Ministry of Marine Resources
TU'ANGA O TE PAE MOANA
COOK ISLANDS

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AITUTAKI WATER QUALITY REPORT AUGUST 2025

SUMMARY

Water samples were collected on the morning of Tuesday 19th August, 2025. The weather observed during collection was sunny with a cool breeze. 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, sargassum, cyanobacteria, padina and dry turbinaria were observed at 8 out of 12 sites, namely; Vaipeka, Tautu Wharf, Taravao, Vainamu, Vainamu Wharf, Rapae, Maunga Pu and Amuri Wharf. All stream sites were reported dry or stagnant and therefore omitted from sampling. The table below provides a summary of enterococci, total suspended solids and dissolved oxygen levels.

Lagoon Site	Total Suspended solids (mg/L)	Enterococci (MPN/100 mL)	Dissolved oxygen (%)
Ootu	1.0	<1	102
Vaipeka	9.1	10	119
Vaipae Wharf	6.0	<1	123
Tautu Wharf	3.8	<1	114
Taravao	11.9	<1	115
Vainamu	9.5	31	91
Vainamu Wharf	6.8	63	90
Arutanga Wharf	5.4	<1	104
Rapae	1.0	41	89
Maunga Pu	1.0	20	88
Maina Nursery	*No water sampled*		
Amuri Wharf	2.0	<1	86

Grading Scale	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

Lagoon:

- An elevated enterococci level of 464 MPN/100 mL was initially observed at Rapae. This site was resampled on Thursday 21st August, yielding an excellent result of 41 MPN/100 mL. Very good to excellent levels of enterococci were observed at the remaining ten sites. Overall, this indicates safe swimming areas at all marine sites.
- Levels of total suspended solids ranged from a very poor level of 11.9 mg/L observed at Taravao, to a very good levels of 1.0 mg/L observed simultaneously at Ootu, Rapae, and Maunga Pu.
- Dissolved oxygen levels ranged from good to excellent with a high of 123 % observed at Vaipae Wharf and a low 86 % observed at Amuri Wharf.
- Temperatures ranged from 20.1 ^{o}C at Vaipeka to 24.7 ^{o}C at Arutanga Wharf, giving an average lagoon temperature of 22.8 ^{o}C.
- Levels of salinity were stable, ranging between 30.0 ppt at Ootu to 35.0ppt at Vainamu Wharf, giving an average of 33.2 ppt.
- pH levels were stable, with a low of 7.86 observed at Vainamu and a high of 8.07 observed at Arutanga Wharf. The average pH level for marine sites was 7.98.

Stream: All streams were reported dry or stagnant and therefore not sampled. There is no stream water quality data available for the month of August.

An updated lab study report and rainfall data for the month of August 2025, are available at the end of this report.

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AITUTAKI WATER QUALITY REPORT SEPTEMBER 2025

SUMMARY

Water samples were collected on the morning of Tuesday 9th September, 2025. The weather during collection was calm at most sites, and windy at Vaipeka and Vaipae Wharf. Due to decreased staff capacity and limited boat access, Maina Nursery was not sampled. The remaining eleven marine sites were accessible and sampled. Algae such as turbinaria, cyanobacteria, dictyota, boodlea, caulerpa, padina, sargassum, and enteromorpha were observed at Vaipeka, Tautu Wharf, Taravao, Rapae, Maunga Pu and Amuri Wharf. All stream sites were reported dry or stagnant and therefore omitted from sampling. The table below provides a summary of enterococci, total suspended solids and dissolved oxygen levels.

Lagoon Site	Total Suspended solids (mg/L)	Enterococci (MPN/100 mL)	Dissolved oxygen (%)
Ootu	4.6	<1	77
Vaipeka	3.5	10	111
Vaipae Wharf	2.0	20	116
Tautu Wharf	13.0	10	111
Taravao	2.9	20	99
Vainamu	20.5	31	86
Vainamu Wharf	4.6	<1	100
Arutanga Wharf	7.1	10	109
Rapae	2.2	<1	80
Maunga Pu	1.3	<1	86
Maina Nursery	*No water sampled*		
Amuri Wharf	2.3	10	92

Grading Scale	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

Lagoon:

- Enterococci levels were excellent, ranging from less than 1 MPN/100 mL to only 31 MPN/100 mL. These levels indicate safe swimming areas.
- Levels of total suspended solids ranged between very good and extremely poor, with more than half the lagoon sites observing favorably low levels. A very good level of 1.3 mg/L was observed at Maunga Pu, and an extremely poor level of 20.5 mg/L was observed at Vainamu.
- Dissolved oxygen levels ranged from a poor 77 % observed at Ootu, to an excellent level of 116 % observed at Vaipae Wharf.
- Temperatures ranged from 20.9 °C observed at Taravao to 24.6 °C observed at Maunga Pu, giving an average lagoon temperature of 23.1 °C.
- Levels of salinity were stable, ranging between 34.4 ppt observed at Taravao and 36.9 ppt observed at Vaipeka. The overall average salinity was observed at 35.6 ppt.
- pH levels were stable, with a low of 7.81 observed at Taravao and a high of 8.04 observed at Vaipae Wharf.

