epex 2024
OPI 61st Conference and Trade Show

EPEX 2024

Energy Prospectors Expo

OPI 61st Conference and Trade Show

June 5th & 6th
Best Western Lamplighter Inn &
Conference Centre, London, Ontario

WHAT IS EPEX?

EPEX highlights the multifaceted nature of Ontario's oil, natural gas and salt industries and how they fit into Ontario's energy landscape. EPEX identifies opportunities to help other energy sectors. We've seen these opportunities in recent years as the conference enjoys more presentations on compressed air energy storage (CAES) and carbon capture, utilization, and storage (CCUS). New uses have energized and reinvigorated exploration in Ontario's subsurface, like the Cambrian. After all, we're all doing the same thing but in different ways -- and that is why the OPI and OGSR Library wanted to bring everyone together.

ENERGY PROSPECTORS EXPO

Each one of you is an **important collaborator** in this conference and your participation highlights the multidimensionality of our energy sector in Ontario.

The EPEX logo is a tesseract, a four-dimensional shape with 24 faces, chosen to represent the complexities and multiple layers of energy production in Ontario.

EPEX is about more than prospects – it's about exploring.

Join us in the plenary session and let's start generating collaborative energy!

Share conference photos with hashtag **#EPEX2024** and **@ogsrlibrary**; we look forward to sharing the conference with you!

Help us improve the conference for 2025 by filling out an in-person **survey**.

Schedule of Events

Wednesday, June 5th

Live at the Best Western Lamplighter Inn & Conference Centre, London, Ontario

Length	*Time*	*Event*	*Presenters*
4 hrs	**9:00 AM**	Trade Show Setup	
2 hrs	**2:00 PM**	Golf 9 Holes	
	5:00	Welcoming Reception & Trade Show	Trade Show Exhibitors
	6:00	Welcome Dinner	
	6:30	Dinner Keynote	TC Energy

Thursday, June 6th

Live at the Best Western Lamplighter Inn & Conference Centre, London, Ontario

Length	*Time*	*Event*	*Presenters*
60 min	**7:30 AM**	Welcome Breakfast	
	8:00	**Exhibit Hall Opens**	Trade Show Exhibitors
15 min	**8:30**	*Official Conference Opening*	Welcoming remarks
		BLOCK 1: Science & Infrastructure	
15 min	**8:45**	*Three-dimensional model of dolomitization patterns in the Salina A-1 Carbonate and A-2 Carbonate units, Sombra Township, southern Ontario*	Terry Carter, Consulting Geologist, Carter Geologic
15 min	**9:00**	*Key Elements for Underground Energy Storage Containers*	Peter Johnston, Geological Engineer
15 min	**9:15**	*So, you suspect you have an old oil or gas well on your property?*	Jug Manocha, Special Projects Engineer, Ameta Projects Inc.
15 min	**9:30**	***Block 1 Panel Discussion***	
60 min	**9:45**	Networking Break and Coffee	Trade Show Exhibitors
		BLOCK 2: Hydrogen	
15 min	**10:45**	*Characterizing Hydrogen Dynamics for Potential Underground Hydrogen Storage in Ontario*	Dru Heagle, CanmetENERGY
15 min	**11:00**	*Planning for the "Energy Transition" - What does this*	Dr. Philip R. Walsh, P. Geo; Principal Investigator, TMU Center for Urban Energy

		mean for the future of Ontario's oil and gas industry?	
15 min	**11:15**	*Storage of Hydrogen in a Depleted Natural Gas Reservoir in Ontario*	David Thompson, President, Northern Cross Energy Limited
30 min	**11:30**	***Block 2 Panel Discussion***	

75 min	**12:00 PM**	Networking Lunch	Trade Show Exhibitors
		Luncheon Keynotes	
	12:30	Dawn Gallagher Murphy, Parliamentary Assistant to the Minister of Natural Resources and Forestry; Christina Sydorko, Oil Museum of Canada	
		BLOCK 3: Cambrian and CCUS	
30 min	**1:15**	*The Hydrogeological Challenge of Geological CO_2 Storage in the Ontario Cambrian Fm.*	Richard Jackson, Lauren Madronich, & Robert Walsh, Geofirma Engineering Ltd.
15 min	**1:45**	*New Energy Solutions for CCUS*	Jacob Wright, NAM Interpretation & Evaluation Services (IES) Manager, North American Region, Weatherford
15 min	**2:00**	*Strategic Workflow for CCS Subsurface Evaluation*	Dickson Lee, CEO & CTO, Big Guns Energy Services Inc. (BGES)
15 min	**2:15**	*Revisiting the Cambrian Stratigraphy of Southwestern Ontario, An Update*	Allan R. Phillips, Department of Earth Sciences, The University of Western Ontario
15 min	**2:30**	***Block 3 Panel Discussion***	
45 min	**2:45**	Networking Break and Refreshments	Trade Show Exhibitors
		BLOCK 4 Cambrian Core Workshop & Reception	
30 min	**3:30**	*Middle Ordovician and Cambrian-aged sediments, Southwestern Ontario*	Ian Colquhoun, President 2289745 Ontario Ltd.
45 min	**4:00**	***Block 4 Core Viewing – Corks and Core Reception***	
5 min	**4:45**	Closing Remarks / Trade Show Closed	
	5:00 PM	Trade Show Closed	Thank You for Attending! ***Submit your post-conference survey to help us build EPEX 2025!***

