Real-Time Water Quality Report

Grieg NL Nurseries Ltd Monitoring Well

Deployment Period:
May 24, 2022 to August 4, 2022

Newfoundland Labrador

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

Prepared by:

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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. Tara Clinton is ECC's main contact regarding the instrumentation or the functionality of the monitoring well operation. Tara is responsible for maintaining and calibrating the water quality instrument, as well as grooming, analyzing and reporting on water quality data recorded at the station.

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 climb 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. Both wells are functioning in good condition. In the event of a catastrophic failure of the main well, the monitoring well can serve as a backup. 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. Recordings can also be disrupted during routine calibration and maintenance of equipment by WRMD. 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.

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

Parameter of Comparison	In-Situ Instrument	Grab Sample Result
pH (pH units)	7.48	7.99
Specific Conductivity (µS/cm)	287.4	310.0

Grieg Monitoring Well

Water Temperature

Water temperature ranged from 7.246°C to 7.37°C during the deployment period (Figure 6). The average water temperature across the deployment is 7.3°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. The water temperatures did not fluctuate significantly across the deployment.

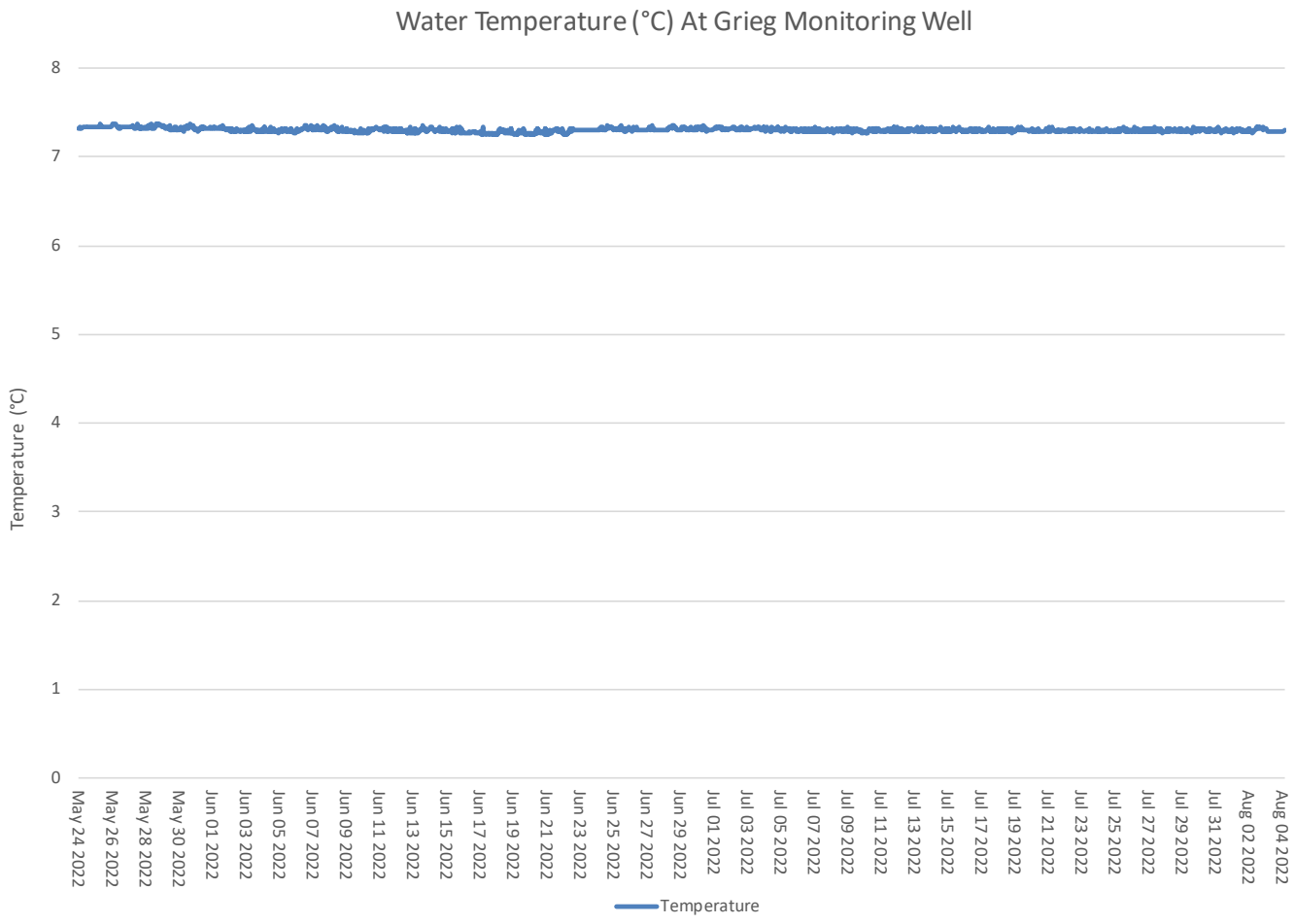

Figure 6: Water temperature (°C) values

pH

Throughout the deployment period, pH values ranged between 7.43 pH units and 7.72 pH units. The pH data remained consistent for the duration of the deployment, with a median of 7.54 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). Data was less variable after June 23rd.

Comparison of the grab sample data for pH indicated the grab sample of 7.99 pH, was slightly higher than what was recorded in-situ at 7.48 pH (Table 1). It would be expected that these two pH results would be different in values. The well was pumped throughout the morning before the sample was taken. The in-situ reading was recorded after the pumping of the well had stopped and the water column allowed to settle.

