

# *Sproule*

## **Sproule Overview**

**Integrated Solutions Across the Energy Value Chain**

CORPORATE OVERVIEW

# About *Sproule*

Sproule, a **global energy consulting** firm, provides in-depth geoscience, engineering expertise, and insights to help clients discover value from worldwide energy resources.

Driven by a 70-year legacy of driving value for clients through independent, expert technical, operational and commercial analysis.

Our perspectives are anchored by a deep bench of subsurface expertise, financial and commercial acumen and operational experience. We bridge the technical and commercial aspects driving decisions and help clients accurately understand value drivers, manage risk and optimize business decisions.

## Vision

Lead the world in energy knowledge.

## Purpose

Contributing solutions for a reliable, affordable, and sustainable energy system

## Values | GRIT

“Passion and perseverance for long-term, meaningful goals.” (Angela Duckworth, 2016)

### Growth Mindset

Consistently working to improve, learn, and grow

### Responsibility

Accountable and responsible for our actions

### Integrity

Act with the highest level of professionalism

### Trust

Build trust through credibility, reliability, and honesty

# Independent, Experienced Global Experts

Geoscience and engineering technical and commercial expertise in all major energy markets across the globe.



# Independent, Experienced Global Experts



# Practice Areas Designed to Support your Organization

Energy Advisory		Geothermal Advisory	Reservoir Services		Asset Management
<i>Strategic Insights &amp; Analysis &gt;</i>	<i>Net Zero Strategy &gt;</i>	<i>Diversify energy resources&gt;</i>	<i>Technical Insights &amp; Analysis &gt;</i>	<i>Disclosure Compliance &gt;</i>	<i>Operational Insights &amp; Analysis &gt;</i>
Transaction Advisory	Carbon Management	Geothermal Management	Reservoir Characterization	Reserves Certification	Asset Management
<p>Identify and execute acquisitions, maximize economic value, understand investment returns through in-depth technical and market insights</p> <ul style="list-style-type: none"> <li>• M&amp;A Advisory</li> <li>• Technical and Commercial Due Diligence</li> <li>• Market Supply Studies</li> <li>• Expert Witness Testimony</li> <li>• Asset Planning and Portfolio Optimization</li> </ul>	<p>Execute strategic decisions in the context of a rapidly changing world to help navigate key drivers for carbon management and broader ESG considerations</p> <ul style="list-style-type: none"> <li>• Carbon Capture, Utilization and Storage (CCUS)</li> <li>• Carbon Storage Assurance</li> <li>• Carbon Pricing</li> <li>• Sustainability/ESG reports</li> <li>• Benchmarking</li> <li>• Strategic Assessment</li> </ul>	<p>A wide depth of technical and commercial geothermal knowledge, to support the development of sustainable geothermal projects.</p> <ul style="list-style-type: none"> <li>• Wells production management</li> <li>• Geothermal project management</li> <li>• Consultancy and due diligence</li> <li>• Seismic risk management</li> </ul>	<p>Understand reservoir rocks and fluids to accurately characterize pools and plays to increase revenue through efficient and effective recovery techniques.</p> <ul style="list-style-type: none"> <li>• Geological, Geophysical, and Petrophysical Interpretations</li> <li>• Static Reservoir Modelling</li> <li>• Dynamic Reservoir Simulation</li> <li>• Integrated Studies</li> </ul>	<p>Build shareholder confidence and maximize resource-based investments with independent analysis of petroleum volumes and economics.</p> <ul style="list-style-type: none"> <li>• Independent Reserves Certification</li> <li>• Competent Person's Reports</li> <li>• Resource Assessments</li> </ul>	<p>Manage and operate oil and gas assets efficiently by employing best practices and extensive experience to provide custom, responsible, and cost-effective management, delivering on stakeholder objectives.</p> <ul style="list-style-type: none"> <li>• Corporate Strategy</li> <li>• Production /Operations / HSE</li> <li>• Reservoir / Geological and Geophysical Expertise</li> <li>• Land Management</li> <li>• Liability / Regulatory Oversight</li> <li>• Financial / Production Accounting</li> </ul>
Energy Training					

Think energy. Discover value.

# Other decarbonization solutions

# Carbon Management Solutions



## Strategic Assessment

- Position in the market (CCUS market assessment)
- Identify opportunities and risks



## Technical Screening

- CO<sub>2</sub> storage resource assessment
- Defining storage complex
- CO<sub>2</sub> plume evolution & injectivity analytical modelling
- Source-sink analysis
- Opportunity ranking



## Risk Analysis

- Containment risk
- Wellbore leak potential
- Migration pathways
- Geomechanical risk analysis
- Regulatory
- Surface considerations



## Economic Evaluation

- CCS cost forecast
- Infrastructure modelling and optimization
- Carbon price sensitivity
- Sequestration incentive evaluations



## Bespoke Solutions

- GHG regulatory impact assessments
- Measurement, monitoring & verification plans
- Drilling and completion support
- Carbon Intensity analysis
- New Energy Solutions



## Strategy Solution & Execution

- Detailed geomodelling and dynamic simulation and uncertainty analysis
- Appraisal well placement analysis
- Site-specific Feasibility and Design
- Data Acquisition Strategy
- Risk Mitigation Plan
- Strategy development and implementation

# Hydrogen Solutions

## ADVISORY

- Structure hydrogen technology growth plans to adapt with dynamic energy transition market conditions.
- Screening hydrogen investment or M&A opportunities.
- Develop a corporate strategy to incorporate hydrogen into companies energy spectrum.
- Leverage strategic EPC industry partners for hydrogen technology analysis.

