Stantec

Municipal Groundwater Supply Evaluation Through Pilot Well Drilling

2026 GANDER WATER AND WASTEWATER WORKSHOP

Agenda

1. Water Sources
2. Groundwater as a water supply option
3. Look at well yields on the island
4. Methods to find enough good quality groundwater
5. Challenges

Water Sources

Population of Newfoundland and Labrador is 521,542 (2025)

85% of the population, or 443,311 people, are on public drinking water systems

Of these public drinking water systems, 7% of the population, or 35,465 people, receive their water from a groundwater source

Private water supplies, usually for individual homes, are almost entirely groundwater.

Groundwater as a Water Supply

- Surface water can be challenging to manage
- Small bodies of water are sensitive to seasonality of flow and drought
- Aging infrastructure and water quality issues lead communities to explore different source water options
- Groundwater as a water supply can be a great option for small communities in NL

Groundwater as a Water Supply

Groundwater (typically) requires less treatment. Sometimes just chlorination.

Quality is more consistent, so treatment (if required) can more easily be automated.

More resilient to seasonality and droughts.

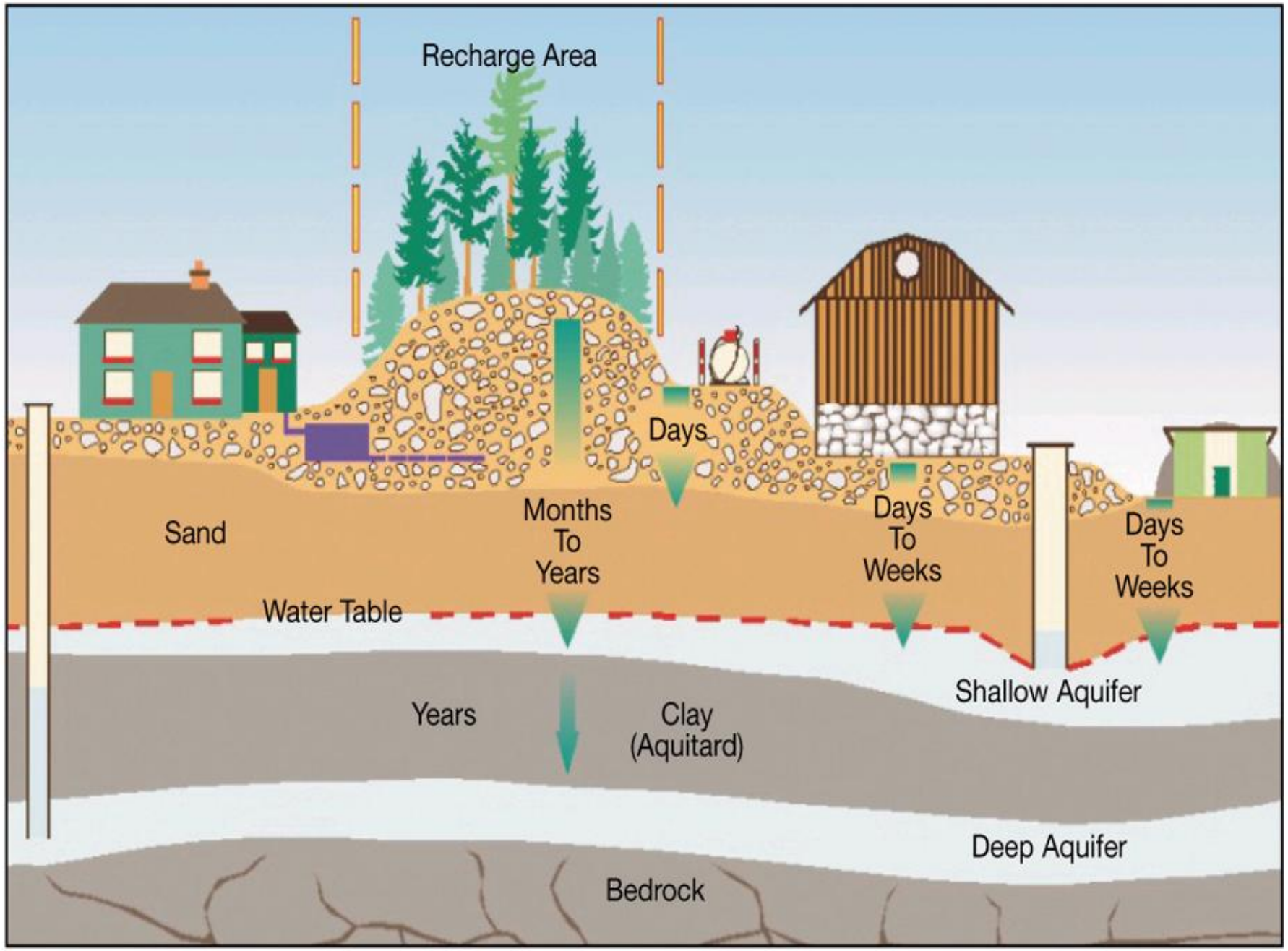
Less susceptible to contamination, when well is properly constructed.

