FGI Webinar: Electrical Leak Location (ELL): Planning & Preparation

Presented by:

Andrew Colby (Branch & Business Manager, BLE Columbia, SC)

Host:

Dr. Timothy D. Stark (Professor, University of Illinois; Technical Director, FGI)

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Introduction & Background

This webinar covered practical planning and preparation for electrical leak location (ELL) on flexible geomembrane (GM) containment systems. Housekeeping included: six additional 2024 webinars scheduled; live Q&A via the control-panel question box; international viewers (Japan, Australia, South Africa) to submit questions during the talk or via the follow-up survey for answers in a post-webinar podcast. Closed captioning was piloted to improve accessibility, with slides advanced by the host to enable captions. A PDF of the slides was provided in the Handouts section; the recording and slide PDF will be posted on the FGI website. PDH certificates will be issued automatically to attendees who complete the entire webinar.

Standards & Method Selection

The recommended starting point is **ASTM D6747**, the umbrella practice governing all ELL methods for GM liners. Beginning with D6747 preserves flexibility with regulators and avoids locking a project into a single method that may prove impractical in the field. Method selection should consider construction stage and goals:

- **Exposed methods** (e.g., **ASTM D7953** dry arc wand; water-puddle variants) are best for locating very small defects on uncovered liner surfaces.

- **Covered methods** (e.g., **ASTM D7007**; **ASTM D853** mapping) are suited to detecting construction-related damage after soil/aggregate or water cover is placed.
  While true “leak-free” performance cannot be guaranteed, using **both exposed and covered** methods provides the highest assurance.

Fundamental Concepts: Signal, Safety, and Isolation

ELL uses controlled **DC voltage/current** so that electrical flow follows the **lowest-resistance path** through a defect. For **exposed** surveys, the practitioner grounds outside the lined area and sweeps the surface with a calibrated wand; audible/visual responses indicate anomalies. For **covered** surveys, the conductive cover (soil/aggregate or water) is energized and a surface probe reads **polarity and potential** to infer leak paths. **Perimeter isolation** (electrical separation of covered liner from surrounding soils/roads) is essential—without it, current bleeds away and defects are masked.

Exposed Methods: Planning & Preparation

- **Surface condition**: The liner must be **dry and reasonably clean**. Rain, ponded water, or silt introduce noise and false positives; plan pumps/blowers, push brooms, and **flat** (not pointed) shovels.

- **Calibration & voltage**: Typical ranges are ~500–35,000 V depending on liner texture/thickness; the practitioner calibrates per ASTM before testing.

- **Site support**: Provide labor to **move ground wires and sandbags**, maintain clear lanes, and coordinate with other crews.

- **Value add**: In addition to instrumented detection, the practitioner's **visual scan** flags incipient risks (e.g., protrusions, heat-thinned spots) that may not be holes today but can evolve into leaks.

Covered Methods (Earthen Cover): Setup, Mapping, and Verification

- **Setup**: Energize the **conductive cover layer** (soil/aggregate) and traverse the surface with a voltmeter array, watching for polarity inversions that emulate "additional injection points"—classic indicators of defects.

- **Mapping**: **ASTM D853** (and commonly D7007) supports GPS-based maps of survey paths and anomalies. Interpretation requires expertise: metallic debris, rocks/roots, or clay clods can distort fields.

- **Excavate & re-survey**: After locating a large defect, **isolate/excavate** it and repeat the survey to reveal **smaller masked holes**.

- **Perimeter isolation**: Maintain a **gap** between covered liner and adjacent soil/roads, or cut an **isolation trench** if cover already bridged the perimeter.

- **Contractor assistance**: Expect minor excavation for calibration pads and for opening flagged anomalies; the ELL crew is not the excavation crew.

Covered Methods (Water Cover): Head, Isolation, and Mark-Back

- **Hydraulic head**: When feasible, test at **maximum operational head** to drive flow through tiny defects; low water levels can silence genuine leaks higher on slopes.

- **Isolation**: Keep water fully **within the lined system**—plug or control inflow/outflow piping to prevent current loss.

- **Mark-back**: Use **sandbags/cones** placed on the floor or **paint with taped measurements** after partial drawdown to relocate repair points precisely.

Multi-Layer Liner Systems (Primary/Secondary)

- **Conductive interlayer**: Use a **conductive geotextile** between liners to enable interstitial ELL; avoid hydrating the witness zone (trapped water loads seams and is hard to remove).

- **Grounding infrastructure**: Install **solid, bare copper wires** (~8–12 ga), ideally within **GCL** or under **geotextile patches** to prevent abrasion; **daylight** wire ends at **anchor trenches**.

- **Layout**: Typical spacing is **~200 ft** with wires placed at **low/mid/high** elevations to ensure access during and after cover placement.

Case Study Applications

Field examples highlighted: (1) polarity maps showing a clear “secondary injection” signature that, upon excavation, corresponded to a damaged area; (2) large defects that initially masked nearby small holes, revealed only after isolating and re-testing; (3) non-leak anomalies (e.g., blasting wire in gravel chimneys) producing strong signals that disappeared once the metallic debris was removed and the area re-tested.

Conclusions and Recommendations

The D6747-anchored approach provides a rational, flexible framework for ELL across construction stages. Highest assurance comes from combining **exposed** and **covered** methods, enforcing **perimeter isolation**, planning for **calibration digs and contractor support**, and using **mapping plus targeted verification** to separate genuine defects from field artifacts. In multi-layer systems, **design-in** conductive interlayers and grounding wires during liner design, not after.

Additional Information

A **PDF of the slides** was available in the Handouts pane; the **recording and slides** will be posted on the **FGI website**. **PDH certificates** will be sent automatically to those who attended the full webinar. Outstanding questions (e.g., wires, grids, wrinkles) will be answered in a **follow-up podcast**. The **next webinar** announced was “Protecting Water with Flexible Geomembranes,” scheduled for **February 8 at 12:00 pm CT**, presented by **Brian Fraser** and **Roheet Sati** (Lakefield Group).