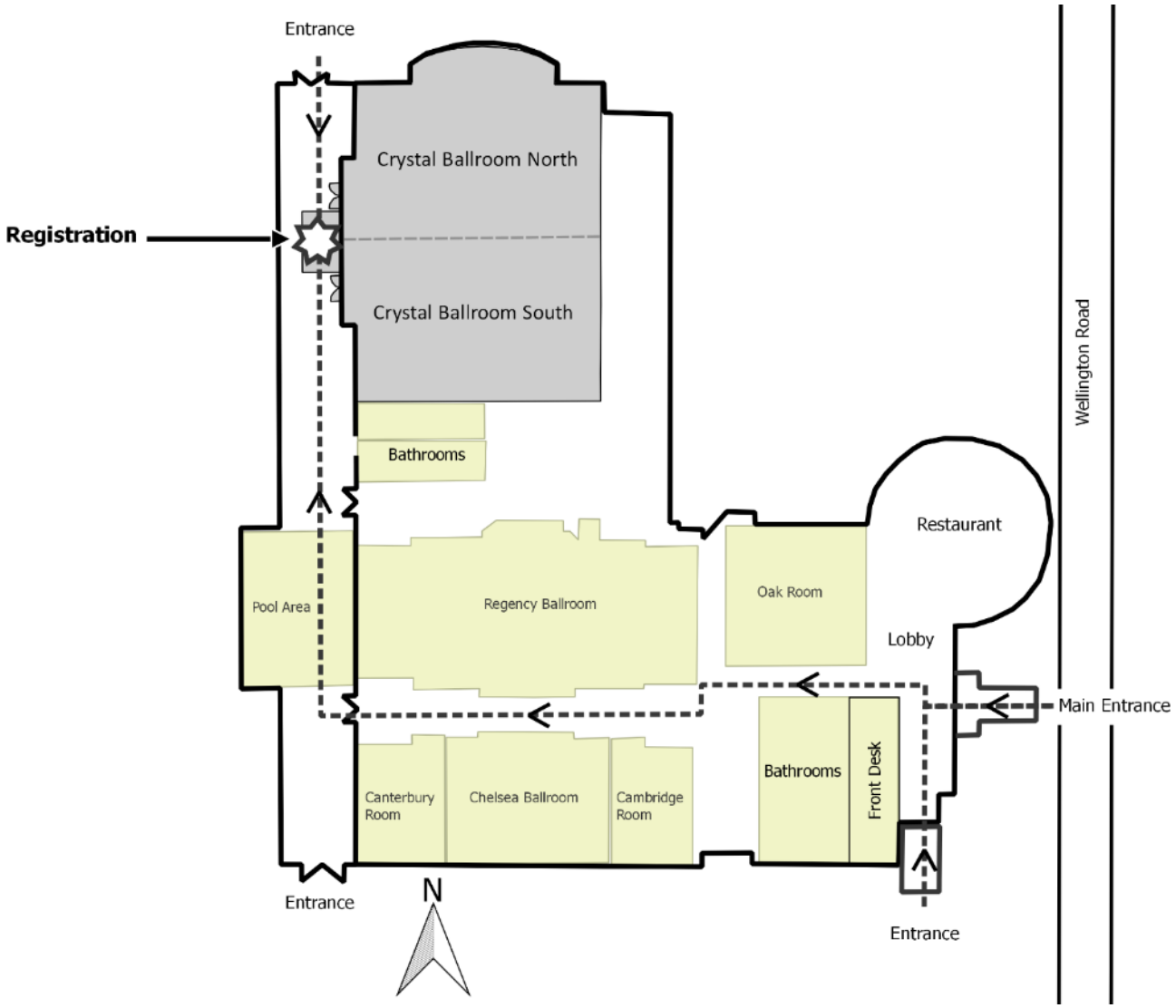
Table of Contents

Venue Map

Best Western Plus Lamplighter Inn & Conference Centre

Crystal Ballroom North – Will host the Trade Show Exhibitors, Networking, and Keynotes.

Crystal Ballroom South – Will host the Plenary and Speaker Blocks.



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OPI Chairman's Welcome

It is my pleasure to extend a warm welcome to all attendees and guests to EPEX 2024.

This year the OPI is pleased to present its 61st Conference and Trade show which has been supporting collaboration and innovation in the oil and gas sector for over 60 years and more recently through the EPEX format broadening participation to all Paleozoic subsurface ideas and activities.

Thank you to all continuing and first-time participants in this year's conference including: sponsors, presenters, exhibitors, and volunteers.

My appreciation and thanks to the OPI Conference Committee co-chaired by Niki Clark and Peter Budd for their work in organizing the Conference.

On behalf of the OPI, I would also like to extend my gratitude to the Oil Gas and Salt Resources library staff including Jordan Clark, Matt Dupont, Connor Macleod, and Elizabeth Lenkić, as well as conference committee member Rhys Paterson for their support in the planning and execution of this year's conference.

We hope you enjoy EPEX 2024.

Thank you for attending,

Scott Lewis, Chairman

Ontario Petroleum Institute

Conference Chairs' Remarks

We are thrilled to come together once again for EPEX 2024. Although the event has evolved over the years and only adopted the name EPEX (Energy Prospectors Expo) in 2018, this conference has been providing industry-relevant content and networking opportunities for energy professionals for 61 years.

