# Multi-year Aerial Leak Survey of Decommissioned Wells

## 2017-2023

BRITISH COLUMBIA ENERGY REGULATOR

May 2024

# Vision, Mission and Values

## Vision

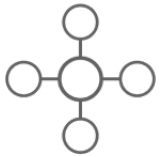
A resilient energy future where B.C.'s energy resource activities are safe, environmentally leading and socially responsible.

## Mission

We regulate the life cycle of energy resource activities in B.C., from site planning to restoration, ensuring activities are undertaken in a manner that:

Protects public safety and the environment

Supports reconciliation with Indigenous peoples and the transition to low-carbon energy



Conserves energy resources

Fosters a sound economy and social well-being

## Values

**Respect** is our commitment to listen, accept and value diverse perspectives.

**Integrity** is our commitment to the principles of fairness, trust and accountability.

**Transparency** is our commitment to be open and provide clear information on decisions, operations and actions.

**Innovation** is our commitment to learn, adapt, act and grow.

**Responsiveness** is our commitment to listening and timely and meaningful action.

# Role of the BC Energy Regulator (BCER)

The British Columbia Energy Regulator oversees the full life cycle of energy resource activities in B.C., from site planning to restoration. We ensure activities are undertaken in a manner that protects public safety and the environment, supports reconciliation with Indigenous peoples, conserves energy resources and fosters a sound economy and social well-being. Our role includes the management of natural gas, hydrogen, ammonia, methanol, oil and aspects of geothermal resources, with an expanded role in carbon capture and storage (CCS).

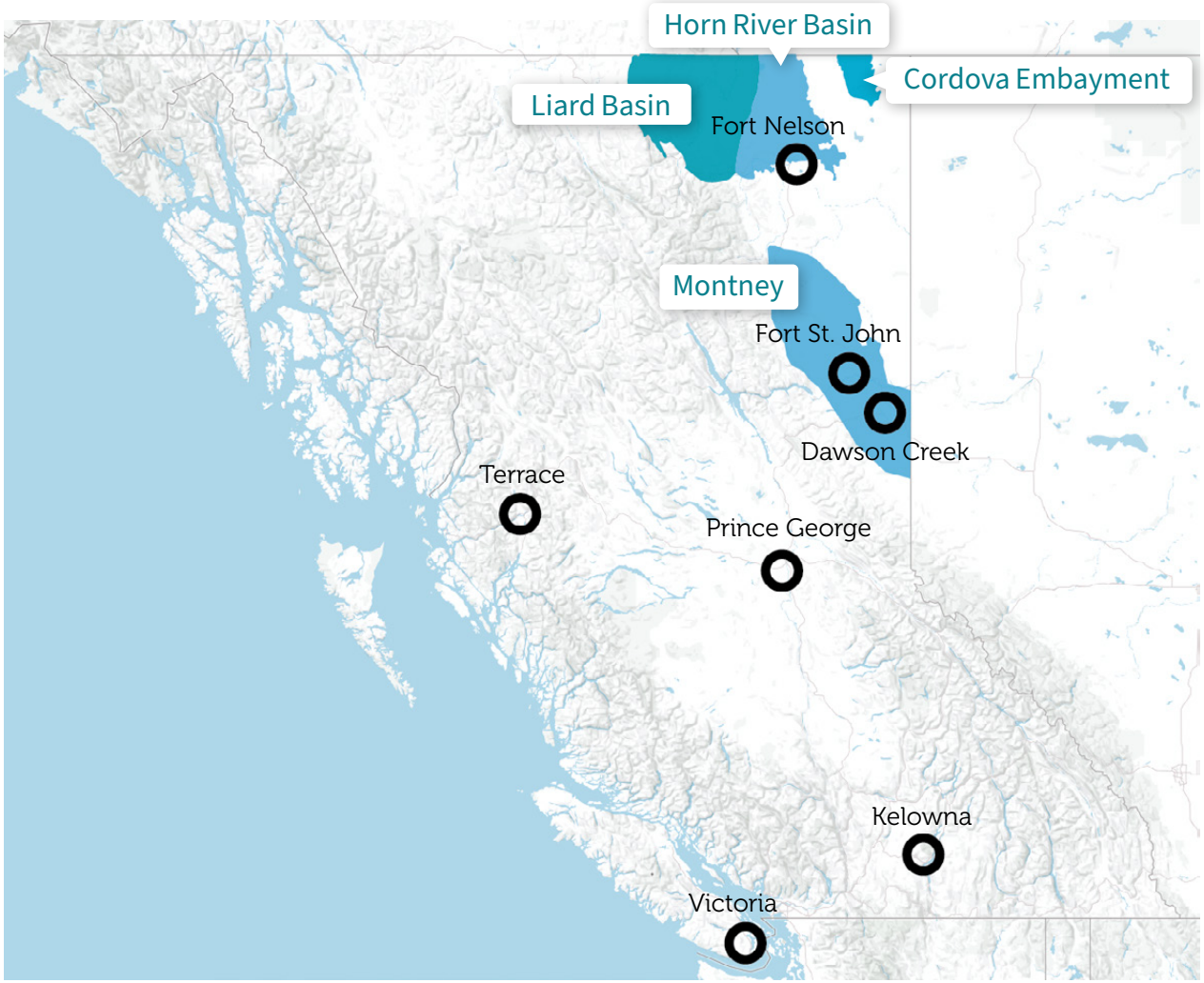
We regulate energy resources through the Energy Resource Activities Act (ERAA) and other associated laws related to heritage conservation, roads, land and water use, forestry, and other natural resources. We work closely with land owners, rights holders, local government, industry, academia and other regulators to gather skills, knowledge and multiple perspectives to evolve our regulatory model.

