INTEGRITY MANAGEMENT

LAKE SUPERIOR CONSULTING

INLINE INSPECTION (ILI) CAPABILITIES

1. Overall Project Management:

- Cost, scope, schedule, and risk management
- Procurement and contractor management support
- Stakeholder and communications management
- "Cradle-to-grave" dig management
- GIS-based dig program management software

2. Tool Selection:

- Integrity Management Plan (IMP) and/or threat review for appropriate tool technologies
- Identification and selection of ILI technologies practical to identified threats (e.g. caliper, magnetic flux leakage (MFL), circumferential magnetic flux leakage (CMFL), straight beam ultrasonic testing (UT), shear wave UT, electro-magnetic acoustic transducers (EMAT)

Deliverable: Summary of all commercially available technologies and analysis of which apply to the system at hand.

3. ILI Feasibility Assessment:

- Assessment of line for mechanical pig passage
- Evaluation of technology and its requirements (e.g. UT requires liquid couplant)
- Identification of any pipeline modifications that may be required (e.g. longer launcher/receiver, bend configuration, valve replacement, wall thickness (WT) changes, diameter changes)

Deliverable: Summary report with line-log/pipe-tally type analysis.

4. Pipeline Modification Design:

- Design and construction support, if required (e.g. trap install or re-design, valve replacements, meter bypass design)

Deliverable: Design and construction documents.

5. ILI Vendor Selection:

- Develop and solicit request for quote (RFQ) to client-approved ILI vendors
- Submit completed pipeline questionnaires; review and summarize proposals
- Recommend top ILI vendor options

Deliverable: Summary of proposals, capabilities, and vendor recommendation.

6. Specification Writing:

- Establish ILI Vendor reporting requirements (scope and timing of reporting deliverables)

Deliverable: Specification or project-specific guideline that the client can internalize.

7. Pipeline Cleaning and Gauging:

- Specification of chemical cleaning agents
- Specification of mechanical cleaning tools
- Tool procurement
- Subcontractor management

Deliverable: Summary report of chemical and cleaning tool selection, PM documents.

8. Above Ground Markers:

- Location selection
- Survey placement

Deliverable: AGM recovery forms.

9. ILI Operations*:

- Field coordinator – monitor run conditions from launch to receive, oversees pig tracking team(s)
- Client support with tool run medium flow control for optimal run conditions
- Tool tracking

Deliverable: Tool tracking calculators, GIS-based tool tracking web portal.

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* *LSC does not operate any valves, trap doors, etc. during tool runs.*

10. ILI Acceptance:

- Evaluation of tool run data coverage for acceptance
- Evaluation of preliminary ILI Vendor report for acceptance
- Evaluation of final ILI Vendor report for acceptance

Deliverable: Submitted checklist reports for data, preliminary, and final reports, pipeline feature population analysis

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11. Final Report Analysis:

- Review for immediate and defined response time conditions
- Reconciliation of appurtenances with the as-built records of the pipeline

Deliverable: Line-log/pipe-tally type data deliverable.

12. Dig Selection:

- Confirm all digs with required response intervals
- Evaluate predicted anomaly populations and recommend validation dig selection
- Develop remediation plan (targeted assessments and repairs, permitting requirements, GIS overviews, site access routes, coating removal and application)

Deliverable: Summary of recommended digs, remediation plan.

13. Dig Survey:

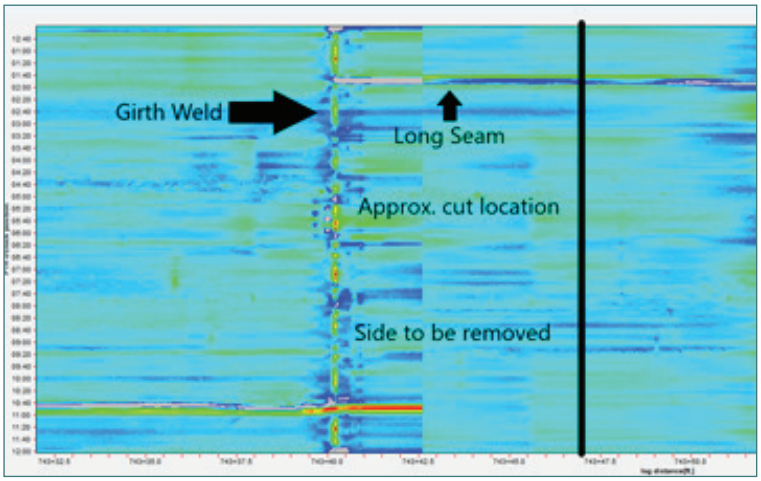
- AGM verification
- Line location and site sweeps
- Redundant dig site location using GPS and chainage from a known position using tool data

Deliverable: Dig survey form(s).

14. Dig Inspection:

- LSC "Dig Tech" includes non-destructive examination (NDE), magnetic partical testing (MT), phased array ultrasonic testic (PAUT), creaform, sub-meter accuracy survey equipment, coating inspection, & environmental site data documentation
- Confirm dig and anomaly location, examine defects, document findings, complete client-required reporting
- Support other inspection roles including certified welding inspection (CWI) and general construction inspection
- Provide metallurgical analysis for materials characterization and failure analysis
- Increase data delivery efficiency and records management accuracy through engineering review of inspection reports and submission through a streamlined GIS-based web portal

Deliverable: NDE reports, client-required reports, ILI-specific reports, metallurgical analysis reports, GIS-based dig data web portal



ILI signal data review for acceptable tie-in locations

15. Engineering:

- Review of raw ILI data prior to and during digs
- QC of NDE reports and repair selection advice during digs
- API 1163 validation report to summarize findings (e.g. predicted vs actual results, unity plots, stats, dig summaries)
- Remaining strength calculations, response time calculations, and reassessment interval determination based on NDE results and tool performance

Deliverable: API 1163 report, ILI raw data alignment reports, summary of repair selection.

16. Post-Run Services:

- Statistical evaluation of tool performance
- Integrity assessment process evaluation
- Final data integration into clients' system(s) for long-term management
- Fitness for service evaluation

Deliverable: Statistical analysis of predicted feature populations and actual population samples, review and summary of assessment process, corrosion growth rate analysis – raw data review process, data integration for long term management – incorporaton of data into client system, fitness for service evaluation – summary report.