In line with our theme of collaboration across the energy sectors, this year's talks will feature a balanced mix of discussions on oil and gas, innovations in underground storage, and updates on key, pending regulatory developments in Ontario. The remarkable transition of using traditional fossil formations for renewable energy and carbon storage is captivating citizens, regulators and industry experts, all of whom are welcomed to this year's conference. Additionally, we are excited to offer a Cambrian core workshop led by Ian Colquhoun, former EPEX Conference Chair.

The direction of energy in Ontario and Canada is shifting expeditiously towards more sustainable and diversified sources. This rapid transition presents both opportunities and challenges for industry professionals and politicians who must implement the underlying frameworks, effectively. As we navigate these changes, staying informed and engaged through events like EPEX is crucial for leveraging new technologies, adapting to regulatory changes, and meeting the growing demand for energy in an environmentally responsible manner.

We look forward to hearing the ideas, messages and recommendations from our keynote and conference speakers. Their insights, generously provided, will inform all of us as we prepare for the next steps of the global and local energy transitions.

We welcome your feedback!

Thank you for joining us.

Niki Clarke & Peter Budd, Conference Co-Chairs

Speaker Biographies and Abstracts

BLOCK 1 – Science & Infrastructure

Terry Carter
Carter Geologic

terry.carter@cartergeologic.com

Terry is the former Chief Geologist, Petroleum Operations of the Ontario Ministry of Natural Resources and has been a Consulting Geologist in London since 2015. Terry specializes in projects related to the Paleozoic bedrock geology of southern Ontario and its petroleum and groundwater resources. He is co-author of the book Subsurface Paleozoic Stratigraphy of Southern Ontario, published by the Ontario Geological Survey in 2010. and is the author or co-author of more than 80 published reports and peer-reviewed papers.

NOTES

Terry Carter - Abstract

Three-dimensional model of dolomitization patterns in the Salina Group A-1 Carbonate Unit and A-2 Carbonate Unit, Sombra Township, Lambton County, southern Ontario

T.R. Carter[1], C.E Logan[2], and H.A.J. Russell[2]

1 Consulting Geologist, Carter Geologic, 35 Parks Edge Crescent, London, Ontario N6K 3P4

2 Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8

In this study three-dimensional (3-D) dolomitization patterns in the Salina Group A-1 Carbonate Unit and A-2 Carbonate Unit in Sombra Township, Lambton County are delineated, updating a previous 2-D study be Carter (1991). The source data consists of percent dolomite measurements in drill cuttings determined by alizarin red staining of 9727 sampled intervals in 409 petroleum wells. Numerical interpolants of the percentage of dolomite versus limestone in the two formations are developed within the boundaries of lithostratigraphic formation layers derived from a 3-D geologic model of southern Ontario, published as GSC Open File 8795, using Leapfrog© Works software with a 400 m grid resolution.

The A-1 Carbonate is predominantly comprised of limestone in the study area while in the A-2 Carbonate Unit there is a gradational increase in dolomite content upwards from a basal limestone to 100% dolomite. Increased proportions of dolomite vs limestone in both formations are spatially associated with the flanks and crests of pinnacles in the underlying Lockport Group carbonates, over which the B Salt has been dissolved, and the downthrown side of the Dawn Fault and Becher faults. In the A-1 Carbonate there is an increase in dolomite content over a minority of incipient reefs in the Lockport.

The cross-cutting relationships of dolomite occurrence in the A-1 Carbonate on the flanks and crests of some pinnacles support a post-depositional burial diagenesis mechanism, consistent with previous interpretations. The pathway for the dolomitizing fluid was laterally through porous and permeable regional paleokarst in the underlying Guelph Formation and uppermost Goat Island Formation, and upwards through the porous reefal carbonates of the pinnacles. Association of the dolomitization haloes with dissolution features in the halite of the overlying B Salt Unit further suggest that the dolomitizing fluids were also responsible for salt dissolution. The preferential association of dolomite with the Dawn and Becher faults suggest that preferential movement of the dolomitizing fluid also occurred along these faults.

The project demonstrates the feasibility and value of assignment and interpolation of attribute values within 3-D volumes of lithostratigraphic layers in the regional 3-D geologic model of southern Ontario.

Peter Johnston

Geological Engineer

Seasoned professional Geological Engineer with over 30 years of underground geology and related business development experience.

NOTES

Peter Johnston – Abstract

Key Elements for Underground Energy Storage Containers

There are 8 key elements to consider when determining if a natural underground reservoir (typically an existing or past producing pool) is suitable for underground storage of fluids. This presentation demonstrates these key elements using the Sombra 4-16-IX pool located in Sombra Township, Lambton County, Ontario as an example.

Jug Manocha
Ameta Projects Inc.

Experienced engineer from an operational and regulatory perspective for the oil and gas and hydrocarbons storage industry specializing in dealing with unplugged and abandoned wells and with storage of hydrocarbons in underground formations and petroleum well emergencies. Project Manager role for plugging of 250 wells under the Abandoned Works Program.

He was recognized with An Award of Merit for sharing his knowledge and the lessons learned and educational at many OPI conferences. He was a recipient of an Amethyst award from the Ontario government for plugging a hazardous well, and with an Award of Merit from Canadian Standards Association for being founding member of the CSA Z341 Storage of hydrocarbons in underground formations and a member of CSA Z624/625 Wel design.

He continues to be involved as project manager for well plugging and with underground storage.

NOTES

Jug Manocha - Abstract

So, you suspect you have an old oil or gas well on your property?