## RISK

- Technical and commercial risk identification and mitigation.
  - Benchmarking the regulatory environment associated with hydrogen projects.
- Evaluating hydrogen hub development and risks to success.



H<sub>2</sub>

## MARKET ANALYSIS

- Integration of hydrogen into broader decarbonization portfolio, utilizing life cycle analysis (LCA).
- Hydrogen strategy for internal emissions reduction.
- Associated carbon credit generation and utilization.
- Market-based pricing and export strategies.

## STORAGE/DISTRIBUTION

- Technical and commercial analysis and screening of salt cavern suitability for hydrogen storage.
- Strategy for integration with hydrogen hubs and supply/demand studies.
- Commercial and technical due diligence on carbon sequestration associated with blue hydrogen.
- Ammonia integration for global shipping and economic transportation.



# Global Credentials & Clients

# Global Midstream and LNG Advisory Experience

## Select Mandates

<p>Supply Study for Infrastructure Investment</p> <p><b>Canadian Midstream Company</b></p> <p>Canada Ongoing</p>	<p>Upstream and Midstream M&amp;A Due Diligence</p>  <p>Canada 2023</p>	<p>Supply Study for Infrastructure Investment</p> <p><b>Canadian Midstream Company</b></p> <p>Canada 2022</p>	<p>Oil Supply Study</p> <p><b>Major Canadian Midstream Company</b></p> <p>Canada 2022</p>	<p>Oil Supply Study</p> <p><b>Confidential Refinery Developer</b></p> <p>Canada 2021</p>	<p>Heat Content Forecasting Study</p> <p><b>Major Canadian Midstream Company</b></p> <p>Canada 2021</p>	<p>Supply Study for Infrastructure Investment</p> <p><b>Canadian Midstream Company</b></p> <p>Canada 2020</p>
Supply study and due diligence for a gas processing plant	Supply study and infrastructure due diligence for acquisition of Kanata Energy Group	25-year natural gas feedstock forecasting to support facility expansion	15-year supply forecast to support strategic decision regarding retention or disposition of a gas processing plant	15-year supply forecast supporting investment decision to develop crude refinery in Saskatchewan	15-year supply and expected heat content forecast flowing to major Western Canadian pipeline system	30-year natural gas and condensate feedstock forecasting underpinning expansion of Deep Basin processing facility
<p>Integrated LNG project due diligence</p> <p><b>International Resource Developer</b></p> <p>Canada 2019</p>	<p>Pre-FID LNG Supply Review</p> <p><b>LNG Producer</b></p> <p>Africa 2019</p>	<p>Upstream Asset Due Diligence for LNG project</p> <p><b>Major Japanese Utility</b></p> <p>Canada 2019</p>	<p>Upstream and Midstream M&amp;A Due Diligence</p>  <p>Canada 2019</p>	<p>Due Diligence for Midstream Corporate Acquisition</p> <p><b>Private Equity Firm</b></p> <p>Canada 2019</p>	<p>LNG Supply Due Diligence</p>  <p>Australia 2018</p>	<p>Oil Supply Study</p> <p><b>Major Infrastructure Fund</b></p> <p>Canada 2018</p>
Review of upstream and midstream development plans underpinning LNG project investment decision	JV partner upstream and midstream development plan due diligence of pre-FID stage LNG project	Review of upstream and midstream development plans underpinning LNG project investment decision	Supply study and infrastructure due diligence for acquisition of Paramount's Karr Gas Plant	Acquisition advisory to financial sponsor successfully acquiring Canadian midstreamer	Audit of upstream assets supplying Australian LNG export facility	Forecasting oil supply flowing to major Canadian midstream infrastructure.