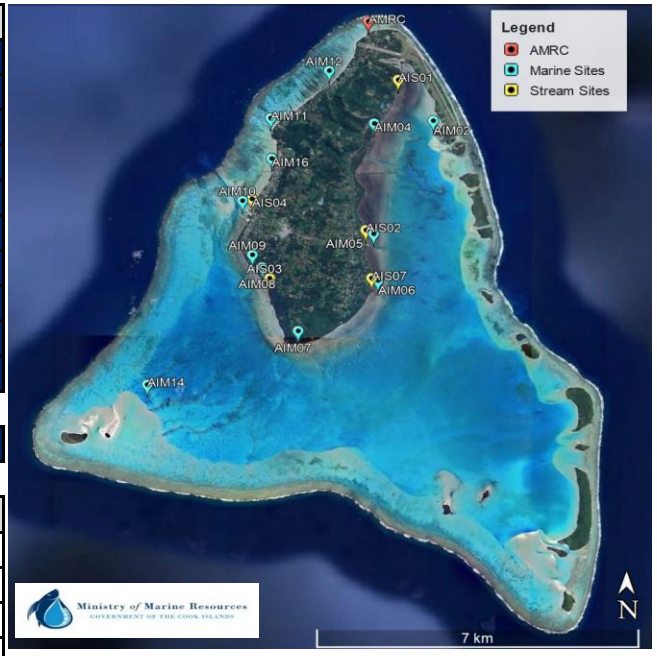
Stream: All streams were reported dry or stagnant and therefore not sampled. There is no stream water quality data available for the month of September.

An updated lab study report for the month of September is available at the end of this report.

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

Lagoon Site	Site ID	Apr	May	Jun	Jul	Aug	Sept
Ootu	AIM02	<1	<1	<1	10	<1	<1
Vaipeka	AIM04	<1	30	52	<1	10	10
Vaipae Wharf	AIM05	10	<1	<1	10	<1	20
Tautu Wharf	AIM06	<1	<1	638	110	<1	10
Taravao	AIM07	41	132	63	<1	<1	20
Vainamu	AIM08	63	10	52	30	31	31
Vainamu Wharf	AIM09	41	98	146	<1	63	<1
Arutanga Wharf	AIM10	10	63	10	<1	<1	10
Rapae	AIM11	<1	20	10	<1	464	<1
Maunga Pu	AIM12	<1	<1	10	20	20	<1
Maina Nursery	AIM14	<1	<1	<1	10	NW	NW
Amuri Wharf	AIM16	10	30	20	<1	<1	10

Stream Site	Site ID	Apr	May	Jun	Jul	Aug	Sept
Vaitiare	AIS01	NW	NW	88	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	238	101	NW	39	NW	NW



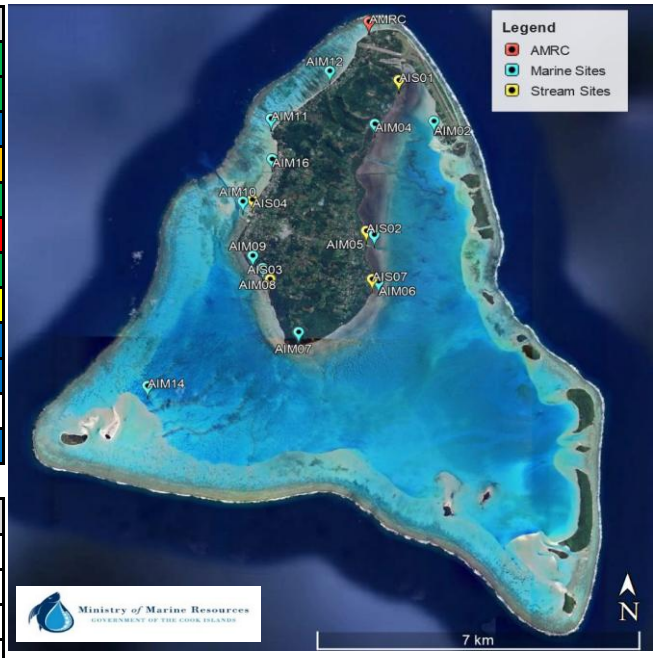
Bacteria Standards GRADING SCALE	< 41	41 ≥ 100	101 ≥ 200	201 ≥ 350	351 ≥ 500	> 500
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