Groundwater Flow

Groundwater flow is typically a subdued reflection of topography

Groundwater recharges from infiltration from precipitation and from surface water

Groundwater discharges to surface water (or to water wells!)



Geology of Avalon Peninsula

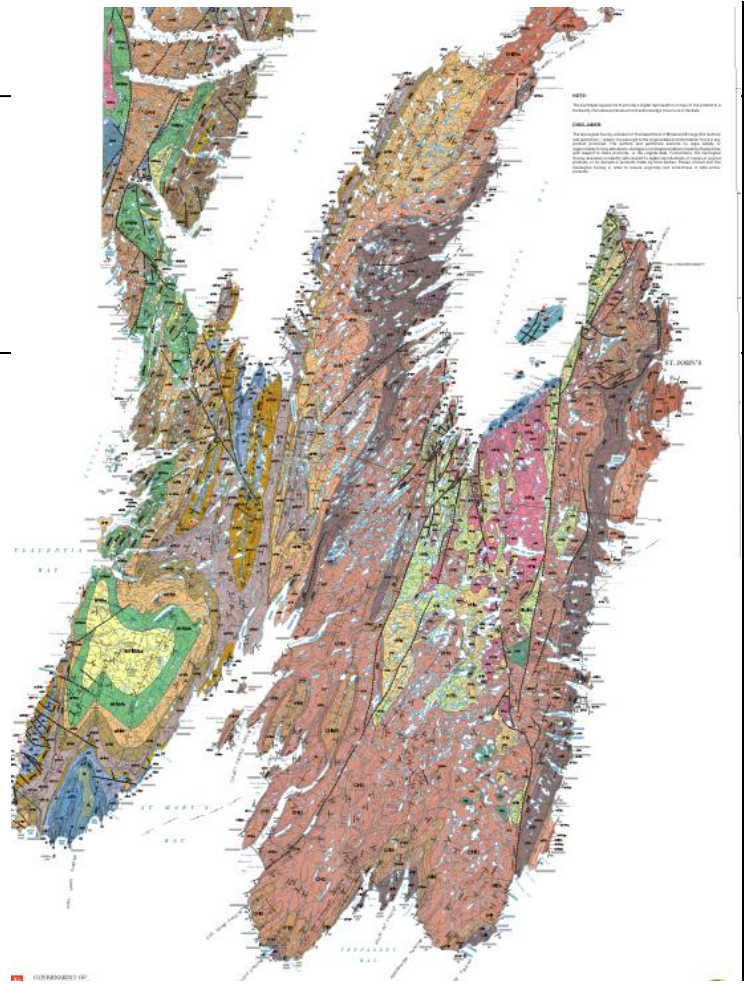
Mainly Sedimentary Rocks

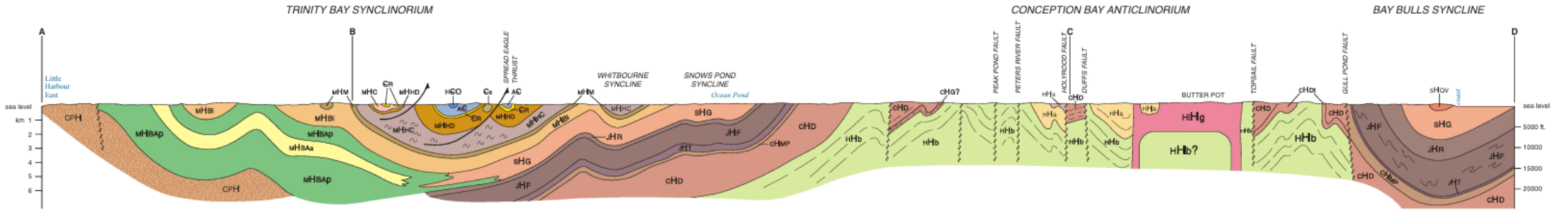
Highly Folded and Faulted

Igneous Intrusions

= not flat lying

Hard to predict fracture locations!