# CCUS Advisory and CO<sub>2</sub> Storage Experience

## Select Mandates

<p>CO<sub>2</sub> Storage</p> <p><b>Confidential Pension Fund</b></p> <p>Canada Ongoing</p> <p>Full value chain techno-economics analysis and screening of Canadian CCS projects</p>	<p>CO<sub>2</sub> Storage</p> <p> <b>cosia</b></p> <p>Canada Ongoing</p> <p>Global review of CO<sub>2</sub> storage projects, lessons learned, and regulatory policies</p>	<p>CO<sub>2</sub> Storage</p> <p><b>Confidential International Company</b></p> <p>Canada 2023</p> <p>Technical, commercial, and regulatory review of Alberta CCUS hubs for power generation site development</p>	<p>CO<sub>2</sub> Storage</p> <p><b>Confidential Upstream Company</b></p> <p>Latin America Ongoing</p> <p>Pre-feasibility CCS/CCUS study with reservoir simulation, detailed pilot design and economic analysis</p>	<p>CO<sub>2</sub> Storage</p> <p><b>Confidential Canadian Upstream Company</b></p> <p>Canada 2023</p> <p>CO<sub>2</sub> sequestration hub integrated probabilistic static and dynamic uncertainty modelling project</p>	<p>CO<sub>2</sub> Storage</p> <p><b>Confidential Land Holding Company</b></p> <p>Southeast, United States Ongoing</p> <p>Valuation and commercial guidance for a proposed CCS project on company managed land</p>	<p>CO<sub>2</sub> Storage</p> <p> <b>PETROGAS E&amp;P</b></p> <p>Europe Ongoing</p> <p>Seal formation assessment for a CCUS reservoir through integrated analysis</p>
<p>CO<sub>2</sub> Storage</p> <p> <b>wintershall</b></p> <p>Europe 2022</p> <p>Developed a proprietary CO<sub>2</sub> injection modelling tool interconnected with reservoir properties</p>	<p>CO<sub>2</sub> Storage</p> <p><b>Confidential US Upstream Company</b></p> <p>Southeast, United States 2022</p> <p>CO<sub>2</sub> storage modelling project and Monitoring, Reporting &amp; Verification (MRV) report to support 45Q submission</p>	<p>CO<sub>2</sub> Storage</p> <p> <b>ecopetrol</b></p> <p>Latin America 2022</p> <p>CCS Pre-feasibility study with geomodelling, conceptual pilot design, and an economic and regulatory overview</p>	<p>CO<sub>2</sub> Storage</p> <p><b>Confidential Canadian Upstream Company</b></p> <p>Alberta, Canada 2022</p> <p>Prepared key elements of Natural Resources Canada CCS Hub project grant application</p>	<p>CO<sub>2</sub> Storage</p> <p> <b>WOLF MIDSTREAM</b></p> <p>Alberta, Canada 2022</p> <p>CO<sub>2</sub> saline aquifer evaluation to support CCUS Hub Application in Alberta</p>	<p>CO<sub>2</sub> EOR Storage</p> <p> <b>ptrc</b> Petroleum Technology Research Centre</p> <p>Saskatchewan, Canada 2021</p> <p>Study of CO<sub>2</sub>-EOR potential of all major oil reservoirs in Saskatchewan</p>	<p>CO<sub>2</sub> EOR Storage</p> <p><b>Weyburn Unit</b></p> <p>Saskatchewan, Canada 2012 – 2021</p> <p>Reserve and field performance studies for Weyburn Unit, one of the largest global CO<sub>2</sub> miscible floods</p>

# Global Upstream Advisory Experience

## Select Projects

<p>Acquisition Advisory</p> <p><b>Independent Latin America Producer</b></p> <p>Nigeria Ongoing</p>	<p>Acquisition Advisory</p> <p><b>Intermediate Canadian Upstream Company</b></p> <p>Canada Ongoing</p>	<p>Acquisition Advisory</p> <p><b>Independent Latin America Producer</b></p> <p>Colombia 2023</p>	<p>Acquisition Advisory</p> <p><b>Independent Global Producer</b></p> <p>North Sea 2023</p>	<p>Acquisition Advisory</p> <p><b>Independent Global Producer</b></p> <p>Middle East 2023</p>	<p>Acquisition Advisory</p> <p><b>North American Private Equity Fund</b></p> <p>Canada 2023</p>	<p>Acquisition Advisory</p> <p><b>Independent Latin America Producer</b></p> <p>Argentina 2023</p>
<p>Evaluation of the economic parameters and financial modelling associated with an upstream acquisition</p>	<p>Upstream technical due diligence supporting acquisition of Canadian E&amp;P company</p>	<p>Evaluate 1P and 2P reserve estimates, PDP, and development plan to support upstream acquisition</p>	<p>Upstream technical due diligence supporting acquisition of E&amp;P company, including emissions analysis</p>	<p>Upstream technical due diligence supporting acquisition of E&amp;P company, including emissions analysis</p>	<p>Opportunity screening, structuring, technical and financial analysis, and negotiation advice</p>	<p>Evaluate 1P and 2P reserve estimates, PDP, and development plan to support upstream acquisition</p>
<p>Equity Investment Support</p> <p><b>U.S. Fund</b></p> <p>Canada 2023</p>	<p>Acquisition Advisory</p> <p><b>U.S. Private Equity Backed Producer</b></p> <p>U.S. 2023</p>	<p>Comparative Analysis</p> <p><b>Independent Latin America Producer</b></p> <p>Colombia 2023</p>	<p>Acquisition Advisory</p> <p><b>Intermediate Canadian Upstream Company</b></p> <p>Canada 2022</p>	<p>Acquisition Advisory</p> <p><b>North American Private Equity Fund</b></p> <p>Canada 2022</p>	<p>Acquisition Advisory</p> <p><b>Intermediate Canadian Upstream Company</b></p> <p>Canada 2022</p>	<p>Acquisition Advisory</p> <p><b>Intermediate Canadian Upstream Company</b></p> <p>Canada 2022</p>
<p>Geological, engineering and commercial review supporting an increase in an equity position</p>	<p>Technical and deal process advisory for a large-scale asset acquisition</p>	<p>Comparative analysis of E&amp;P companies to screen acquisition targets</p>	<p>Upstream technical due diligence supporting acquisition of Canadian E&amp;P company with net zero strategy planning</p>	<p>Conducted a technical review process to assist in the quantification of asset upside and flag key risks</p>	<p>Evaluate 1P and 2P reserve estimates, PDP, and development plan to support upstream acquisition</p>	<p>Evaluated upstream Montney acquisition assets</p>