Jug Manocha, Ameta Projects Inc. and Ben Barnes, Double B Projects

Ontario oil and gas history starts with first commercial well in Oil Springs in 1858. Since that time an estimated 50,000 oil and gas wells have been drilled in the province. There are records for approximately 27,000 wells at the Oil, Gas and Salt Resources Library. There are currently 1,680 active natural gas wells and 1,130 active oil wells. Many of the former oil and gas wells, may not show up on the well records, and may or may not have been properly plugged and abandoned.

Wells that are not properly plugged may pose some environmental and safety hazards. Wells may provide a conduit for migration of fluids, such as oil and/or gas, formation waters and hydrogen sulphide to migrate through or around the well bore. The wells should be properly plugged and abandoned to reduce the risks of any sort of leakage and seepage. Many times, prolonged delays may increase plugging costs due to deterioration of well equipment, casing corrosion and problems caused by debris falling into the well bore.

When approaching unknown wells, caution must be taken to ensure your safety and those of others around you. Some of the wells may contain pressurized natural gas and or hydrogen sulphide. Only a small portion of the well is visible at surface, and most of the well is below ground, where it is subjected to many different subsurface formations and fluids.

Check databases to see if there is a record of former water well or oil and gas well on the property. OGSR Library has database for oil and gas wells and can be accessed on the mapping application for any address. Some of the signs of a former oil and gas well on the property include, pipe sticking out of ground, gas venting through or around the sticking pipe, flowing water or a constant wet area, black area or dead vegetation, hydrogen sulphide smell, unexplained wooden or concrete slabs, evidence of tanks or pipelines in the area. Engage a qualified professional to assess the site, hazards and recommend a course of action.

Become familiar with the regulatory requirements under the Oil, Gas and Salt Resources Act and the Environmental Protection Act regarding any work to be undertaken on the wells. A well licence is required for working on any suspected oil and gas well. With a professionally designed well plugging program and prudent well plugging techniques, wells can be left in environmentally sound and safe manner.

BLOCK 2 – Hydrogen

Dru Heagle

CanmetENERGY

Dru Heagle is a Research Scientist in the Subsurface Energy Technology Group at Canmet Energy in Ottawa. The group works on geological CO2 storage in Ontario and Atlantic Canada, geothermal energy in the north, and underground hydrogen storage in Canada. Dru went to the University of Waterloo and the University of Calgary and has worked on a range of subsurface project including:

- improving oil and gas recovery from tight formations,
- improving well abandonment techniques,
- geological CO2 storage in Ontario,
- and underground hydrogen storage.

He has more than 20 years of geoscience experience in Ontario, working with academic, industrial, and municipal organizations in Ontario to solve geoscience-related challenges in the province.

NOTES

Dru Heagle - Abstract

Characterizing Hydrogen Dynamics for Potential Underground Hydrogen Storage in Ontario

Hydrogen gas will be used as a clean, low-carbon energy source to lower our carbon footprint and hydrogen production projections in Canada exceed 500 Mt in 2050. Underground Hydrogen Storage (UHS) is the preferred approach to safely store hydrogen at scales large enough to meet economic demand. UHS in salt caverns has been proven in the UK, the US, and salt caverns are used for natural gas storage in several provinces in Canada (NRCAN, 2020). However, salt caverns are not ubiquitous in Canada, creating a need to investigate other types of reservoirs, such as depleted oil and gas reservoirs and saline aquifers. Hydrogen gas molecules have unique physical and chemical properties. How the gas interacts with rocks and fluids must be understood before hydrogen can be safely stored. We must conduct fundamental research to determine if Canadian oil or gas reservoirs and saline aquifers are capable of safely and economically storing hydrogen. This presentation discusses current UHS research at Canmet Energy Ottawa to develop codes and standards for subsurface hydrogen storage and to quantify selected processes leading to hydrogen loss from depleted oil and gas reservoirs.

Dr. Philip R. Walsh
Professor, Entrepreneurship and Strategy
Ted Rogers School of Management
Principal Investigator - TMU Center for Urban Energy

Dr. Philip Walsh is a Professional Geoscientist and a Professor of Entrepreneurship and Strategy at the Ted Rogers School of Management. Phil has over 40 years of energy industry experience as a geologist and geophysicist with a significant amount of that time spent in the Ontario oil and gas industry. He has been involved in a number of exploration and natural gas storage projects in the province and continues to provide consulting services to energy companies and regulators to this day. His position at the Center for Urban Energy at TMU, formerly Ryerson University, involves research in the commercialization and adoption of sustainable innovation. In addition to being a registered professional geoscientist in Ontario, Phil is a member of the Society of Petroleum Engineers, the International Association of Energy Economics, and the Geoscience Energy Society of Great Britain.

NOTES

Dr. Philip R. Walsh - Abstract

Planning for the "Energy Transition" - What does this mean for the future of Ontario's oil and gas industry?

Continued societal and political pressures to de-carbonize the global energy industry may have significant implications for today's oil and gas producers. It should not be expected that oil and gas demand will disappear completely. However, if governments follow through on their climate pledges and related energy policies it is expected that by 2050 global demand for oil and gas will only be 45 percent of what that demand is currently. Accordingly, oil and gas producers are considering their involvement in an ongoing energy transition to cleaner fuels. What will that transition look like and more specifically what will that mean for the future of Ontario's oil and gas industry? This presentation will provide insight into that transition and highlight opportunities for oil and gas producers in Ontario.