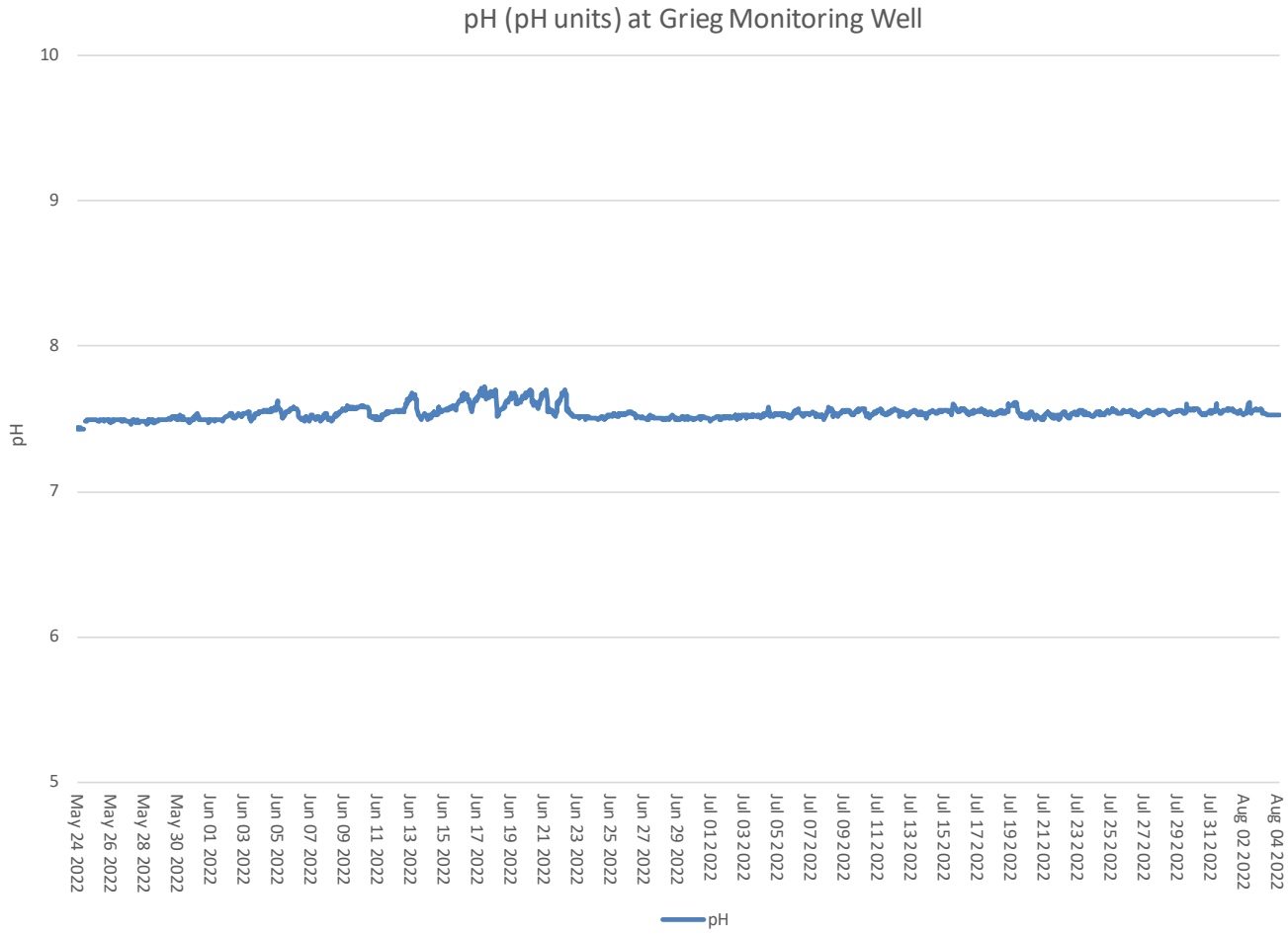

Figure 7: pH (pH units) values

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 270.43 µS/cm and 368.6 µS/cm (Figure 8). The higher spikes in conductivity are likely due to pumping 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 0.24 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 and TDS was observed on July 19th, the same time as a slight increase in pH and major disruption to water level. This may indicate work occurring at the well at this time.

