Real-Time Water Quality Report

Grieg NL Nurseries Ltd Monitoring Well

Deployment Period:
March 7th, 2023 to May 10th, 2023

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment & Climate Change
Water Resources Management Division

Prepared by:

Victoria Hollohan
Environmental Scientist
Water Resources Management Division
Department of Environment & Climate Change
4th Floor, Confederation Building, West Block
St. John's NL A1B 4J6
Ph. No.: (709) 729 - 5925
Fax No.: (709) 729 - 0320
victoriahollohan@gov.nl.ca

General

The Water Resources Management Division (WRMD) in partnership with Grieg NL Nurseries Ltd, maintain a real-time water quality groundwater monitoring station. The station is located near the Marystown YMCA and Track and Field Complex.

Figure 1: Location of Real-Time Groundwater Well

Figure 2: Hut Structure for groundwater well

Figure 3. View standing in front of well looking toward main road in Marystown, NL

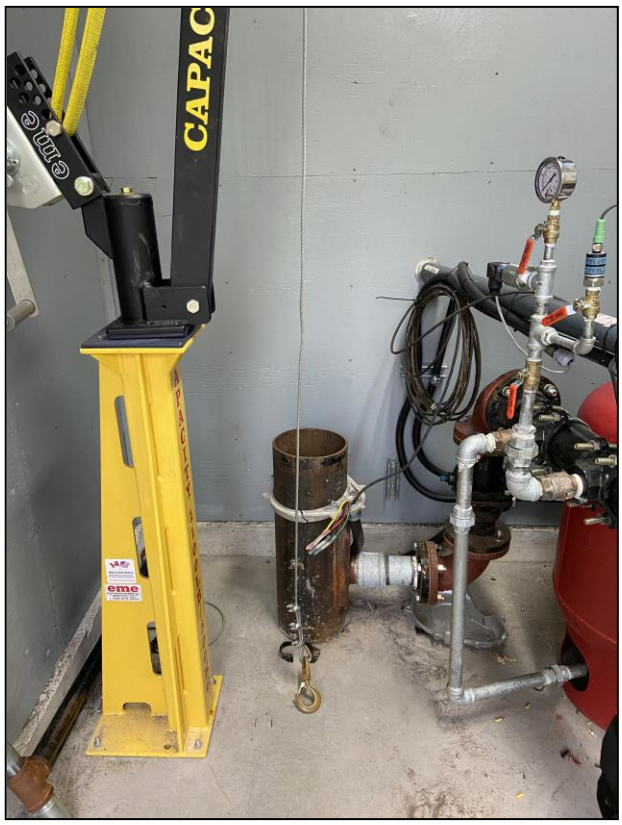

Figure 4: Well Casing in the hut

Figure 5: View looking into well

Quality Assurance and Quality Control

WRMD staff (Environment & Climate Change (ECC)) are responsible for maintenance of the real-time water quality monitoring equipment, as well as recording and managing the water quality data. Grab samples are collected at the beginning of each deployment period to compare against the initial in-situ logged data. Grab samples compliment the real-time data and provide an extra source of water quality data for comparisons when tracking changes over time at the station (Table 1).

It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be divided into subgroups of temperature dependent, temperature compensated and temperature independent. Due to the temperature sensor's location on the sonde, the entire sonde must be at a constant temperature before the temperature sensor will stabilize. The values may take some time to adjust to the appropriate reading.

Status of Station

Grieg Seafood has two available wells: a main production well that provides new water to the facility as needed, and a monitoring/backup well that houses the WRMD monitoring equipment. To ensure the pump installed in the monitoring/backup well is functioning, the pump is started periodically (about once per week). The WRMD's monitoring equipment is not removed during the pump test and as a result may disrupt the water parameter recordings. This groundwater well shares its aquifer with the main pumping well for the hatchery and variations in the water parameters could be a result of pumping from either well.

In-Situ instrument measurements are recorded shortly after the freshly calibrated instrument is deployed. The limited time for the sonde to reach equilibrium with its surroundings can occasionally lead to variations in values between grab sample results and instrument measurements.