# Global Geothermal Advisory Experience

## Select Projects

<p>Acquisition Advisory</p> <p><b>Confidential Private Equity Firm</b></p> <p>Netherlands 2023</p> <p>Acquisition due diligence support for a private equity firm evaluating a geothermal project in South Holland.</p>	<p>Development Project Strategies</p> <p><b>Confidential Geothermal Developer</b></p> <p>United States 2023</p> <p>Strategic advice, geoscience, engineering, and development support for assets in the Southern United States.</p>	<p>Geothermal Advisory</p> <p><b>Confidential Geothermal Developer</b></p> <p>Canada 2023</p> <p>Geoscience, engineering, and technical insights to de-risk geothermal project development.</p>	<p>Geothermal Advisory</p> <p><b>V.O.F. Geothermie De Lier</b></p> <p>Netherlands 2023</p> <p>Complete technical review of geothermal production and strategic advice for a geothermal operation.</p>	<p>Geothermal Advisory</p> <p></p> <p>Netherlands 2022</p> <p>Static geomodel and geological evaluation for prospective geothermal development in Moerdijk-Breda.</p>	<p>Geothermal Advisory</p> <p></p> <p>Netherlands 2022-2023</p> <p>Well design and installation program for double tubing in existing doublet.</p>	<p>Development Project Strategies</p> <p><b>ENERGIE TRANSITIE PARTNERS</b></p> <p>Netherlands Since 2020</p> <p>Geological and Engineering review supporting upstream asset acquisition.</p>
<p>Development Project Strategies</p> <p></p> <p>Netherlands Since 2020</p> <p>Injectivity analyses and engineering advice on double tubing for doublet in Lutteleest.</p>	<p>Development Project Strategies</p> <p> <b>Visser &amp; Smit Hanab</b> brengt energie Zevenbergen</p> <p>Netherlands Since 2019</p> <p>Strategic advice and operational support for first and only shallow geothermal operation in the Netherlands.</p>	<p>Geothermal Advisory</p> <p></p> <p>Netherlands Since 2018</p> <p>Well test, stimulation designs, and execution. Support at the first geothermal doublet for urban heating.</p>	<p>Development Project Strategies</p> <p> <b>Wayland Energy</b></p> <p>Netherlands Since 2018</p> <p>Production analyses and strategic advice on production improvement for geothermal operation.</p>	<p>Project Management</p> <p></p> <p>Netherlands Since 2018</p> <p>Project management for realization geothermal operation and geothermal operations support.</p>	<p>Project Management</p> <p></p> <p>Netherlands Since 2017</p> <p>Geothermal project management for realization of Trias Westland I doublet and production support.</p>	<p>Development Project Strategies</p> <p></p> <p>Netherlands Since 2012</p> <p>Subsurface engineering during realization and exploitation phases as part of the operator Hydreco Geomec.</p>

# An Established Client Base Across Region

**Multi-Country Projects** Support to global oil companies in multi-country projects

**Long-Term Relationships** with key national oil companies around the world

**Global Midstream Advisory**  
Selected Midstream Infrastructure Advisory Projects

**Technical and Commercial**  
Providing technical and commercial decision support for leading heavy oil companies



# Established Global Finance Client Base

**Technical and Commercial**  
Key technical and commercial  
decision support for the world's  
leading financial sponsors



**Trusted Advisor** throughout the  
IPO process and beyond



Note(s): <sup>1</sup>. Select clients only

# Sproule Practice Areas

Offering Expertise across the Energy Value Chain



## Practice Area Leaders



**Sheldon McDonough**

Managing Director, Energy Advisory

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## Services

- M&A and Bid Round Advisory
- Technical and Commercial Due Diligence
- Market Valuations
- Market Supply Studies
- LNG and Midstream Advisory
- Asset Planning and Portfolio Optimization
- Regulatory Strategy and Development
- Expert Witness Testimony

In today’s price environment, making the right business decision has never been more critical.

For energy companies and financial institutions, it can mean the difference between success and failure.

From supporting strategy to securing financing for development plans or finding the right investment opportunity to maximize returns and minimize risk, Sproule’s independent experts have an established track record of advising organizations on mergers and acquisitions, technical due diligence and fair market valuations.

## Select Projects

Acquisition  
Advisory

**North American  
Private Equity  
Fund**

Canada  
Ongoing

Acquisition  
Advisory

**Major Canadian  
Investment Fund**

Canada  
2021

Divestment  
Advisory

**African National  
Energy Company**

Africa  
2021

Heat Content  
Forecasting  
Study

**Major  
Canadian  
Midstream  
Company**

Canada  
2021

Acquisition  
Advisory

**THE CARLYLE GROUP**  
GLOBAL ALTERNATIVE ASSET MANAGEMENT

Colombia  
2020

## Practice Area Leaders



**Sheldon McDonough**  
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**Richard Hares**  
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## Services

- Carbon Capture, Utilization & Storage (CCUS)
- Carbon Storage Assurance
- Carbon Pricing
- Sustainability/ESG reports
- Benchmarking
- Strategic Assessment

Execute strategic decisions to navigate key drivers for carbon management and broader ESG considerations in a rapidly changing world.

Sproule’s expertise straddles across the energy value chain, and our dedicated carbon management practice helps clients navigate opportunities and challenges associated with the carbon economy.

Our combination of technical, operational and commercial expertise provides a complete view of projects and supports solutions consistent with reducing emissions and developing long-term, sustainable strategies.

