

CAPABILITY STATEMENT

SUBJECT

Cover Sensor Monitoring

MARKETS

Feasibility and Mine Planning | Mine Operations | Mine and Quarry Closure
Rehabilitation, Monitoring and Research

ISO

9001:2015 | 14001:2015 | 45001:2018





Cover Sensor Monitoring

Critical aspects of environmental stewardship in mining operations include mine closure and management of mine waste. A major concern during mine closure is that mine waste is properly handled and rehabilitated as it can pose significant environmental risks if not managed in a timely and effective manner. A key challenge in this process is designing covers or capping systems that can successfully encapsulate hazardous mine waste to protect the surrounding environment.

The design of these covers is influenced by site-specific factors and government regulations. Using site information and regulatory standards, conceptual cover designs are developed and modelled to assess their effectiveness in safeguarding the receiving environment from potential contamination. Practicality and performance of these cover designs must be confirmed through field-scale trials and monitoring systems.

Monitoring cover systems plays a crucial role in evaluating the integrity and performance of covers over an extended period of time. Various sensors and monitoring devices are employed to assess key parameters and ensure that the covers meet required criteria. For instance, volumetric water content sensors are used to measure water availability, infiltration rates and seepage within mining landforms. Matric suction sensors measure pore water tension which influences plant root uptake and water movement.

Lysimeters are instrumental in collecting seepage from covers as they provide data on leachate generation, nutrient leaching and groundwater recharge rates. These factors help assess contamination risks. Galvanic cells measure oxygen concentration which is particularly important in oxygenated sulfide-bearing mine waste that can lead to acid mine drainage if not properly managed.

Weather stations equipped with sensors for evapotranspiration calculation are essential in understanding the water balance and the effectiveness of vegetation in removing infiltration from covers. Accurate evapotranspiration data aids in evaluating the overall performance of covers and vegetation in minimising water and oxygen infiltration into mine waste.

Key considerations

- 1. Sensor selection:** Choose sensors that accurately measure critical parameters relevant to cover performance such as water content, matric suction, oxygen concentration and weather-related variables like temperature, humidity, wind speed and rainfall. Ensure that the sensors are suitable for the specific environmental conditions.
- 2. Sensor placement:** Place sensors strategically throughout the cover to capture data from different depths, locations and critical points. For example, install water content sensors at various depths to monitor moisture distribution within the cover layers and lysimeters to collect seepage data at key locations.
- 3. Monitoring duration:** Plan for an appropriate monitoring duration that allows for comprehensive data collection and analysis. Cover trials typically span several years (at least 3-5 years) to capture seasonal variations, long-term trends and potential changes in performance.



4. **Data management and analysis:** Develop a robust data management system to collect, store and analyse sensor data effectively. Use data analysis techniques to interpret trends, identify anomalies or deviations from expected performance and make informed decisions regarding cover design adjustments or maintenance requirements.
5. **Integration with performance criteria:** Align the instrumented cover trials with pre-defined performance criteria or standards that have been established by regulatory bodies and / or based on industry best practices. Evaluate the data collected from sensors against these criteria to determine if the cover meets the required performance targets for environmental protection and waste containment.

Approach

Innovative cover designs and instrumentation involve a holistic approach to ensure stability and reliability by maintaining a sustainable interface with the mine waste, thereby ensuring environmental protection and regulatory compliance.

SGME's cover designs and instrumentation strategies address physical and chemical stability. Our strategy includes thorough site assessments to fully comprehend and understand geology, hydrology, environmental conditions including landscape, and the landform and its associated elements. We apply regulatory requirements to our innovative cover designs and their instrumentation by considering applicable standards and environmental licence requirements.

The conceptual design considers factors such as reclamation, revegetation, erosion protection, store-and-release mechanisms, barrier systems, saturated soil or rock characteristics, and site-specific slopes and drainage systems. We apply numerical modelling to simulate cover performance under multiple scenarios. Appropriate sensors for monitoring are recommended based on key parameters such as water content, gas concentrations, temperature, vegetation health and instrumentation. These sensors are strategically installed to ensure proper calibration and data collection methods.

Through our strategy, we implement robust monitoring plans using the latest technology including temperature- and humidity-controlled data loggers that are IP65 environmental protection rated and carry the CE marking. Our innovative IP software measures data with precision for effective data management. We apply a holistic approach to collecting data, measuring real-time performance, detecting anomalies, enabling regulatory compliance, and ensuring time and cost savings are maximised. Cover performance is measured for a number of years during which SGME performs several field services, including annual and scheduled maintenance, at an intensity that will enable continuous monitoring. This reduces the risk of human error and removes the risk of a forgotten or missed reading. Digital data from external sensor probes is stored and actively monitored for comparison against cover performance and environmental parameters.



Outcomes

Partnering with SGME for mine closure, waste management and / or cover strategy needs will facilitate a comprehensive and tailored approach that includes trialling different options. Our work is delivered by a team of professionals with in-depth cover sensor and monitoring experience.

Our deep understanding of mining-related environmental challenges enables customised solutions tailored to your site-specific needs. Innovative cover designs and instrumentation plans are implemented to support mine closure, waste management and cover strategies based on environmental conditions. This approach mitigates and anticipates risks to aid informed decision-making, thereby maximising your return on investment.

Our commitment to environmental stewardship is evident in our focus on waste containment, minimising environmental impacts and optimising cover design for long-term effectiveness. SGME's services encompass sensor calibration, sensor installation, accurate and reliable data management, analysis and detailed reporting to provide actionable insights and make recommendations for improved environmental outcomes.

Working with SGME

Engaging SGME as a collaborative partner delivers numerous benefits:

- **Improved return on investment (ROI):** Our expertise maximises ROI to satisfy investor expectations.
- **Reduced mine closure risks and disruptions:** Our strategies minimise complex closure risks to ensure a smooth future land use transition.
- **Addressing environmental, social, and governance (ESG) risks:** We focus on ESG criteria to mitigate environmental impacts and meet regulatory standards.
- **Enhanced strategic insight:** Collaboration boosts your performance through strategic planning.
- **Industry collaboration:** We foster partnerships with mining experts, staying abreast of technology and regulatory advancements.
- **Future risk vigilance:** Our proactive approach anticipates future risks to aid informed decision-making.

Our proactive and ethical approach ensures adaptability, sustainability and responsible development to safeguard the mining industry and create enduring value.

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