



RAROTONGA WATER QUALITY REPORT JANUARY 2026

SUMMARY

Water samples were collected on Tuesday 20th January. Weather was cloudy and light showers with high tides during sample collection. All twelve lagoon sites were accessible and sampled. Boodlea algae was observed at Tikioki Packing Shed and Totokoitu Station lagoon sites. Salinity data was unavailable for all lagoon sites as the sensor is in the process of being replaced. Three out of eight streams were flowing and sampled. Juvenile fish were observed in Areiti stream. Lack of water, stagnancy and seawater influence were observed at the remaining five streams, therefore were not sampled. Summary table for Enterococci bacteria, total suspended solids and dissolved oxygen results and levels below.

Lagoon Site	Site ID	Enterococci (MPN/100ml)	Total Suspended Solids (mg/L)	Dissolved Oxygen (%)		
Pouara Raui	RAM03	<1	1.0	159		
Avana Mudflats	RAM04	31	8.4	127		
Paringaru	RAM05	10	2.2	117		
Tikioki Packing Shed	RAM06	<1	1.3	135		
Totokoitu Station	RAM08	31	1.0	118		
Papua	RAM09	<1	1.1	127		
Arorangi School	RAM11	41	7.0	130		
Social Centre	RAM13	175	10.5	120		
Muri Buoy	RAM16	<1	1.3	116		
Betela Beach	RAM17	10	1.2	123		
Avatiu	RAM18	20	1.5	125		
Muri Koka	RAM19	85	2.4	133		
Stream Site	Site ID	Enterococci (MPN/100ml)	Total Suspended Solids (mg/L)	Dissolved Oxygen (%)		
Avana	RAS01	517	0.3	83		
Paringaru	RAS02	NW	NW	NW		
Akapuao	RAS03	NW	NW	NW		
Totokoitu	RAS04	NW	NW	NW		
Betela	RAS06	NW	NW	NW		
Avatiu	RAS08	411	0.1	51		
Vaiterenga	RAS10	NW	NW	NW		
Areiti	RAS11	365	1.0	34		
GRADING SCALE	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor



Lagoon:

- Enterococci bacteria results were low at ten sites, ranging from <1 to 175 MPN/100mL showing good to excellent levels that were safe for swimming. However, Avana Mudflats and Arorangi School observed very poor and extremely poor levels with high results at 373 and 2,909 MPN/100mL, respectively. Resampling was carried out and the low result of 41 MPN/100mL showed very good levels at Arorangi School. Yet Avana Mudflats remained at very poor levels and a high result of 480 MPN/100mL. Another resampling was carried out. Final result was low with excellent levels at 31 MPN/100mL.
- Total suspended solids levels were good to excellent with results ranging from 1.0 to 2.4 mg/L at nine sites that indicated clearer waters and minimal threat to coral reefs. However, Avana Mudflats, Arorangi

School and Social Centre showed poor and very poor levels with high results of 8.4, 7.0 and 10.5 mg/L. Field observations at these sites noted poor water clarity from suspended sediment caused by high tides.

- Dissolved oxygen levels were above the recommended threshold of 80% showing excellent levels at all sites.
- Temperature ranged from 28.7 degrees at Papua to 30.9 degrees at Paringaru. Mean temperature was 29.7 degrees.
- pH ranged from 7.02 at Papua to 8.09 at Pouara Rai with a mean pH of 7.80.

Stream:

- Enterococci bacteria were at very poor levels with 411 and 365 MPN/100mL at Avatiu and Areiti, respectively; and extremely poor levels with 517 MPN/100mL at Avana.
- Dissolved oxygen was 34% with extremely poor levels at Areiti, 51% with very poor levels at Avatiu and 83% with good levels at Avana.
- Temperature ranged from 24.1 degrees at Avana to 26.9 degrees at Avatiu, with a mean temperature of 25.3 degrees.
- Salinity was stable at all three sites with 0.2 ppt at Avatiu, 0.4 ppt at Areiti and 1.0 ppt at Avana. Overall mean salinity was 0.5 ppt.
- pH ranged from 6.50 at Avatiu to 6.65 at Areiti with a mean pH of 6.56.

