Unlocking Insights through Artificial Intelligence: A Case Study of Regulatory Assessment & Remediation in Ontario

The accelerating evolution of generative artificial intelligence (GenAI) and Retrieval-Augmented Generation (RAG) has opened new frontiers for environmental data analytics. Regulatory frameworks such as Ontario Regulation 153/04 generate thousands of Records of Site Condition (RSCs) and hundreds of Certificates of Property Use (CPU), yet the information contained in these documents remain untapped due to the volume of reports. This case study demonstrates how AI-driven methods can transform these documents into actionable intelligence and the challenges associated with using AI to analyze large volumes of text-based documents.

Using a hybrid approach that combines Python code-based tools with Microsoft Azure services - including Azure OpenAI, Cognitive Search, and vector databases - we developed a pipeline to retrieve, process, and analyze unstructured regulatory data at scale. By leveraging large language models (LLMs), vector embeddings and semantic search powered by deep learning, we uncover critical insights: What proportion of RSCs involve remediation versus risk assessment? How often do remediation attempts transition to risk-based strategies? To what extent are emerging contaminants such as PFAS addressed in Phase Two RSCs and RAs? How many end up with vapour intrusion mitigation systems (VIMS)? How many RSCs involved remediation in each Ministry of Environment, Conservation and Parks (MECP) Region?

Preliminary findings reveal patterns that can inform regulatory policy, optimize remediation strategies, and enhance environmental risk management. Beyond Ontario, this methodology offers a scalable blueprint for applying GenAI to regulatory datasets globally, supporting reporting, compliance audits, and brownfield development. This work illustrates not only the technical feasibility but also the transformative potential of AI in environmental decision-making.

Scott Ambridge
Geosyntec

Scott Ambridge (CPEng, P.Eng) is an environmental engineer with over 20 years of experience delivering innovative solutions in environmental engineering and data-driven decision-making. With a career spanning Australia and Canada, Scott combines deep technical expertise with strategic insight into global business challenges in the environmental industry. Over the past three years, he has led Geosyntec's data modernization initiatives, introducing centralised database systems and advanced analytics tools. Today, Scott is at the forefront of Artificial Intelligence adoption, driving the development and deployment of AI applications across the enterprise and plays a key role in shaping AI strategy, governance, and transformative solutions.