Glencairn Golf Club
Halton Hills
April 19

AGAT Laboratories

tech talks 2023

toronto

Welcome to the 2023 AGAT Science and Technology Talks!

As Chief Executive Officer of AGAT Laboratories, it is once again my distinct pleasure to welcome you all to the 2023 edition of our Science and Technology Talks. This year we are focused on celebrating innovation, advancements in science and environmental successes coast to coast to coast.

These sessions are hosted each year as they align with our company purpose “Service Beyond Analysis”. For us our purpose means that we are more than just analytical data, beyond the analysis we provide our ultimate goal is to serve. In that respect, our purpose is upheld by the three pillars critical to our business: Our People, Our Clients and the communities that surround us. Being able to host these technical sessions for you all allows us to showcase our commitment to serving you, our valued clients, while also providing us a chance to highlight the incredible work going on in our communities.

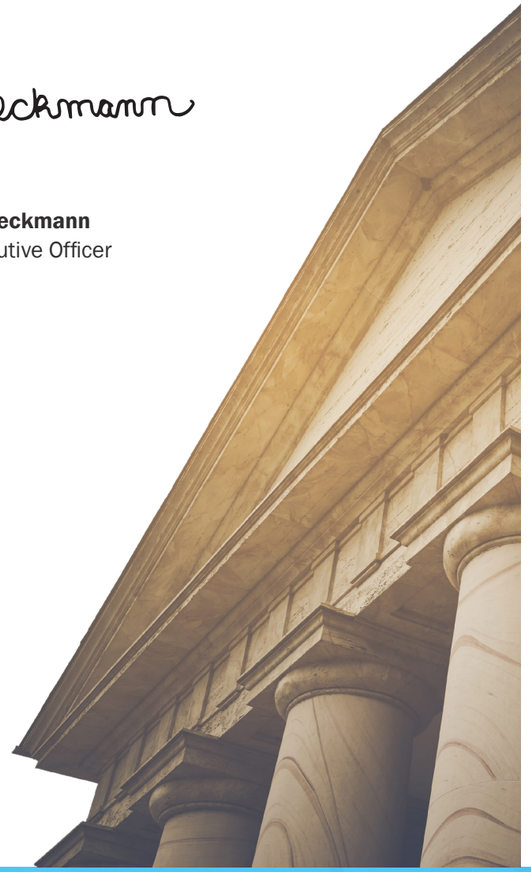
Throughout the year we will continue to stand behind our purpose and prove to you all what an important part of our company you play within our structure. The support that you continue to provide us gives us the stability to remain strengthened and resilient across all operations.

We look forward to this year’s sessions as they are filled with insight from industry leaders looking to share their knowledge and passion. I am delighted that you have chosen to partake in these sessions and to support one another in furthering our professional development.

To our distinguished speakers, please accept a very sincere thank you on behalf of all of us at AGAT as well as our attendees. Without your involvement and support these events would not be possible, and for that we are truly appreciative.

Sincerely,

Marissa Reckmann
Chief Executive Officer



Program

7:15 AM	**Registration and breakfast**
8:10 AM	**Introductions and AGAT Technical Update** Laura Rathgeber, Vice President - National Accounts and Bill Smith, Director, Business Development *AGAT Laboratories*
8:20 AM	**Digging Deeper with 3D RaVE: Managing and visualizing impacted excess soils using three-dimensional, rapid, volume estimation technology** J. Brant Gill, P.Geo., QP–ESA, Senior Hydrogeologist and Anna Best, M.Sc., P.Geo., Hydrogeologist *Matrix Solutions Inc.*
9:10 AM	**When is Rock No Longer Rock? Cracks in Excess Soil** Freesia Waxman, P.Eng., QP-ESA, Senior Engineer *Grounded Engineering*
9:40 AM	**Randle Reef Sediment Remediation Project Stage 2** Wayne Harris, Senior Project Manager *Milestone Environmental Contracting Inc.*
10:10 AM	**Coffee break**
10:25 AM	**The Development of an Equilibrium Passive Sampler for PFAS Detection and Exposure** Brent Pautler, Ph.D., Chemistry Services Manager *SiREM*
10:55 AM	**Tackling PFAS Today A Contractors Perspective** Ben Sweet, Director, Environmental Technologies *QM Environmental*
11:25 AM	**Excess Soil - How to Cost Effectively Reuse Soils at your site** Bruce Tunnicliffe, M.A.Sc., P.Eng., President *Vertex Environmental Inc.*
11:55 AM	**Full course lunch**
12:55 PM	**Environmental Isotopes as Forensic Tools to Solve Practical Environmental Contamination Problems** Fatemeh Vakili, Ph.D., Hydrogeologist *Dragun Corporation*
1:25 PM	**High-Value Activated Carbon from Two-Stage Activation of Corn Fiber** Hayat Raza, P.Eng. Project Engineer and Mitchell Ubene, Masters student University of Guelph, Mechanical Engineering *Continental Carbon Group*
1:55 PM	**Coffee break**
2:10 PM	**ESG Enviromental Risks and Opportunities** Joanna Vince, B.Sc. (Hons.), J.D., Partner, LSO Certified Specialist in Environmental Law *Willms & Shier Environmental Lawyers*
2:40 PM	**PFAS: The Shifting Regulatory Regime and Emerging Implications for Excess Soil Management** Krista Barfoot, Ph.D., C.Chem., QPRA, Infrastucture Sector Leader *SLR Consulting (Canada) Ltd.*
3:10 PM	**Excess Soil: Insights and Takeaways** Nihila Anthonypillai, Technical Services Manager, *AGAT Laboratories,* Krista Barfoot, Ph.D., C.Chem., QPRA, Infrastucture Sector Leader, *SLR Consulting (Canada) Ltd.*, Freesia Waxman, P.Eng., QP-ESA, Senior Engineer, *Grounded Engineering,* Bruce Tunnicliffe, M.A.Sc., P.Eng., President, *Vertex Environmental* **Moderated by:** Laura Rathgeber, Vice President - National Accounts, *AGAT Laboratories*
3:40 PM	**Closing remarks**

