



AITUTAKI WATER QUALITY REPORT OCTOBER 2025

SUMMARY

Water samples were collected on Tuesday 14th October. Weather observed on the day prior to sampling was windy and overcast that continued the next day with occasional showers and tides shifting from low to high during sample collection. Due to decreased staff capacity and limited boat access, Maina Nursery was not sampled. The remaining eleven lagoon sites were accessible and sampled. Algae such as Boodlea, Padina, Sargassum, Spirogyra, Cyanobacteria, and dry Turbinaria and Halimeda were observed at nine out of eleven sites except at Vaipae and Arutanga Wharves. Tautu stream was flowing and sampled. Stagnancy and absence of water were observed in the remaining four streams and therefore omitted from sampling. Enterococci bacteria, total suspended solids and dissolved oxygen results and levels are summarized in the table below.

Lagoon Site	Site ID	Enterococci (MPN/100ml)	Total Suspended Solids (mg/L)	Dissolved Oxygen (%)
Ootu	AIM02	<1	7.5	110
Vaipaka	AIM04	<1	7.7	117
Vaipae Wharf	AIM05	<1	13.6	122
Tautu Wharf	AIM06	<1	4.0	117
Taravao	AIM07	<1	5.4	117
Vainamu	AIM08	107	17.9	87
Vainamu Wharf	AIM09	10	9.5	94
Arutanga Wharf	AIM10	<1	8.9	106
Rapae	AIM11	41	2.0	84
Maunga Pu	AIM12	<1	0.3	83
Maina Nursery	AIM14	NO WATER SAMPLED		
Amuri Wharf	AIM16	41	2.4	87
Stream Site	Site ID	Enterococci (MPN/100ml)	Total Suspended Solids (mg/L)	Dissolved Oxygen (%)
Vaitiare	AIS01	NW	NW	NW
Vaipae	AIS02	NW	NW	NW
Pata	AIS03	NW	NW	NW
Arutanga	AIS04	NW	NW	NW
Tautu	AIS07	56	10.0	15



GRADING SCALE	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor
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Lagoon:

- All sites were safe for swimming due to low Enterococci bacteria results at <1 MPN/100mL to 107 MPN/100mL with good to excellent levels.
- Total suspended solids results exceeded the recommended limit of 5.0 mg/L for healthy coral reefs at seven out of eleven sites. Levels at these seven sites were poor and very poor except at Tautu and Amuri Wharves, Rapae and Maunga Pu where good to excellent levels were observed.
- Dissolved oxygen levels were above the recommended threshold of 80% at all sites showing good to excellent levels.
- Temperature ranged from 21.7 degrees at Taravao to 24.7 degrees at Arutanga Wharf with a mean temperature of 23.2 degrees.

- Salinity was stable ranging from 33.5 ppt at Vaipae Wharf and Rapae to 36.3 ppt at Arutanga Wharf with a mean salinity of 34.8 ppt.
- pH ranged from 7.76 at Rapae to 7.99 at Vaipae Wharf with a mean pH of 7.87.

Stream:

- Tautu results were as follows:
 - Enterococci bacteria level was very good with a low result of 56 MPN/100mL.
 - Level of total suspended solids was poor with a high result of 10 mg/L. This unfavourable outcome had minimal impact on its lagoon counterpart at Tautu Wharf that showed a good level and a low result of total suspended solids.
 - Dissolved oxygen was at extremely poor level with a low result of 15%. Slow water current and poor water clarity observed may have contributed to this.
 - Temperature, salinity and pH were within normal range at 23 degrees, 0.2 ppt and 6.4, respectively.

The monthly summary reports, rainfall data and lab study report can be found at the end of this report.