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

1. ENTEROCOCCI BACTERIAL COUNTS - RAROTONGA

Most Probable Number of Enterococci per 100 mL (MPN/100mL)

Lagoon Site	Site ID	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
Pouara Raui	RAM03	<1	<1	10	<1	ND	<1
Avana Mudflats	RAM04	20	74	10	10	ND	31
Paringaru	RAM05	<1	10	<1	86	ND	10
Tikioki Packing Shed	RAM06	<1	31	<1	41	ND	<1
Totokoitu Station	RAM08	41	20	20	<1	ND	31
Papua	RAM09	<1	52	10	<1	ND	<1
Arorangi School	RAM11	10	31	10	31	ND	41
Social Centre	RAM13	<1	110	<1	<1	ND	175
Muri Buoy	RAM16	<1	<1	63	<1	ND	<1
Betela Beach	RAM17	10	20	<1	20	ND	10
Avatiu	RAM18	10	<1	<1	<1	ND	20
Muri Koka	RAM19	10	<1	75	20	ND	85
Ngatipa	RAM20	<1	NO DATA	<1	NO DATA	ND	NO DATA
Matavera Outfall	RAM21	<1		ND			
Muri Aroko	RAM22	20		97		ND	
Tikioki	RAM23	<1		<1		ND	
Papaaroa	RAM24	<1		<1		ND	

Stream Site	Site ID	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
Avana	RAS01	NW	435	NW	NW	NW	517
Paringaru	RAS02	NW	NW	NW	NW	NW	NW
Akapuao	RAS03	NW	NW	NW	NW	NW	NW
Totokoitu	RAS04	2420	816	NW	NW	NW	NW
Betela	RAS06	1986	NW	1046	NW	NW	NW
Avatiu	RAS08	NW	NW	NW	NW	NW	411
Vaiterenga	RAS10	NW	NW	NW	NW	NW	NW
Areiti	RAS11	488	328	58	112	NW	365
Takuvaine	RAS12	NW	NO DATA	NW	NO DATA	NW	NO DATA
Pouara	RAS13	NW		NW			
Avana Mouth	RAS14	NW		NW			
Papua	RAS15	NW		NW		NW	
				NW		NW	



GRADING SCALE			REFERENCE
Excellent	A	< 41	WHO 2021 Guidelines on Recreational Water Quality for Coastal and Fresh Waters.
Very Good	B	41 ≥ 100	
Good	C	101 ≥ 200	
Poor	D	201 ≥ 350	
Very Poor	E	351 ≥ 500	
Extremely Poor	F	> 500	

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

Lagoon Sampling Site	Site ID	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
Pouara Raui	RAM03	2.0	2.6	0.4	0.3	0.3	1.0
Avana Mudflats	RAM04	3.0	2.0	0.4	1.3	1.4	8.4
Paringaru	RAM05	2.0	1.9	1.9	3.3	3.0	2.2
Tikioki Packing Shed	RAM06	2.0	2.2	0.3	2.3	2.5	1.3
Totokoitu Station	RAM08	4.3	16.7	1.3	2.3	1.3	1.0
Papua	RAM09	2.0	10.1	0.3	0.3	0.3	1.1
Arorangi School	RAM11	4.1	7.4	1.3	0.3	1.0	7.0
Social Centre	RAM13	2.0	3.9	0.3	0.3	4.8	10.5
Muri Buoy	RAM16	2.0	0.3	0.3	0.3	2.5	1.3
Betela Beach	RAM17	5.0	5.6	0.3	1.3	0.3	1.2
Avatiu	RAM18	3.0	0.3	2.3	3.3	1.0	1.5
Muri Koka	RAM19	4.0	1.3	2.3	2.3	2.4	2.4
Ngatipa	RAM20	0.3	NO DATA	1.3	NO DATA	2.0	NO DATA
Matavera Outfall	RAM21	2.0		2.3		1.3	
Muri Aroko	RAM22	1.0		0.3		ND	
Tikioki	RAM23	2.0		0.3		0.3	
Papaaroa	RAM24	3.0		1.3		0.3	