*All presented times are Eastern Standard Time (EST).

Registrants are eligible for Professional Development Credits with **AIA, **APEGA**, **ACPA**, **ASPB**, **Eco Canada**, **PGO** and **PEO**.

Your techtalks2023 hosts

Laura Rathgeber, **Vice President - National Accounts** and **Bill Smith, Director, Business Development**
AGAT Laboratories

Laura Rathgeber

With over 16 years of experience in the environmental and oil and gas sector and a degree in environmental studies and biology, Laura Rathgeber started her career as an environmental scientist with a small private firm working on site remediation and reclamation in remote areas around Alberta. After consulting, she moved into a business development role with AGAT Laboratories for the environmental division working closely with consultants and oil and gas companies.

To further her career, she also spent time with Stantec as a senior consultant focusing on strategic growth and Newalta as an Area Sales Manager, enhancing her knowledge in the environmental compliance and waste management field.

Now back with AGAT Laboratories as the Vice President of Business Development, Laura works closely with the senior sales and client services teams leading business development strategy across Canada.

Bill Smith

Bill Smith is the Director of Business Development for Ontario and Atlantic Canada for AGAT's Environmental Division. Bill began his career with AGAT in 2020 leading the Ontario team. Over the past two years, Ontario has realized its most successful years to date. In 2023, AGAT added Atlantic Canada to his responsibilities to ensure the same success in Eastern Canada and providing additional value to AGAT's clients.

Bill has almost 20 years of sales experience selling highly technical environmental services/solutions to various industries including aerospace, pharmaceuticals and general manufacturing while working hand in hand with environmental consultants and government agencies including the Ministry of Environment, Health Canada, among others.

Bill currently manages all aspects of Business Development in Ontario and Atlantic Canada while liaising with AGAT's senior leaders on strategic and sales initiatives, growth opportunities and community engagement.

Bill's client focused approach and years of experience continues to move AGAT forward as a leader in the environmental industry in Canada.

Digging Deeper with 3D RaVE: Managing and visualizing impacted excess soils using three-dimensional, rapid, volume estimation technology

J. Brant Gill, P.Geo., QPESA, Senior Hydrogeologist and **Anna Best, M.Sc., P.Geo., Hydrogeologist**
Matrix Solutions Inc.

Abstract

The Ontario Ministry of the Environment's Regulation 406/19: On-Site and Excess Soil Management regulation (O. Reg. 406/19) has been implemented to promote the beneficial reuse of excavated soil rather than landfilling clean soils previously treated as "waste". Under the regulation, excess soils from a source site can no longer be directly discarded at landfills, but must first be assessed for potential beneficial reuse or directed to one or more off-site receiving sites.

Under the regulation, the beneficial reuse of soils requires a comprehensive understanding of often complex site conditions and detailed soil quality characterization to pair a source site to a suitable receiving site. Matrix has developed 3D-RaVE, a three-dimensional rapid volume estimation tool, with visualization and quantitative capabilities, to interactively display site data and model impacted soil volume(s). This innovative approach facilitates stakeholder regulatory compliance with O. Reg 406/19 and can be used to enhance site characterization, identify data gaps, develop and implement soil sampling and analysis plans, evaluate applicable remediation technologies, visualize and plan construction excavations, improve construction schedule management, and promote efficient and beneficial excess soil reuse and off-site soil management decisions.

Matrix' approach combines qualified person (QP) experience, specialized technical modelling skills, and a thorough understanding of regulatory requirements to employ the latest in advanced 3-D modelling systems. With 3D-RaVE, we can rapidly generate 3-D delineations of impacted soil and estimate clean and contaminated soil volumes to identify data gaps that may require additional sampling and laboratory analyses, and improve the efficiency of excess soil management. The approach can be applied to any suite of soil and groundwater laboratory data referencing the Ministry of Environment, Conservation and Parks' Site Condition Standards for environmental soil quality, or multiple and fully customizable and site-specific set of soil quality. 3D-RaVE provides the QP with an improved characterization and delineation of impacted soil quality. This presentation will summarize and visually demonstrate Matrix' 3D-RaVE tool application for impacted soil delineation, soil volume estimation, soil remediation, and 3 D visualization.