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	Apr	May	Jun	Jul	Aug	Sept
Ootu	AIM02	6.2	6.7	4.9	3.6	1.0	4.6
Vaipeka	AIM04	4.7	4.4	13.1	3.0	9.1	3.5
Vaipae Wharf	AIM05	9.6	4.9	4.4	2.6	6.0	2.0
Tautu Wharf	AIM06	10.9	10.0	2.3	3.3	3.8	13.0
Taravao	AIM07	16.2	23.3	41.7	3.3	11.9	2.9
Vainamu	AIM08	16.7	7.3	44.4	11.8	9.5	20.5
Vainamu Wharf	AIM09	3.9	3.4	16.7	6.3	6.8	4.6
Arutanga Wharf	AIM10	5.5	3.2	3.1	4.6	5.4	7.1
Rapae	AIM11	0.3	2.6	1.3	1.0	1.0	2.2
Maunga Pu	AIM12	1.3	2.4	1.3	1.0	1.0	1.3
Maina Nursery	AIM14	0.3	3.0	1.3	0.3	NW	NW
Amuri Wharf	AIM16	3.3	4.1	3.3	1.0	2.0	2.3

Stream Site	Site ID	Apr	May	Jun	Jul	Aug	Sept
Vaitiare	AIS01	NW	NW	26.7	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	6.7	12.3	NW	8.3	NW	NW



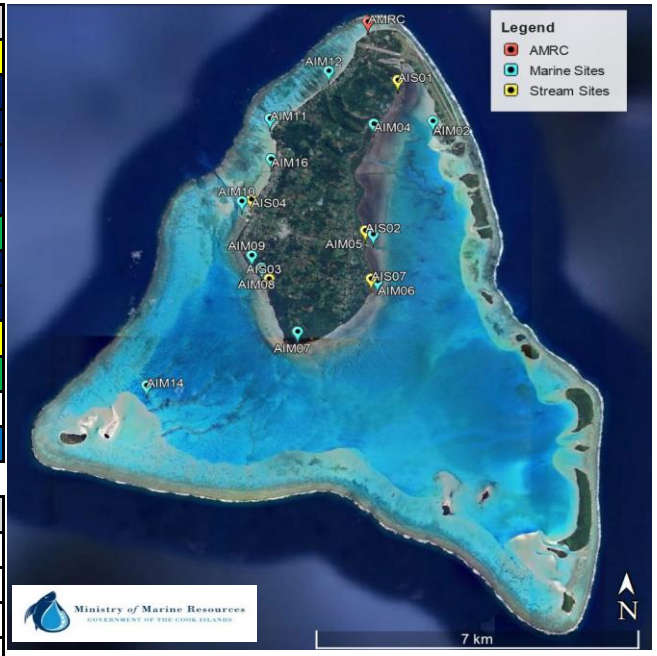
Total Suspended Solids	< 1.0	1.0 ≥ 2.5	2.5 ≥ 5.0	5 ≥ 10	10 ≥ 20	> 20
Standards	A	B	C	D	E	F
GRADING SCALE	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

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

3. DISSOLVED OXYGEN - AITUTAKI - Percent (%)

Lagoon Site	Site ID	Apr	May	Jun	Jul	Aug	Sept
Ootu	AIM02	77	80	102	93	102	77
Vaipeka	AIM04	99	96	110	89	119	111
Vaipae Wharf	AIM05	102	103	110	102	123	116
Tautu Wharf	AIM06	101	101	108	104	114	111
Taravao	AIM07	101	97	114	94	115	99
Vainamu	AIM08	77	69	81	89	91	86
Vainamu Wharf	AIM09	91	84	95	103	90	100
Arutanga Wharf	AIM10	96	62	68	95	104	109
Rapae	AIM11	71	74	93	105	89	80
Maunga Pu	AIM12	69	72	101	83	88	86
Maina Nursery	AIM14	94	74	92	92	NW	NW
Amuri Wharf	AIM16	81	87	95	93	86	92