1. ENTEROCOCCI BACTERIAL COUNTS - AITUTAKI - Most Probable Number of Enterococci per 100 mL (MPN/100mL)

Lagoon Site	Site ID	May	Jun	Jul	Aug	Sep	Oct
Ootu	AIM02	<1	<1	10	<1	<1	<1
Vaipeka	AIM04	30	52	<1	10	10	<1
Vaipae Wharf	AIM05	<1	<1	10	<1	20	<1
Tautu Wharf	AIM06	<1	52	110	<1	10	<1
Taravao	AIM07	132	63	<1	<1	20	<1
Vainamu	AIM08	10	52	30	31	31	107
Vainamu Wharf	AIM09	98	146	<1	63	<1	10
Arutanga Wharf	AIM10	63	10	<1	<1	10	<1
Rapae	AIM11	20	10	<1	41	<1	41
Maunga Pu	AIM12	<1	10	20	20	<1	<1
Maina Nursery	AIM14	<1	<1	10	NW	NW	NW
Amuri Wharf	AIM16	30	20	<1	<1	10	41

Stream Site	Site ID	May	Jun	Jul	Aug	Sep	Oct
Vaitiare	AIS01	NW	88	NW	NW	NW	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	101	NW	39	NW	NW	56



ENTEROCOCCI BACTERIA STANDARDS	< 41	41 ≥ 100	101 ≥ 200	201 ≥ 350	351 ≥ 500	> 500
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

REFERENCE: WHO 2021 Guidelines on Recreational Water Quality for Coastal and Fresh Waters.

2. TOTAL SUSPENDED SOLIDS - AITUTAKI - Milligrams per Litre (mg/L)

Lagoon Site	Site ID	May	Jun	Jul	Aug	Sep	Oct
Ootu	AIM02	6.7	4.9	3.6	1.0	4.6	7.5
Vaipeka	AIM04	4.4	13.1	3.0	9.1	3.5	7.7
Vaipae Wharf	AIM05	4.9	4.4	2.6	6.0	2.0	13.6
Tautu Wharf	AIM06	10.0	2.3	3.3	3.8	13.0	4.0
Taravao	AIM07	23.3	41.7	3.3	11.9	2.9	5.4
Vainamu	AIM08	7.3	44.4	11.8	9.5	20.5	17.9
Vainamu Wharf	AIM09	3.4	16.7	6.3	6.8	4.6	9.5
Arutanga Wharf	AIM10	3.2	3.1	4.6	5.4	7.1	8.9
Rapae	AIM11	2.6	1.3	1.0	1.0	2.2	2.0
Maunga Pu	AIM12	2.4	1.3	1.0	1.0	1.3	0.3
Maina Nursery	AIM14	3.0	1.3	0.3	NW	NW	NW
Amuri Wharf	AIM16	4.1	3.3	1.0	2.0	2.3	2.4

Stream Site	Site ID	May	Jun	Jul	Aug	Sep	Oct
Vaitiare	AIS01	NW	26.7	NW	NW	NW	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	12.3	NW	8.3	NW	NW	10.0



TOTAL SUSPENDED SOLIDS STANDARDS	< 1.0	1.0 ≥ 2.5	2.5 ≥ 5.0	5.0 ≥ 10	10 ≥ 20	> 20
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

REFERENCE: Bell 1992, total suspended solids recommended limit is ≤5 mg/L for healthy coral reef.

3. DISSOLVED OXYGEN - AITUTAKI - Percent (%)

Lagoon Site	Site ID	May	Jun	Jul	Aug	Sep	Oct
Ootu	AIM02	80	102	93	102	77	110
Vaipeka	AIM04	96	110	89	119	111	117
Vaipae Wharf	AIM05	103	110	102	123	116	122
Tautu Wharf	AIM06	101	108	104	114	111	117
Taravao	AIM07	97	114	94	115	99	117
Vainamu	AIM08	69	81	89	91	86	87
Vainamu Wharf	AIM09	84	95	103	90	100	94
Arutanga Wharf	AIM10	62	68	95	104	109	106
Rapae	AIM11	74	93	105	89	80	84
Maunga Pu	AIM12	72	101	83	88	86	83
Maina Nursery	AIM14	74	92	92	NW	NW	NW
Amuri Wharf	AIM16	87	95	93	86	92	87

Stream Site	Site ID	May	Jun	Jul	Aug	Sep	Oct
Vaitiare	AIS01	NW	24	NW	NW	NW	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	19	NW	62	NW	NW	15