J. Brant Gill

Anna Best

Mr. Brant Gill is a senior hydrogeologist and Qualified Person for environmental site assessments (QPESA) at Matrix with 27 years of consulting experience within a diverse range of business sectors, including environmental site characterization, environmental management, municipal infrastructure, land development, excess soil management, transportation, water supply, aggregates, mining, and oil & gas. Brant has led public engagement information meetings, completed numerous environmental peer review assignments, and has served as expert witness for the Crown (Ontario) regarding contaminated site environmental impacts.

Mr. Gill works closely with clients, regulatory agencies, and engineering and environmental technical disciplines to resolve permitting requirements, assess surface water/groundwater interactions, develop beneficial soil reuse and excess soil management plans, estimate construction dewatering requirements, assess environmental impacts, and develop and implement effective sustainable risk based environmental mitigation, management, and monitoring plans.

Ms. Anna Best completed her Master of Science in Land Resource Science Degree at the University of Guelph in 2013, specializing in non point-source groundwater contamination in glacial sediments. Anna effectively integrates her knowledge of hydrogeologic systems into comprehensive three-dimensional (3D) conceptualizations of the subsurface.

At Matrix Solutions, Anna applies her experience in hydrogeology and geospatial analysis to support groundwater resource management projects in southern Ontario and Western Canada. Anna has transitioned her groundwater modelling experience into estimating excavated environmentally impacted soil and bedrock volumes in support of Excess Soil Management projects and preparing aggregate resource volume estimates. Anna has characterized contaminant impacts and the nature and distribution of aquifers in a variety of hydrogeologic settings

When is Rock No Longer Rock? Cracks in Excess Soil

Freesia Waxman, P.Eng., QP-ESA, Senior Engineer
Grounded Engineering

Abstract

The implementation of Ontario Regulation 406/19: On-Site and Excess Soil Management (O.Reg. 406/19) has led to some grey areas with respect to how excavated shale is being treated across the province. At the crux of the issue is the addition of the term ‘crushed rock’ to the definition of excess soil. How crushed does rock have to be before it becomes subject to the new excess soil regulation? Direction from the Ministry of the Environment, Conservation and Parks (MECP), Qualified Person discretion, reuse sites acceptance criteria, variance in sample collection methodologies, naturally occurring exceedances in rock, and range of laboratory crushing procedures prior to analysis are all contributing factors to varying interpretations.

Freesia Waxman

Freesia has dealt with Excess Soil across multiple business sectors and all levels of government. She has 13 years of experience in environmental engineering with extensive project management, coordination, technical, and field experience in a variety of environmental services including Excess Soil, Phase One and Two Environmental Site Assessments, Risk Assessments, Records of Site Condition (RSCs), remediation programs, soil and fill management plans, underground storage tank removals, baseline environmental studies, hydrogeological investigations, and environmental compliance approvals (ECAs) for liquid soils and Class 1 Soil Management Sites.

She is responsible for external peer review, project management, senior review and guidance on environmental, hydrogeological, remediation, and brownfield development projects, and is regularly retained to consult on excess soil and O.Reg. 406/19.

Freesia holds undergraduate and graduate degrees in Civil Engineering from McMaster University. She is a licensed Professional Engineer in the Province of Ontario and is a Qualified Person (QPESA) with the Ministry of the Environment, Conservation and Parks under Ontario Regulation 153/04 and O.Reg. 406/19.

Randle Reef Sediment Remediation Project Stage 2

Wayne Harris, Senior Project Manager
Milestone Environmental Contracting Inc.