Table 1: Comparison of the In-Situ instrument vs. Grab Sample Results

Parameter of Comparison	In-Situ Instrument	Grab Sample Result	Comparison Ranking
pH (pH units)	7.47	8.08	Fair
Specific Conductivity (µS/cm)	285.62	320.00	Poor

Table 2: QAQC Comparison Ranking Chart

Parameter	Excellent	Good	Fair	Marginal	Poor
pH (pH units)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Specific Conductivity (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-10 to 15	>+/-20
Specific Conductivity (µS/cm) > 35 (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-10 to 15	>+/-20

Grieg Monitoring Well

Water Temperature

Water temperature ranged from 7.33°C to 7.51°C during the deployment period (Figure 6). The average water temperature across the deployment is 7.42°C.

Grieg's monitoring station is a groundwater well; generally, the water temperatures will remain consistent throughout the deployment. This is evident during this deployment with the small range between minimum and maximum values.

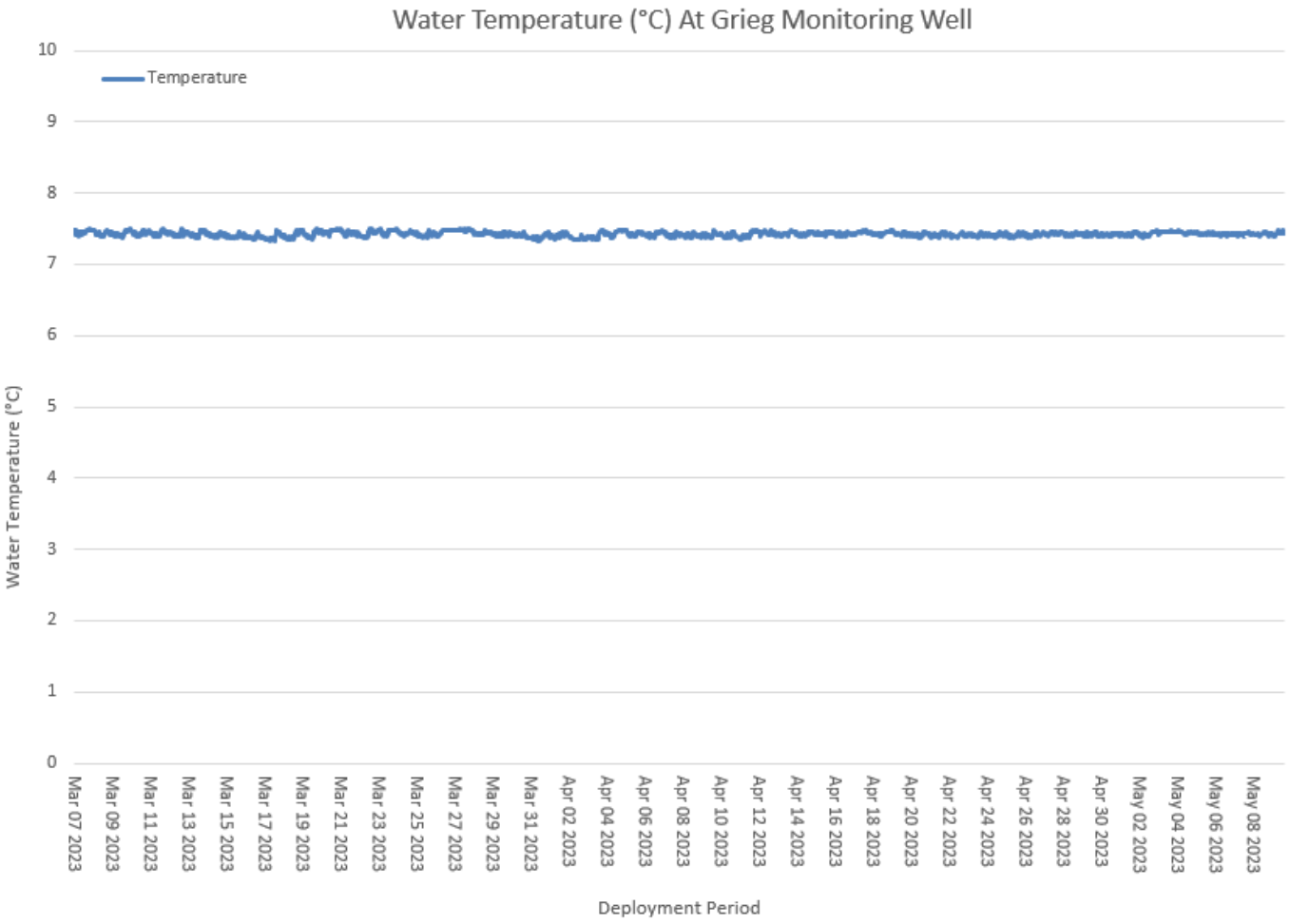

Figure 6: Water temperature (°C) values

pH

Throughout the deployment period, pH values ranged between 7.50 pH units and 7.68 pH units. The pH data remained consistent for the duration of the deployment, with an average of 7.56 pH units.

Small changes in pH were likely the result of pumping within the aquifer. As the well refills and the level adjusts, there will be movement in the pH levels for a short period of time (Figure 7).

Comparison of the grab sample data for pH indicated the grab sample of 8.08 pH, was slightly higher than what was recorded in-situ at 7.54 pH (Table 1). It would be expected that these two pH results would vary slightly. The well was pumped prior to collecting the grab sample, while the in-situ reading was recorded after the pumping of the well had stopped and the water column allowed to settle.

