AMURI IRRIGATION COMPANY

FACTSHEET: UNDERSTANDING YOUR WATER QUALITY RESULTS

Water Quality Analysis Scales

Nitrates

Groundwater

- Excellent (0-1g/m³)
- Good (1-2.3g/m³)
- Moderate (2.3-6.9g/m³)
- Poor (6.9-11.3g/m³)
- Very Poor (>11.3g/m³)

Surface Water

- Excellent (0-1g/m³)
- Good (1-2.3g/m³)
- Moderate (2.3-5.6g/m³)
- Poor (5.6-6.9g/m³)
- Very Poor (>6.9g/m³)

This nitrate classification is a simple system to convey local variability in water quality. If we were to use national benchmarks for surface water, it won't look as good because the NPS national bottom line for nitrate is only 2.4g/m³.

E.coli

Groundwater

E.coli in Groundwater is solely about drinking water. Any contamination by E.coli poses a risk to health, unless the water is treated. Many bores have only one sample. A single sample with no E.coli is not a guarantee that E.coli is never present, hence why only bores with at least 20 E.coli-free samples get an excellent classification.

Median	Max	Samples	Class
0	0	>20	Excellent
0	0		Good
0	>1		Moderate
1-10			Poor
>10			Very Poor

Surface Water

- Excellent (<33MPN/100ml)
- Good (34-65MPN/100ml)
- Moderate (66-130MPN/100ml)
- Poor (131-259MPN/100ml)
- Very Poor (>260MPN/100ml)

This E.coli classification is a simple system to convey local variability in water quality. It is only loosely based on the drinking water standard criteria. Demonstrating compliance with the NZ Drinking Water Standard is considerably more complicated.

Phosphorus

Our Phosphorus scale is a **work in progress**. We'll update and re-issue this factsheet as soon as that information has been made available.

Water quality tests undertaken on groundwater quality samples may include a range of parameters (depending on the type of test undertaken). The following provides some background to parameters commonly included in standard water quality tests.

Nitrate-Nitrogen

Nitrate (N) is a form of Nitrogen which forms in the soil as a result of the breakdown of organic matter or the oxidation of other forms of Nitrogen (such as Urea or Ammonia in urine patches). Nitrate is highly soluble in water and is a critical requirement for plant growth. However, excess Nitrate in the soil which is not taken up by plants can be leached into underlying groundwater by water infiltrating through the soil zone.

At high concentrations, Nitrate in groundwater can be a risk to human health. The Drinking Water Standards for New Zealand set a maximum safe concentration of 50g/m^3 Nitrate (equivalent to 11.3g/m^3 Nitrate-Nitrogen) in drinking water.

However, Nitrate concentrations much lower than the limits for safe drinking water can adversely affect the ecology of surface waterways which receive groundwater discharge. For example, the National Policy Statement for Freshwater Management (NPS-FM) specifies a national bottom line of 2.4g/m^3 Nitrate-Nitrogen in surface waterways.

Hardness

Water containing excessive levels of calcium and magnesium is said to be 'hard'. The occurrence of 'hard' water generally reflects the presence of carbonate (e.g., limestone) rocks in an aquifer.

Hard water is a purely aesthetic problem that causes soap and scaly deposits in plumbing and decreased cleaning action of soaps and detergents. Hard water can also cause scale buildup in hot water heaters and reduce their effective lifetime.

Taumata Arowai guidelines specify a maximum Total Hardness of less than 200mg/L to avoid scale deposition and scum formation from soap and detergents.

Bacteria

The indicator organism Escherichia coli (E. coli) is used to assess the microbial quality of water. E. coli occur in high concentrations in the gut of all warm-blooded animals. While E. coli is generally not a disease-causing (pathogenic) organism, it is used as an indicator that water has been in contact with faecal material and may therefore contain organisms (various bacterial and viral strains) which are pathogenic. The presence of any E. coli in a water sample indicates the water is not suitable for drinking due to disease risk.

The most common cause of elevated E.coli concentrations in groundwater supplies is due to poor wellhead protection which allows surface contaminants (particularly run-off after rainfall) to enter the top of a bore or well. In some areas where soil is coarse-grained and water table is shallow, microbial contaminants can also infiltrate from the land surface to groundwater. Microbial contamination of groundwater can also occur down-gradient of point discharges such as septic tanks and offal holes.