Abstract

Background/Objectives. Located in the southwest corner of Hamilton Harbour, in the Port of Hamilton, the Randle Reef site is approximately 60 hectares (120 football fields) in size. The site contains approximately 615,000 cubic metres of sediment contaminated with polycyclic aromatic hydrocarbons (PAH) and other toxic chemicals – the largest PAH-contaminated sediment site on the Canadian Great Lakes. Impacted by historic operations this site has a legacy of a variety of past industrial processes dating back to the 1800s. There were multiple sources of contamination including coal gasification, petroleum refining, steel making, municipal waste, sewage and overland drainage. Environment and Climate Change Canada (ECCC) serves as the project lead and Public Services Procurement Canada (PSPC) provides technical and construction management, and procurement services. Environmental Setting: Active port; average total PAH concentration near 5,000 ppm with peaks over 73,000 ppm; Depth of Water: ranges from ~4 m to ~ 12 m; Sediment Depth: ranges from ~0.1 m to >3 m. This project included the design of a remediation plan that included constructing a 6.2 hectare Engineered Containment Facility (ECF) over the highly contaminated sediment (Stage 1). The ECF is made of double steel sheet pile walls with the outer walls driven to depths of up to 24 metres into the underlying sediment. The inner wall is sealed creating an impermeable barrier. Stage 2 of this project involved using a combination of hydraulic and mechanical dredging to remove approximately 450,000 m3 of contaminated sediment and placing within the ECF. The dredging of the contaminated sediments also involved the treating and dewatering the ECF to balance the water input into the ECF. This involved the design/build of a water treatment plant that would match the input of the dredging and balance the water level within the ECF. Dredging was then followed by Isolation Capping of the Stelco Intake/Outfall Channel sediments and Thin Layer Capping of marginally contaminated sediment.
Approach/Activities. The Stage 2 project involved the custom design and build of a hydraulic cutter suction dredge that would meet the Canadian Floating Plant Clause, and management of associated debris during dredging. Project also involved the design and build of a water treatment plant for treating water with high suspended solids, contaminated with Polycyclic Aromatic Hydrocarbons (PAHs) and Metals which was achieved by implementing a high-rate clarification process with a compact footprint and the ability to handle significant variations in water quality. The project finally involved the construction of an Engineered Isolation Cap and Thin Layer Cap achieved by placement of an active treatment cap utilizing a geocomposite mat impregnated with organophilic clay, sand cap mixture, and geotextile/armouring stone layer for protection of the installed cap. This involved implementing methodologies for accurately placing these materials within an active industrial water intake and outfall channel to remediate the elevated remaining sediment contaminant levels in depths of water ranging from 7 to 8 metres.
Results/Lessons Learned. The project was successfully completed in 2021 with all components installed and water treatment completed. The use of custom designed equipment, sophisticated GPS technology, robust technologies, and innovative installation methods, coupled with good team collaboration, added to the successful completion of this project.

Wayne Harris

Wayne Harris, C.Tech., is an Environmental Technician and Project Manager for Milestone Environmental Contracting Inc. with 28 years of experience in a variety of environmental and heavy civil disciplines. A Certified Technician with the Ontario Association of Certified Engineering Technicians and Technologists, Wayne has direct experience managing and supervising projects for soil and groundwater remediation, brownfield remediation, marine remediation, site decommissioning, landfill construction and closure, heavy civil construction projects including site servicing, excavation and grading, and implementing project specific health and safety plans, policies and procedures. Wayne`s past experience includes working environments sites such as brownfields, landfills, marine, oil and gas, forestry, pulp and paper, mining, industrial and commercial, power generation and transportation.

Wayne obtained a diploma in Terrain and Water Resources from Sir Sandford Fleming College in 1994 which followed with ten years working as a site technician, in a consulting role, for soil surveys, Phase 1 and 2 contaminated sites investigations, soil and water remediation projects, and soil, surface water and groundwater studies. In 2004, Wayne began working in a contracting role for contaminated sites remediation, including heavy civil construction, in varying positions such as site superintendent, general superintendent, project manager and operations manager.

The Development of an Equilibrium Passive Sampler for PFAS Detection and Exposure

Brent Pautler, Ph. D., Chemistry Services Manager
SiREM

Abstract

Per-and Polyfluoroalkyl Substances (PFAS) have emerged as a concern in the environment due to their persistence, bioaccumulation in living organisms, and toxicity. The established sampling protocols and PFAS concentration determination in sediment and surface water currently only captures the total concentration at a single timepoint and represents the entire mass of PFAS present, which may result in an overestimation of the bioavailable PFAS exposure to human and ecological receptors. Equilibrium passive sampling is a popular approach used to assess bioavailability and risk through the dissolved phase of contaminants but as PFAS are emerging contaminants, researchers have only started investigating potential passive sampling solutions. Given their partial water-solubility and the ability of analytical laboratories to detect trace amounts of PFAS in water, a diffusion-based equilibrium passive sampler was developed. When deployed, analytes dissolved in the water or sediment equilibrate with the water in the sampler through the semi-permeable membrane. Through a series of bench-scale laboratory experiments, factors affecting the migration of several carboxylate and sulfonate PFAS into a diffusion cell were tested including the type of membrane filter, filter size, and solution chemistry. The results of these experiments suggested that the uptake of PFAS into the sampler was the fastest with polycarbonate membrane-based samplers, that the solution chemistry did not influence the PFAS uptake, PFAS were not lost to sorption or was not produced from sampler materials and that this sampler could be used to monitor multiple PFAS compounds.
The laboratory validated sampler was further tested in an in-situ field pilot to measure PFAS in sediment porewater and surface water. Targeted analytical results (Modified EPA 537, EPA 1633) indicated that equilibrium was reached in 14 days for surface water and after 28 days in porewater an average 75% equilibrium for all target compounds was reached. Also, all data were within a factor of 2 or less with averaged grab sample results. Non-targeted analysis from the samplers showed more diversity in species and the applicability for detection of additional PFAS analytes with this sampler. This sampling approach was also validated for groundwater monitoring wells by comparison to dialysis bags and grab sampling. Future experiments include direct comparison with tissue samples to further validate the relationship between passive sampling results and exposure, risk and bioaccumulation

