Sunshine Coast Regional District

ANNEX A

Groundwater Investigation Round 2 Phase 3 – Langdale Well

Summary of Findings and Next Steps

Prepared for the Committee of the Whole Meeting on January 11, 2024

Kalwij Water Dynamics Inc.

Ineke Kalwij, Ph.D., P.Eng.

Project Manager, Senior Hydrogeological Engineer

Kalwij Water Dynamics Inc.

Well & Water Tyfe Services

ONSITE Engineering Ltd.

Groundwater Investigation Round 2, Phase 3 – Langdale Well

- The drilling and construction of two production-sized test wells at the Langdale well site, near test well TW-2(20) which was constructed & tested under *Groundwater Investigation Phase 2, Part 2 and Phase 3 – Gray Creek*.

- To expand SCRD's access to groundwater to meet current water supply deficit in the Chapman Water System and to diversify water supply sources.

Project Scope and Purpose

1| Construction of two Production-Sized Test Wells.

2| Pumping Tests.

3| Technical Assessment & Reporting.

4| Water Licence Application & Other Requirements.

5| Conceptual Design – Wellfield & Water Treatment Plant.

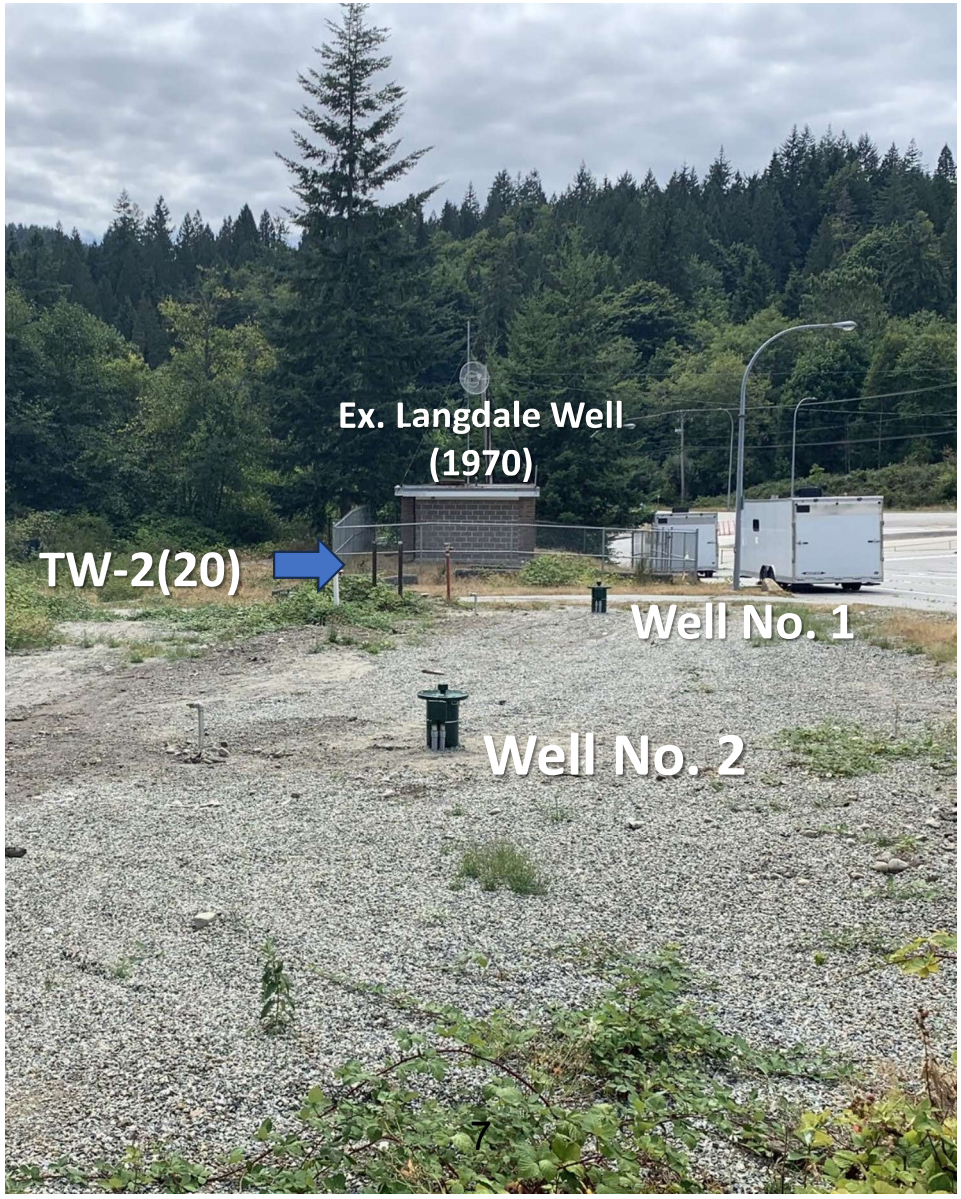
6| Preliminary Construction Cost Estimate.