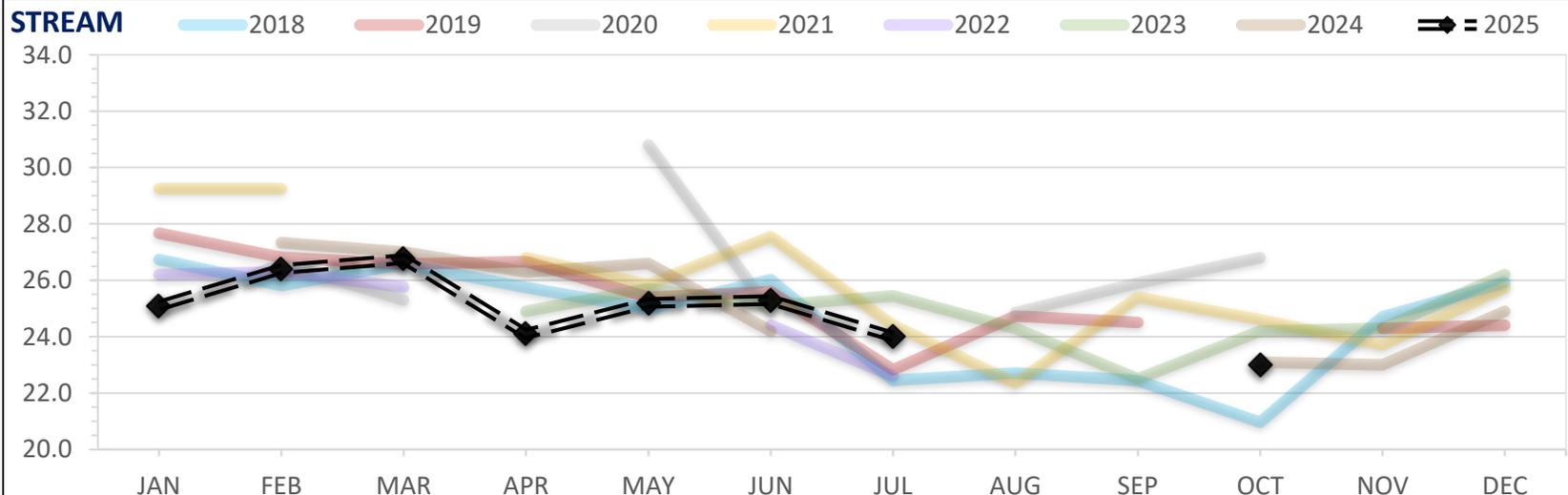
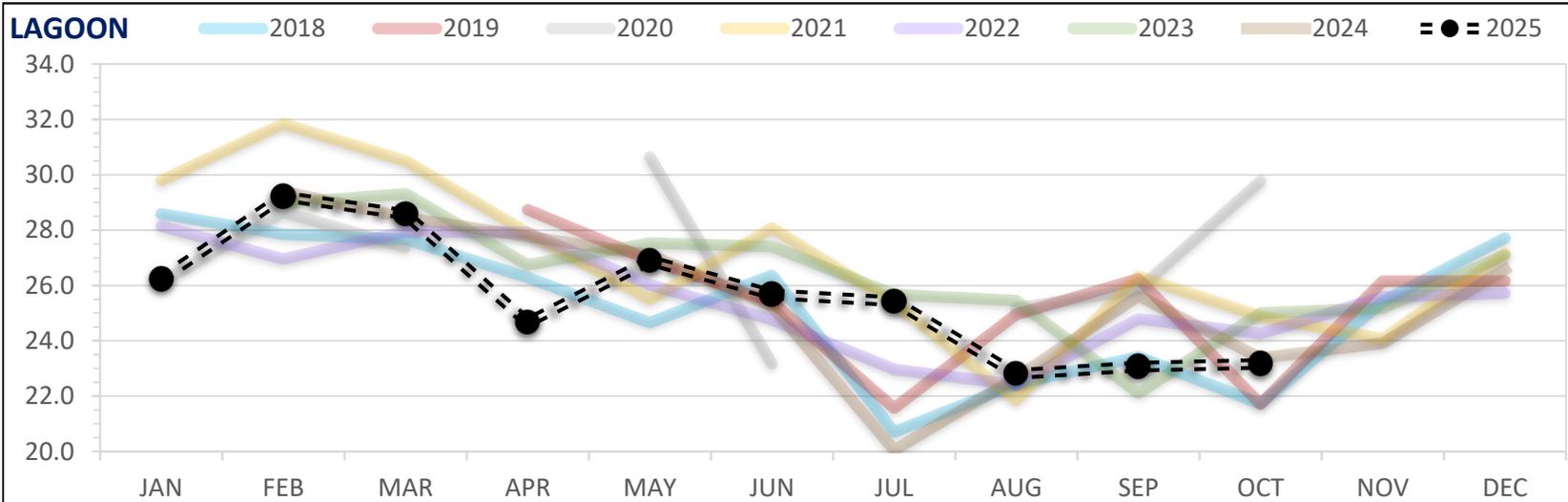