Stream Sampling Site	Site ID	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
Avana	RAS01	NW	0.7	NW	NW	NW	0.3
Paringaru	RAS02	NW	NW	NW	NW	NW	NW
Akapuao	RAS03	NW	NW	NW	NW	NW	NW
Totokoitu	RAS04	0.3	4.4	NW	NW	NW	NW
Betela	RAS06	4.5	NW	4.0	NW	NW	NW
Avatiu	RAS08	NW	NW	NW	NW	NW	0.1
Vaiterenga	RAS10	NW	NW	NW	NW	NW	NW
Areiti	RAS11	3.8	36.7	25.0	12.1	NW	1.0
Takuvaine	RAS12	NW	NO DATA	NW	NO DATA	NW	NO DATA
Pouara	RAS13	NW		NW		NW	
Avana Mouth	RAS14	NW		NW		NW	
Papua	RAS15	NW		NW		NW	



GRADING SCALE			REFERENCE
Excellent	A	< 1.0	Bell 1992, total suspended solids recommended limit is ≤5mg/L for healthy coral reef.
Very Good	B	1.0 ≥ 2.5	
Good	C	2.5 ≥ 5.0	
Poor	D	5 ≥ 10	
Very Poor	E	10 ≥ 20	
Extremely Poor	F	> 20	

3. DISSOLVED OXYGEN - RAROTONGA - Percent (%)

Lagoon Sampling Site	Site ID	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
Pouara Raui	RAM03	118	181	127	137	159	159
Avana Mudflats	RAM04	115	109	120	110	103	127
Paringaru	RAM05	119	120	136	114	131	117
Tikioki Packing Shed	RAM06	130	125	128	125	110	135
Totokoitu Station	RAM08	125	122	128	128	117	118
Papua	RAM09	126	131	126	130	125	127
Arorangi School	RAM11	129	125	140	154	145	130
Social Centre	RAM13	127	127	133	125	120	120
Muri Buoy	RAM16	118	96	118	114	96	116
Betela Beach	RAM17	128	126	135	138	124	123
Avatiu	RAM18	136	165	142	135	134	125
Muri Koka	RAM19	122	113	123	121	107	133
Ngatipa	RAM20	140	NO DATA	137	NO DATA	130	NO DATA
Matavera Outfall	RAM21	123		127		148	
Muri Aroko	RAM22	116		119		ND	
Tikioki	RAM23	128		127		113	
Papaaroa	RAM24	128		129		120	