## Select Projects

CO2 Storage	CO2 Storage	CO2 Storage	CO2 Storage	CO2 EOR Storage
Confidential Major Midstream Company	Confidential Canadian Major Midstream Company	Confidential US Upstream Company	Confidential Major Midstream Company	
Eastern North America 2021-2022	Alberta, Canada 2021	Southeast, United States 2021	Eastern North America 2021	Saskatchewan, Canada 2021

## Practice Area Leaders



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**Meghan Klein**  
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## Services

- Independent Reserves Certification (SPE-PRMS and COGEH)
- Competent Person’s Reports
- Resource Assessments
- Regulatory Disclosure
- Petroleum Economics

Rely on proven technical and commercial expertise to help your organization communicate corporate performance, increase stakeholder confidence, secure financing, and execute corporate strategy.

As trusted advisors, Sproule understands how reserves and resource evaluations provide an essential piece of the equity narrative presented to the investment community. We are committed to providing insightful, accurate, on time, and on budget evaluations for clients across the world.

## Select Projects

<div>Reserves Evaluation</div> <div></div> <div>Canada, UK</div> <div>2021</div>	<div>Reserves Audit</div> <div></div> <div>Mexico</div> <div>2021</div>	<div>Reserves Evaluation</div> <div></div> <div>Canada, UK, West Africa</div> <div>2020</div>	<div>Reserves Audit</div> <div></div> <div>Australia, Myanmar, Malaysia</div> <div>2019</div>	<div>Reserves Evaluation</div> <div></div> <div>Colombia, Bolivia, Vietnam</div> <div>2019</div>
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# Reservoir Characterization

## Practice Area Leaders



**Richard Holst**

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**Alexey Romanov**

Senior Geoscientist

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## Services

- Geophysical Interpretations
- Petrophysical Interpretations
- Static Geological Modeling
- Statistical Analysis and Probabilistic Modelling
- Dynamic Reservoir Modeling/Simulation
- Exploration & Basin Assessment
- Gas Storage Screening & Optimization
- Surface Network & Facilities Modelling
- Integrated Studies

Understanding rocks and fluids and the interaction between them is critical to accurately characterize reservoirs, reduce risk and optimize field development—from exploration to enhanced recovery.

Using the latest technologies and techniques, Sproule experts transform opportunities into cost-effective production. Our professionals can address the most pressing geoscience and engineering challenges facing decision-makers today.

### INTEGRATED SERVICES

Sproule offers experienced project management services—from well testing to field development planning and pilot designs. Established relationships with best-in-class experts across a project life cycle result is the safe execution of critical projects, on time and on budget.

## Select Projects

CO2 EOR  
Reservoir  
Study



USA

2022

Field  
Development  
Studies



Oman

2022

Underground  
Gas Storage  
Optimization



Canada

2021

Thermal EOR  
Reservoir  
Studies



Colombia

2020

Offshore Gas  
Condensate  
Study



SE Asia

2020

## Practice Area Leaders



**Richard Wade**  
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## Services

- Corporate Strategy
- Production and Operations Management
- Reservoir Management
- Geological and Geophysical Management
- Land Management
- Liability Management
- Regulatory Management
- HSE Management
- Financial and Production Accounting

Reducing capital costs and optimizing returns through the entire life cycle of oil and gas assets can be challenging for operators.

Our qualified, experienced and independent professionals provide turnkey asset management services that can help.

Our unique model focuses on stakeholder objectives and delivers industry-leading performance through custom and cost-effective solutions. Our service offering brings staffing, credibility and experience to the project and is a fit-for-purpose solution for smaller and transitional management teams.

## Select Projects

Asset Management	Receivership Management	Receivership Management	Land Royalty Management	Past Receivership
2018-Present	2017-Present	Receiver	E&P company	E&P company
		Canada 2014-Present	2009-Present	Canada 2015-2018

## Practice Area Leaders



**Floris Veeger**  
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## Services

- Strategic Advisory
- Geothermal Project Management
- Production and Operations Management
- Reservoir Management
- Geological and Geophysical Management and consultancy
- Consultancy and Due Diligence
- Geo-hazard Risk Management

A wide depth of technical and commercial geothermal knowledge, to support the development of sustainable geothermal projects.

- Wells production management
- Geothermal project management
- Consultancy and due diligence
- Seismic risk management

## Select Projects

<div>Geothermal Advisory</div> <div></div> <div>2023</div> <div>Geothermal geomodel, geological evaluation, and technical advice for geothermal development in Texas, USA</div>	<div>Development Project Strategies</div> <div></div> <div>Since 2018</div> <div>Production analyses and strategic advice on production improvement for geothermal operation</div>	<div>Development Project Strategies</div> <div></div> <div>Since 2012</div> <div>Subsurface engineering during realization and exploitation phases as part of the operator Aardyn</div>	<div>Technical review</div> <div></div> <div>2021</div> <div>Well test program for 10 exploration wells for national geothermal potential project (SCAN)</div>	<div>Geothermal Advisory</div> <div></div> <div>2022</div> <div>Seismic hazard management strategy and geomodelling geothermal reservoir</div>
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# Sproule Case Studies

Discovering value for clients

# Independent Reserves Certification in Colombia

Global | 2018-2020 | Reserves Certification

A large exploration and production company with regulatory requirements for disclosure on the NYSE required an experienced global reserves evaluation firm to help drive stakeholder confidence. In addition to technical expertise, the scale and scope of the project required exemplary project management skills.

**Large Colombian E&P client**

**10,000 boe/d gross production**

**Assessed waterflood potential for client**

**SEC disclosure requirements**

## Challenges

- Large exploration and production company with regulatory requirements for disclosure on the NYSE.
- The project required significant geophysical expertise, with fields containing multi layered zones that are highly fractured.
- Secondary recovery required to be evaluated for specific fields

## Solution

- Final deliverables provided for NYSE U.S. Securities Exchange Commission (SEC) disclosure.
- Sproule utilized a multi-disciplinary team to understand the reservoir and assign reserves
- Sproule's technical team analyzed the waterflooded reservoir to estimate incremental recovery factors for the secondary recovery.