DISSOLVED OXYGEN STANDARDS	> 95	90 ≥ 95	80 ≥ 90	60 ≥ 80	40 ≥ 60	< 40
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

REFERENCE: Department of Health, Clean Water Branch Hawaii 1994: Dissolved oxygen recommended limit is ≥75% saturation for oceanic waters, embayments, open coastal waters & estuaries; ≥80% saturation for streams.

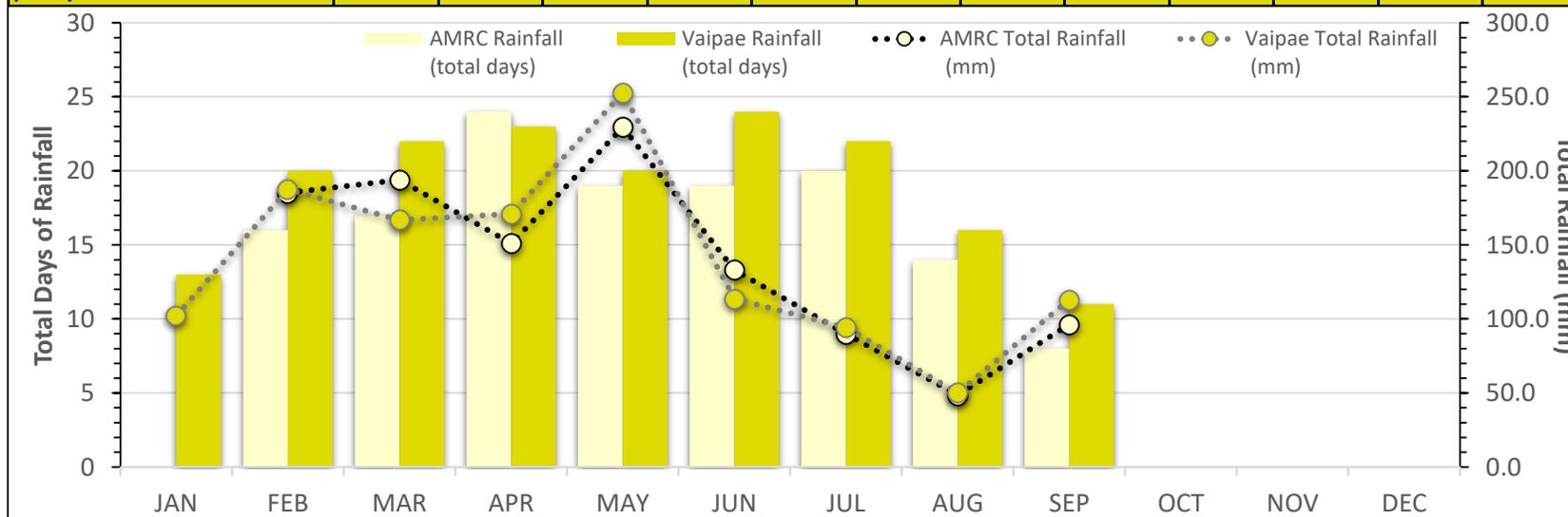
4. AVERAGE TEMPERATURE - AITUTAKI - Degrees Celcius (°C)

