the reports for all repair special conditions with priority emphasis placed on anomalies that qualify as immediate repair conditions or other conditions indicating a serious threat to pipe segment integrity (see Repair conditions) and the actions required per "Action Required". During this evaluation LGS will also use other sources of data including past assessment data (Baseline or Reassessment), completed repair data and other information relevant to the pipe segment(s) and the repair decision making process.

Based on the above evaluation LGS personnel proceed to prioritize and schedule ILI tool validation/repair locations as outlined in the plan.

Repair Conditions

Upon Discovery of a Condition in a pipe segment that could affect an HCA, LGS determines if the condition meets any of the following special requirements for scheduling a repair.

Immediate Repair Conditions

The following conditions constitute Immediate Repair Conditions in pipe segments that affect HCAs:

- Metal loss greater than 80% of the nominal wall regardless of dimensions.
- Calculated remaining strength indicates a failure pressure that is less than or equal to 1.1 times MAOP.
- A dent having any indication of metal loss, cracking, or a stress riser.
- An indication or anomaly that is judged by the person designated by LGS to evaluate assessment results as requiring immediate action.
- Metal-loss indications affecting a detected longitudinal seam if that seam was formed by direct current or low-frequency electric resistance welding or by electric flash welding; [ASME B31.8S, Section 7.2.1].
- All indications of stress corrosion cracks; [ASME B31.8S, Section 7.2.2].
- Any indications that might be expected to cause immediate or near-term leaks or ruptures based on their known or perceived effects on the strength of the pipeline. [ASME B31.8S, Section 7.2.3].
- Any other significant anomaly that in LGS's judgment requires immediate action.

For ILI assessments, LGS's contractual agreements with its ILI vendors specify that a preliminary report be delivered within 30 calendar days from removal of the final ILI tool from a successfully inspected pipeline. Contained in this preliminary report is information on topside dents (greater than 6% or that show

metal loss) and at a minimum all anomalies with metal loss greater than or equal to 80% of the nominal pipe segment wall thickness. This information is used by LGS in the determination of Immediate Repair Conditions.

ILI assessment final reports provide an analysis of either all defects that were detected by the ILI tool and that can be characterized or only defects that meet LGS's reporting threshold requirements. LGS reviews the final assessment reports with priority on discovery of additional Immediate Repair Conditions not previously included in the preliminary ILI report information.

Action Required Upon Discovery of an Immediate Repair Condition

Upon discovery of an Immediate Repair Condition, LGS will ensure that the appropriate Operation's leadership personnel responsible for that pipeline segment and the Control Center will either shut down the pipe segment or reduce the operating pressure via the issuance of a temporary Management of Change as soon as possible until the Immediate Repair Condition is repaired. The reduction in operating pressure shall be calculated as follows:

- LGS can use B31.G or RSTRENG to calculate P_{safe} . This calculation, in either case, includes a safety factor of 0.72.
- LGS can reduce pressure to 80% of its level at the time the defect was discovered. OPS considers that a reduction of this magnitude includes sufficient safety margin.
- LGS can use B31.G or RSTRENG to calculate $P_{failure}$ and can then apply safety margins to determine a new safe operating pressure. If LGS can demonstrate and justify reliable defect growth rates using empirical data, LGS may be able to justify higher temporary operating pressures, e.g., if LGS can show that the defect will not grow to a size that result in the predicted failure pressure being less than 1.1 times the temporary operating pressure within 365 days of initiating the pressure reduction. (If reliable defect growth rates cannot be determined, Table B1 of B31.8S provides conservative estimates of growth rates that can be used for this purpose). Defect growth calculations must be performed based on defect growth during the entire time between when the assessment data was obtained and the end of the 365 day period.

One-Year Repair Conditions

The following constitute one-year repair conditions from Discovery in pipe segments that could affect an HCA:

- A smooth dent located between the 8 and 4 o'clock positions (upper 2/3 of the pipe) with a depth greater than 6% of the pipeline diameter.

- A dent with a depth greater than 2% of the pipeline's diameter, that affects pipe curvature at a girth weld or at a longitudinal seam weld.

Monitored Conditions

The following constitute monitored conditions from Discovery in pipe segments that could affect an HCA:

- A dent with a depth greater than 6% of the pipeline diameter located between the 4 and 8 o'clock position (lower 1/3) of the pipe.
- A dent located between the 8 and 4 o'clock position (upper 2/3) of the pipe with a depth greater than 6% of the pipeline diameter, and engineering analysis to demonstrate critical strain levels are not exceeded.
- A dent with a depth greater than 2% of the pipeline diameter, that affects pipe curvature at a girth weld or a longitudinal seam weld, and engineering analysis of the dent and girth or seam weld to demonstrate critical strain levels are not exceeded.

The rule does not require that monitored conditions be repaired. These conditions must be recorded so that they can be monitored during future integrity management assessments. They must be repaired if future assessments show changes which cause these anomalies to meet criteria for immediate repair or one-year conditions or in the judgment of the person evaluating the assessment are sufficient to require repair. Monitored conditions will be listed on LGS's remediation schedule.

Examples of conditions that might be identified that could result in the need to remediate the monitored condition include, but are not limited to:

- Corrosion growth rates at nearby locations are determined to be greater than originally assumed.
- New threats to the pipeline segment are identified that could interact with the monitored condition and cause failure before the next assessment.
- Identification of previously unknown encroachment could cause a small dent that was previously thought to be construction damage to be re-interpreted as third party damage.

Other Conditions and Information Integration

Upon completion of the Immediate Repair, One-Year Repair, and Monitored condition review, LGS uses other sources of data that when integrated with the assessment results, determine if there are other conditions that should be

further examined and/or repaired. Other conditions that may warrant additional evaluation and that could negatively impact the integrity of a pipe segment include:

- Any significant change since the previous assessment.
- Mechanical damage that is located on the topside of the pipe.
- An anomaly abrupt in nature.
- An anomaly over a large area.
- An anomaly located in or near a casing, a pipeline crossing or an area with suspect cathodic protection.

Validation of Assessment Results

After ILI tools are run, LGS will perform excavations or use other techniques to verify the accuracy and reliability of the inspection tools in order to have confidence in the assessment results. Tool tolerance shall be one piece of information that shall be verified. Tool tolerance is specific to each tool type and manufacturer.

The primary method LGS will use to validate and calibrate ILI tool data will be through excavations. The GMT will make the determination on the appropriate number and location of validation digs. LGS will use a *minimum of two excavation digs* unless the GMT can justify a lesser number. If data comparison from the two excavations conflicts with the ILI tool anomaly data, a least one other excavation dig shall be performed. LGS will select the two most severe locations for the two validation digs, unless the engineer can justify otherwise. The engineer shall document their excavation decision based on statistics or other sound engineering practices.

The actual anomaly characteristics (type and dimensions) will be compared to the anomaly characteristics inferred from the ILI tool data to calibrate the ILI tool data to match known examples of detected anomalies. LGS will work with the ILI vendor to assure the assessment data is valid.

These verifications will be selected to verify tool accuracy for various types of anomalies, including but not limited to, internal corrosion, external corrosion, dents, ovality, gouges, and other types of anomalies. In the case of metal loss anomalies, an onsite UT tool will be used to determine the actual remaining wall thickness in order to verify or eliminate the possibility of internal corrosion.

The required information to be gathered during an excavation to ensure proper validation of the inline inspection tools is listed below:

- 1) Soil ph
- 2) Soil resistivity
- 3) Test for MIC
- 4) Soil type
- 5) Coating type
- 6) Wall thickness of pipe
- 7) Pipe type