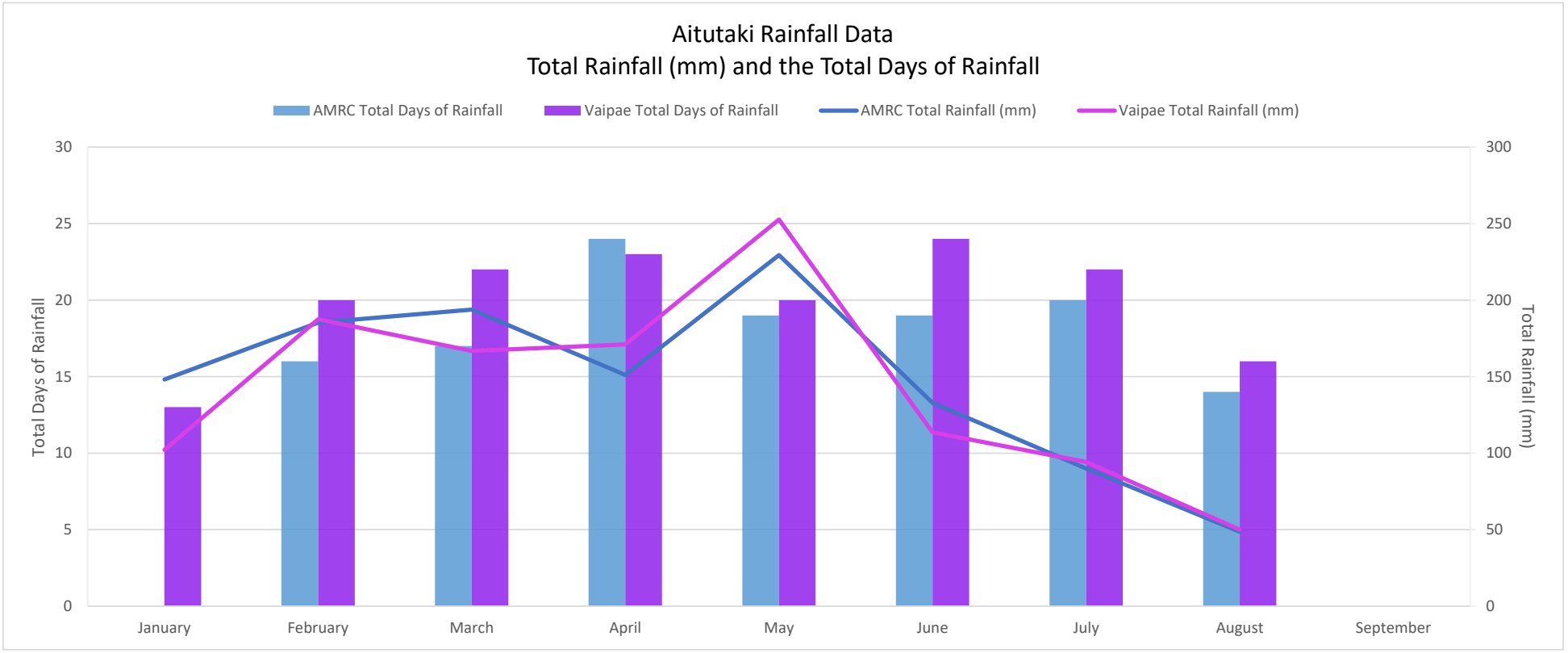
Stream Site	Site ID	Apr	May	Jun	Jul	Aug	Sept
Vaitiare	AIS01	NW	NW	24	NW	NW	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	40	19	NW	62	NW	NW



Dissolved Oxygen Standards GRADING SCALE	> 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. AITUTAKI RAINFALL DATA - AMRC & VAIPAE



	January	February	March	April	May	June	July	August	September	October	November	December
AMRC Total Rainfall (mm)	148.1	185.2	193.8	151.0	229.4	132.9	89.9	48.6				
AMRC Total Days of Rainfall	ND	16	17	24	19	19	20	14				
AMRC Day of Highest Rainfall	ND	19th 43.8mm	3rd 39.6mm	6th 75.8mm	24th 95.0mm	26th 72.4mm	11th 20.4mm	7th 19.2mm				
Vaipae Total Rainfall (mm)	102.2	187.4	166.8	171	252.6	113.6	94.2	50				
Vaipae Total Days of Rainfall	13	20	22	23	20	24	22	16				
Vaipae Day of Highest Rainfall	10th 26.2mm	19th 44.4mm	3rd 33.0mm	6th 68.4mm	24th 100.2mm	26th 52.0mm	11th 20.0mm	7th 19.0mm				