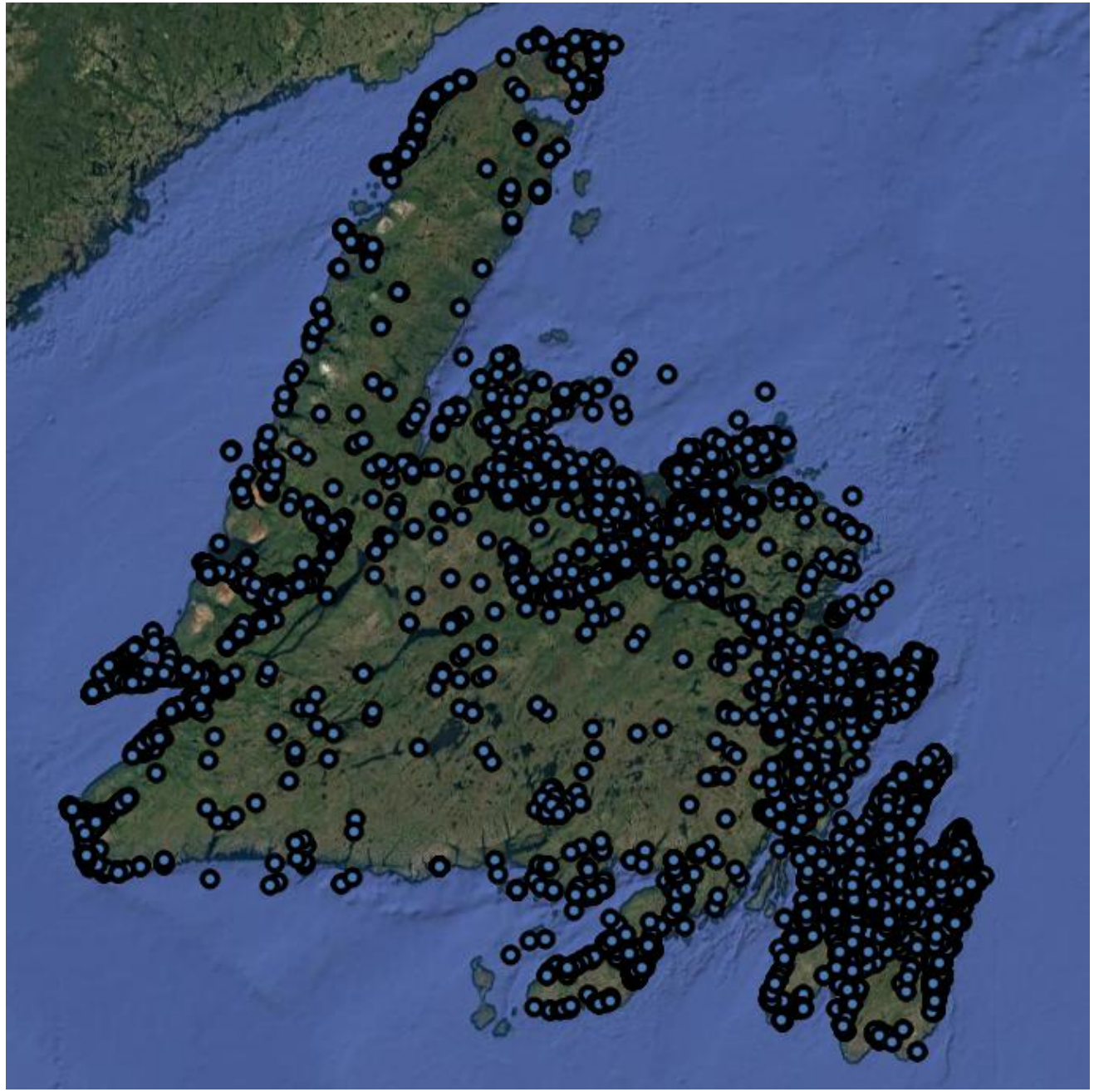
Well Yield Data

Provincial records available for 27,312 drilled wells on the island

Estimated yield available for 24,889 of these records

Approximately half of available well records are on the Avalon

Well records are used to get an idea of water availability in a particular area, but no guarantees