We respect Indigenous values and seek learning opportunities as we co-develop new processes that we put into practice in all facets of our business and decision-making. We are focused on advancing reconciliation and building trust and apply this in our work with First Nations and Indigenous communities as partners in building B.C.'s energy resource future.

We currently have over 280 employees operating out of seven locations: Fort Nelson, Fort St. John, Dawson Creek, Terrace, Prince George, Kelowna and Victoria. The largest number of employees are in the Fort St. John office.

With over 25 years' dedicated service, we're committed to ensuring safe and responsible energy resource management for British Columbia.

**BC Energy Regulator Office Locations Throughout B.C.**




We acknowledge and respect the many First Nations, each with unique cultures, languages, legal traditions and relationships to the land and water, on whose territories the British Columbia Energy Regulator's work spans.

# Introduction

In 2017, the British Columbia Energy Regulator (BCER) conducted a pilot study to assess the effectiveness of new aerial survey technology in detecting leaks from decommissioned wells. Following the pilot study, the BCER implemented an annual program of surveying decommissioned wells in northeast British Columbia to improve understanding of the likelihood of abandoned well leaks and the long-term risk of methane leaks at decommissioned wellsites.

This annual initiative aligns with two of the BCER's strategic areas of focus: *Restoration, Stewardship & Cumulative Effects* and *Operational Effectiveness & Innovation*. Through this work, the BCER continues to explore emerging technologies and utilize the latest science to effectively manage energy resource activities including well integrity oversight.

The multi-year aerial leak survey program allows the BCER to obtain a representative sampling of decommissioned wells while embracing new, innovative technologies for detecting abandoned well leaks in remote and hard to reach locations, and working to protect the public and the environment. The findings help us to evaluate decommissioning practices and determine whether further regulatory safeguards are necessary to ensure long-term well integrity. The BCER sees the benefits of utilizing this valuable technology in upcoming programs.

# Aerial Survey Methodology

The aerial surveys were conducted using a methane detector mounted on the underside of a helicopter, flying at an altitude of 90–150 metres (300-500 feet) above ground level. The methane detector uses lasers directed downwards to illuminate an area on the ground and is reflected back to the detector. Where methane is present in the path of the beam, the reflection is weaker due to absorption of the laser. The detector can compensate for different atmospheric and ground conditions when surveying the sites.