Brent Pautler

Brent is SiREM's Chemistry Services Manager and received his Ph.D. in environmental analytical chemistry in 2013 where he gained advanced technical experience in spectroscopy, chromatography, mass spectrometry, passive sampling, and chemistry informatics. Throughout his career, he has worked with scientists, engineers, and consultants, applying his chemistry and information technology expertise to help them solve unique problems in the laboratory and the field. His role includes managing and advancing SiREM's passive sampling portfolio, analytical testing services while supporting Compound Specific Isotope Analysis (CSIA) business development.

Tackling PFAS Today A Contractors Perspective

Ben Sweet, Director, Environmental Technologies
QM Environmental

Abstract

The active remediation and management of environmental liabilities is a complex process involving legal, regulatory, technical, and logistical challenges. Addressing these challenges requires the support of a multidisciplinary team to navigate the nuance and deliver project success. Nowhere is this complexity greater than in the management of the emerging challenges associated with Per- and Polyfluoroalkyl Substances (PFAS).

Per- and Polyfluoroalkyl Substances (PFAS) represent a significant threat to the environment and human health. The growing understanding of the risks associated with these compounds is leading to continuous developments in regulatory and legal action across many jurisdictions. Despite the uncertainty, the need for stakeholders to engage in active management of PFAS contamination and waste materials grows daily.

Active remediation, water treatment, and engineered risk management measures are available today in the Canadian marketplace to help stakeholders address the challenges associated with these emerging contaminants. This presentation explores these options through case study and addresses some of the practical challenges with managing PFAS materials in an ever evolving technical, regulatory, and legal framework.

Ben Sweet

Mr. Sweet is an Environmental Professional with over ten years experience in the environmental industry. Over this period, he has occupied numerous roles ranging from Environmental Scientist to Technical Lead, supporting specialized environmental contracting and consulting entities with a focus on water treatment, in-situ remediation, and contaminated site characterization.

Mr. Sweet has delivered complex remediation and site characterization projects across the US and Canada for various Consulting Engineer's and Industrial/ Commercial stakeholders. He has personally led the delivery of characterization, remediation, and water treatment programs involving a diversity of site scales and challenges including emerging contaminants, complex hydrogeological conditions, NAPLs, and sensitive regulatory and/or legal constraints.

Mr. Sweet is currently the Director of Environmental Technologies for QM Environmental. In this role, he provides technical support and business unit leadership to further expand QM's environmental technology offerings and comprehensive environmental service line. Mr. Sweet strives to ensure QM's clients are equipped with innovative and cost-effective solutions to manage their environmental liabilities.

Mr. Sweet has completed his Bachelor of Science in Environmental Science from Acadia University and a Master's in Chemical Engineering from the University of New Brunswick. Mr. Sweet has shared his expertise as a member of technical committees and has presented at numerous workshops and conferences across Canada and the US.

Excess Soil - How to Cost Effectively Reuse Soils at your site

Bruce Tunnicliffe, M.A.Sc., P.Eng., President
Vertex Environmental Inc.

Abstract

Excess soil is soil that has been dug up, typically during construction activities. An estimated 25 million cubic meters of excess soil is generated in Ontario every year. While most excess soil can be safely reused, some soil may have limited levels of contaminants and care must be taken when determining where it may be reused, unless it can first be treated to reduce contaminant concentrations to more acceptable levels.

In December 2019, the Ministry of the Environment, Conservation and Parks (MECP) released a new regulation under the Environmental Protection Act, titled “On-Site and Excess Soil Management” to support improved management of excess soil generated in Ontario. This regulation views soil as a reusable resource and not necessarily as a waste and will be phased in over time.

New regulation can initiate change and adaptations with regards to project execution along with general changes to the environmental business. New regulation can also lead to confusion. Many in the industry have been wondering, how can one cost effectively reuse soils under the new rules?

The purpose of this talk is to present examples of how excess soils can be cost effectively reused on job sites.

A case study will be provided, specifically with regards to excess soil reuse at the Toronto Port Lands. As soils were being excavated to create the new mouth of the Don River, they were triaged and treated according to contaminant levels. Mr. Tunnicliffe was responsible for soil treatment within the Soil Management Area (SMA) at the Port Lands from 2020 through to 2022. During this presentation an overview of ex-situ soil treatment will be provided, along with state of the practice, lessons learned, and future predictions for excess soils.

Bruce Tunnicliffe

Mr. Tunnicliffe is founder and president of Vertex Environmental Inc., is an Environmental Engineer and has more than twenty years of experience designing and implementing remediation approaches to treat contaminated soil and groundwater. Mr. Tunnicliffe holds a Master’s degree from the University of Waterloo.