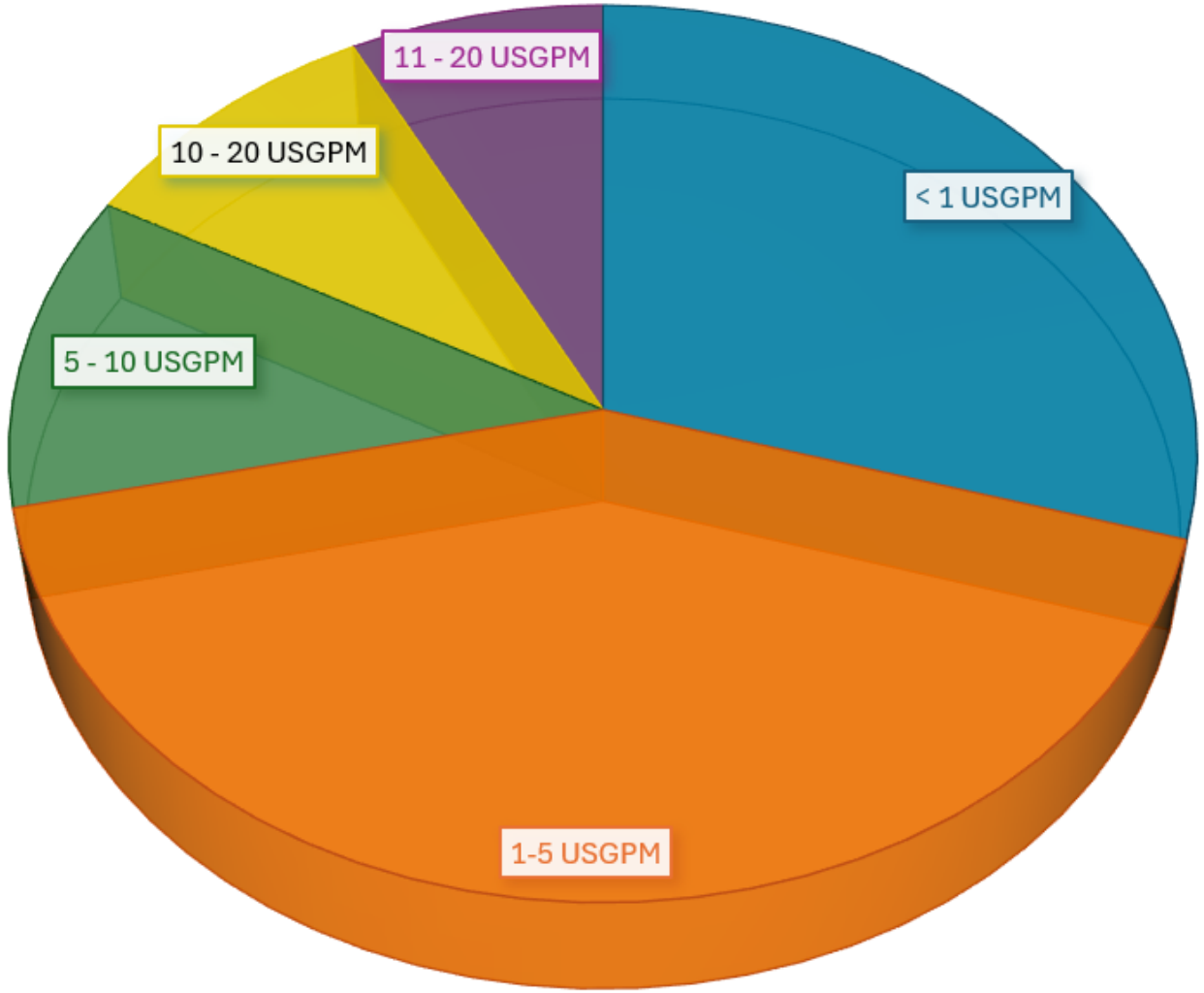
Well Yield Data

Most individual wells (72%) have an estimated yield below 5 US gallons per minute (USGPM)

Province-wide median yield of approximately 2.5 USGPM.