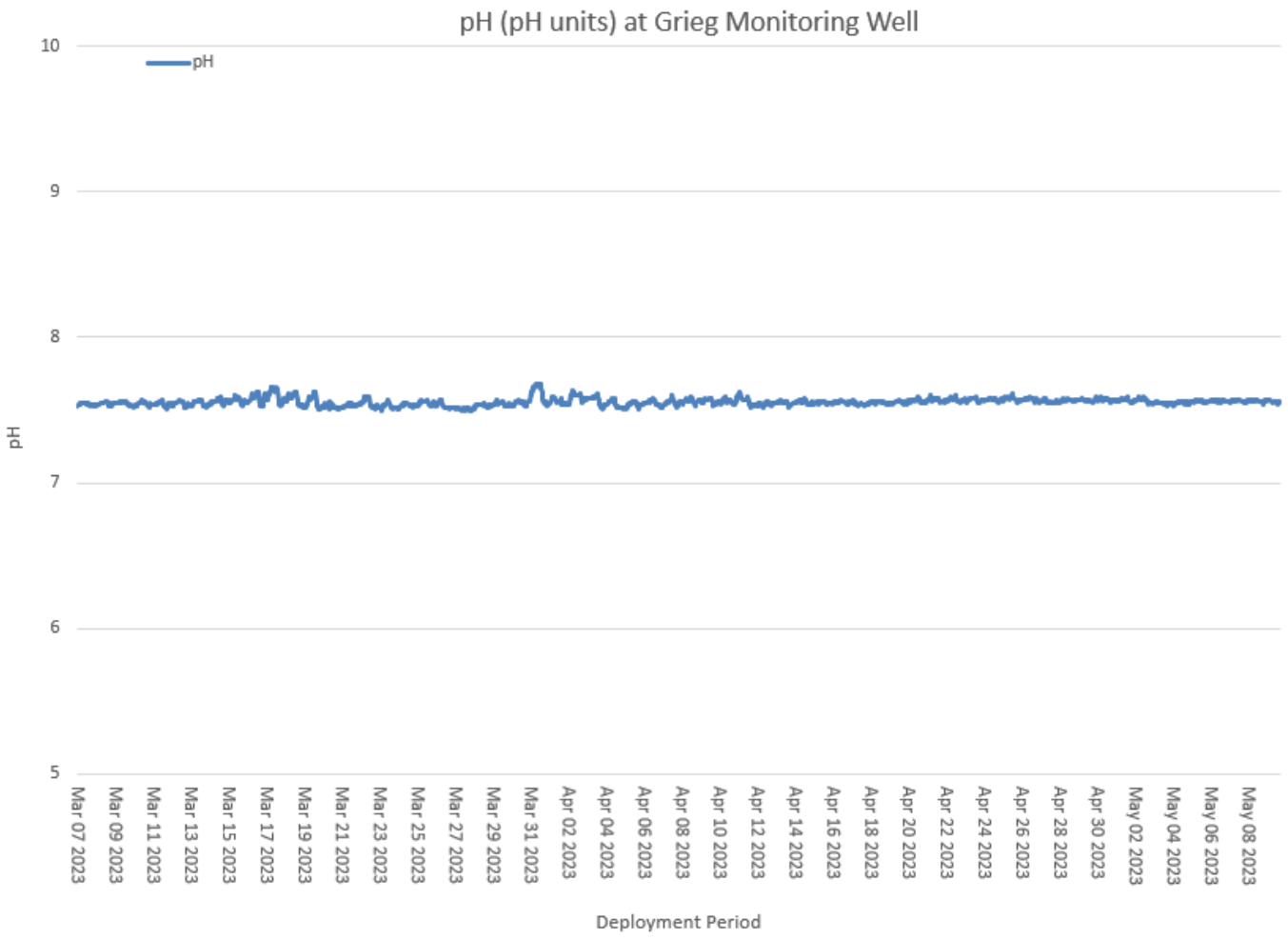

Figure 7: pH (pH units) values

Specific Conductivity & Total Dissolved Solids (TDS)

The specific conductivity probe measures the presence of diluted salts and inorganic materials in a water source. During the deployment, conductivity levels were within 270.3 µS/cm and 345.3 µS/cm ,with an average of 286.4 µS/cm (Figure 8). The higher spikes in conductivity are likely due to pumping disturbance within the aquifer. Pumping can disrupt the diluted salts and inorganic materials that are present in the groundwater.

TDS data is derived from the specific conductivity data. The water quality instrument is programmed to calculate an estimated TDS value from a conductivity value. TDS data will mirror the movement of the specific conductivity data, however the TDS is calculated in g/L (Figure 9). For the deployment period, TDS ranged within 0.18 g/L to 0.22 g/L.

Due to minimal or no influence from an outside source, the conductivity in groundwater well is generally stable. Any significant changes in the conductivity data at this site are likely due to pumping the well and any associated movement of the equipment in the well casing. A notable increase in conductivity was observed on April 3rd, 2023, the same time as a decrease to the water level in the well casing (Figure 10). This could indicate that water was being pumped from the aquifer at this time.