Project Site

(New Wells)

Well No. 1

Well ID No.
63382

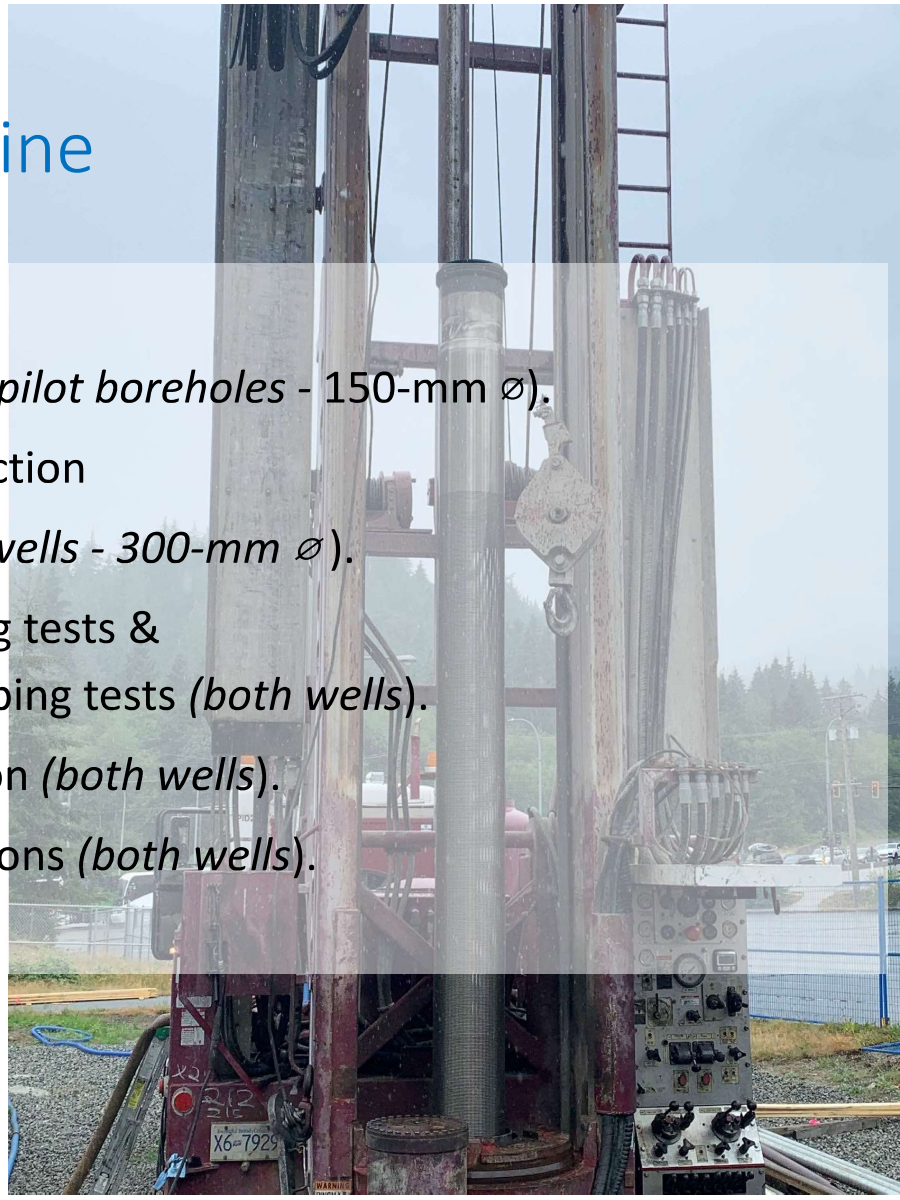


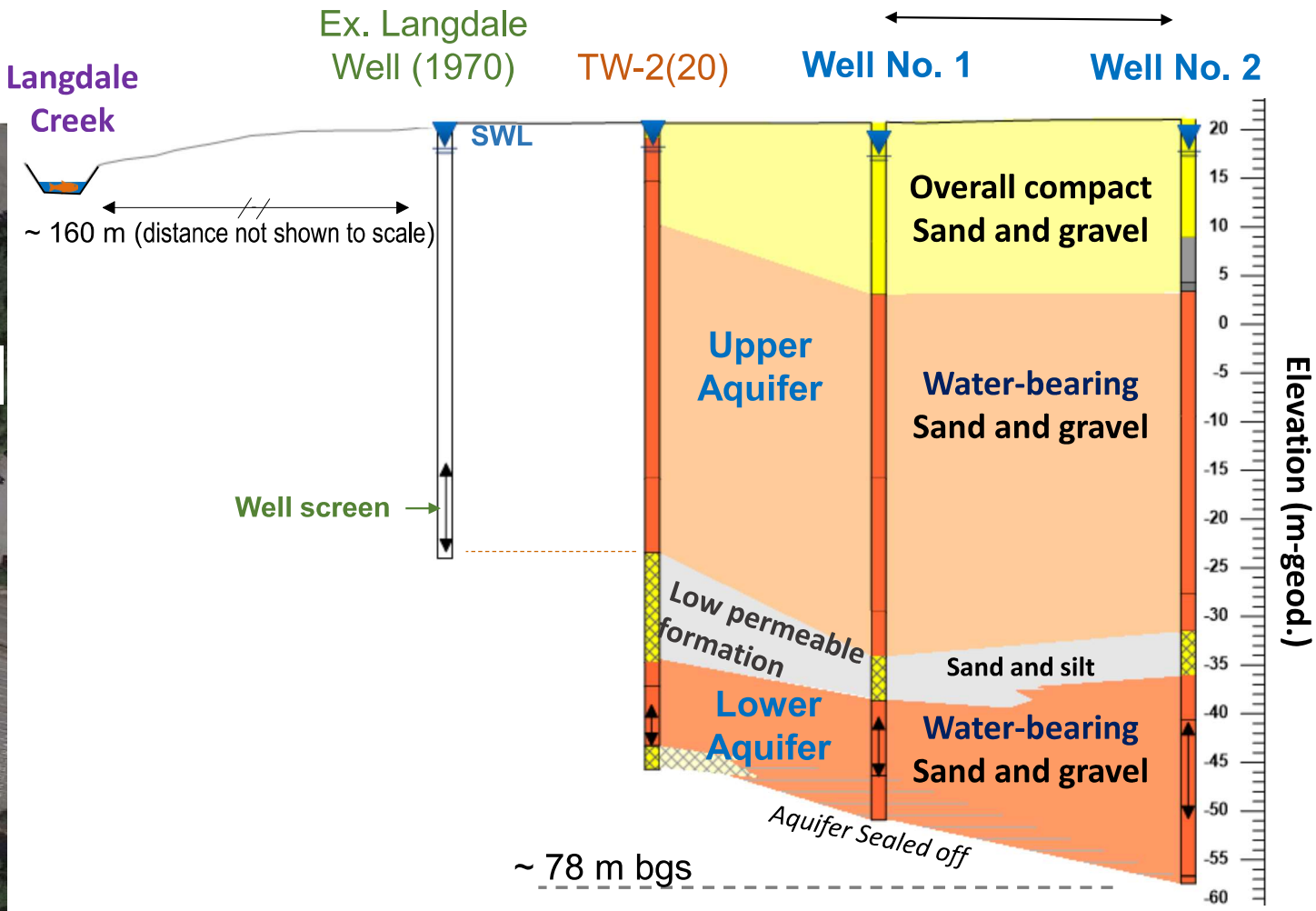
Well No. 2

Well ID No.
63383

Fieldwork Timeline

- May 25 - June 2, 2022: Pilot borehole drilling (*2 pilot boreholes* - 150-mm ⌀).
- July 6 - October 5, 2022: Well drilling and construction (2 *production-sized test wells - 300-mm ⌀*).
- February 13 - March 3, 2023: Step-drawdown pumping tests & 72-hr constant rate pumping tests *(both wells*).
- May 17 - May 18, 2023: Pitless adapter installation *(both wells*).
- May 25, 2023: Downhole video inspections *(both wells*).