## Value

- The client received a timely and cost effective independent evaluation of its assets in order to meet SEC disclosure requirements



# Reserves Certification for Onshore Mexico

Mexico | 2019 | Reserves Certification

An onshore operator in Mexico needed independent reserves and resources certification with expertise in assessing geologically complex environments and United Kingdom regulatory requirements.



## Challenges

- One of the largest independent onshore operators in Mexico needed independent reserves and resources certification services within a short timeframe
- The client needed a consulting firm with expertise in assessing geologically complex environments including multi layer zones that are highly fractured, seismic interpretation and with experience in United Kingdom regulatory disclosure.
- The fields, located in Mexico's Burgos, Tampico-Misantla, Veracruz, and Macuspana Basin's are geologically complex.

## Solution

- Sproule evaluated the reserves and resources, validating future potential within a range of uncertainty using SPE-PRMS guidelines
- Seismic interpretation helped book reserves, contingent resources and unlock potential in the operator's prospective resources
- Final deliverables including Competent Person's Report (CPR) supported London Stock Exchange AIM disclosure.

## Value

- Sproule completed the project on time and within a 3 month timeframe.
- Independent evaluation contributed to investor confidence and in line to meet with regulatory requirements of both the United Kingdom (AIM) and Mexican (CNH) regulatory bodies.
- The client's understanding of the reserves and resources processes and how to navigate the UK regulatory system with confidence improved significantly
- The reserves evaluation provided justification to support development/investment opportunities in a key resource-rich region.

# Due Diligence and Field Operations Services Support Corporate Acquisition

Canada | Asset Management

A small venture capital team was looking to purchase strategic high-value assets in the WCSB leveraging the low market cost to maximize returns in the coming years. The small team had funding but needed the technical bandwidth to assess and prioritize opportunities and the ability to run the field operations. Sproule developed a fit for purpose solution allowing the team to successfully complete a corporate acquisition and Sproule continues to manage the assets.

**Lowered G&A costs by 55%**

**Reduced field operating costs by 60%**

**Implemented a four-step process for managing liabilities**

**Decommissioning obligations met in a safe and cost-effective manner**

## Challenges

- Investors required support to evaluate an opportunity, including assessing the condition of the assets and the commercial, technical, financial and environmental risks involved.
- The deal included a capital allotment for the fulfillment of decommissioning obligations.
- The assets were in a remote winter access only area in northern British Columbia.
- Investors required an immediate plan to execute the program.

## Solution

- Sproule completed the due diligence: evaluating land, accounting, field operations, and developing an execution program for the decommissioning obligations.
- Sproule provided an integrated team to run the field operations, engineering, land and accounting functions.
- We implemented a four-step process for managing liabilities.
- Sproule supported creating a trust fund for decommissioning obligations.
- We hired local contractors to ensure the most experienced and knowledgeable team was in place to minimize time and costs.

## Value

- Sproule implemented fit for purpose asset management and field operations services maximizing the value of the acquisition for the client.
- We identified value-add opportunities to increase cash flow and reduce costs, lowering G&A costs by 55% and reducing field operating costs by 60%.
- On behalf of the client, we worked proactively with the BC Oil and Gas Commission and were able to collaborate and share services to further reduce costs.
- Decommissioning obligations were satisfied in a safe and cost-effective manner, on-time and under the allocated budget.

# Transformative Acquisition Enables New Market Entry

Europe | Strategic Advisory

1.3 Tcf in place

\$1.4bn investment  
decision

Supported new market  
entry for portfolio  
diversification

Delivered complex  
offshore analysis

## Challenges

- The complex offshore reservoir was a first-of-a-kind opportunity for the investment firm to enter into a new market, providing a working interest in the project but also increasing investment risk
- With only a small in-house technical team to conduct the analysis, the client needed external geoscience and engineering expertise to determine their bid range based on risk and upside potential, as this was a significant investment that would secure entry into a new market
- The complex investment opportunity required a multi-disciplinary evaluation approach, relying on integrated geological, geophysical, simulation and engineering expertise

## Solution

- Sproule provided a multi-disciplinary team to determine the range of technical risk across the geoscience and engineering disciplines. The five senior professionals averaged more than 20 years of industry experience.
- A phased approach allowed the client to allocate budget to each milestone versus an all-in project – helping them understand the process better and make critical go / no-go decisions along the project lifecycle
- Sproule stress-tested multiple development field scenarios to support the bid process, which required visiting the physical data room overseas as part of the project

## Value

- The client successfully bid on the project and secured the opportunity, diversifying their portfolio
- The firm's investment decision was supported by deep expertise in geology, geophysics, simulation, geomodelling and engineering without having to build an in-house team

# Montney Supply Study Supports Investment Decision

Canada | Strategic Advisory

**250 MMcf per day in  
expected yield**

**Evaluation of a \$500MM  
investment**

**Extending infrastructure  
in a world-class gas play**

**Applying strategy to E&P  
investment decisions**

## Challenges

- Faced with a very short timeline for a decision, the major midstream company needed to value an infrastructure investment opportunity in the Montney play
- The company had to balance the gas supply with the competing plants already in the area to assess market share risk and the volume of material being handled. This would impact the scale and cost of the project and the expected life of the investment based on future production in the area