Environmental Isotopes as Forensic Tools to Solve Practical Environmental Contamination Problems

Fatemeh Vakili, Ph.D., Hydrogeologist
Dragun Corporation

Abstract

Environmental isotopes can be used to identify the origin of groundwater and source(s) of organic and inorganic contaminants, such as nitrate and chlorinated solvents in groundwater. This presentation includes two practical case studies that use isotopes to determine sources of the contamination. In addition, we used high-resolution investigative methods to test the isotopic evaluations.

Isotopes are different forms of the same element; although they have the same number of protons they have a different number of neutrons. For example, most oxygen atoms have 8 protons and 8 neutrons, (160), but 2% of oxygen atoms have 8 protons and 10 neutrons (180). As a result, different isotopes of an element have the same chemical properties but different physical properties.

The differences in physical properties between isotopes are the basis for solving practical hydrogeological and contaminant problems. The stable isotopic ratios of water (2H/1H) and (180/160) change during meteoric processes such as evaporation and precipitation. The isotopic ratios of manufactured chemicals such as trichloroethylene (TCE) can be distinct (13C/12C and 37Cl/35Cl). These ratios may change in the subsurface due to processes such as biodegradation. Finally, numerous field studies indicate stable isotopic ratios of different sources of nitrate (chemical vs manure) have distinct 15N/14N and 180/160 ratios.

In the first case study, we used stable isotopes in TCE to determine whether there were two sources of TCE on two properties that fell along the same groundwater flow path. Usually in this situation, the contaminated upgradient property is blamed for the contamination on the downgradient property. Since the isotopic signature of the TCE is independent of the groundwater flow direction and contaminant concentrations, isotopes provide a robust tool to determine whether there were different sources of the same contaminant. In this case study, we also used a passive soil-gas survey, a high-resolution technique, to test whether the contaminant plume on both properties originated from two separate sources.

In the second case study, we used stable isotopes of nitrate and water to help a large dairy farm determine a representative background nitrate concentration for permitting purposes. The literature and local testing indicated regional nitrate concentrations in groundwater greatly exceeded the nitrate drinking water criteria, which is 10 mg/L. This “legacy” nitrate originated from historical widespread use of chemical fertilizers that occurred long before the dairy was established. However, for permitting purposes the regulators used a low nitrate concentration (< 10 mg/L) observed in a monitoring well located in the upgradient corner of the dairy as background. We used nitrate isotope signatures in the groundwater to demonstrate the high nitrate concentrations beneath and around the dairy originated from chemical fertilizer. The regulators eventually accepted the concept of a higher background concentration (>30 mg/L), which was consistent with the regional legacy nitrate concentrations. However, why did the “upgradient” monitoring well indicate low nitrate groundwater? We used water isotopes during and high-resolution groundwater elevation monitoring during a large recharge to resolve the apparent discrepancy.

Fatemah Vakili

Dr. Fatemeh Vakili, P.Geo. is a hydrogeologist at Dragun. Dr. Vakili joined Dragun in 2017 and has a Master’s of Science and Doctorate in Earth and Environmental Sciences.

Dr. Vakili’s academic research and expertise is in using Compound Specific Isotope Analysis (CSIA). Her expertise in CSIA is used to understand the source(s) and fate and transport of chemicals in the subsurface. Dr. Vakili works with other senior scientists at Dragun on projects involving site assessments, litigation support, and more. These projects focus on “water-related issues” (quality and quantity) where Dr. Vakili uses her advanced knowledge of isotopes to find practical answers to what are often complex questions.

In addition to her hands-on project experience, Dr. Vakili has presented at the prestigious Battelle Conference, written for publications as varied as Environmental Science and Engineering, Chemical Engineering Process (CEP), and the Journal of Nutrient Management.

High-Value Activated Carbon from Two-Stage Activation of Corn Fiber

Hayat Raza, P.Eng., Project Engineer and **Mitchell Ubene, Masters student**
University of Guelph, Mechanical Engineering
Continental Carbon Group

Abstract

Contamination of water sources is an imminent global issue as elevated levels of harmful micropollutants are increasingly found in drinking water sources derived from fertilizers, pesticides, antibiotics, and industrial chemicals. During a climate crisis where it is essential to reduce greenhouse gas (GHG) emissions, it has become vital to find low-cost and environmentally friendly adsorbents for water treatment that can be produced sustainably. High value carbons such as activated carbons (AC) are porous materials with well-developed surface areas and excellent adsorption characteristics. Their use in adsorption processes covers a wide range of contaminants such as pharmaceuticals, organic compounds, metallic pollutants, or even odours and dyes.

Conventionally, AC is produced from fossil fuel-based resources such as coal, however, research in recent years has demonstrated the viability to produce AC from more environmentally friendly waste and bio-based feedstocks. Paired with the use of hydrothermal carbonization (HTC) technology for the initial carbonization step, the upgrading of typically undesirable moisture containing biomass into high-value ACs has been made practical. Considering these developments, it desirable to materialize AC production chains in Canada, given the high amounts of agricultural waste streams that exist and the nonexistence of a domestic AC supply chain. This work was designed to meet this objective by exploring the use of corn fiber, a by-product of the ethanol industry, as a feedstock for a novel AC production process and testing the carbon performance as an adsorbent for various chemicals.