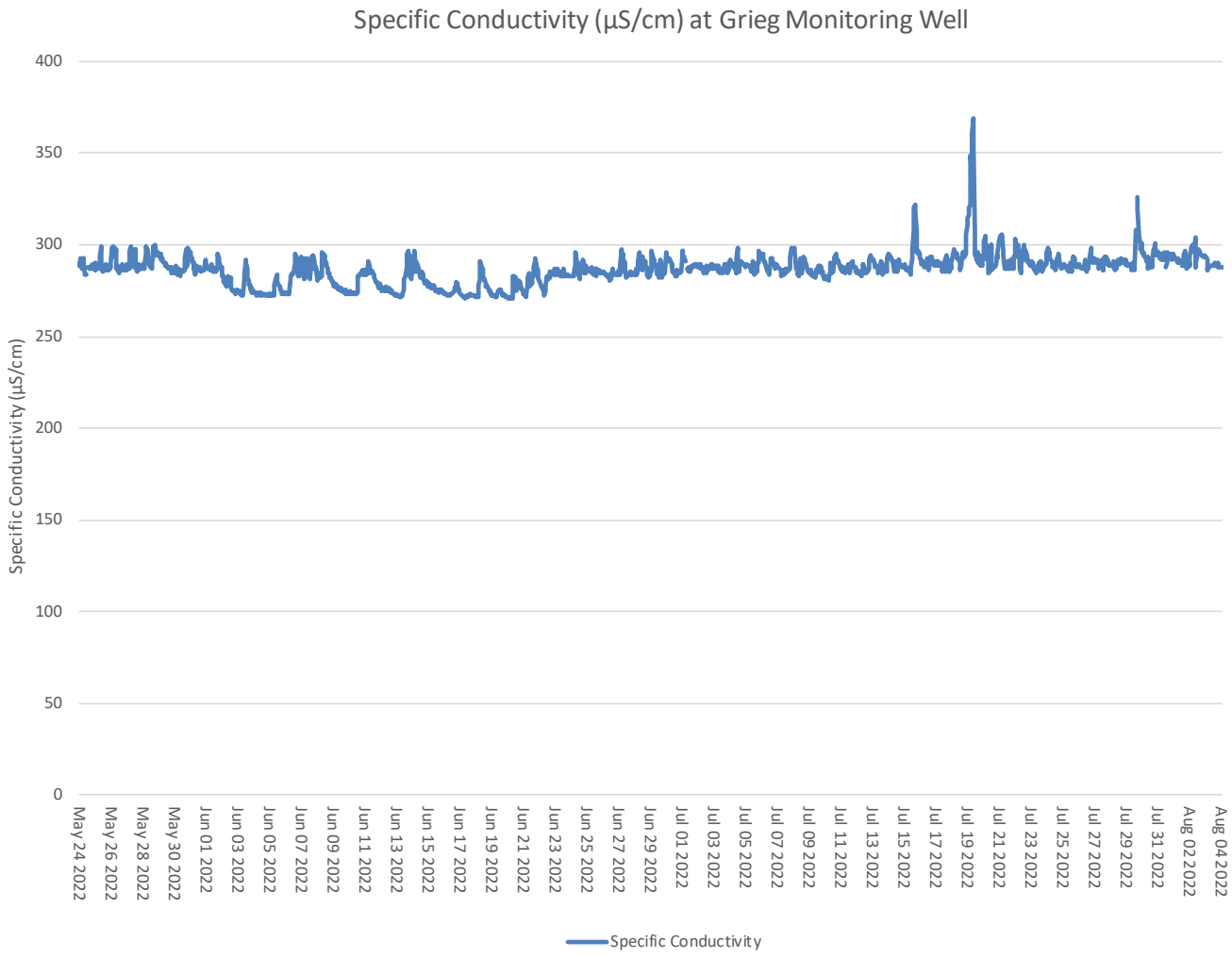

Figure 8: Specific conductivity (µS/cm) values

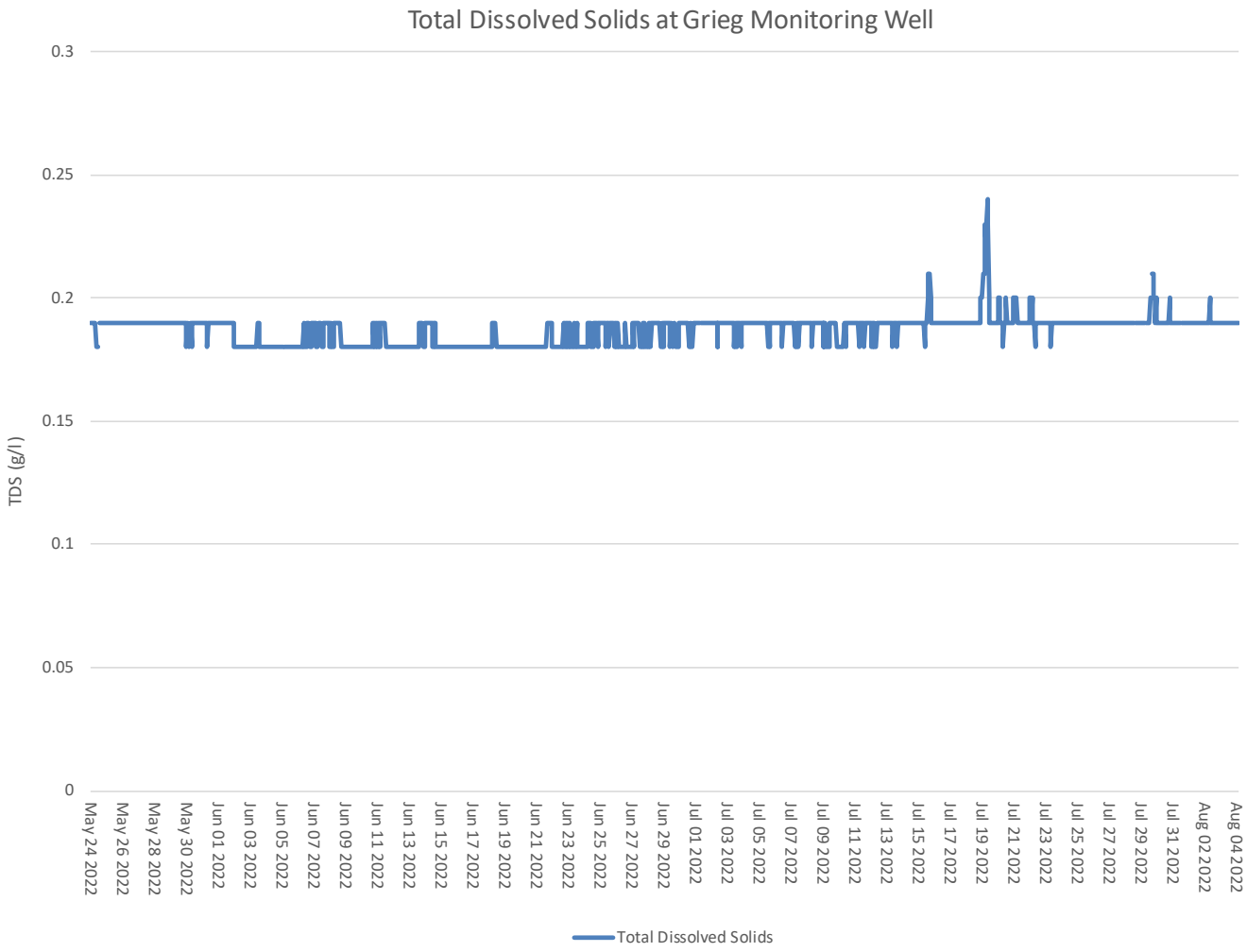

Figure 9: Total Dissolved Solids (TDS)

Oxidation or Reduction Potential (ORP)

ORP levels during the deployment ranged within 124.9 mV to 338.4 mV (Figure 10). The dataset had a median of 287.07 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 10 as the ORP values rise and fall.

Oxidation-Reduction Potential is used to determine the oxidizing or reduction potential of the groundwater. The 'redox potential' can indicate the presence of agents that may adjust water quality parameters of this 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.

