Real Time Water Quality Deployment Report

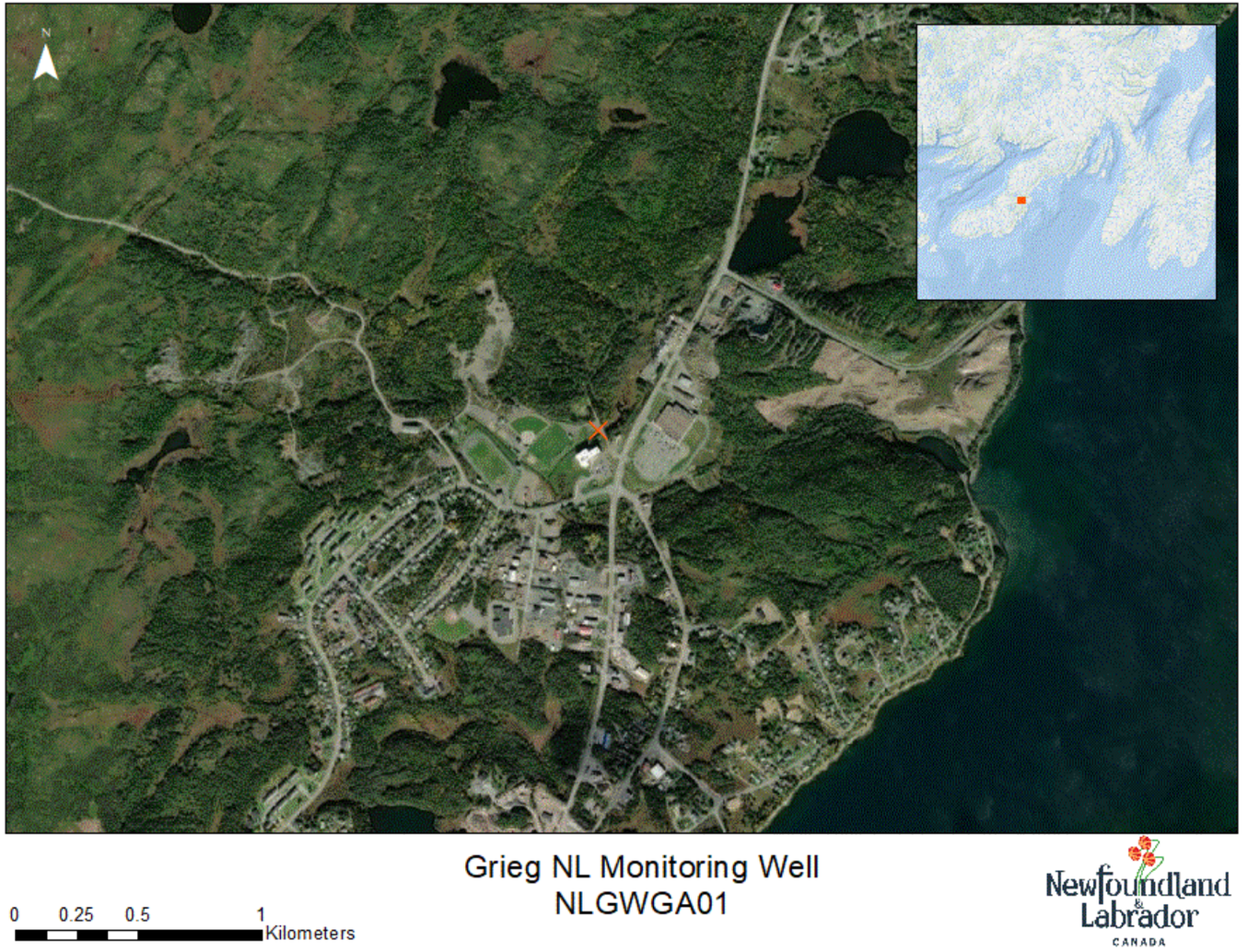
Grieg NL Monitoring Well

NLGWGA01

2024-07-04 to 2024-08-06

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

Grieg NL Monitoring Well



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

Grieg Seafood has two wells: a primary production well responsible for supplying fresh water to the facility on demand, and a secondary well used for monitoring and backup purposes, housing the WRMD monitoring equipment. To ensure the effective operation of the pump installed in the backup well, the pump is initiated approximately once per week. This can result in variations and abrupt changes in the data collected by the water monitoring instrument.