A two-stage process using HTC and chemical activation to valourize corn fiber to AC was engineered to optimize the product characteristics that would enhance absorbance such as porosity and surface functionality. The lab-produced carbon was tested for its contaminant adsorption capacity and compared to commercially available ACs produced from coal, coconut, and wood using a rapid small-scale column test (RSSCT). This practice is a common lab-scale method for determining breakthrough curves (when available adsorption sites have been filled up with the contaminant) and has been accepted as an accurate model to predict adsorbent performance at a large scale. RSSCTs present the advantages of reducing the time and cost that would be required to conduct full or pilot scale studies, which allowed for multiple contaminants to be tested in this research. The results present the AC performance in removing chlorine, trihalomethanes (THM), alachlor, and tetrachloroethylene.

Overall, the lab produced carbon performed favourably to the commercial AC samples, encouraging the incorporation of this sustainable process for real-world water treatment applications. The promising results were attributed to the superior specific surface area (SSA) and microporosity that was attained in the optimized samples. These results provide valuable insight into biobased engineered carbon for large-scale adsorbent processes that promote eco-friendliness and improved sustainability.

Hayat Raza

Mitchell Ubene

Hayat Raza currently works as Project Engineer with Continental Carbon Group, Inc. in Ontario, Canada. His work involves providing air, drinking water and groundwater treatment solutions to clients utilising various physical and chemical water treatment technologies. Prior to this he worked at Watts Water Technologies, Inc. for over two years with a foundation in Disinfection, Filtration, Ion Exchange and Reverse Osmosis. Hayat obtained his bachelor's and master's in chemical engineering with research in the areas of Ozone and Supercritical Water Oxidation. He is currently serving as the Regional Director ON for IWA YWP Canada and is one of the founding members of the YWP Canada group. Hayat also works with Water for People (WFP) in helping create awareness, solving drinking water and sanitation challenges for populations in developing countries.

Mitchell Ubene is a master's student in mechanical engineering at the University of Guelph specializing in biochemical processes, specifically with respect to the thermochemical conversion of biomass and other agri-food wastes. His main research has been focused on the process design for high-quality activated carbons using hydrothermal carbonization to be used in wastewater treatment and hydrogen storage applications. In cooperation with Continental Carbon Group, Mitchell has worked on testing the adsorption performance of carbon materials made in the lab to compare with activated carbons that are commercially used in water treatment. The goals of his projects align with his commitment to lessen the impacts of climate change by exploring waste streams in Canada that can be used to produce valuable products from sustainable methods.

ESG Enviromental Risks and Opportunities

Joanna Vince, B.Sc. (Hons.), J.D., Partner, LSO Certified Specialist in Environmental Law
Willms & Shier Environmental Lawyers

Abstract

Environment, Social and Governance (ESG) factors have become key considerations for investors locally and globally. ESG signals a move by lenders and investors towards companies and projects that promote positive environmental, social, and corporate governance initiatives. This presentation will provide an overview of ESG, explain some of the benefits arising from ESG, and set out some of the associated risks and liabilities.

Joanna Vince

Joanna Vince, B.Sc. (Hons.), J.D., is a Partner and Certified Specialist in Environmental Law by the Law Society of Ontario at Willms & Shier Environmental Lawyers LLP. Joanna has significant expertise assisting clients with environmental approvals and permits for developments and industry. Joanna advises industry, conservation authorities, governments and crown corporations, Inuit groups, tribunals and land claims organizations on environmental law matters.

Joanna helps clients navigate the environmental regulatory process. She advises clients about compliance obligations and represents them in managing regulatory inspections and investigations. She has appeared before environmental tribunals and boards on behalf of clients to obtain, confirm or dispute environmental permits and approvals, including for wastewater treatment systems, noise and air emissions, and water permits.

Joanna advises on the environmental liabilities associated with contaminated lands and how to manage those liabilities for holding, redeveloping, buying and selling contaminated lands. Joanna is called to the Bar of Ontario, Nunavut, the Northwest Territories, and the Yukon.

PFAS: The Shifting Regulatory Regime and Emerging Implications for Excess Soil Management

Krista Barfoot, Ph.D., C.Chem., QPRA, Infrastucture Sector Leader
SLR Consulting (Canada) Ltd.

Abstract

Per- and poly-fluorinated alkyl substances (PFAS) are a group of more than 4,000 man-made chemicals, with the most common including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). This emerging class of contaminants, central to the Netflix movie entitled “The Devil We Know” and the November 2019 Hollywood release “Dark Waters”, is ubiquitous at very low levels in the environment and has been measured in water supplies across the United States (US). The broad use of these parameters in a wide array of industries and products, coupled with their mobility, persistence, toxicological uncertainties, and technical obstacles to remediation, presents a far more complex challenge to the environmental community than prior contaminants. Consequently, the US Environmental Protection Agency (EPA) is heavily invested in PFAS research efforts and is currently moving forward with establishing Federal regulation regarding PFAS contamination. US Federal regulation is expected in 2023.