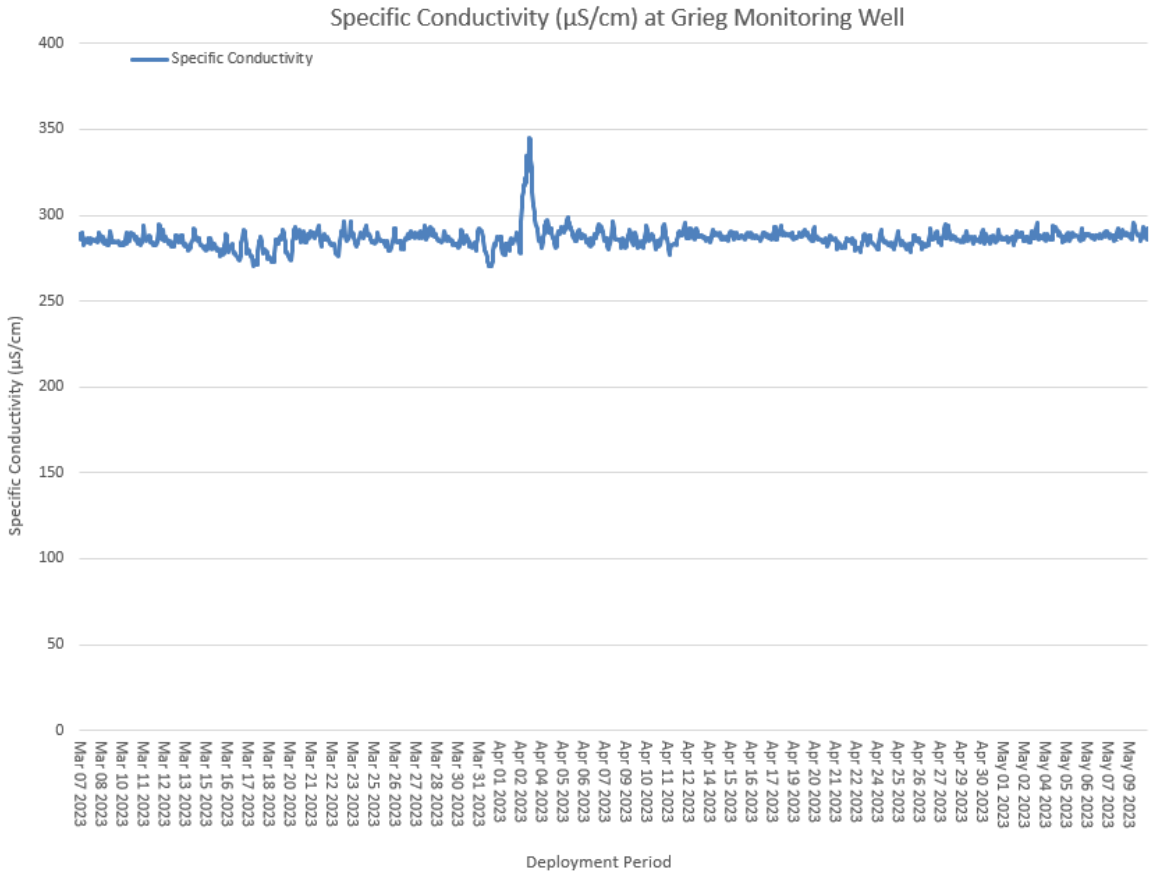

Figure 8: Specific conductivity (µS/cm) values

Grieg Monitoring Well, Newfoundland and Labrador

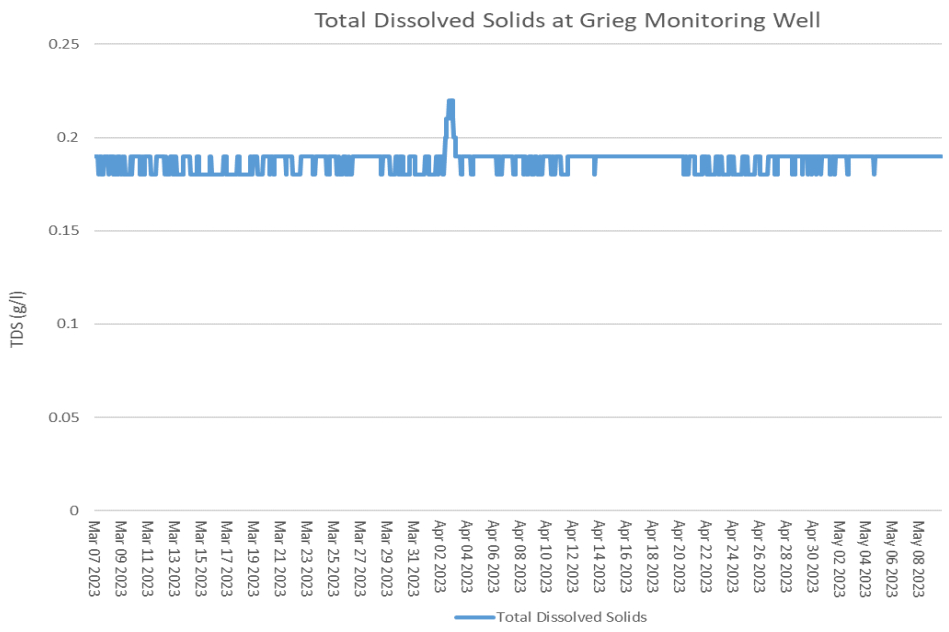

Figure 9: Total Dissolved Solids (TDS)