David R. Thompson

Lonquist & Co., LLC

David Thompson is President of Northern Cross Energy Limited, a company he founded in 1984. The company is a fully integrated natural gas company which owns and operates 5 producing pinnacles reefs along with associated production, processing, pipelines and distribution facilities located in northern Huron County, Ontario. He is also President and CEO of Eavor Yukon Inc., a Yukon Company founded to develop large scale geothermal power and thermal energy projects in the Yukon, Canada. David has broad experience in clean and renewable power projects, including high efficiency gas fired generation, wind and solar power. He was a founder and CEO of Port Albert Wind Farms and also a founder and past Chairman of Next Hydrogen Corporation, which has researched, developed and now commercialized grid scale electrolysers for the production of green hydrogen from surplus renewable power.

David graduated in engineering from Queen's University and has more than 40 years of experience in the broader energy industry in Canada and internationally. Mr Thompson received the ICD.D professional designation from the Institute of Corporate Directors in 2014.

David has served on the board of many business and community organizations, including the Ontario Petroleum Institute. He is currently serves as an associate with Creative Destruction Labs, mentoring start up companies from across North America in the Energy stream.

NOTES

David R. Thompson – Abstract

Storage of Hydrogen in a Depleted Natural Gas Reservoir in Ontario

Hydrogen has long been seen as a pathway to carbon free renewable energy.

It can also be a long term energy storage medium.

Grid scale water electrolysers can respond power demand variations and convert surplus renewable energy to hydrogen.

To be an effective method of energy management large scale, long term storage is required.

In the near term, the storage must have an efficient interface with existing natural gas and electric power grids.

A proposal for underground hydrogen storage in existing depleted pinnacle reefs in Ontario will be presented along with a possible demonstration project.

BLOCK 3 – Cambrian & Carbon Capture, Utilization, and Sequestration (CCUS)

Richard Jackson, Lauren Madronich, & Robert Walsh
Geofirma Engineering Ltd.

Richard Jackson

Richard Jackson is a Fellow with Geofirma Engineering and lives in the Waterloo Region. He worked with Environment Canada as a hydrogeologist and in Texas doing chemical flooding. He was principal author with Robert Walsh and Lauren Madronich of a report released this Spring by Environment & Climate Change Canada on potential geological CO2 reservoirs in central and eastern Canada.

Lauren Madronich

Lauren Madronich has an MSc from the University of Calgary in structural geology and lives in Cochrane, Alberta. She has undertaken research with uCalgary and the GSC on the tectonostratraphic evolution of the Cambrian Fm. across North America.

Robert Walsh

Robert Walsh is a geological engineering consultant based with Geofirma in Ottawa with broad experience in numerical modeling of subsurface processes. He studied Civil Engineering at the University of Alberta and continued with graduate studies in Germany. More recently, Dr. Walsh has had a leading role in a multi-year effort to model the effect of increased delta pressure in a large number of gas storage reservoirs in SW Ontario. He leads Geofirma's geological CO2 storage programme.

NOTES

Richard Jackson PhD., P.Eng., FGC(Hon) and Robert Walsh- Abstract

The Hydrogeological Challenge of Geological CO_2 Storage in the Ontario Cambrian Fm.

R.E. Jackson
Geofirma Engineering, Heidelberg, Ontario, Canada

L.I. Madronich
Geofirma Engineering, Cochrane, Alberta, Canada

R. Walsh
Geofirma Engineering, Ottawa, Ontario, Canada

Assuming that the hydrogeological requirements for geological CO2 storage (GCS) in SW Ontario follow CSA Standard Z741-12, the Cambrian Formation along the north shore of Lake Erie will be the principal target of hydrogeological investigations. However, few boreholes have been drilled into the Cambrian and even fewer have available testing data. As a result, much remains unknown of the hydrogeological and petrophysical properties that will govern the migration and trapping of CO2 injected into Cambrian sandstone aquifer sections. Offshore petroleum exploration cores from beneath Lake Erie yield permeabilities of 100 millidarcies (K~10-6 m/s) associated with porosities in the range 15-20%. The extent of such permeable sections beneath the thinner onshore Cambrian is unknown. Regionally, basic hydrogeological parameters for predicting the pressure response – transmissivity and storativity – are also unknown and await interwell tests. A related uncertainty is the gas saturation within the sandstone layers, which will affect the compressibility of pore fluids in the sandstone aquifer. This may profoundly alter the extent of the pressurized area surrounding each injection well. Preliminary simulations with TOUGH3-ECO2M indicate that just 5% residual gas saturation will substantially decrease the lateral extent of the pressure front over 20 or more years of injection. Pressurization will be the primary influence on the interwell spacing of injection wells. Our working hypothesis is that each vertical injector will have an injectivity of ~200 kT/yr, about half that of the early rates of each of the three Quest injectors in the basal Cambrian sands of Alberta.

Jacob Wright
Weatherford

Jacob Wright is a Senior Geoscientist and the North American manager for the Interpretation and Evaluation Services (IES) department within Weatherford. He graduated with a Bachelor of Science in Geology from Texas A&M University. He has 13 years of experience, starting as a wireline Field Specialist. As a Well Integrity subject matter expert, he has provided technical support on a global scale and makes knowledge sharing a fundamental part of his career.

NOTES

Jacob Wright - Abstract

New Energy Solutions for CCUS

Renewable energies and Carbon Capture technology are revolutionizing the energy sector while bringing new challenges to today's energy operator. Among these new challenges is the potential impact to well integrity, an aspect of underground storage that is vital to its success and sustainability. Whether repurposing existing wells or planning new projects, a detailed picture of the overlying formation, caprock and reservoir is necessary to identify threats to overall well Integrity and operational efficiency. This presentation breaks down Well Integrity and what role it plays in the downhole storage environment.