This survey method allows easy access to sites in very difficult and inaccessible terrain. It's fast, cost-effective and can detect very low concentrations of methane. Lower limits have been consistently found between 0.8 and 1.0 $m^3/d$ with the lowest at 0.4 $m^3/d$. A recent technical report, supported by research and funding from the BC Oil and Gas Research and Innovation Society (BCOGRIS), noted the importance of this program:

> "such surveys and their results are therefore hugely valuable and should, where possible, be continued/expanded to increase knowledge and understanding on integrity of plugged & abandoned wells across B.C. These data can help constrain the incidence rate of failure, quantify any resultant magnitudes of leakage and aid in identification of risk factors associated with development of integrity failure."[1]

[1] HERIOT WATT University, Research Project ES-Wells-2021-02 Technical Report, Towards Optimizing Well Plug and Decommissioning in British Columbia through Data Analytics, Field Investigations and Predictive Modelling - BCOGRIS

# Annual Survey Summaries

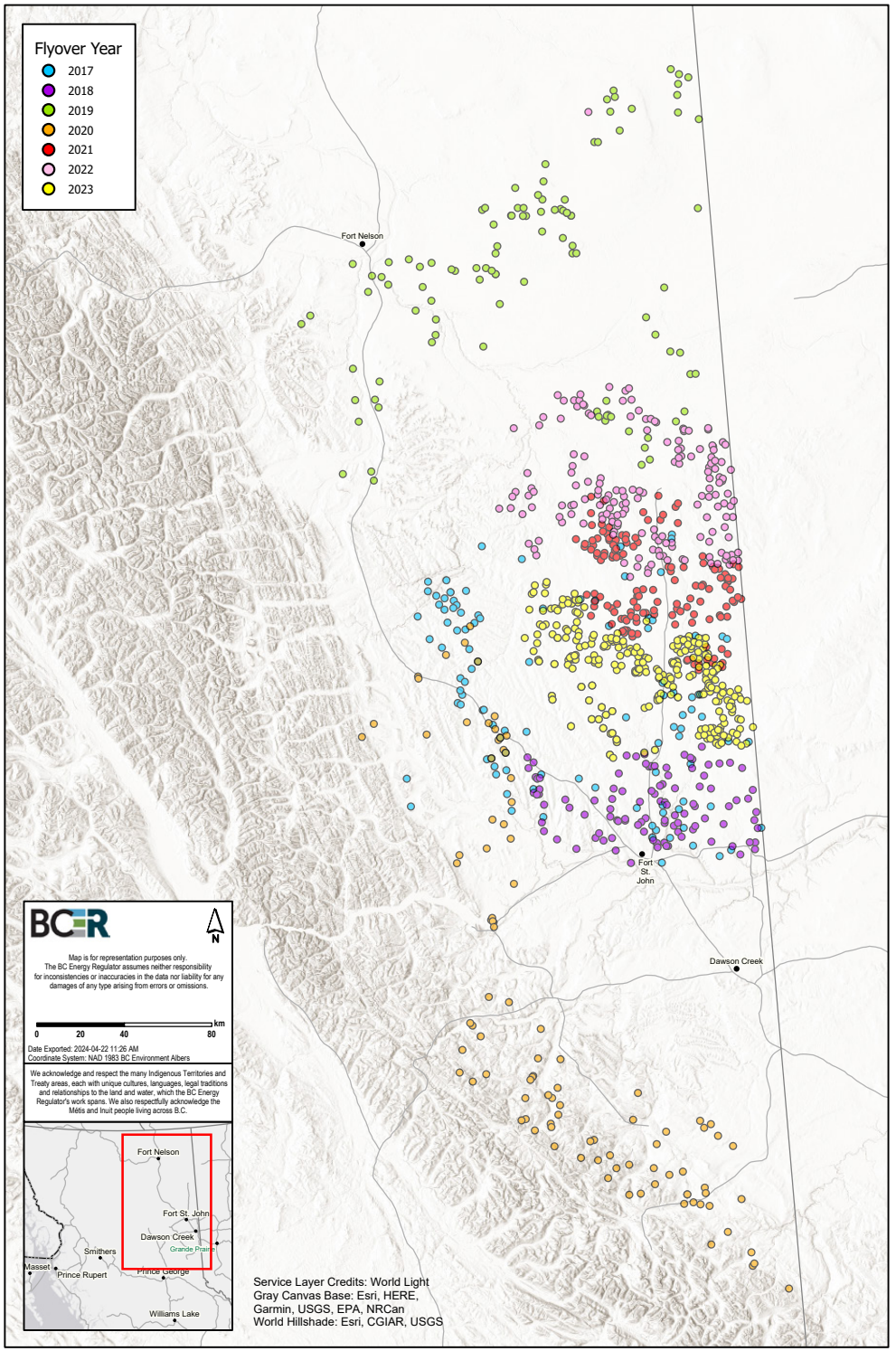
**The 2017 aerial survey** ● focused around Fort St. John and surveyed 105 wells, including non-decommissioned wells with known methane emissions. This subset of known emitting wells were included to evaluate the capabilities of the survey technology. Wells were selected randomly from a number of subgroups, to include open-hole abandonment plugs, wells with a previous history of surface casing vent flows and wells with previously remediated wellbore integrity issues. The aerial survey identified one potential leaking abandoned well. A subsequent investigation determined that the well was not leaking.