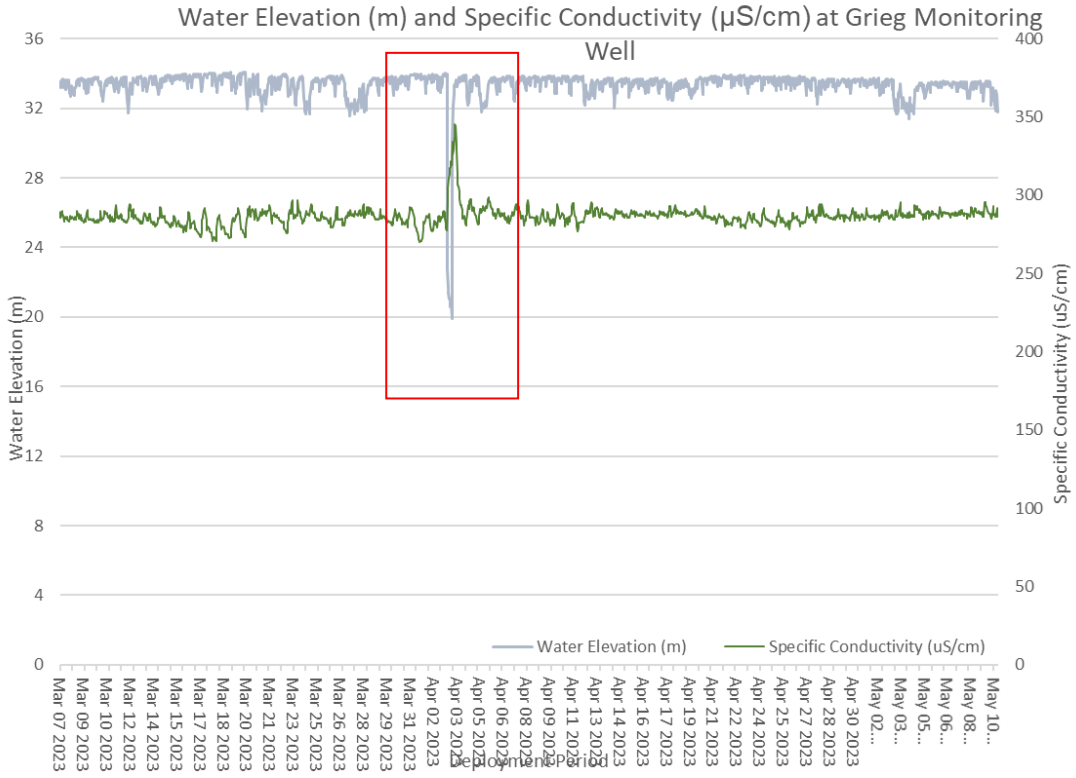

Figure 10: Water Elevation (m) and Specific Conductivity (µS/cm) at Grieg Monitoring Well. The red box indicates a sharp decrease in water elevation (likely due to pumping), followed by an increase in specific conductivity.

Oxidation-Reduction Potential (ORP)

ORP levels during the deployment ranged within 192.10 mV to 457.70 mV (Figure 11). The dataset had an average of 306.67 mV. Due to the disruption of the well with frequent pumping of the aquifer, it is expected that the ORP would fluctuate. The changes across the deployment are evident on Figure 11 as the ORP values rise and fall.

Oxidation-Reduction Potential is used to determine the oxidizing-reduction potential of the groundwater. The 'redox potential' of the groundwater can indicate the presence of agents that may contaminate groundwater. ORP is individual and specific to each water body and gathering background data is essential in understanding what the changes in the data represent.