2025	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lagoon	26.2	29.2	28.6	24.7	26.9	25.7	25.4	22.8	23.1	23.2		
Stream	25.1	26.4	26.8	24.1	25.2	25.3	24.0	ND	ND	23.0		



5. AITUTAKI RAINFALL - AMRC & VAIPAE - Total Rainfall (mm) & Total Days of Rainfall

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AMRC Total Rainfall (mm)	ND	185.2	193.8	151.0	229.4	132.9	89.9	48.6	96.2			
AMRC Rainfall (total days)	ND	16	17	24	19	19	20	14	8			
AMRC Highest 1-Day (mm)	ND	43.8	39.6	75.8	95.0	72.4	20.4	19.2	74.8			
AMRC Highest 1-Day (date)	ND	19th	3rd	6th	24th	26th	11th	7th	18th			
Vaipae Total Rainfall (mm)	102.2	187.4	166.8	171.0	252.6	113.6	94.2	50.0	113.0			
Vaipae Rainfall (total days)	13	20	22	23	20	24	22	16	11			
Vaipae Highest 1-Day (mm)	26.2	44.4	33.0	68.4	100.2	52.0	20.0	19.0	89.0			
Vaipae Highest 1-Day (date)	10th	19th	3rd	6th	24th	26th	11th	7th	18th			



Report Date: 16.10.2025		AITUTAKI LAB STUDY REPORT – OCTOBER				Lab Report No.: 10L5351 – 10L5362		
SAMPLE DESCRIPTION								
Date Samples Collected:		Name of Sample:	Collected By:	Submitted By:	Time of Receipt:	Physical Description:		Quantity Per Site Received:
Tuesday 14 th October		Marine	MMR		10:20am	Clear		2.5L
		Stream				Slightly turbid		
Study No.		1	2	3	4	5	6	7
SITE ID	LAB ID	Enterococci (MPN/100ml)	Temperature (°C)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	pH	Total Suspended Solids (mg/L)
MARINE								
AIM02	10L5351	<1	23.8	35.0	109.7	7.59	7.83	7.5
AIM04	10L5352	<1	22.7	35.8	116.6	8.18	7.90	7.7
AIM05	10L5353	<1	22.9	33.5	121.7	8.62	7.99	13.6
AIM06	10L5354	<1	22.7	35.6	116.6	8.19	7.88	4.0
AIM07	10L5355	<1	21.7	35.0	117.4	8.43	7.84	5.4
AIM08	10L5356	107	22.7	34.0	87.1	6.17	7.81	17.9
AIM09	10L5357	10	22.8	35.3	93.5	6.56	7.88	9.5
AIM10	10L5358	<1	24.7	36.3	105.9	7.16	7.92	8.9
AIM11	10L5359	41	22.7	33.5	84.4	6.00	7.76	2.0
AIM12	10L5360	<1	24.2	34.1	82.9	5.72	7.86	0.3
AIM16	10L5361	41	23.9	35.0	87.4	6.03	7.85	2.4
STREAM								
AIS07	10L5362	56	23.0	0.2	14.6	1.3	6.4	10.0
Study Method		IDEXX Enterolert*	YSI Manual	YSI Manual	YSI Manual	YSI Manual	YSI Manual	MMR Lab Manual Water Quality Monitoring V5
Recommended Limit		Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments

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Abbreviation

NL: Not Listed, MPN: Most Probable Number, cfu: Colony Forming Unit, mL: milli Litre, FAU: Formazin Attenuation Unit, NTU: Nephelometric Turbidity Unit, ppt: Parts Per Thousand, DB: Designated Bathing Beach, MB: Moderate Use of Bathing, LB: Light Use of Bathing, IB: Infrequent Use of Bathing
NA: Not Available, however data will be available at a later date; ND: No Data due to equipment failure or logistics problems or time delay or methodology problem or combination of all; NW: No Water, stream dry or water stagnant or water level too low for sample collection or water dirty/murky.