These estimates are from air-lift testing, not long-term testing

Municipalities may need multiple wells to meet the demand of their community



Bedrock Hydrostratigraphic Units

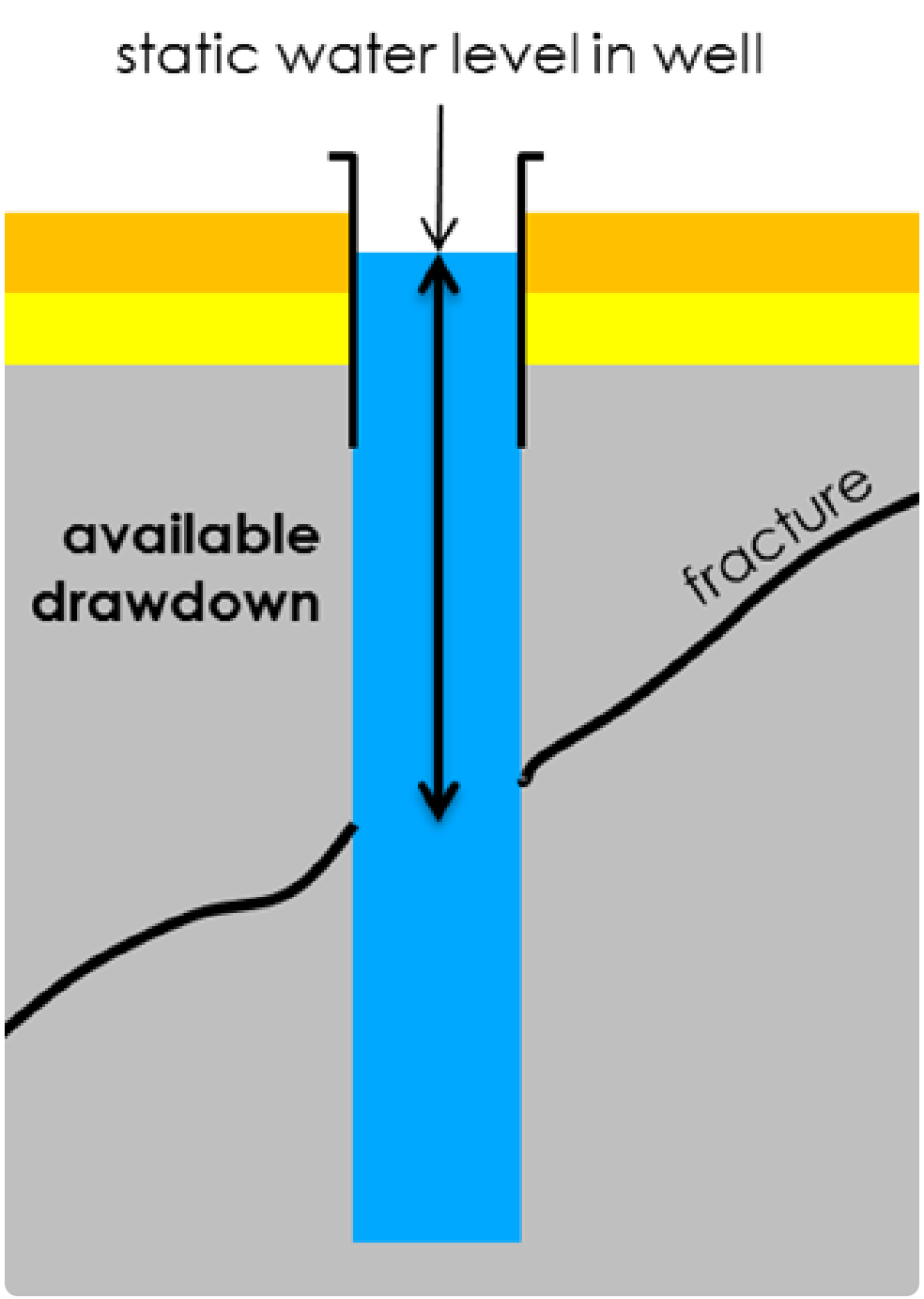
Hydrostratigraphic Unit	Lithology	Number of Wells	Well Yield Characteristics (L/min)		Well Depth Characteristics (m)	
			Average	Median	Average	Median
Unit 1 **Low to Moderate Yield** Siltstone and Shale Strata	Siltstone, shale, with minor volcanic flows and tuffs	5100	20	9	64	61
Unit 2 **Moderate Yield** Sandstone and Conglomerate	Sandstone, conglomerate, breccia, greywacke, with minor volcanic flows and tuff.	2789	22	9	64	56
Unit 3 **Moderate Yield** Cambro-Ordovician Sedimentary Strata	Shale, siltstone, sandstone, with minor slate and limestone beds	1694	29	14	54	44
Unit 4 **Low to Moderate Yield** Volcanic Strata	basic pillow lava, flows, breccia and tuff, with minor sedimentary rocks	1819	25	9	67	61
Unit 5 **Moderate Yield** Plutonic Strata	granite, granodiorite, diorite and gabbro	95	31	14	69	64
Unit 6 **Low to Moderate Yield** Meta Volcanic Strata	Sericite & chlorite schist derived from felsic and mafic volcanic and sedimentary rocks; minor gneiss and migmatite	168	18	4	61	52

From: AMEC 2013 Hydrogeology of Eastern Newfoundland

Approach

What do when it’s hard to predict if we’ll get enough water?

- Data shows average and median yields are generally low, but some higher yield wells do exist in typically lower yield areas



Approach

Drill more!

- But first, do a desktop study and site visit
- Recommend drilling at least **three pilot wells** to get a better understanding of local capacity
- If away from ocean, can recommend well depths up to 500 ft / 150 m increase chances of finding fractures and to add storage

Approach

Important considerations for choosing well location(s):

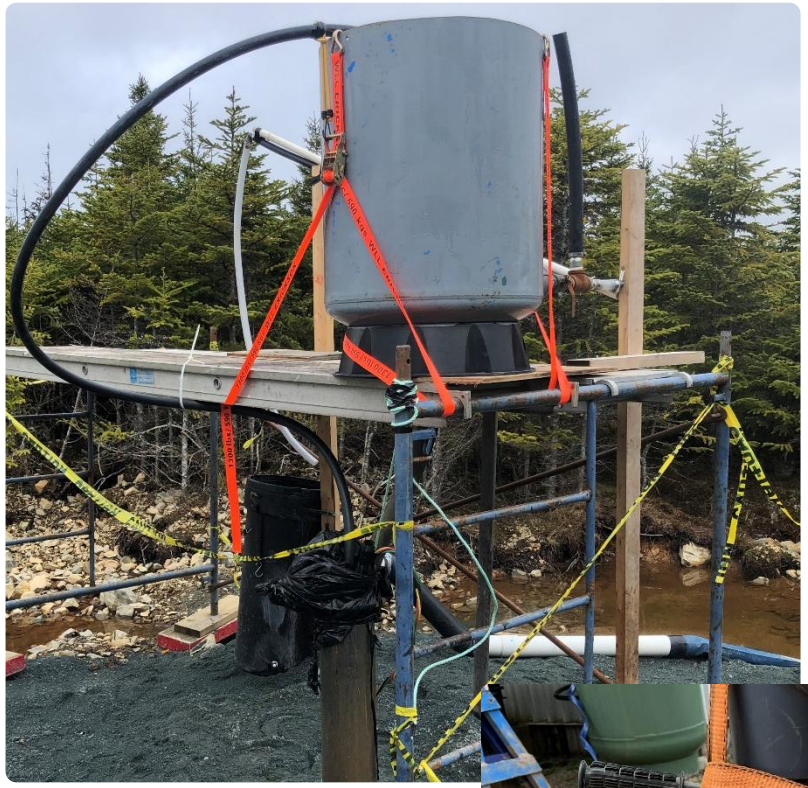
- Geology
- Potential for well interference
- Access for drill rigs
- Infrastructure
- Site visit