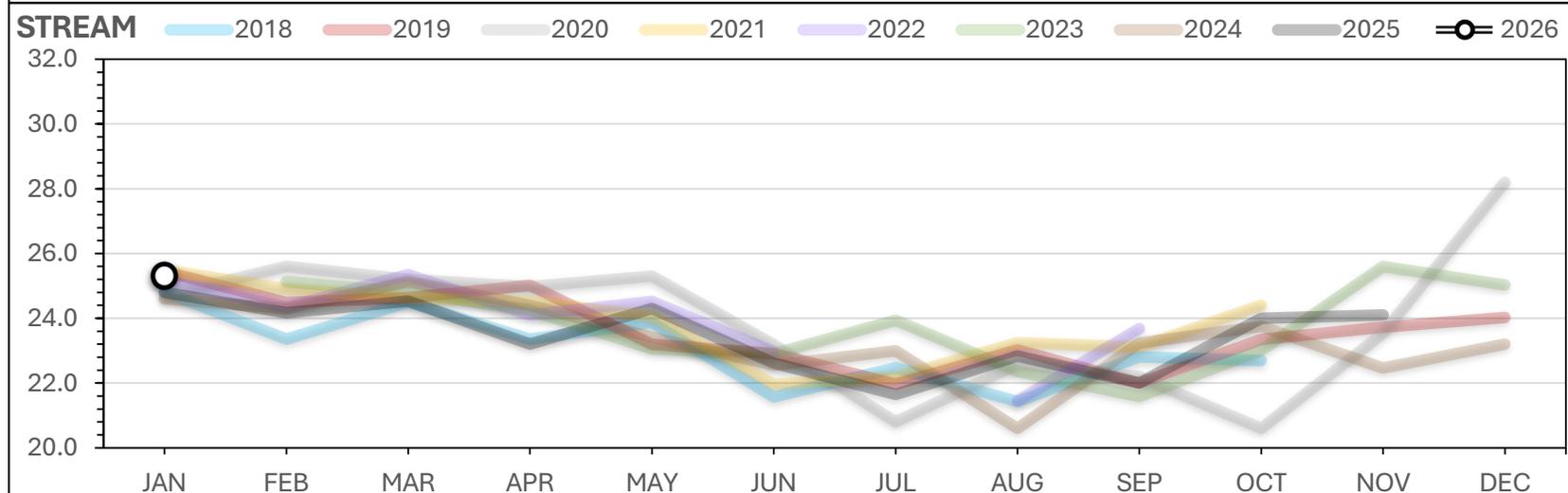
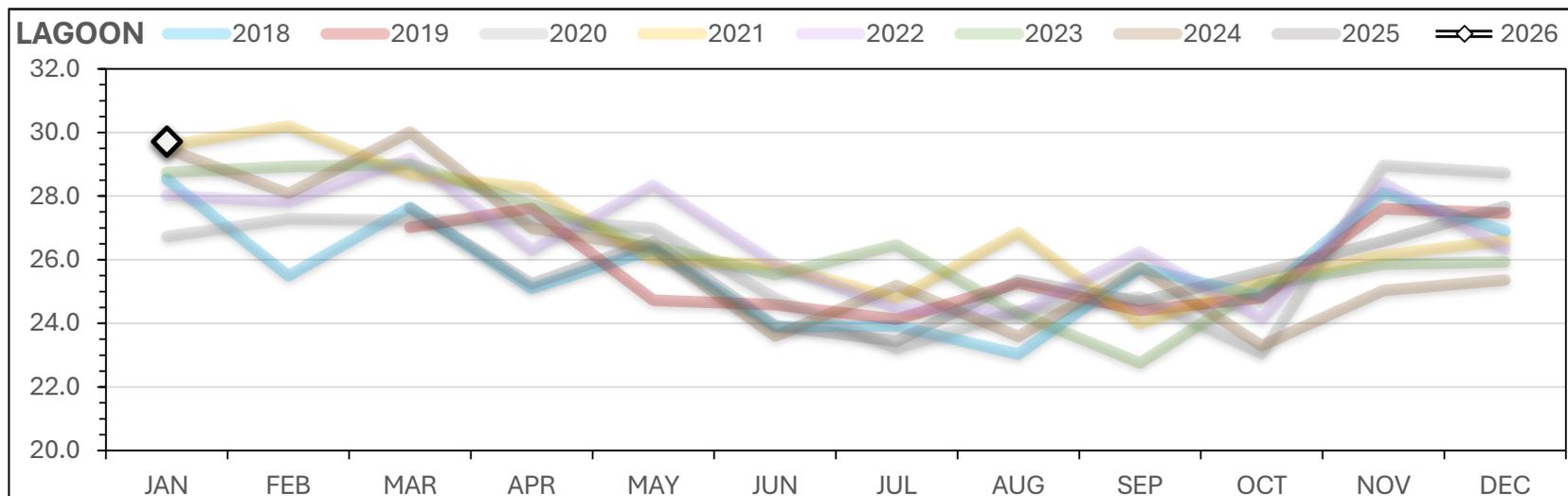
Stream Sampling Site	Site ID	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26
Avana	RAS01	NW	76	NW	NW	NW	83
Paringaru	RAS02	NW	NW	NW	NW	NW	NW
Akapuao	RAS03	NW	NW	NW	NW	NW	NW
Totokoitu	RAS04	81	ND	NW	NW	NW	NW
Betela	RAS06	53	NW	79	NW	NW	NW
Avatiu	RAS08	NW	NW	NW	NW	NW	51
Vaiterenga	RAS10	NW	NW	NW	NW	NW	NW
Areiti	RAS11	49	62	55	47	NW	34
Takuvaine	RAS12	NW	NO DATA	NW	NO DATA	NW	NO DATA
Pouara	RAS13	NW		NW		NW	
Avana Mouth	RAS14	NW		NW		NW	
Papua	RAS15	NW		NW		NW	