5. AVERAGE TEMPERATURE - AITUTAKI - Degrees (°C)

Month	January	February	March	April	May	June	July	August	September	October	November	December
Lagoon	26.2	29.2	28.6	24.7	26.9	25.7	25.4	22.8	23.1			
Stream	25.1	26.4	26.8	24.1	25.2	25.3	24.0	NW	NW			

Report Date: 10.09.2025	AITUTAKI LAB STUDY REPORT – AUGUST 2025	Lab Report No.: 08L5267 – 08L5278

SAMPLE DESCRIPTION

Date Samples Collected:	Name of Sample:	Collected By:	Submitted By:	Time of Receipt:	Physical Description:	Quantity Per Site Received:
Tuesday 19th August, 2025	Marine Stream	MMR		10:15 am	Clear NW	2.5L

Study No.		1	2	3	4	5	6	7
SITE ID	LAB ID	Enterococci	Temperature	Salinity	Dissolved Oxygen	Dissolved Oxygen	pH	Total Suspended Solids
MARINE		(MPN/100ml)	(°C)	(ppt)	(%)	(mg/L)		(mg/L)
AIM02	08L5267	<1	23.0	30.0	101.6	7.34	7.97	1.0
AIM04	08L5268	10	20.1	34.3	118.6	8.79	7.95	9.1
AIM05	08L5269	<1	22.8	34.0	122.5	8.67	8.06	6.0
AIM06	08L5270	<1	22.6	33.9	114.4	8.13	8.05	3.8
AIM07	08L5271	<1	20.5	32.6	114.8	8.52	7.95	11.9
AIM08	08L5272	31	22.9	33.2	90.9	6.45	7.86	9.5
AIM09	08L5273	63	23.5	35.0	90.3	6.28	7.98	6.8
AIM10	08L5274	<1	24.7	34.8	103.5	7.05	8.07	5.4
AIM11	08L5275	464	23.1	32.8	88.9	6.30	7.97	1.0
AIM12	08L5276	20	24.4	32.0	88.2	6.13	8.03	1.0
AIM14		NW	NW	NW	NW	NW	NW	NW
AIM16	08L5277	<1	23.2	33.0	86.1	6.08	7.93	2.0
STREAM		*Streams reported dry or stagnant, therefore no stream data is available for this month.*						
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

Resample #	Date of collection	Time of Receipt	Physical Description	Quantity Received	Site ID	Lab ID	Marine Study Parameter	Result	Unit
1	21.08.2025	10:15 AM	Clear	500 mL	AIM11	08L5278	Enterococci	41	MPN/100 mL

Report Date: 10.09.2025	AITUTAKI LAB STUDY REPORT – SEPTEMBER 2025	Lab Report No.: 09L5318 – 09L5328

SAMPLE DESCRIPTION

Date Samples Collected:	Name of Sample:	Collected By:	Submitted By:	Time of Receipt:	Physical Description:	Quantity Per Site Received:
Tuesday 9th September, 2025	Marine	MMR		10:08 am	Clear	2.5L
	Stream				NW	

Study No.		1	2	3	4	5	6	7
SITE ID	LAB ID	Enterococci	Temperature	Salinity	Dissolved Oxygen	Dissolved Oxygen	pH	Total Suspended Solids
MARINE		(MPN/100ml)	(°C)	(ppt)	(%)	(mg/L)		(mg/L)
AIM02	09L5318	<1	24.0	35.4	76.5	5.25	7.96	4.6
AIM04	09L5319	10	21.7	36.9	111.0	7.87	7.90	3.5
AIM05	09L5320	20	22.7	35.6	116.3	8.16	8.04	2.0
AIM06	09L5321	10	22.8	35.6	111.2	7.79	8.00	13.0
AIM07	09L5322	20	20.9	34.4	99.0	7.23	7.81	2.9
AIM08	09L5323	31	23.4	35.1	85.6	5.95	7.89	20.5
AIM09	09L5324	<1	23.7	35.9	100.2	6.90	7.96	4.6
AIM10	09L5325	10	23.8	35.8	109.1	7.50	8.02	7.1
AIM11	09L5326	<1	23.1	35.7	79.7	5.55	7.89	2.2
AIM12	09L5327	<1	24.6	35.1	85.8	5.85	8.01	1.3
AIM14		NW	NW	NW	NW	NW	NW	NW
AIM16	09L5328	10	23.0	35.8	91.9	6.41	7.91	2.3
STREAM		*Streams reported dry or stagnant, therefore no stream data is available for this month.*						
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

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^{o}C, Max. True daily mean 29.4^{o}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
[β]WHO Guidelines on Recreational Water Quality for Coastal and Fresh Waters 2021