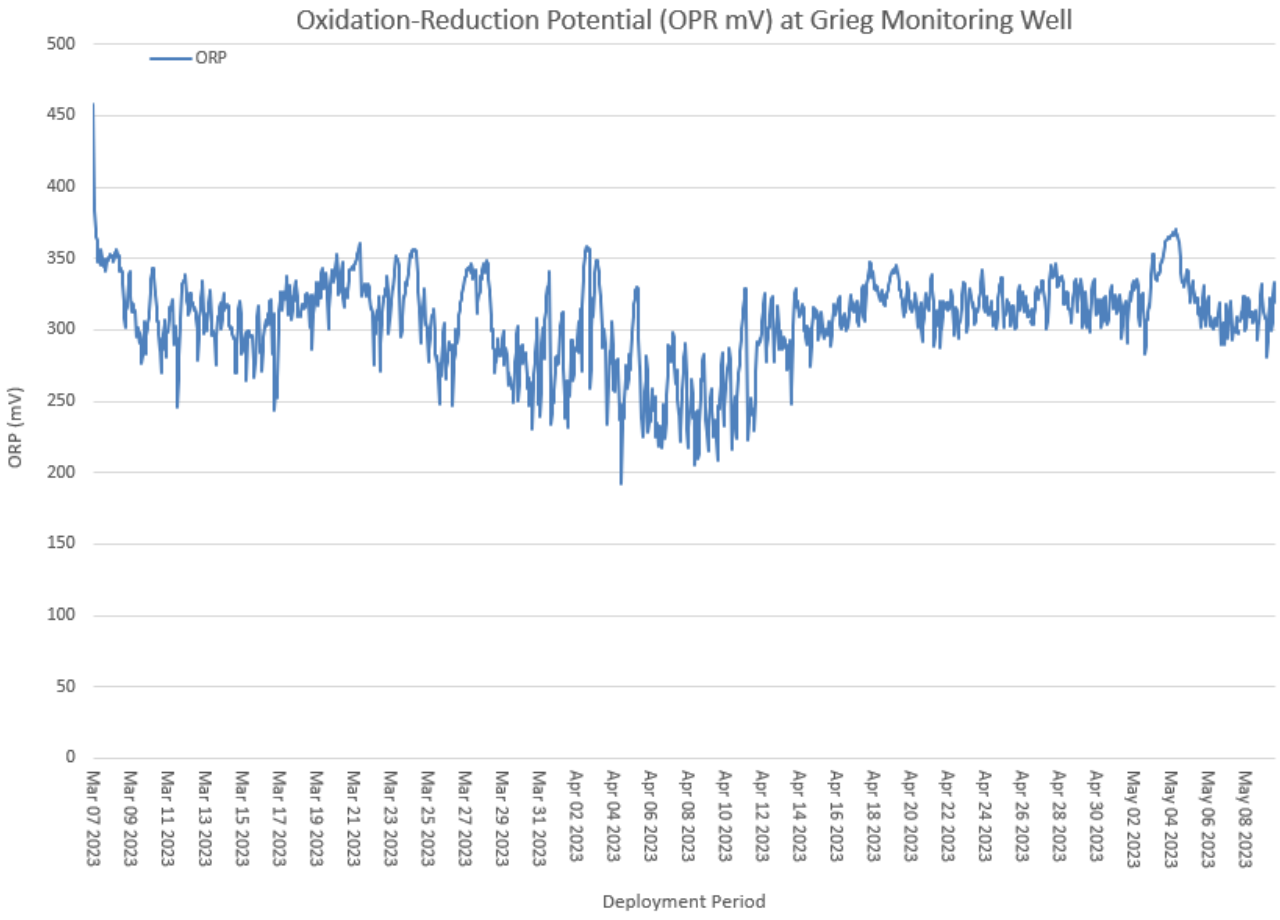

Figure 11: ORP values (mV)

Water Elevation

Water elevation at the monitoring well, ranged within 19.89 m to 34.06 m. The data set had an average of 33.54 m. Generally, water elevation within a groundwater well is consistent if the water is not drawn for use. The well is intermittently pumped, therefore there will be variations in water level as noted on Figure 12. Aside from one larger dip in water elevation, the range of the elevation was reasonably consistent across deployment.