GRADING SCALE			REFERENCE
Excellent	A	>95	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.
Very Good	B	90 ≥ 95	
Good	C	80 ≥ 90	
Poor	D	60 ≥ 80	
Very Poor	E	40 ≥ 60	
Extremely Poor	F	< 40	

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

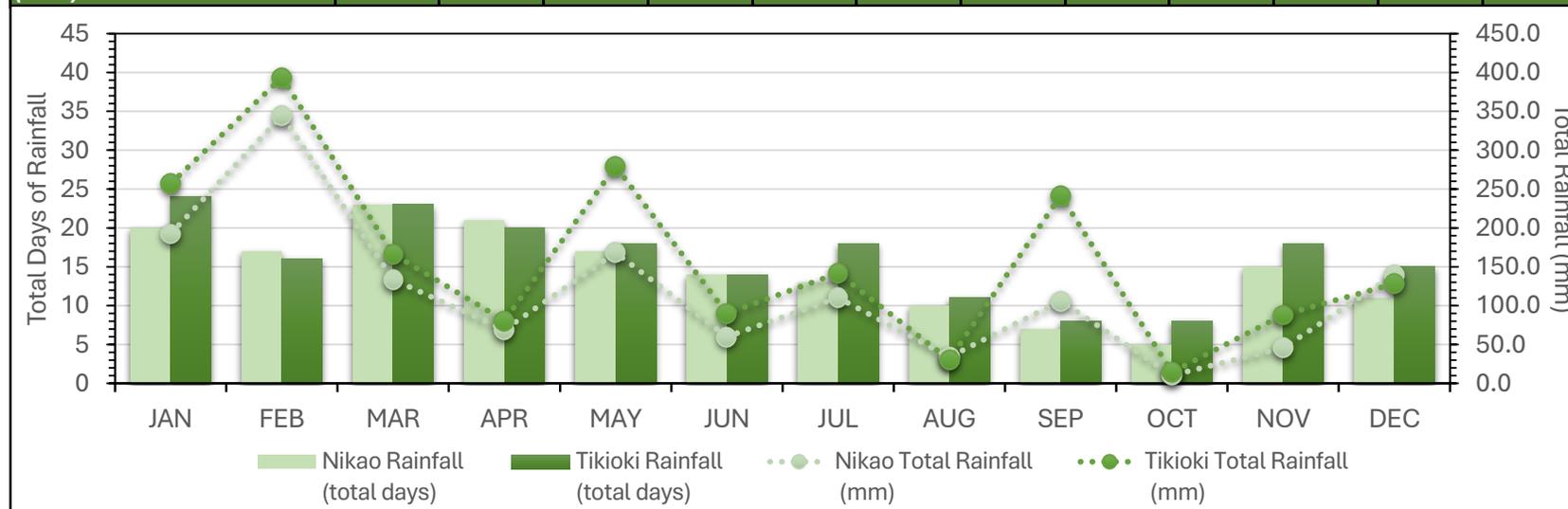
2026	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lagoon	29.7											
Stream	25.3											