Hydrogeology (Cross-Section - Schematic)

Production-Sized Test Well Drilling & Construction

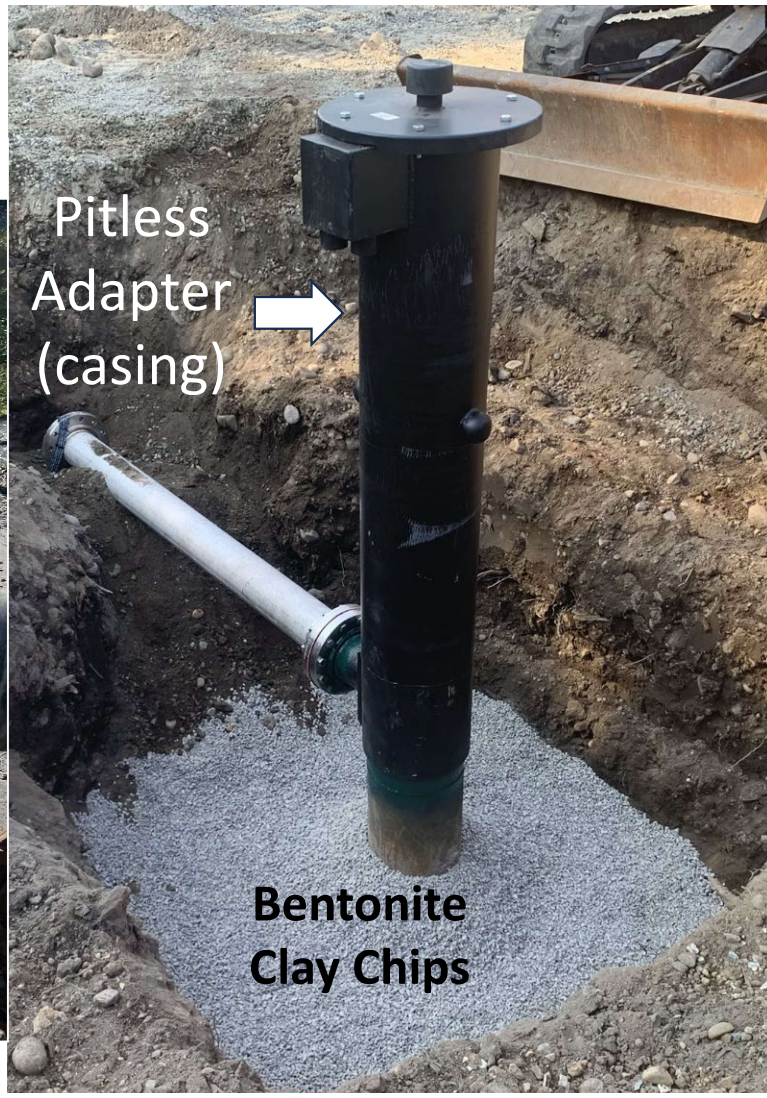
- Casing diameter: 300 mm
- Completed well depth:
  - Well No. 1: 68.6 m (222 ft)
  - Well No. 2: 72.9 m (236 ft)

Well Screen Assembly Installation

- Well No. 1: 5.8 m (screen)
- Well No. 2: 9.1 m (screen)

Well Development

Pitless Adapter Installation



Aquifer Testing & Analysis

- Step-drawdown tests
- 72-hr constant rate pumping tests

- Well No. 1: **19.6 L/s** (311 gpm)
- Well No. 2: **56.8 L/s** (900 gpm)

  - Observation wells.
  - Langdale Creek.
  - Water sampling / analysis.
  - Electrical conductivity, pH monitoring.

Long Term Yield of the Production Wells

- **Well No. 1: 13.1 L/s**
  - *Certified yield: 13.1 L/s*
- **Well No. : 92.8 L/s**
  - *Certified yield: 56.8 L/s*

Water Quality Analysis Results

The water quality of the analyzed constituents meets Canadian Drinking Water Guidelines for maximum acceptable concentrations (MAC) and aesthetic objectives (AO), except the AO for iron and manganese:

Analyte	Well No. 1	Well No. 2	Guideline Limit
Dissolved Iron (mg/L)	0.54	0.67	0.3 AO
Dissolved Manganese (mg/L)	0.047	0.031	0.02 AO; 0.12 MAC

Current levels are not a human health concern but may cause staining and discolouration.

Analyte	Well No. 1	Well No. 2	Guideline Limit
Hardness (mg/L)	38	36	
pH (-)	7.21	7.3	7.0 – 10.5
EC (µSiemens/cm)	114	115	
TDS (mg/L)	61	60	500 AO

Organic Carbon <= NDL (0.5 mg/L); no concerns for water under the influence of surface water.