While legislation to date has been limited in Canada, on April 24, 2021 the Federal government released a Notice of Intent to move forward with activities to address the broad class of PFAS, noting the large and diverse number of commercially available PFAS with limited toxicological and chemical data rendered a substance-by-substance approach impractical. An update from the Federal government on their intentions for regulating PFAS in the environment, including potentially new screening criteria, is expected as soon as January 2023. At the provincial level, British Columbia, the four Atlantic provinces, and Alberta have established regulated standards for a limited suite of PFAS in water and soil. Ontario and Quebec have released guideline values for PFAS in water only, and these values are not regulated.

In several provinces in Canada, concurrent to the evolution of guidelines and policy around PFAS, has been the development of regulation, policy and best practices specific to the management of excess soil generated during construction activities. Typically, the focus of related sampling, assessment and tracking efforts is specific to soil derived from previously developed sites. This focus stems from the general understanding that soil contamination is more likely to be observed at infill sites. Undeveloped, or “greenfield” sites, are generally understood to be comprised primarily of unimpacted or “low-risk” soil; however, emerging concerns regarding the presence of PFAS in the wastewater stream, and potential for PFAS to be absorbed to land applied biosolids, may have implications for the management of agricultural soils as PFAS regulation evolves.

This presentation will review the challenges associated with PFAS releases to the environment, the current and projected status of international and Canadian PFAS regulation and standards, and the potential implications of the evolving regulatory regime for biosolids and excess soil management.

Krista Barfoot

A Contaminated Sites Specialist, Dr. Barfoot has over 25 years of experience with expertise spanning from the technical elements of project delivery to program management, risk management, policy development, and stakeholder communication. A Qualified Person for Risk Assessment (per O.Reg. 153/04), her technical expertise includes strategic site planning, risk assessment, vapour intrusion assessment, management of excess soil, non-aqueous phase liquid, risk mitigation measures, and emerging contaminants – including per- and polyfluoroalkyl substances (PFAS). Experienced in PFAS investigative and analytical approaches, risk assessment considerations, and remediation techniques, her PFAS project experience includes brownfields, AFFF sites, and landfills.

Dr. Barfoot has an established industry presence via engagement in numerous associations, including the Ontario Environmental Industry Association (ONEIA), Canadian Brownfields Network (CBN), Interstate Technology and Regulatory Council, and the Ministry of Environment, Conservation and Parks Excess Soil Engagement Group. She currently serves as the Chair of ONEIA’s PFAS Committee and Vice-President of the CBN.

Excess Soil: Insights and Takeaways

Nihila Anthonypillai, Technical Services Manager, AGAT Laboratories, **Krista Barfoot, Ph.D., C.Chem., QPRA, Infrastucture Sector Leader**, SLR Consulting (Canada) Ltd.,
Freesia Waxman, P.Eng., QP-ESA, Senior Engineer, Grounded Engineering, **Bruce Tunnicliffe, M.A.Sc., P.Eng., President**, Vertex Environmental

Moderated by: Laura Rathgeber, Vice President - National Accounts, AGAT Laboratories

Nihila Anthonypillai

As Manager of Technical Services at AGAT Laboratories, Nihila comes with 25 years in the Environmental Testing Services. After graduating from York University with a Bachelor's degree in Chemistry, she has taken on different roles within the laboratory operations and has hands-on experience running various instrumentation for the testing of environmental contaminants of concern including Petroleum Hydrocarbons, Volatile Organics, Chlorinated Pesticides and others.

In her current role, Nihila continues to offer support to all internal teams within AGAT in handling technical enquires and operational challenges. She is also a member of industry associations such as ONEIA and CCIL and sits on the Technical Advisory Committee with MECP where subject focused issues are tabled on regular basis.

Krista Barfoot

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Freesia Waxman

Freesia has dealt with Excess Soil across multiple business sectors and all levels of government. She has 13 years of experience in environmental engineering with extensive project management, coordination, technical, and field experience in a variety of environmental services including Excess Soil, Phase One and Two Environmental Site Assessments, Risk Assessments, Records of Site Condition (RSCs), remediation programs, soil and fill management plans, underground storage tank removals, baseline environmental studies, hydrogeological investigations, and environmental compliance approvals (ECAs) for liquid soils and Class 1 Soil Management Sites.

Bruce Tunnicliffe

Mr. Tunnicliffe is founder and president of Vertex Environmental Inc., is an Environmental Engineer and has more than twenty years of experience designing and implementing remediation approaches to treat contaminated soil and groundwater. Mr. Tunnicliffe holds a Master's degree from the University of Waterloo.

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