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5. RAROTONGA RAINFALL - NIKAO & TIKIOKI - Total Rainfall (mm) & Total Days of Rainfall

2025	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Nikao Total Rainfall (mm)	192.6	344.3	133.6	68.8	168.3	60.0	110.2	33.7	106.1	10.4	45.7	139.6
Nikao Rainfall (total days)	20	17	23	21	17	14	13	10	7	5	15	11
Nikao Highest 1-Day (mm)	37.4	72.5	43.0	10.6	28.5	19.1	80.6	15.2	50.6	3.1	13.7	52.1
Nikao Highest 1-Day (date)	9th	13th	3rd	2nd	24th	16th	6th	7th	18th	15th & 16th	28th	12th
Tikioki Total Rainfall (mm)	256.6	393.6	166.4	80.8	279.2	89.8	141.8	30.2	241.8	14.4	88.3	128.2
Tikioki Rainfall (total days)	24	16	23	20	18	14	18	11	8	8	18	15
Tikioki Highest 1-Day (mm)	83.8	94.4	53.6	13.0	67.8	48.0	79.6	15.4	145.0	8.0	35.4	41.8
Tikioki Highest 1-Day (date)	9th	20th	30th	6th	15th	16th	6th	6th	15th	15th	28th	12th



SAMPLE DESCRIPTION

Date Samples Collected:	Name of Sample:	Collected By:	Submitted By:	Time of Receipt:	Physical Description:	Quantity Per Site Received:
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Tuesday 20 th January	Marine	NES		01:30pm	Clear	2.5L
	Stream	MMR		11:20am	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								
RAM03	01M5417	<1	29.1	ND	159.0	11.67	8.09	1.0
RAM04	01M5418	373	30.2	ND	126.8	8.89	8.02	8.4
RAM05	01M5419	10	30.9	ND	117.2	8.00	7.86	2.2
RAM06	01M5420	<1	30.5	ND	135.2	9.25	7.97	1.3
RAM08	01M5421	31	28.9	ND	118.0	8.27	7.13	1.0
RAM09	01M5422	<1	28.7	ND	126.6	8.91	7.02	1.1
RAM11	01M5423	2909	30.0	ND	130.0	8.89	7.86	7.0
RAM13	01M5424	175	29.7	ND	119.9	8.20	7.91	10.5
RAM16	01M5425	<1	29.7	ND	116.4	8.17	7.94	1.3
RAM17	01M5426	10	29.6	ND	122.6	8.48	7.74	1.2
RAM18	01M5427	20	29.2	ND	124.6	8.59	8.05	1.5
RAM19	01M5428	85	30.1	ND	132.5	9.18	7.98	2.4

STREAM								
RAS01	01M5429	5172	24.1	1.0	82.9	6.92	6.54	0.3
RAS08	01M5430	4106	26.9	0.2	50.8	4.05	6.50	0.1
RAS11	01M5431	3654	24.9	0.4	33.7	2.78	6.65	1.0

Study Method	IDEXX Enterolert*	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	Ref. Comments

Resample #	Date Sample Collected	Time of Receipt	Physical Description	Quantity Per Site Received	Marine Study Parameter	Unit	Site ID	Lab ID	Result	Study Method	Recommended Limit
1	22.01.2026	10:40am	Clear	500mL	Enterococci	MPN/100mL	RAM04	01M5432	480	IDEXX Enterolert*	Ref. Comments
							RAM11	01M5433	41		
2	23.01.2026	2pm	Clear	500mL	Enterococci	MPN/100mL	RAM04	01M5434	31		

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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 at Amuri (Aitutaki Marine Research Centre – AMRC) and at Vaipae (Rowan Strickland’s residence).
Rainfall is measured in millimetres (mm) and reported as total rainfall per month, total number of days that had rainfall and the highest amount of rainfall in 1-day and date(s).

[#]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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