Dickson Lee

Big Guns Energy Services Inc. (BGES)

Dickson holds the dual roles of Chief Executive Officer and Chief Technical Officer at Big Guns Energy Services Inc., leveraging 24 years of specialized experience in the upstream oil & gas sector. His technical expertise encompasses caprock integrity evaluation, core geotechnical lab testing, in-situ stress testing, injectivity tests, and logging for diverse applications such as CCUS, enhanced oil recovery projects, subsurface storage, and solution mining. Additionally, he serves as a member of the technical committee for CSA Z341 for storage of hydrocarbons in underground formations.

Dickson has co-authored the paper "Practical Approach to Caprock Analysis," published by the Society of Petroleum Engineers. He has also contributed to the paper "Innovative Mechanical Integrity Tests for Solution-mined Caverns Using Distributed Temperature Sensing (DTS) Technology," published by the Solution Mining Research Institute, and is the inventor of this patented system.

He holds registration as a Professional Engineer in Canada, a Chartered Professional Engineer in Australia, and is recognized as an International Professional Engineer. His academic credentials include a Master's degree in Petroleum Engineering from the University of New South Wales, a Master's degree in Business Administration, and a Bachelor's degree in Mechanical/Manufacturing Engineering from the University of Calgary.

NOTES

Dickson Lee - Abstract

Strategic Workflow for CCS Subsurface Evaluation

Moving towards a sustainable future entails navigating new territories, necessitating systematic planning, meticulous evaluations, and innovative approaches. In the realm of carbon capture and storage (CCS), assessing subsurface storage and containment is vital to meet three fundamental requirements: capacity, injectivity, and containment. Risks such as CO2 leakage, induced seismicity, and related environmental, health and safety concerns emphasize the need for rigorous evaluation methodologies.

Our proposed evaluation workflow aligns with and incorporates principles from the CSA Z741 standard for Geological Storage of Carbon Dioxide and the US Department of Energy NRAP Recommended Practices for Containment Assurance and Leakage Risk. This structured approach comprises five phases: Geological Studies (Site Screening & Selection), In-situ Reservoir Testing, Site Characterization, Containment Studies, and Computer Modelling.

During site screening and selection, prospective sites are identified and evaluated to determine the most promising candidates for further assessment. It incorporates geological evaluation, land use considerations, analysis of existing data, and basic geomodelling. Subsequently, in-situ reservoir tests offer valuable insights into formation permeability, continuity, boundaries and connectivity.

Site characterization entails analysis of the geology, geochemistry, and geomechanics of the storage formation and the caprocks, as well as any existing wells. Further containment studies, including in-situ testing or geotechnical lab testing, are essential to assess seal integrity and migration pathways.

As part of a comprehensive site characterization, various models are developed to simulate different aspects of the subsurface system. These include geological static models, reservoir models, geochemical models, and geomechanical models. The models will rely on actual test data as inputs to reduce uncertainty and are designed to predict CO2 movement, assess containment integrity, and evaluate potential risks such as induced seismicity.

The workflow is iterative, continuously refined with new data to ensure long-term containment and safety. By incorporating robust evaluation methodologies, this workflow contributes to the success and sustainability of CCS initiatives, facilitating the transition to a low-carbon future.

Allan R. Phillips
Department of Earth Sciences, The University of Western Ontario

Allan Phillips is a consulting geologist and president of the Clinton-Medina Group. Just weeks after receiving his HBSc degree in Geological Sciences from Brock University he was working as a wellsite geologist in the middle of Lake Erie. Today his career has gone full circle, and he is back working on the Paleozoic geology of southwestern Ontario. His career has spanned over four decades and allowed him to explore for oil and gas in several basins in Canada and northeastern United States. In his quest to better understand these complex reservoirs he has logged many kilometers of core and drill cuttings. Lithologically these rocks have ranged from clastics, carbonates, evaporites to unconventional reservoirs in mudstones and shales. This career path has taken a detour in recent years and the reservoir evaluation studies are now also focused on storage potential. Today he is looking at putting carbon and other products back into underground reservoirs. Most recently he has been able to share his experience and expertise on carbonate and clastic reservoirs in southwestern Ontario with the next generation of geoscientists as an adjunct research professor at the University of Western Ontario.

NOTES

Allan R. Phillips

Revisiting the Cambrian Stratigraphy of Southwestern Ontario, An Update

Allan R. Phillips (Department of Earth Sciences, The University of Western Ontario)
Frank R. Brunton (Earth Resources and Geoscience Mapping Section, Ontario Geological Survey)
Kei H. Yeung (Earth Resources and Geoscience Mapping Section, Ontario Geological Survey)

In early 2022 the Ontario Geologic Survey embarked on Project-22-004 to map the basal Paleozoic (Cambrian-Lower Ordovician age) strata in the subsurface of SW Ontario. The stratigraphic succession predominately consists of sandstones and dolostones that are penetrated by oil and gas exploration wells and deep stratigraphic cores. The project has three main goals. 1) to develop a robust stratigraphic scheme for the Cambrian in SW Ontario using all available data sources (including core, geophysical logs, drill cuttings) and as applicable, modern analytical techniques including petrography, well test data and standard core analysis. 2) undertake lithofacies descriptions (core, cuttings and select thin sections) in order to define formational-rank contacts using both rock and geophysical characteristics. 3) Create a series of cross sections and maps that will be used to illustrate the distribution of Cambrian units across SW Ontario. This is an update on the progress of this project.