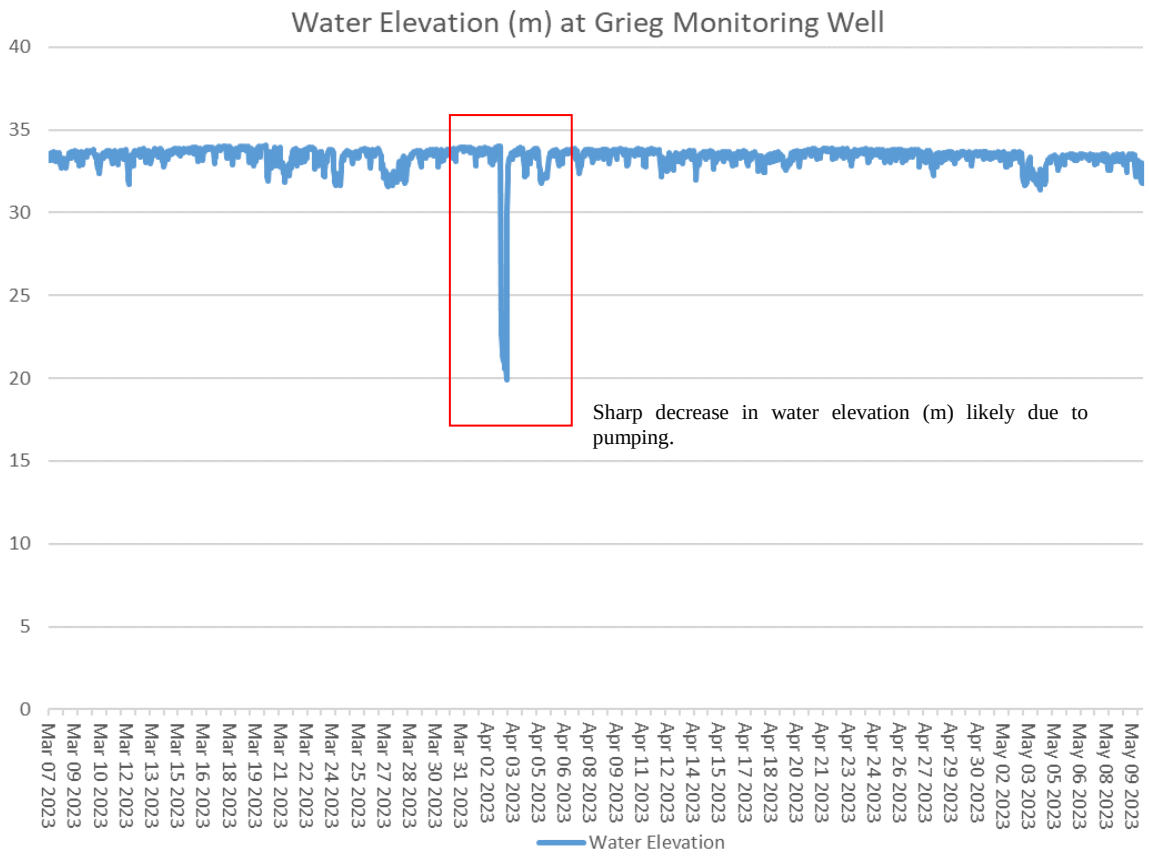

Figure 12: Water Elevation (m)

Appendix I

Water Quality Statistics of Grieg Groundwater Well

	Water Temperature (oC)	pH (pH units)	Specific Conductivity (uS/cm)	TDS(g/L)	ORP (mV)	Depth (m)	Water Elevation (m)
MIN	7.333	7.5	270.25	0.18	192.1	20.003	19.8874
MAX	7.505	7.68	345.25	0.22	457.7	34.24	34.057
MEDIAN	7.424	7.56	286.42	0.19	312	33.724	33.54305
MEAN	7.422982318	7.556304063	286.4494037	0.187304918	306.7110164	33.52466383	33.34057235