**The 2018 aerial survey** ● was conducted around Fort St. John and surveyed 103 decommissioned wells. Out of the population of wells, two sites were noted as potentially having methane emissions. Subsequent inspections confirmed one abandoned well leak and determined the other well was not leaking.

**The 2019 aerial survey** ● targeted an area east of Fort Nelson, surveying 104 decommissioned gas wells, with possible methane detections noted at six well sites. Subsequent inspections confirmed three abandoned well leaks, two well sites with no leaks and the one other well was placed under investigation.

**The 2020 aerial survey** ● was conducted for 98 decommissioned gas wells in the foothills area between Hudson's Hope and the Alberta border. Three well sites had shown initial indications of methane. Subsequent site inspections determined no evidence the wells were leaking.

**Decommission Well Flyover Projects 2017-2023**



**The 2021 aerial survey** ● of 144 decommissioned gas wells was located between Fort St. John and the Milligan Hills area. One location was noted as having a small methane indication, outside the lease area. A subsequent inspection by BCER staff was completed and determined no evidence of the well leaking. Further in 2021, the BCER began information sharing with First Nation communities within the area of the program, notifying them of tentative start dates, the area of inspection, fuel-staging areas and providing a detailed map of survey locations.

**The 2022 aerial survey** ● targeted 373 decommissioned gas wells southeast of Fort Nelson where eight potential methane indications were identified. Subsequent inspections confirmed two abandoned well leaks , two wells that were not leaking and the remaining wellsites are currently under investigation. Non-compliance notices were issued for the required follow-up inspections and remediation plans as warranted.