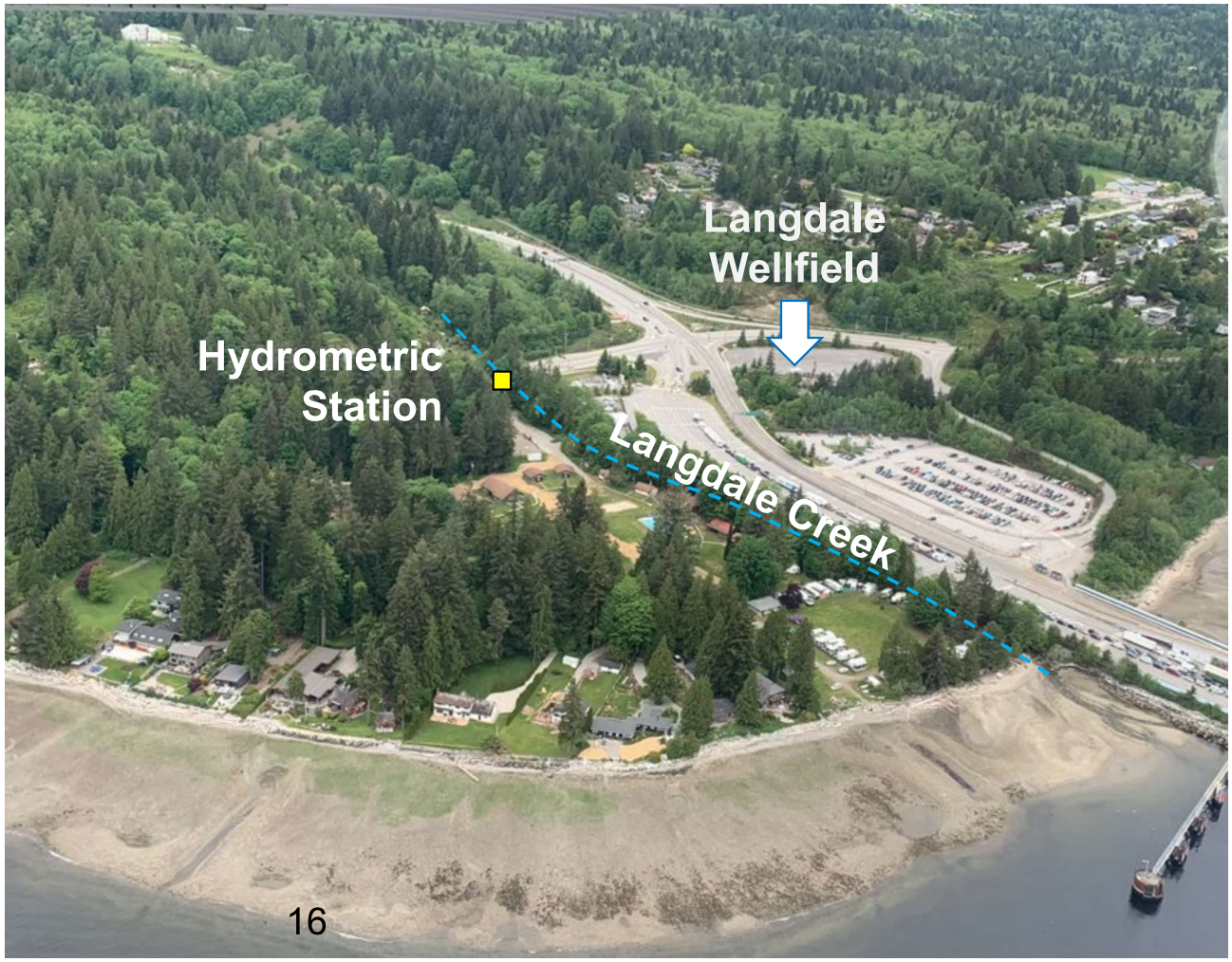
Langdale Creek Monitoring

- ✓ May 20, 2021, to Sep 28, 2022:
  - Recording of water levels (levelogger).
  - Periodical flow measurements (flow velocity probe).
  - Establish stream - discharge curve.