Quality Assurance and Quality Control

As part of the Quality Assurance and Quality Control protocol (QA/QC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey. With the exception of water quantity data (elevation), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.

Parameter	Excellent	Good	Fair	Marginal	Poor
pH	≤ ± 0.2 units	≤ ± 0.21 - 0.5 units	≤ ± 0.51 - 0.8 units	≤ ± 0.81 - 1 units	> ± 1 units
Specific conductance	≤ ± 3 µS/cm or ≤ ± 3%, whichever is greater	≤ ± 3.1-10 µS/cm or ≤ ± 3.1-10%, whichever is greater	≤ ± 10 - 15 µS/cm or ≤ ± 10.1-15 %, whichever is greater	≤ ± 15.1 - 20 µS/cm or ≤ ± 15.1-20 %, whichever is greater	> ± 20 µS/cm or > ± 20 %, whichever is greater

At the beginning of the deployment period, grab samples are collected to compare against initial in-situ logged data. Values for pH and specific conductivity are compared between the instrument and the grab sample**.** Based on the degree of difference between parameters recorded by the Field Sonde and grab sample results at deployment, a qualitative statement is made on the data quality.

There are a few circumstances which may cause QA/QC rankings below excellent. Typically when the well is pumped to provide water for the grab sample, the pumping can disturb the water column including any diluted salts and inorganic materials that are present in the groundwater. Additionally, 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.

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; if a reading is taken too soon it may not accurately portray the water body.

Fair

pH Grab Sample Ranking

Poor

Spec. Conductivity Grab Sample Ranking

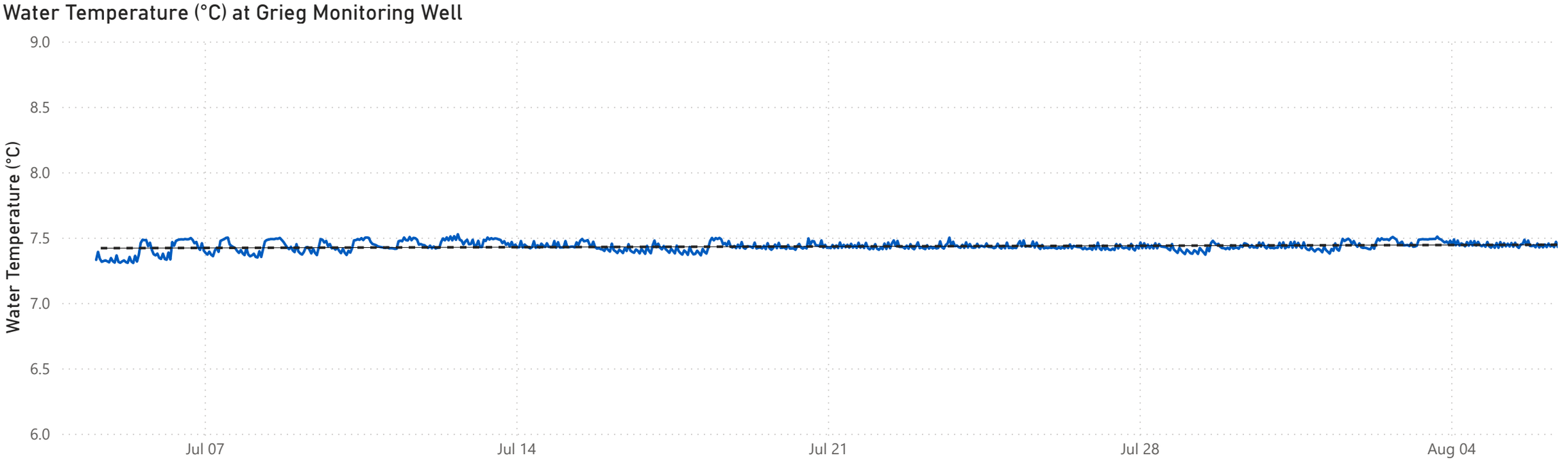
PARAMETER	Field Value	Grab Sample	Difference
pH	7.42	7.99	-0.57
Specific Conductivity (µS/cm)	445.84	360.00	85.84

When comparing field data to grab sample data, pH ranked fair while specific conductivity ranked poor. This is likely due to the disturbance in the well from pumping prior to taking the sample.