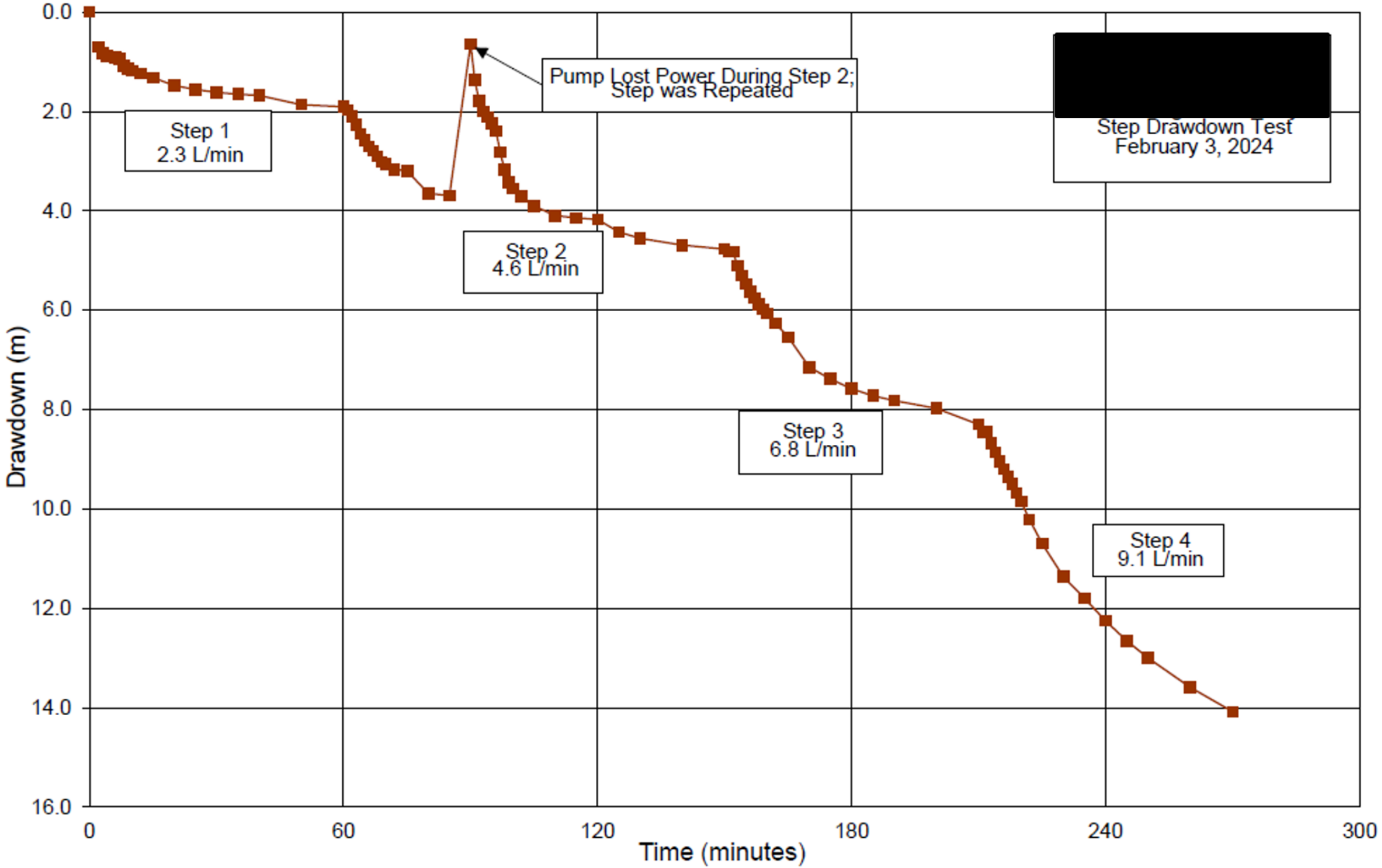
Approach

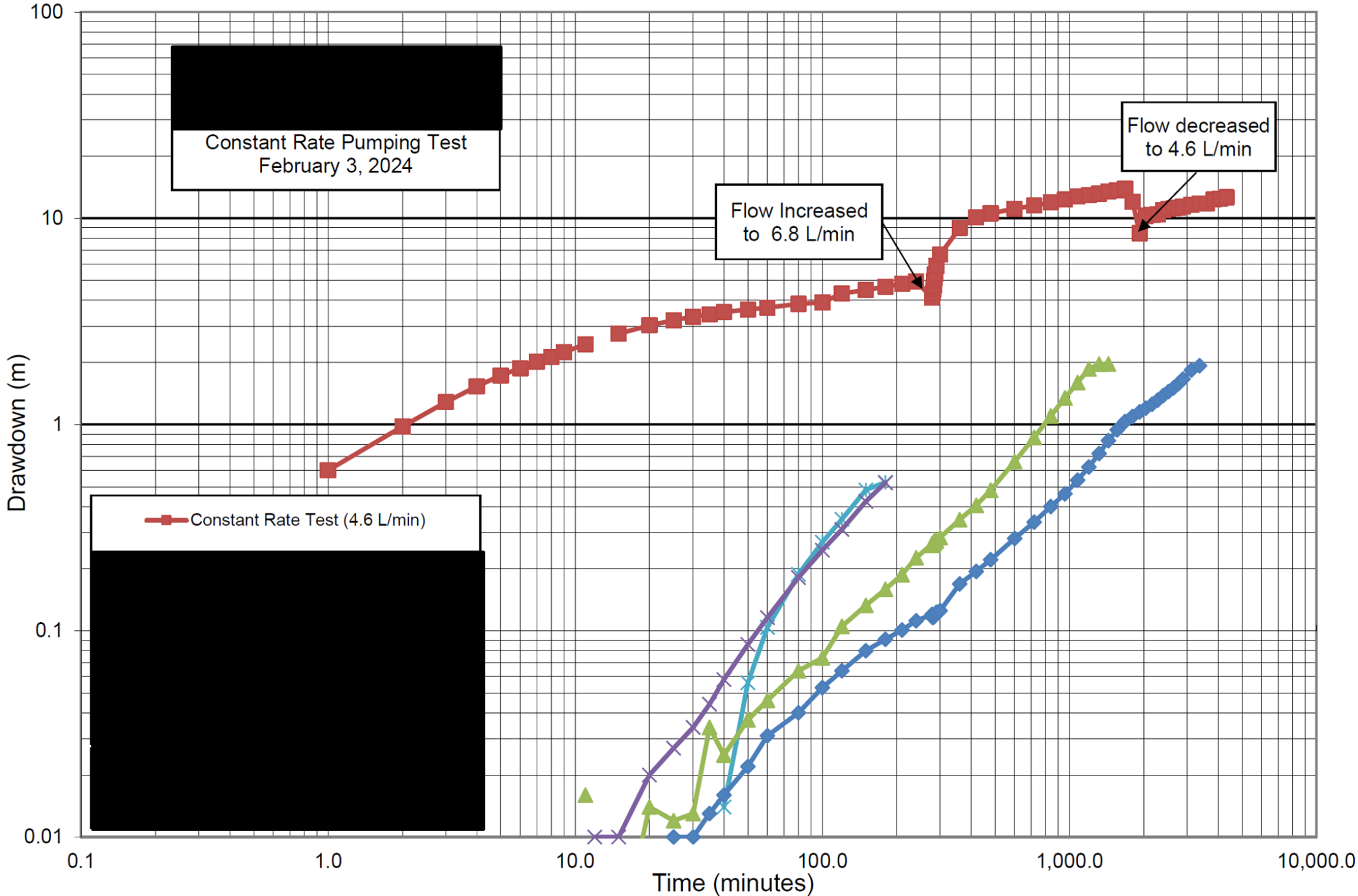
Conduct **hydraulic testing** on the most productive wells

- Step tests
- Pumping tests
    - 72 hour constant rate test
- Recovery tests

Driller's predicted yield usually much higher than safe yield from constant rate test




[redacted]
Step Drawdown Test
February 3, 2024
Pump Lost Power During Step 2;
Step was Repeated
Step 1
2.3 L/min
Step 2
4.6 L/min
Step 3
6.8 L/min
Step 4
9.1 L/min
Drawdown (m)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
0
60
120
180
240
300
Time (minutes)


[redacted]
Constant Rate Pumping Test
February 3, 2024
Flow Increased
to 6.8 L/min
Flow decreased
to 4.6 L/min
Constant Rate Test (4.6 L/min)
[redacted]
Drawdown (m)
100
10
1
0.1
0.01
0.1
1.0
10.0
100.0
1,000.0
10,000.0
Time (minutes)

Challenges

Well interference is when drawdown in one well also causes drawdown in other nearby wells within the same aquifer system

Challenges

Groundwater quality is generally easier to manage than surface water:

- E.g., less total organic carbon, less/consistent suspended sediment/turbidity

However, some health-based parameters can be higher in groundwater:

- E.g., arsenic, manganese

Other concerns:

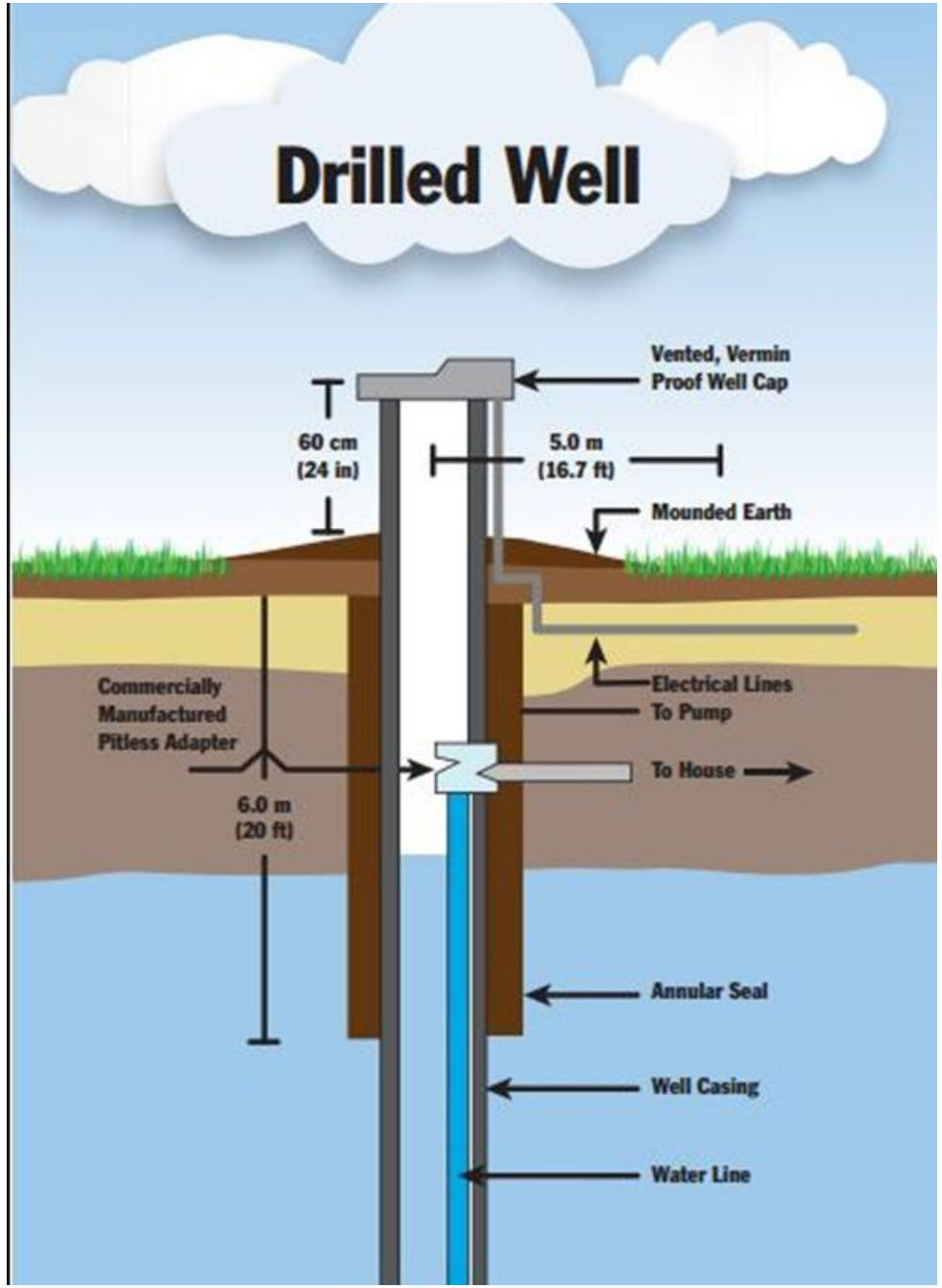
- Saltwater intrusion near ocean (sodium and chloride)
- Bacteria in poorly constructed or dug wells
- Less common metals, such as lead and uranium

Challenges

Saltwater intrusion is challenging to predict within irregularly fractured bedrock

Challenges

Drill rig availability can delay projects. Limited rigs on the island and even fewer companies are equipped for aquifer testing.



Approach for Municipality

1 – Municipality applies for funding
2 – Province issues RFP
3 – Consultant does desktop study
4 – Municipality applies for funding for phase 2
5 – Consultant does phase 2
6 – Water supply is hooked up

Conclusion

- Account for more drilling in capital works planning
- Plan for potential water treatment
- Hire your friendly neighbourhood hydrogeological consultant to do a desktop study to help plan out the study phases

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Thank you