Electrical Conductivity

Electrical conductivity (EC) is a measure of the ability of a water sample to conduct electricity and is an indirect measure of the total concentration of dissolved ions in a water sample. Generally, rainwater and water in alpine-sourced rivers exhibit low EC, reflecting low concentrations of dissolved ions. However, as water moves through the soil zone it can mobilise soluble ions increasing groundwater EC.

Depending on the aquifer, the EC of a water sample may provide a general indication of the likely concentrations of contaminants (such as Nitrate-Nitrogen) and is often an indicator of localised contamination due to wells being located close to a contaminant source (such as septic tank or silage pit) or poor wellhead protection. EC values in alluvial aquifers (i.e., gravels deposited by alpine rivers) are typically in the range of 10-35mS/m. However, EC can also be elevated (40-60mS/m) where groundwater is slow moving or comes into contact with carbonate (limestone) rocks.

Iron

Concentrations of dissolved Iron are strongly influenced by the amount of oxygen dissolved in a groundwater sample. Where groundwater is oxygenated, dissolved Iron concentrations are typically low. However, in old groundwater or aquifers containing organic material, oxygen concentrations in groundwater may be very low, resulting in elevated dissolved Iron concentrations.

Elevated Iron concentrations affect the potability (taste) of water and may cause staining of laundry, handbasins and toilets. Corrosion of metal bore casings can also result in the occurrence of particulate iron in groundwater supplies, particularly where groundwater pH is low.

Dissolved Metals

Metals such as copper, lead and iron, zinc can be derived from a range of natural and manmade sources. These trace metals can dissolve in water and, under certain onditions, occur in concentrations sufficient to adversely affect human health via drinking water sources.

Natural dissolved metal concentrations in groundwater are typically low to very low. However, in some situations metals such as Arsenic can be elevated where groundwater flows through marine-derived sediments or in locations down-gradient from specific sources (e.g., landfills). The most common source of elevated dissolved metal concentration in water supplies sourced from groundwater is associated with corrosion of metal pipes and fittings due to low pH.

Safe limits for drinking water vary for individual dissolved metals. To determine suitability for drinking, water quality test results should be compared to the Maximum Acceptable Values specified in the New Zealand Drinking Water Standards.

pH

pH is a measure of the acidity or alkalinity of a water sample. Groundwater often exhibits slightly acidic pH values (6.0 to 7.0) due to natural processes occurring in the soil zone.

pH is an important overall measure of water quality as it can alter corrosivity and the solubility of contaminants (particularly metals). Groundwater with low pH can result in pitting of pipes and fixtures, staining (often blue if pipes are copper) and exhibit a metallic taste. At high pH, water may have a "slippery" feel or exhibit a soda taste.

Taumata Arowai (the drinking water regulator) specify a guideline range for pH between 7.0 and 8.0 to avoid elevation of dissolved metals due to corrosion of pipes and fittings (referred to as plumbosolvency). Many groundwater sources exhibit pH values below this range.

Viruses

Groundwater affected by faecal contamination may contain disease-causing viruses (viral pathogens). The presence of E.coli in water, is utilised to indicate potential faecal contamination which may also signal the potential presence of viral pathogens.

Sickness caused by viruses is common in rural New Zealand where untreated groundwater is used for potable supply. Potential sources are similar to microbial contaminants and can often be eliminated by ensuring a good standard of wellhead protection.

Manganese

The occurrence of Manganese in groundwater is similar to iron and generally reflects natural concentrations of dissolved oxygen in an aquifer. Elevated Manganese concentrations may cause staining and adversely affect health from drinking over an extended period.

Taumata Arowai guidelines specify a maximum dissolved Manganese concentration of less than 0.04mg/L to avoid staining (typically black) and 0.10mg/L to avoid adverse effects on taste. The Drinking Water Standards for New Zealand specify a dissolved Manganese concentration of less than 0.4mg/L to avoid health effects.

We're Here to Help

If you have any questions, queries or would like some assistance please do not hesitate to contact us.

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