Water Temperature

7.43	7.43	7.31	7.53
Average (°C)	Median (°C)	Minimum (°C)	Maximum (°C)

Water temperature ranged from 7.31°C to 7.53°C during the deployment period. The median water temperature across the deployment is 7.43°C. Grieg's monitoring station is a groundwater well; generally, the water temperatures will remain consistent. 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.



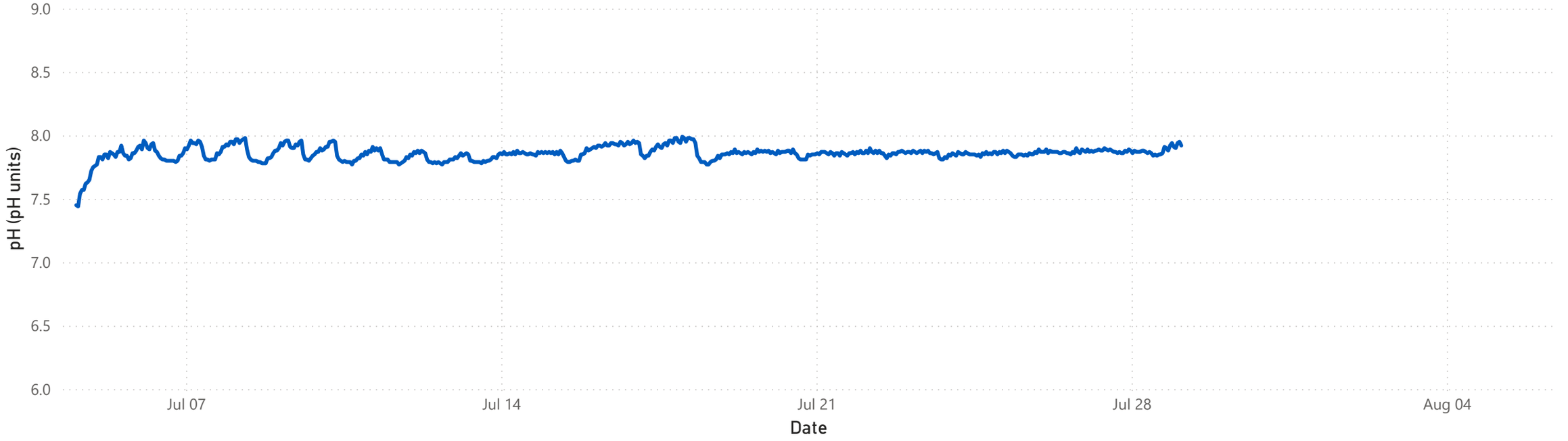
pH

7.86	7.86	7.44	7.99
Average of PH	Median of PH	Min of PH	Max of PH

Throughout the deployment period, pH values ranged between 7.44 pH units and 7.99 pH units. The pH data remained consistent for the duration of the deployment, with a median of 7.86 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. 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 7.42 pH. It would be expected that these two pH results would vary slightly. The well was pumped throughout the morning before the sample was taken while the in-situ reading was recorded after the pumping of the well had stopped.

On July 29, 2024, the pH and ORP readings became erratic and erroneous, with pH values exceeding 18 units. The sonde was removed from the well on August 6, and the pH/ORP sensor was sent back to the manufacturer, where a complete sensor failure was confirmed. As a result, the data from July 29 to August 6 was excluded from the dataset.

pH (pH units) at Grieg Monitoring Well



Oxidation-Reduction Potential (ORP)

348.96	361.95	203.50	480.10
Average ORP (mV)	Median ORP (mV)	Min ORP (mV)	Max ORP (mV)

Throughout the deployment period, ORP values ranged between 203.50 mV and 480.10 mV with a median of 361.95 mV. ORP may require days to weeks to reach equilibrium with its surroundings, as illustrated in the figure below, where it initially rises at the start of deployment. Since this deployment period was shorter, ORP continued to rise but did not reach a point of stabilization hence the continuous upward trend. ORP is individual and specific to each water body and gathering background data is essential in understanding what the changes in the data represent.