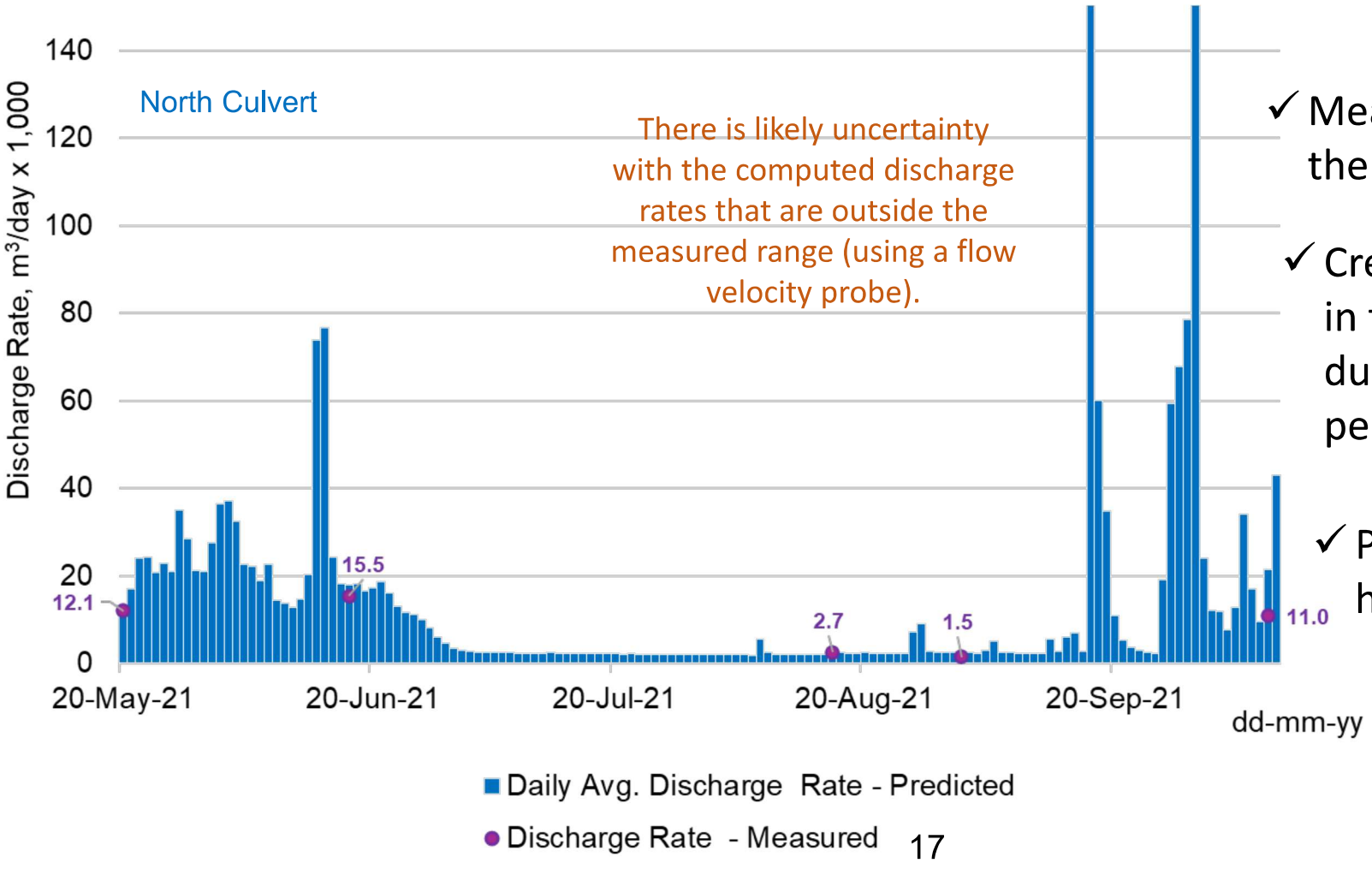
- ✓ During the constant rate pumping tests

  Feb 13 – Mar 3, 2023:
  - Recording of water levels (levelogger).

Langdale Creek Monitoring



Langdale Creek Monitoring - Results



- ✓ Measured <u>low flow</u> in the creek: 1500 m^3/day.
- ✓ Creek did not dry up in this lower reach during the monitored period.
- ✓ Peak flow within 24 hrs of a storm event

Results

- ✓ There was no measurable impact observed on the creek water levels during the **pumping test** window for each well (**New Wells**), with pumping at an average discharge rate of 19.6 L/s and 56.8 L/s for **Well No. 1** (**Test 1**) and **Well No. 2** (**Test 2**), respectively.