BLOCK 4 – Cambrian Core Workshop

Ian Colquhoun
Consultant

Ian received his BSc and MSc in Geology from Brock University in St. Catharines Ontario, studying the geology and geochemistry of the Trenton-Black River Group carbonates of SW Ontario. He completed a PhD in Geology on the reservoir characterization of the Oil Sands deposits at Cold Lake and Southern Primrose areas of Alberta collaborating with Imperial Oil and Amoco Petroleum at Western University. Ian has authored papers published in the OPI Gold Volumes and has presented core workshops on the Trenton-Black River Group hydrothermal dolomite oil play in SW Ontario for the OPI, AAPG and PTTC.

Ian began his career working as a well-site geologist for Pembina Exploration as part of their exploration and development of on-shore oil pools and off-shore Lake Erie gas pools. He has worked for more than 25 years as an exploration and development geologist in SW Ontario for both private and public companies, spent some time in the Gulf Coast of Louisiana and Texas, and in Michigan assessing the economic viability of the potash deposits in the Michigan Basin. Ian is currently working as a prospect generator with ALPX Energy Canada ULC to explore and develop oil and gas deposits in SW Ontario.

NOTES

Ian Colquhoun

Middle Ordovician and Cambrian-aged sediments, Southwestern Ontario

Cambrian sediments were deposited in SW Ontario between ~539 mya and 485 mya during the Sauk Transgression. The Sauk Transgression was responsible for the flooding of coastal Laurentia (North America) and the deposition of Cambrian-aged sediments within the Michigan and Appalachian Basins. Previous research described the depositional facies along Eastern Laurentia as sandstones near the paleo-shoreline, a broad area of limestones, and shales representing deeper water sediments farther offshore along the carbonate platform.

The Sauk Transgression was made up of smaller cycles of transgression and regression, which led to cyclic deposition of sandstones, sandy limestones, and limestones of Cambrian and Middle Ordovician age across SW Ontario, and these have been described from core 1130 of T012159. Core 1130 records sediments with textures and features that provide insight into the local depositional environments and their early burial history. Logs and cores taken from oil and gas exploration wells were used to generate geologic cross-sections that demonstrate an active early basin with the development of horsts and grabens, which affected the local and regional thickness of these sediments. Evaluation of sedimentary units described on stratigraphic and structural cross-sections reveals an interplay between deposition and fault movement, which affected thickening of the sediments within local and regional scale structures. Local structures are important for oil and gas exploration whereas regional scale structures have potential for their future use as large storage container(s) for the disposition of supercritical liquid CO2, soon to be captured from industrial operations as part of their decarbonization efforts across SW Ontario.

Detailed descriptions of these sediments in core allowed this author to interpret cycles of deposition that can be assigned to a sedimentary unit and to formation, where this core workshop maintains the historical nomenclature but records distinct depositional units within the Eau Claire and Mount Simon formations.

Exhibitors

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Baker Hughes is an energy technology company that provides solutions to energy and industrial customers worldwide.

Conducting business in over 120 countries and approximately 58,000 employees, we design, manufacture, and deliver leading technology solutions for our customers. Powered by the industry's only end-to-end technology portfolio, and enabled by our people and scale, we drive productivity and improve outcomes for ourselves and our customers.

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BGES (Big Guns Energy Services Inc.)

BGES (Big Guns Energy Services Inc.) is a leading provider of specialized in-situ reservoir testing and subsurface containment evaluation. In 2023, our expertise in Geologic Carbon Sequestration was featured in a cover story. Further accolades include being named Company of the Year in 2022, receiving the Oil & Gas Award, and earning a place among the Top 200 companies by Alberta Oil Magazine.

Since our inception in 1996, BGES has been at the forefront of applying science to prevent safety, environmental, and financial calamities. Our approach is underpinned by a specialized, multidisciplinary team that successfully narrows the gap between concept and implementation. This strategy not only optimizes our in-house operations but also pushes the boundaries, with a keen focus on innovations.

With a deep specialization in CCUS, Energy Storage, Unconventional Resources, and Oilsands, BGES has conducted field operations across Canada, complemented by a dedicated geotechnical lab in Alberta. Our company's success is attributed to a seamless integration of operational integrity and technical prowess, led by a leadership team with decades of experience in geoscience, geomechanics, and engineering, addressing some of the industry's most complex challenges.

Double B Well Services

Double B Well Services Ltd. was founded in 2013 by Ben Barnes, a Petroleum Engineering Technologist and the fifth generation of his family to be involved in oil production and well servicing in the historic Ontario oil and petrochemical industry.

Double B Well Services Ltd. was formed to provide local expertise tailored to the unique underground hydrocarbon storage industry of Southern Ontario, mainly centered around Sarnia and Lambton County.

Services provided include onsite wellsite supervision, workover and testing program development and engineering, project management, and equipment sourcing.

Building on Ben's experience working with his Father completing over 100 oil and gas well abandonments in Southern Ontario, Double B Well Services Ltd. also offers a complete one-stop source for oil and gas well abandonments from program development to completion. Our modern equipment and techniques paired with historical knowledge, insights and decades of experience are specially tailored to the wide variety and unique challenges encountered with Ontario's historic and century old oil and gas wells.