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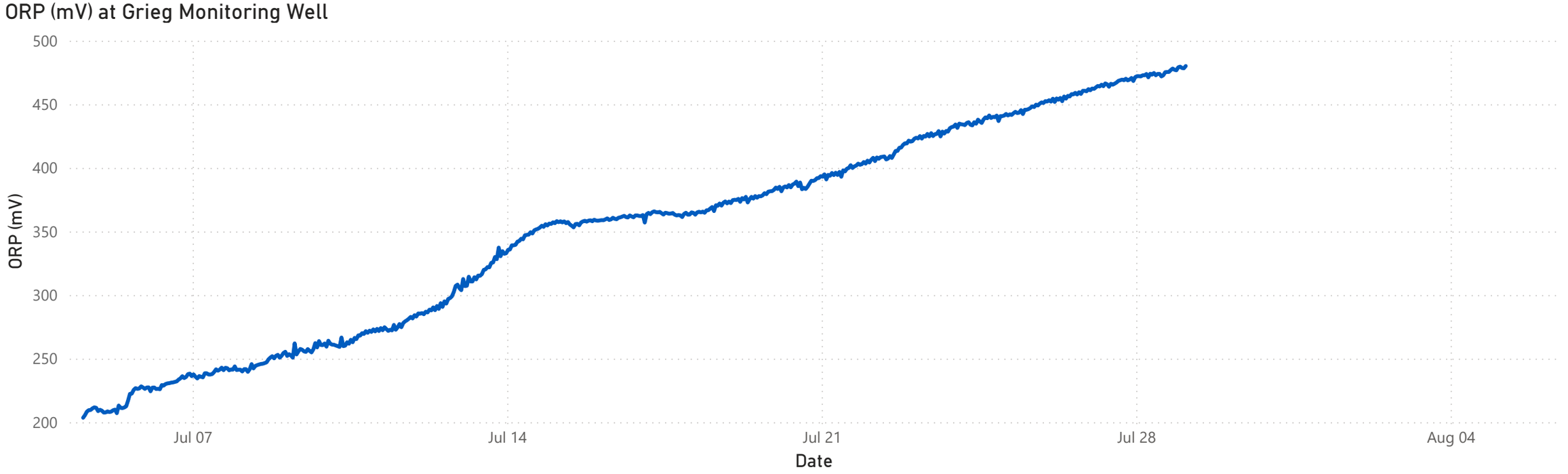
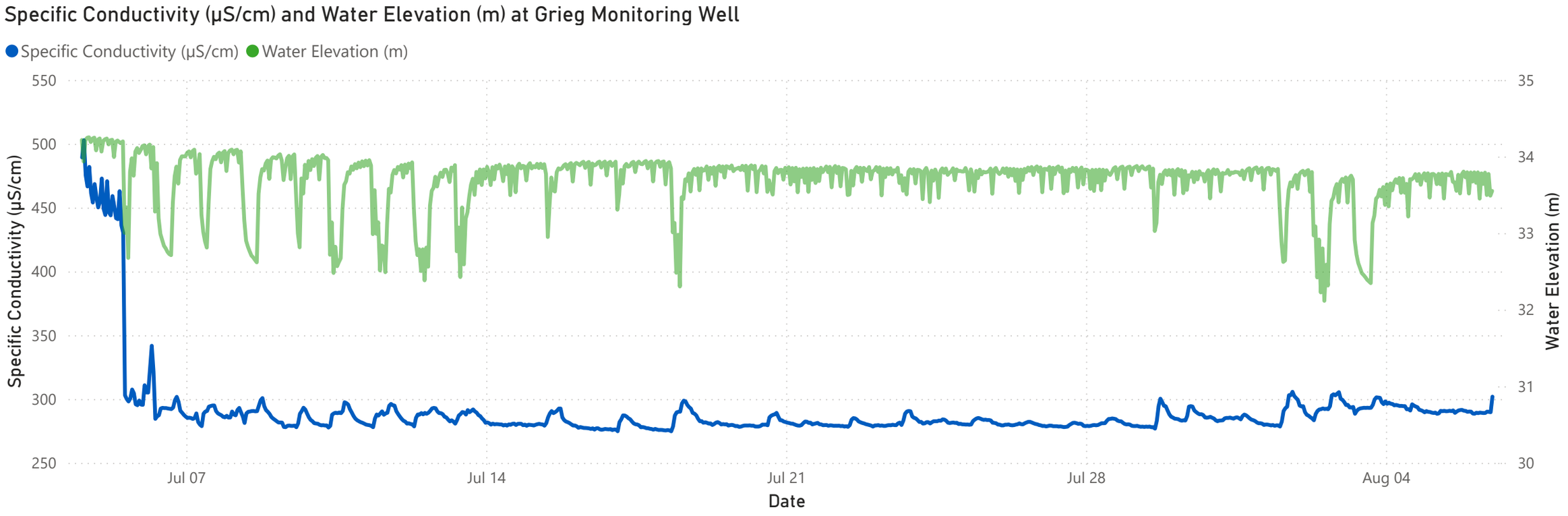