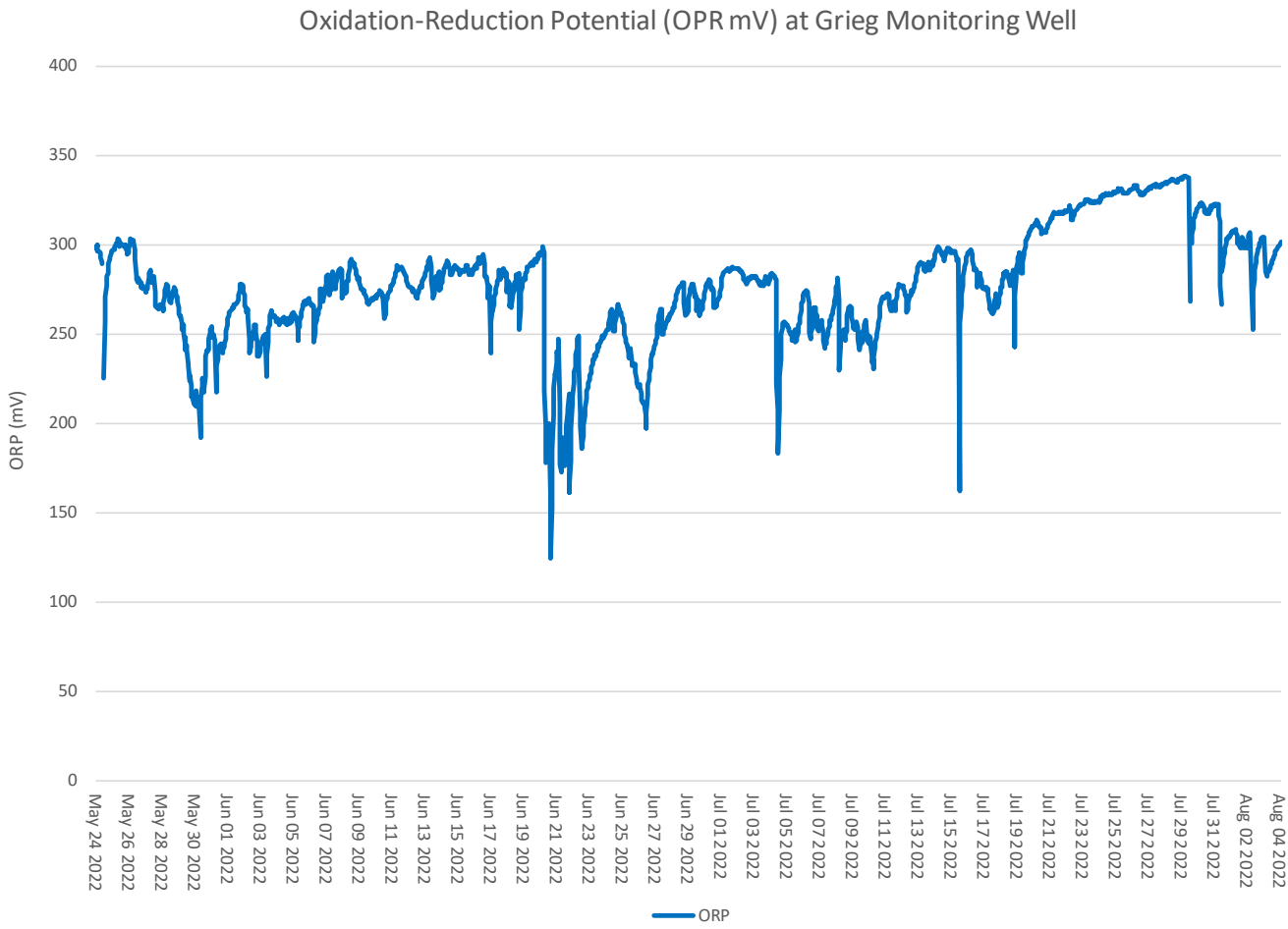

Figure 10: ORP values (mV)

Water Elevation

Water Elevation at the monitoring well, ranged within 20.87 m to 34.95 m. The data set had a median of 34.44 m. Generally, water elevation within a groundwater well is consistent if the water is not accessed for use. This well and its aquifer are frequently pumped, therefore there are variations in water level as noted on Figure 11. Aside from the larger dips in water elevation, the range of the elevation was reasonably consistent across deployment.

Conductivity was included on the graph to indicate the changes in the parameters when the water elevation changes. The dips in water elevation result in slight increases in conductivity.