## Solution

- Sproule technical experts reviewed the production history, completion history, and geologic interpretation of the play, including thermal maturity windows, to create a set of type curves for each maturity window
- The team then created a development inventory for the operator's lands which included some remaining peripheral offsetting lands
- Using the planned plant capacity of solution gas and condensate, Sproule experts then determined how long the plant would stay at capacity given three development scenarios
- In addition, Sproule provided a profitability comparison of this play versus other plays in the operator's portfolio to assess the likelihood of the project moving forward from the operator's perspective

## Value

- The midstream company could reduce the risk of the investment opportunity by addressing critical future development and supply questions

# Multidisciplinary Project Management Team Supports Heavy Oil Field Development

Argentina | Reservoir Characterization

Two heavy oil fields in Argentina

Sproule is leading this large integrated project

Project team consists of internal and external experts

Project is currently in process

## Challenges

- The client requires technical support to develop two heavy oil fields including pilot design and construction in one of the fields. Project components includes:
  - Technical project management
  - Laboratory test program
  - Enhanced oil recovery (EOR) processes and reservoir simulation for heavy oil applications
  - Heavy oil field development plan
  - Thermal pilot design for the reservoir and facilities
  - Thermal pilot execution for the reservoir and facilities

## Solution

- Sproule has assembled a project team that includes internal and external experts
- The project includes field data acquisition (coring) through to pilot construction and commissioning

## Value

- Leveraging established relationships with best-in-class experts across a project life cycle in combination with in-house expertise enables Sproule to provide the necessary technical and project management support, allowing the client to develop the new opportunity

# Investigating Enhanced Oil Recovery in a Complex Reservoir

Colombia | Reservoir Characterization

**Complex geology with  
near vertical producing  
zone**

**Highly faulted and  
heavily fractured  
reservoir**

**Successfully screened  
several EOR  
opportunities**

**Provided valuable  
forecasts for optimizing  
field**

## Challenges

- The client, who was operating an oil field in Colombia, needed to assess the technical feasibility of various secondary and tertiary recovery schemes to increase the ultimate recovery factor of the field
- The reservoir was highly faulted with a deformed anticline; large expanses that were once horizontal were now nearly vertical
- Relatively low oil viscosities had enabled resource development using non-thermal techniques; however, rapid oil rate declines and elevated gas/oil ratios signaled the loss of drive energy, and recovery under primary production was expected to be low

## Solution

- Sproule experts constructed a discrete-fracture geomodel, which was then exported for use in a dual-porosity simulation model
- The simulation model was history matched to performance data, and a calibrated model was used to run numerous secondary and tertiary recovery forecasts
- Infill cases, water flooding and various Enhanced Oil Recovery (EOR) techniques were studied and recovery factors were determined

## Value

- The forecast results provided the necessary information for the client to conduct a detailed economic analysis of the various cases and select the optimal development strategy for the field

# Robust Corporate Training Ensures High Standard of Annual Reserves and Resources Reporting for Petronas

Global | 2017 | Training

Each year, Petronas, a fully integrated oil and gas multinational discloses a summary of the internally generated Annual Review of Petroleum Resources (ARPR) to the global investment community. To ensure the utmost level of quality of the report, the company designed an internal governance structure and system of standards. What they needed next was a robust training program for 700+ colleagues to ensure a consistent approach to classification, categorization and estimation of petroleum resources

**Co-developed a custom training program for the Petronas**

**Trained 700+ individuals**

**Created consistent interpretation of guidance and governance standards**

**Provided competency assessment**

## Challenges

- To ensure the utmost level of quality for the Petronas' ARPR, the company designed an internal governance structure and system of standards modeled on the SPE Petroleum Resources Management System (SPE-PRMS). While similar to SPE-PRMS, the company's standards require increased rigor regarding reserves and resource classification, categorization and estimation.
- With the new reserve and resource classification system, the IOC set out to train +700 technical and financial staff members to increase company-wide consistency and compliance in reserve and resource classification, categorization and estimation.
- The IOC required outside expertise to provide a custom and robust training within an aggressive timeline.

## Solution

- Sproule together with the Petronas' reserve team created a custom training program, using actual project scenarios, and provided guidance on the application of the standards to both conventional and unconventional plays.
- With an in-depth understanding of SPE-PRMS, Sproule could clearly articulate the differences between those standards and those of the IOC's resource management system.
- Training had to take into consideration the needs of both technical and financial professionals, including those with the host government's regulator, a subsidiary operating entity, and third-party and joint-venture operators.

## Value

- Sproule professionals delivered two to three courses every week over approximately two months, ultimately training more than 700 team members. An exam, designed by Sproule and the company, assessed staff competency in the principles, knowledge and application of the standards, with those passing earning certification.
- As a result of the engagement, Petronas now has greater confidence that staff members understand the principles and application of its standards. It also helps ensure that everyone has a consistent interpretation of the guidance and governance standards, and that they apply them in a consistent and compliant manner. Moreover, the program fosters greater confidence in the resource evaluation process and subsequent disclosure to the global investment community.