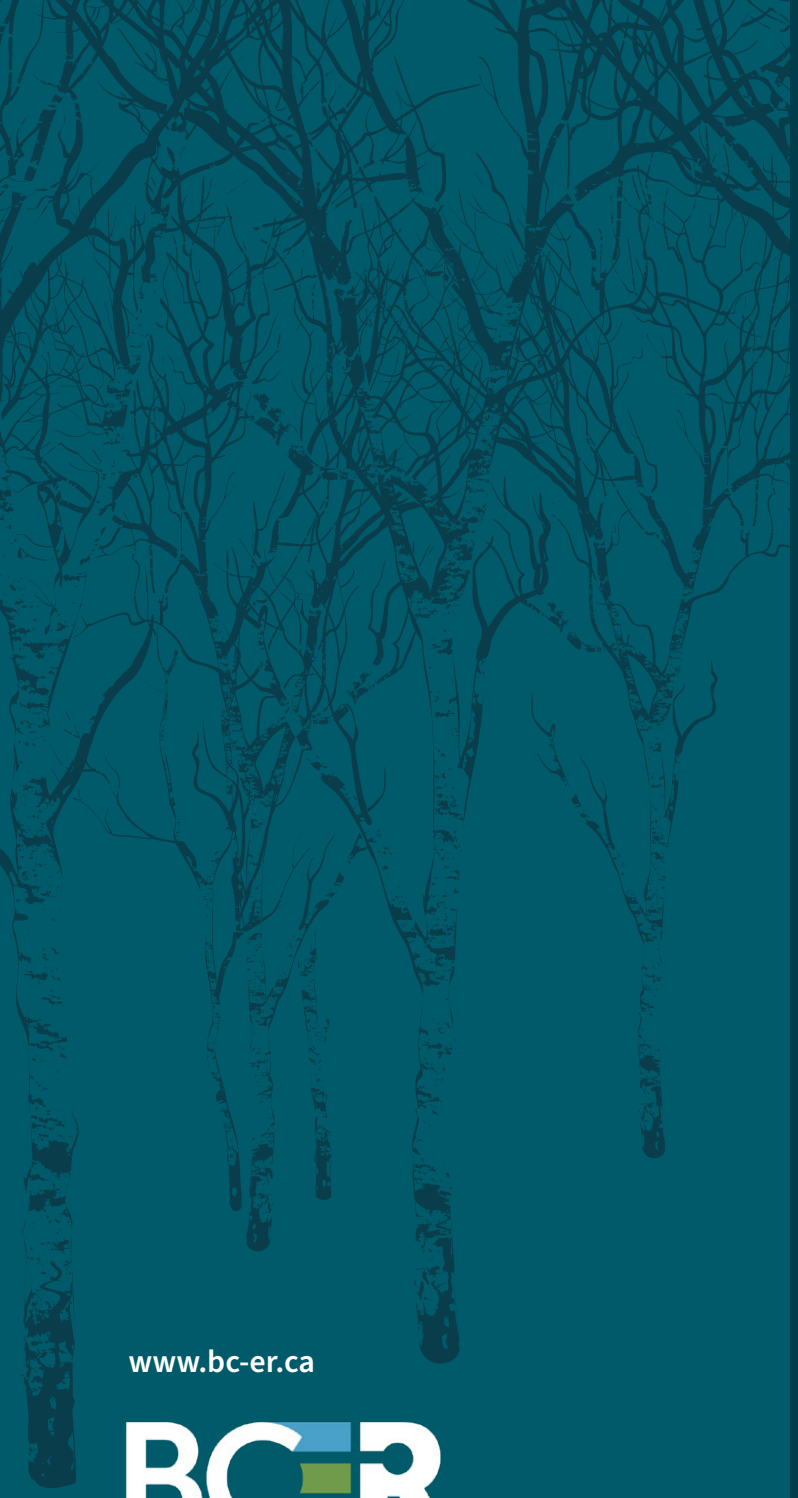
**The 2023 aerial survey** ● was conducted over 294 decommissioned gas wells located north of Fort St. John to Nig Creek and the surrounding Peejay area. Out of the wells analyzed, four sites were noted as potentially having methane emissions. The four wells were subsequently inspected and require further investigations. Permit holders have been notified to conduct follow-up investigations, via the BCER's compliance management system.

The BCER plans to continue its annual program of surveying decommissioned wells in northeast British Columbia in 2024.

## Cumulative Results

A total of 1,221 wells were surveyed aerially between 2017 and 2023, including *non*-decommissioned wells, which were used to validate the technology's suitability. Among the decommissioned wells, we strived for representative sampling across well types and characteristics, including legacy wells, wells with a known surface casing vent flow or wellbore integrity history, over-pressured zones, $H_2S$ content, surface casing set depth or the presence of an open hole abandonment plug. Where an aerial survey indicates a well may be leaking, the BCER conducts a ground inspection. If the BCER discovers evidence or potential evidence of a leaking well, the Regulator notifies the Permit Holder to conduct further investigation, and if a leak is confirmed, conduct repairs. Of the 1,221 aerial surveyed wells, 25 had initial indications of methane leaks. Subsequent inspections of the leaking sites, through ground inspections, confirmed six abandoned well leaks (three of which have been measured thus far at reported release rates of less than 1.0 $m^3/d$), 10 with no methane leaks with nine currently under further investigation.

| Year | # of Wells Surveyed | Initial Methane Indication | Confirmed Abandoned Well Leak | Wellsites Under Further Investigation |
|---|---|---|---|---|
| 2017 | 105 | 1 | 0 | 0 |
| 2018 | 103 | 2 | 1 | 0 |
| 2019 | 104 | 6 | 3 | 1 |
| 2020 | 98 | 3 | 0 | 0 |
| 2021 | 144 | 1 | 0 | 0 |
| 2022 | 373 | 8 | 2 | 4 |
| 2023 | 294 | 4 | 0 | 4 |
| **Total** | **1,221** | **25** | **6** | **9** |



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