- ✓ This rules out direct hydraulic connectivity between the New Wells and Langdale Creek, which might otherwise be observed if the cone of depression from well pumping had intercepted the base of the creek.

Results

- ✓ Given the shallow (unconfined) aquifer inferred to underlie the Langdale Creek Delta, the creek is likely in direct hydraulic connection with that shallow aquifer.

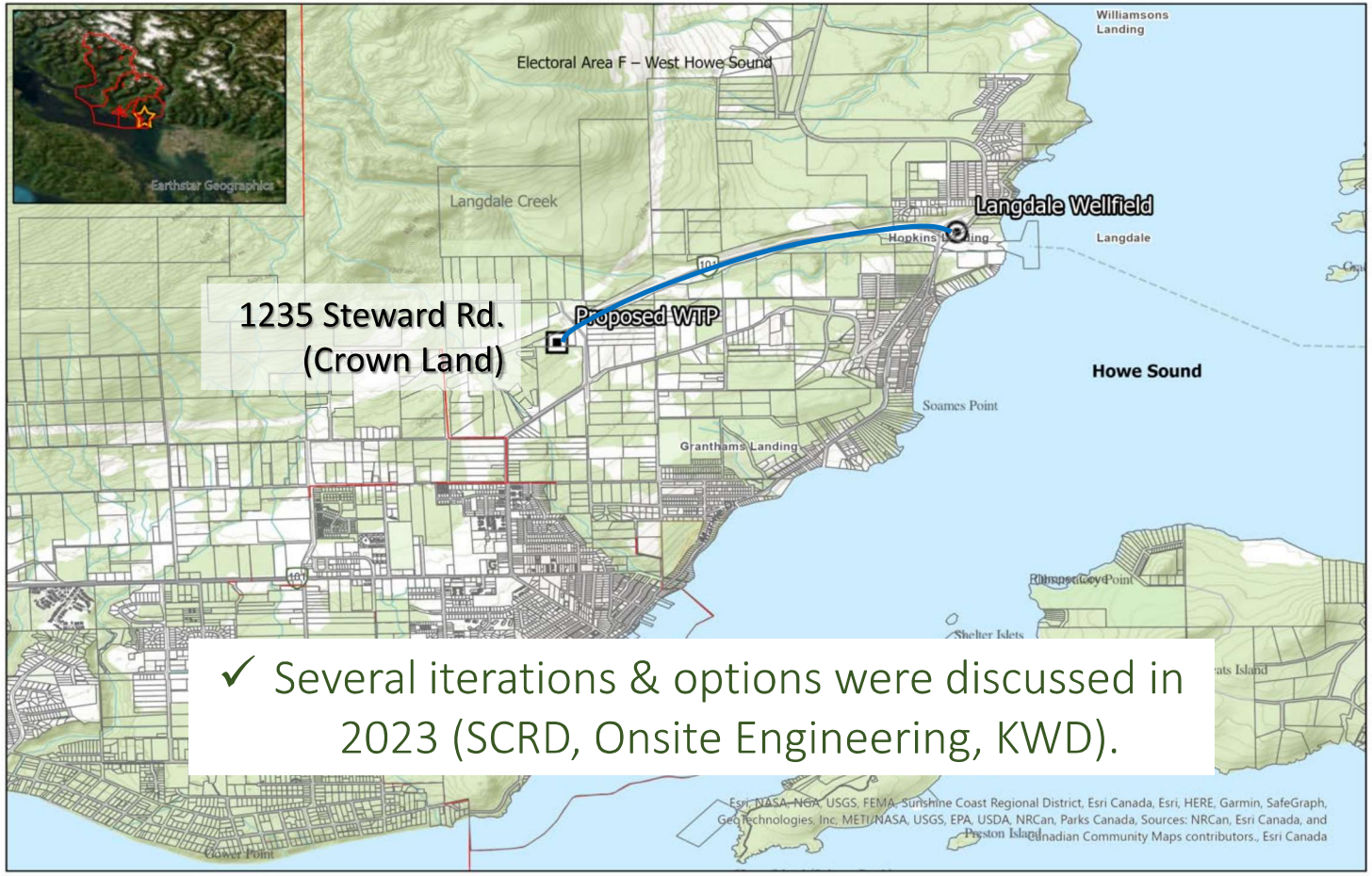
- ✓ The New Wells have been constructed in a lower (leaky) confined aquifer system (*below low permeable formation with likely vertical leakage from the upper aquifer*).