# CO<sub>2</sub> Sequestration Study to Support Saline Aquifer Hub Proposal for Wolf Midstream

North America | 2022 | Carbon Management

**Assessment of CO<sub>2</sub> sequestration potential to support future sequestration hub project proposal**

**Scenario modelling to evaluate the CO<sub>2</sub> storage potential, injection performance, plume extent, and expected pressure increases in AOI**

**Identified optimal appraisal well location using probabilistic modelling considering uncertainty in key reservoir parameters**

**Provided CO<sub>2</sub> injection appraisal well design, cost, and drilling risk assessment**

## Challenges

- Wolf Midstream (“Wolf”) identified a CO<sub>2</sub> sequestration project in Alberta, Canada, in close proximity to multiple large CO<sub>2</sub> emission sources, existing pipeline infrastructure and a saline aquifer with CO<sub>2</sub> storage potential
- Wolf engaged Sproule for the purpose of supporting a sequestration hub project proposal, including verifying the maximum storage resource potential through geological and reservoir simulation modelling of the area of interest (AOI), and identifying an appraisal well location considering injection requirements, CO<sub>2</sub> plume extents and aquifer pressure increase in the AOI
- Sproule considered geological property uncertainty due to limited well control in the saline aquifer project area
- Numerous injection scenarios were performed to better understand the effect that injection performance had on storage potential, along with CO<sub>2</sub> and pressure plume extent

## Solution

- Wolf Midstream (“Wolf”) identified a CO<sub>2</sub> sequestration project in Alberta, Canada, in close proximity to multiple large CO<sub>2</sub> emission sources, existing pipeline infrastructure and a saline aquifer with CO<sub>2</sub> storage potential
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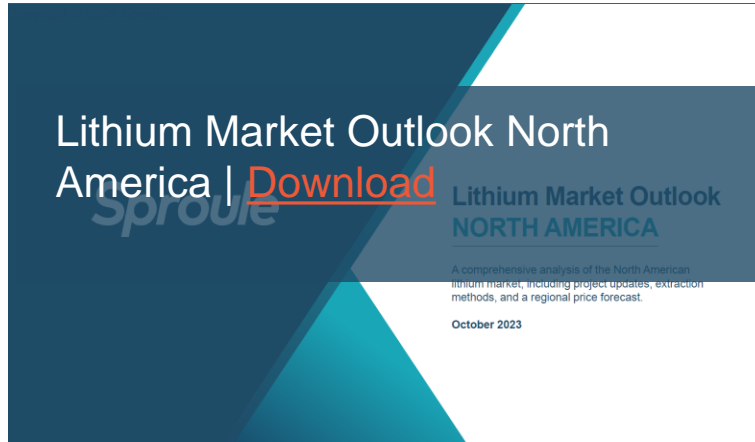
## Value

- Sproule applied their deep subsurface modelling expertise, coupled with their novel integrated saline aquifer geological and numerical simulation-based workflow to significantly advance Wolf’s understanding of the area’s storage potential and key uncertainties
- Sproule recognized the need to consider alternative storage development plans and future adjacent CO<sub>2</sub> sequestration to fully evaluate storage potential and impact on flowing bottom-hole pressures and displaced saline aquifer volumes
- Sproule leveraged its Asset Management business unit to provide a CO<sub>2</sub> appraisal well drilling and completion program, design, costing and risk assessment
- Sproule provided Wolf a thorough analysis of maximum CO<sub>2</sub> storage potential supported by robust geological and numerical modelling, which successfully underpinned a saline aquifer sequestration hub proposal

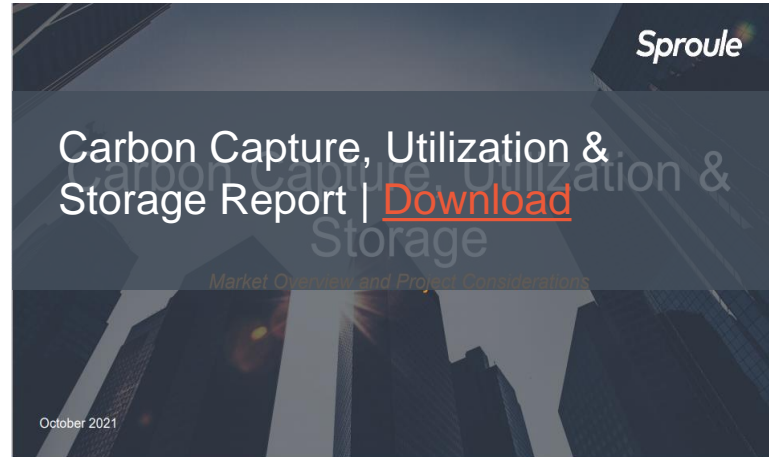


# Access Additional Insights from Sproule

Sproule



US oil and gas companies are potentially subject to state and local taxation. Oil, gas, and other natural resource tax rates vary by state and possibly other political subdivisions such as counties, cities, and municipalities. One common type of tax that states impose on oil and gas companies is severance tax. Severance taxes are imposed on the extraction, production, and sale of non-renewable resources to compensate for the severance (loss) of the resource from the earth's surface. Although not exhaustive, this document summarizes state severance tax rates and other fees related to the oil and gas industry.



In this special market report, Sproule examines the current state of the global CCUS market and its role in achieving net zero emissions, as well as key drivers underpinning a successful CCUS project with a focus on capture costs, geology, and regulatory considerations.



2023 remained a year of recovery for the Latin American energy market, as there were fewer upstream transactions than in 2022. We observed some green shoots in select countries with growing exploration, drilling and production, despite a backdrop of political and social challenges.

sproule.com

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THANK YOU

# Questions