Comments

1. Temperature[#]
Subtropical regions (south of Cape Canaveral and Tampa Bay, Florida, and Hawaii).
Short-term Max. 32.2°C, Max. True daily mean 29.4°C (average of 24-hourly temperature reading).
Temperature is the measure of warmth and coldness, reported as an average and measured in degrees celcius (°C).
2. pH
Changes to pH can be caused by a range of potential water quality problems (e.g., low values due to acid sulphate runoff). pH values are also related to soil geology and may be naturally low or high (in limestone areas). High pH values can also be caused temporarily when high rates of photosynthesis by aquatic plants (including algae) lead to a decrease in carbon dioxide, and therefore a decrease in carbonic acid in the water.
3. Salinity
A measure of the amount of dissolved salts in the water, and therefore an indicator of salinity. Excess salinity in freshwater streams occurs as a result of excess soil salinity, which may be caused by excess land clearing and changes to the groundwater table. Salinity is reported as parts per thousand (ppt).
4. Dissolved Oxygen[^]
DO levels indicate how much oxygen is in the water. Low DO levels indicate an abnormal disturbance in the ecosystem such as an algal bloom. DO is measured in percentage (%).
Low DO: 3.5 mg/L at 26C leads to 100% mortality of *Acipenser oxyrhincus*
2.7 mg/L at 19C leads to 22% mortality of *Acipenser oxyrhincus*
<3.7 mg/L Demersal finfish biomass diminishes
<3.5 mg/L Species richness diminishes
Below 2 mg/L infaunal species migrate to sediment surface and epifaunal species move to better aerated water.
Oxygen is essential for life processes of most aquatic organisms. Many aquatic organisms will suffocate if there is insufficient oxygen in the water.
5. Suspended Solids[@]
Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonably established norm for aquatic life. Total suspended solids (TSS) are non-living (inorganic) such as silt and mud; and organic matter such as animal and plant material found in the water. The presence of large amounts of particles are responsible for creating the murky appearance of dirty water and can quickly kill coral reefs. TSS is measured in milligrams per litre (mg/L).
6. Turbidity
Water clarity (the degree of light penetration) is important as aquatic plants depend on light to photosynthesize and produce oxygen. Large amounts of sediment in a water body can also smother benthic organisms. Suspended solid results are interactive and interdependent with turbidity. Expert interpretation needed. Turbidity is measured as FAU.
7. Enterococci^β
The presence of bacteria Enterococci *sp* is monitored as an indicator of human and animal waste pollution. The higher the numbers of Enterococci bacteria present in a sample, the greater the amount of faecal pollution in the water. Bacteria count is measured in Most Probable Number of Enterococci cells per 100mL of sample (MPN/100mL).
8. Nutrients (Nitrate, Nitrite, Ammonia, Phosphate)
High nutrient concentrations in a water body (eutrophication) may lead to excessive weed and algal growth. Excess nutrients enter a water body through several means, including discharge of treated sewage, storm water, and in run-off from land, for example as fertiliser, animal waste, or decaying plant matter.
9. Chlorophyll-a
Chlorophyll-a is a pigment found in green plants, including aquatic plant. Measuring the amount of chlorophyll-a in the water therefore indicates the amount of green algae present in the water. High concentrations of algae (algal blooms) may harm other aquatic organisms, either through the production of toxins, reduction of available light through covering the water surface, or by using all available oxygen during respiration at night. Chlorophyll-a is measured in micrograms per litre (µg/L).
10. Rainfall
Rarotonga: daily rainfall data is provided by the Cook Islands Meteorological Service.
Aitutaki: daily rainfall data is recorded by MMR Staff (Aitutaki Marine Research Centre – AMRC) at Amuri and by Rowan Strickland at Vaipae.
Rainfall is measured in millimetres (mm) and reported as an average per month, total number of days that had no rainfall and the highest amount of rainfall in 1-day.

[#]EPA Quality Criteria for Water Gold Book 1986

[^]EPA Ambient Aquatic Life Water Quality Criteria for DO (Saltwater): Cape Cod to Cape Hatteras Nov 2000

[@]EPA Quality Criteria for Water Red Book 1976

^βWHO Guidelines on Recreational Water Quality for Coastal and Fresh Waters 2021

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