Other Considerations

- ✓ No concerns of saltwater intrusion – based on water quality data collected during the pumping tests.
- ✓ No concerns with respect of well interference (third party wells) – main (other) groundwater user within 1 km radius is Hopkins Water System.

Conceptual Design –

Wellfield, Alignment & Water Treatment Plant (WTP)



✓ Several iterations & options were discussed in 2023 (SCRD, Onsite Engineering, KWD).

Proposed at the wellfield:

- ✓ New building (electrical, controls).
- ✓ Gated access (wellhead protection).
- ✓ Submersible pump-motor assembly (production wells).
- ✓ Backup generator.

Approximately 3 km of 400 mm ø raw watermain along the Sunshine Coast Hwy.

N

Conceptual Design –

Wellfield, Alignment & Water Treatment Plant (WTP)

✓ Reservoir sizes and other required sizing are all design aspects that need to be confirmed.

WTP:

- ✓ 250 m^3 raw water reservoir.
- ✓ Booster station.
- ✓ Pre-packaged greensand filtration water treatment plant.
- ✓ 2 x 2,500 m^3 treated water reservoir.
- ✓ Waste residual handling and management area.
- ✓ Backup generator.

Treated water transmission main to connect to existing 300 mm ø w/m (intersection N. Road and Reed Road)

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Class D Cost Estimate

Item	Cost
Langdale Wellfield Completion	$ 1,400,000
Raw Water Transmission Main	$ 4,215,000
Water Treatment Plant	$ 8,200,000
Treated Water Transmission Main and Connections	$ 1,525,000
Total Construction Costs	**$ 15,340,000**
Engineering and Contingency	$ 6,700,000
Project Sub-Total	**$ 22,040,000**

Source: Onsite Engineering – Technical Memorandum #5

Water Licence Application & Other Requirements

- Groundwater licence application (Ministry of Water, Land and Resource Stewardship - MWLRS)
  - Requested amount: 60 L/s (1,892,160 m^3 per year).
  - Application to be submitted in January 2024.
- Crownland Tenure Application (MWLRS) -
  - 1235 Steward Rd. – Proposed WTP.
  - Application to be submitted in January 2024.
- Project Notification: News Wells & Ex. Langdale Well(1970)
  - Application to be submitted in January 2024.

Next Steps

Key Next Steps

- Secure funds for the Infrastructure needed to connect the New Wells to Chapman Water System (Wellfield, Alignments & WTP).
- Finalize Infrastructure design.
- Continuing communications with the Ministry of Water, Land and Resource Stewardship regarding the Water Licence Application and Crown Land Tenure Applications.

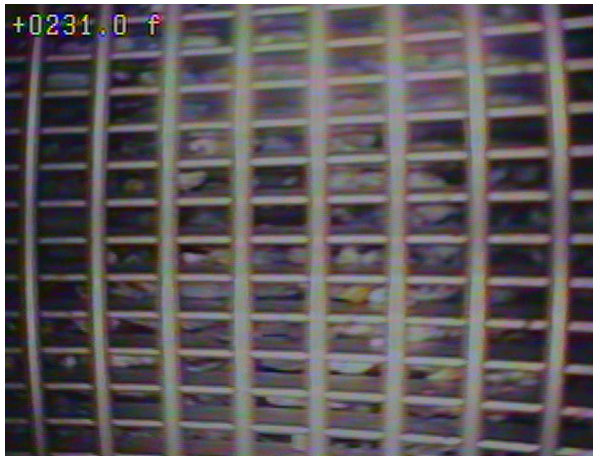
Key Next Steps

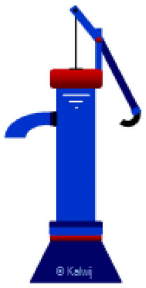
- Organize an information session / consultation meeting with the First Nations – *Communications / scheduling in progress*.

- Ministry of Transportation & Finance (MOTF) & BC Ferries Terminal (BCF) – Langdale Wellfield Land Use / Land Swop: land falls within area leased by BCF from MOTF – *Communications in progress*.

- Ministry of Transportation & Infrastructure (MOTI): permission for trenchless crossings, raw water transmission main construction along Sunshine Coast Hwy, access road to WTP, tie-in to Chapman Water System.

Downhole Video: view through the well screen towards the geological formation (aquifer).





Thank you for your Attention.

Any Questions?