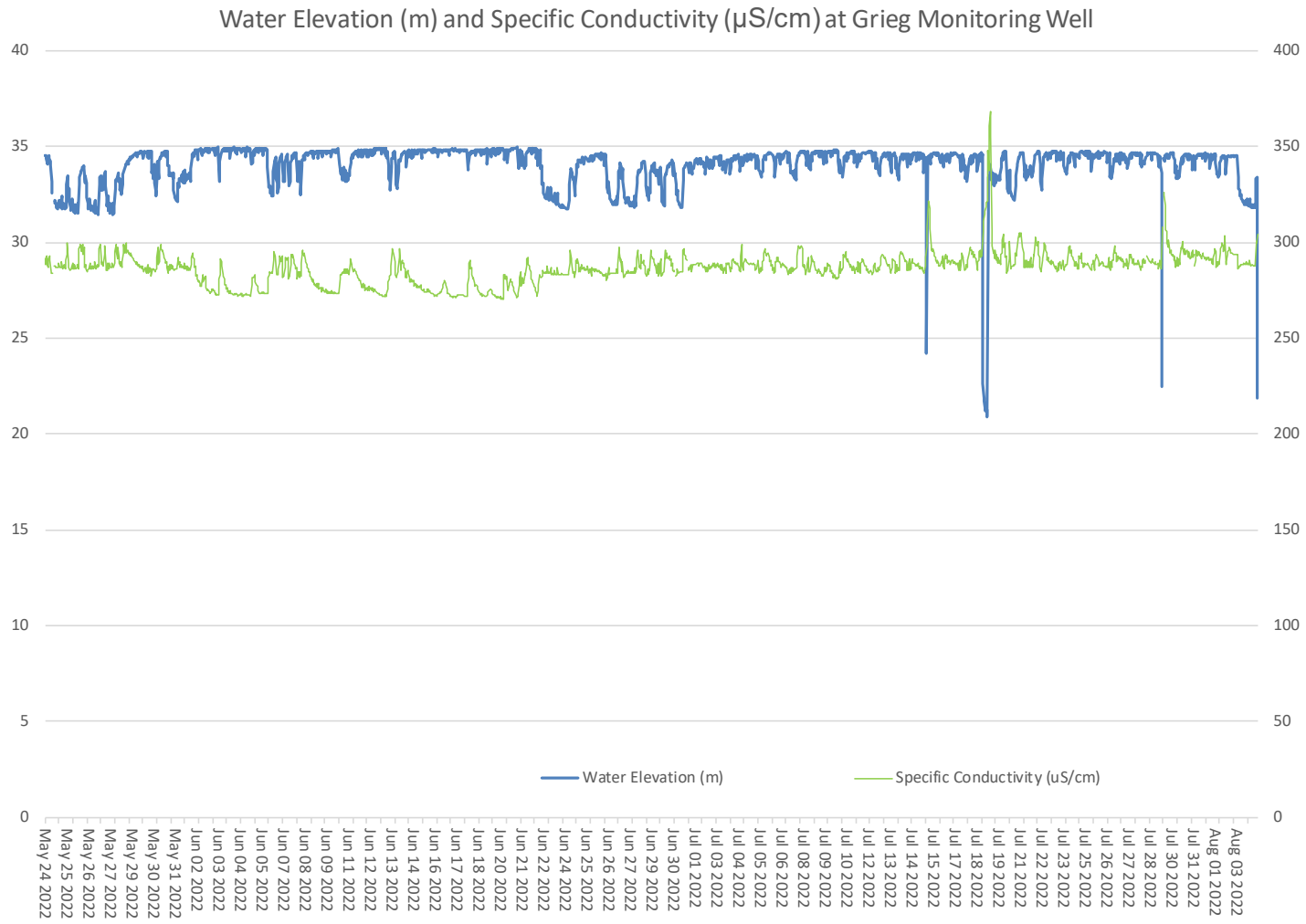

Figure 11: Water Elevation (m)

Appendix I

Water Quality Statistics of Grieg Groundwater Well

Parameter	Min	Max	Median	Mean
Water Temperature (°C)	7.25	7.37	7.30	7.30
pH (pH units)	7.43	7.72	7.54	7.54
Specific Conductivity (µS/cm)	270.43	368.6	287.07	286.57
Total Dissolved Solids (g/L)	0.18	0.24	0.19	0.19
ORP (mV)	124.9	338.4	277.2	276.7
Water Elevation (m)	20.87	34.95	34.44	34.00