Double B Well Services Ltd. also provides experienced crews, well service rigs, fluid injection pumps, pipe handling, well control equipment and services specifically designed for geological investigation and testing projects.

Ben Barnes, President

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Elexco

Elexco is a full service land company providing land consulting and land administration services for the renewable energy, oil and gas, utility and telecommunication industries in North America. Services include land acquisitions, land negotiations, right of way, oil and gas leasing, easements, title curative, land registration, GIS services, customized mapping and seismic permitting.

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Hetek Solutions Inc.

Hetek, a leading GAS and Water Leak Detection service provider, is driven by a singular purpose: "keeping people safe in the most worry-free way possible" and has guided us through 65 years of serving Canada's gas utilities, water utilities, municipalities, and the midstream and upstream oil and gas sector. The loyalty of our customers helped us become one of Canada's primary vendors for both Gas and Water leak detection products and services to these sectors and expanding to the United States locations.

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Ministry of Natural Resources and Forestry

The very first commercial oil production in North America started in Ontario in 1858. Since that time, many tens of thousands of wells have been drilled in the province, predominantly in southern Ontario. The Ministry of Natural Resources and Forestry's Petroleum Operations Section (POS) ensures compliance with the Oil, Gas and Salt Resources Act, its regulations and the provincial operating standards through issuing licences and approvals, and inspection. This framework provides oversight for the exploration, development and decommissioning of wells and works associated with oil, gas, solution-mined salt and underground storage resource-related activities (e.g., hydrocarbons, compressed air, carbon dioxide), to ensure these regulated activities are done in a safe, environmentally responsible and efficient manner.

OGSR Library

https://www.ogsrlibrary.com/

The management of Ontario petroleum well data by the Oil, Gas and Salt Resources (OGSR) Library is now in its 26th year and represents a rare case of an industry-funded petroleum data centre. Collection of oil well data in the Province occurred shortly after the first hand-dug well of 1858. Government management of public petroleum well data was handed over to the industry to be maintained in trust in 1998.

The OGSR Library has prioritized the digitization and modernization of the data catalogue to provide maximum value to industry. In response to these initiatives, industry and government partners have engaged with the Library on more complex and innovative projects that would not have been possible otherwise. The Library has also engaged with data users outside of the traditional petroleum industry by highlighting the applicability of petroleum data to Universities, environmental consultants, and groundwater researchers, evolving the Library into a geoscience research centre.

Oil Museum of Canada

The Oil Museum of Canada, National Historic Site is a non-profit museum, owned and operated by the County of Lambton. We preserve the site of the very first commercial oil well of North America, dug by James Miller Williams in 1858. At the 100-year anniversary, a committee of community and industry support gathered. Representatives from all over the county and oil industry created the Oil Springs Museum Committee. The Oil Museum of Canada opened to the public in 1960.

Oil Springs received a National Historic Site designation in 1925 from the Historic Sites and Monuments Board of Canada. The Museum is located on the site of a rare industrial landscape that marks the beginnings of the oil industry in Canada. This site is credited with a handful of national and international achievements. Registration of the world's first petroleum company, first commercial oil well in North America, first commercial oil field in the world, and first oil and gas gushers in Canada, to name a few. In 2006, the Historic Sites and Monuments Board of Canada cleared up the boundaries of this designation. Its revision now includes all the original oil field. Both the museum and Fairbank Oil Fields make up this national designation. The first commercial oil well dug by James Miller Williams in 1858 is on the Oil Museum of Canada's grounds. The first gusher struck by John Shaw in 1861 is on the adjacent Fairbank Oil Fields.

The Oil Museum of Canada collaborated with community and planning stakeholders in 2010. Together we achieved the designation of Ontario's first Industrial Heritage Conservation District.

In 2017, we partnered with Fairbank Oil Fields to ask Parks Canada to include our sites on the Tentative World Heritage Sites List. This would ultimately lead to UNESCO World Heritage Designation. Unfortunately, we were not successful. Feedback from this application is supporting future paths as we expect our reapplication in 2027.

The Museum and outdoor exhibit buildings contain a range of petroleum industry artifacts, interactive exhibits, fascinating stories, intriguing photographs and more! The Museum grounds are made up of seven buildings situated on 10 acres of land. Four of our buildings are historic structures and two have Ontario Heritage Designations. Our main building is open year-round and our outbuildings are open for the season from May to October.

Visitors engage with interactive displays, like our International Drillers room, and learn our story through the interpretation of our collection of over 9,000 artifacts and a 12-minute movie called “The Spark that Ignited the World”.

Visitors from all around the world tour our museum to learn our story of innovation and the contributions made by Canada's oil pioneers. They immerse themselves in historical facts about what started the modern petroleum industry.

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- Reservoir Intelligence Network creates effective solutions using data-driven, multidisciplinary analysis.
- Openhole technologies determine asset value and set the stage for efficient production.
- Cased-hole technologies evaluate and diagnose downhole issues.
- Conveyance systems obtain a full spectrum of logs, even in complex wellbores

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By gathering valuable information, our openhole wireline solutions guide the drilling, completion, stimulation, and production decisions that ultimately help you to optimize reservoir performance.

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Our cased-hole wireline solutions provide data that identifies your downhole issues, pinpoints bypassed production, and gives a hyper-accurate well-integrity assessment that helps maximize asset recovery.

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Presentations from EPEX 2018 - 2023 are available on the OGSR Library YouTube channel:

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