Specific Conductivity

290.63	283.66	274.72	502.86
Average µS/cm	Median µS/cm	Minumum µS/cm	Maximum µS/cm

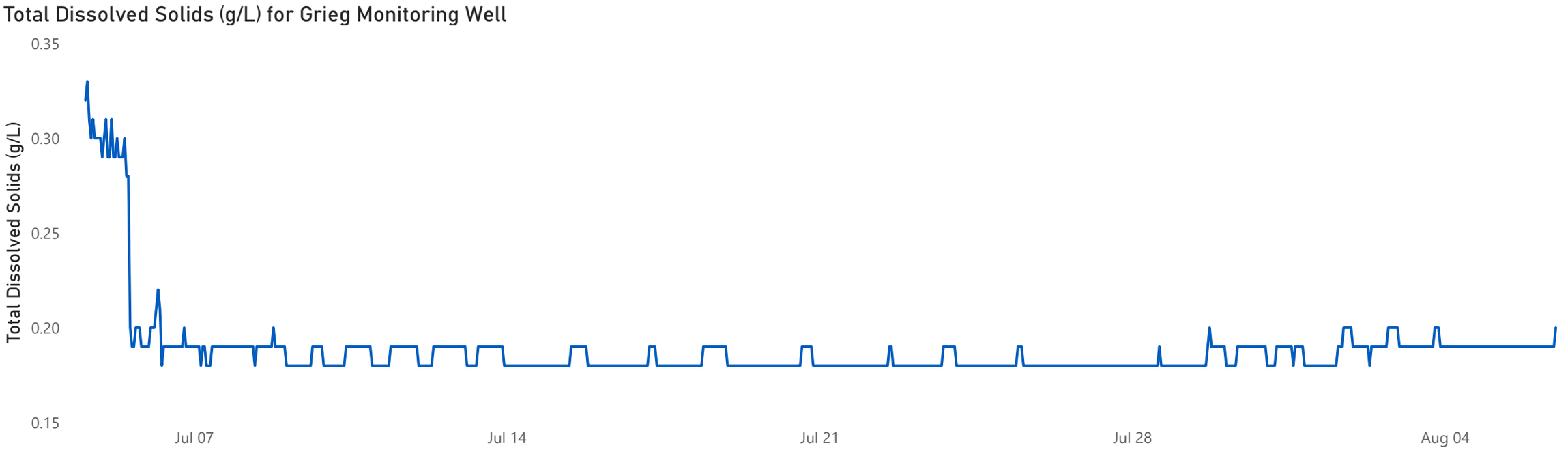
During the deployment, specific conductivity levels were within 274.72 µS/cm and 502.86 µS/cm ,with a median of 283.66 µS/cm. Comparison of the grab sample data for specific conductivity indicated the grab sample of 360.00 µS/cm, was slightly lower than what was recorded in-situ at 445.84 µS/cm. Conductivity was elevated at the start of the deployment period, coinciding with a slightly higher water elevation. As the water level dropped, conductivity decreased, suggesting that the well may have recharged with water of lower conductivity. Conductivity was relatively stable and consistent for the rest of the deployment period. The small spikes in conductivity are likely due to pumping within the aquifer, which can disrupt the diluted salts and inorganic materials that are present in the groundwater.



Total Dissolved Solids (TDS)

0.19	0.18	0.18	0.33
Average TDS (g/L)	Median TDS (g/L)	Min TDS (g/L)	Max TDS (g/L)

For the deployment period, Total Dissolved Solids ranged within 0.18 g/L to 0.33 g/L, with an average of 0.19 g/L. 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 TDS is calculated in g/L.



Water Elevation (m)

33.68	33.80	32.12	34.25
Average (m)	Median (m)	Minimum (m)	Maximum (m)

For the deployment period, water elevation ranged within 32.12 m to 34.25 m, with a median of 33.80 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 seen on the graph below. There is a slight downward trend in water elevation observed throughout the deployment period.