

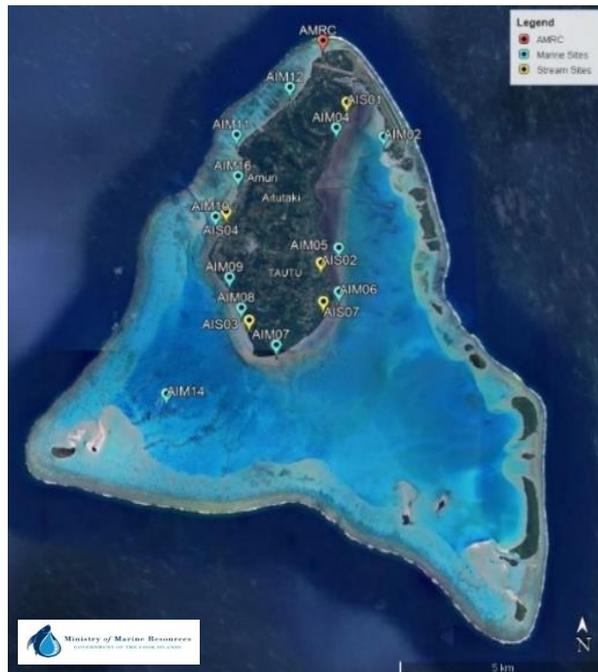


## AITUTAKI WATER QUALITY REPORT MARCH 2025

### SUMMARY

Water samples were collected in the morning of Tuesday 11<sup>th</sup> March, 2025. During collection the weather was calm, breezy, and drizzling rain at some sites. All marine sites were accessible and sampled. Presence of boodlea, ulva, and spirogyra were observed at Vaipeka, Vaipae Wharf, Tautu Wharf, and Taravao. Vaitiare and Tautu streams were flowing and sampled for testing, while the remaining three sites were reported dry or stagnant. Samples were received in Rarotonga at 5:30pm as there was no available cargo space on the earlier flights departing Aitutaki. Due to staff availability after-hours and lab protocol, bacteria testing was not conducted and enterococci data is not available. The table below provides a summary of total suspended solids and dissolved oxygen levels.

Lagoon Site	Total Suspended Solids (mg/L)	Dissolved Oxygen (%)
Ootu	9.3	66
Vaipeka	6.7	50
Vaipae Wharf	6.0	57
Tautu Wharf	3.0	54
Taravao	7.0	58
Vainamu	8.9	47
Vainamu Wharf	3.0	78
Arutanga Wharf	4.0	73
Rapae	1.0	73
Maunga Pu	2.0	68
Maina Nursery	1.0	74
Amuri Wharf	0.3	56
Stream Site	Total Suspended Solids (mg/L)	Dissolved Oxygen (%)
Vaitiare	3.1	40
Tautu	4.5	19



Grading Scale	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor
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#### Lagoon:

- Levels of total suspended solids were excellent to poor, ranging from 0.3 mg/L at Amuri Wharf to 9.3mg/L at Ootu.
- Dissolved oxygen levels were poor to very poor, ranging from 78% at Vainamu Wharf to a low of 47% at Vainamu.
- Temperatures ranged from a low of 26.2 °C at Vaipeka to a high of 30.7 °C at Maunga Pu, giving an average lagoon temperature of 28.6 °C.
- A low salinity level of 19.3 ppt was observed at Taravao, indicating fresh water influence at the site. Salinity levels at the remaining lagoon sites ranged from 29.2 ppt at Vainamu to 35.3 ppt at Maina Nursery, giving an overall average of 32.1 ppt.
- pH levels were stable, ranging from 7.45 to 8.04, giving an average of 7.77.

#### Stream:

- Good levels of total suspended solids of 3.1 mg/L and 4.5 mg/L were observed at Vaitiare and Tautu respectively.
- Dissolved oxygen levels ranged from very poor to extremely poor, with a low of 40% observed at Vaitiare and a very low level of 19% observed at Tautu.
- Stream temperatures ranged from 26.3 °C to 27.2 °C, giving an average of 26.8 °C.
- Salinity levels were observed at 0.2 ppt at both stream sites.
- pH levels were stable, ranging from 6.9 at Tautu and 7.0 at Vaitiare.

Updated rainfall data for the month of February has been provided in this report.

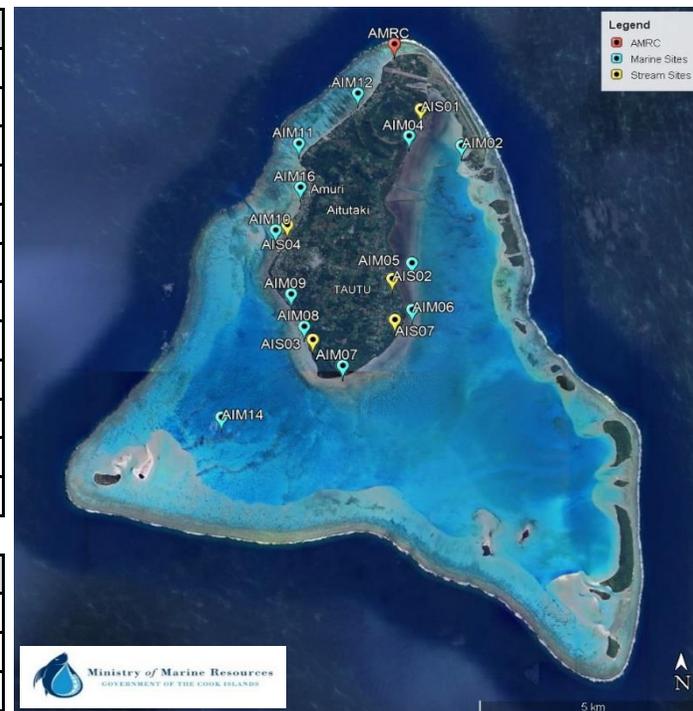
Please see below for updated monthly summary tables and lab study report.

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

Lagoon Site	Site ID	Jan	Feb	Mar	Apr	May	Jun
Ootu	AIM02	10	97	ND			
Vaipeka	AIM04	10	<1	ND			
Vaipae Wharf	AIM05	<1	63	ND			
Tautu Wharf	AIM06	<1	<1	ND			
Taravao	AIM07	10	<1	ND			
Vainamu	AIM08	30	121	ND			
Vainamu Wharf	AIM09	86	<1	ND			
Arutanga Wharf	AIM10	<1	<1	ND			
Rapae	AIM11	<1	10	ND			
Maunga Pu	AIM12	<1	63	ND			
Maina Nursery	AIM14	<1	10	ND			
Amuri Wharf	AIM16	<1	10	ND			

Stream Site	Site ID	Jan	Feb	Mar	Apr	May	Jun
Vaitiare	AIS01	28	NW	ND			
Vaipae	AIS02	NW	NW	NW			
Pata	AIS03	NW	NW	NW			
Arutanga	AIS04	79	NW	NW			
Tautu	AIS07	18	225	ND			



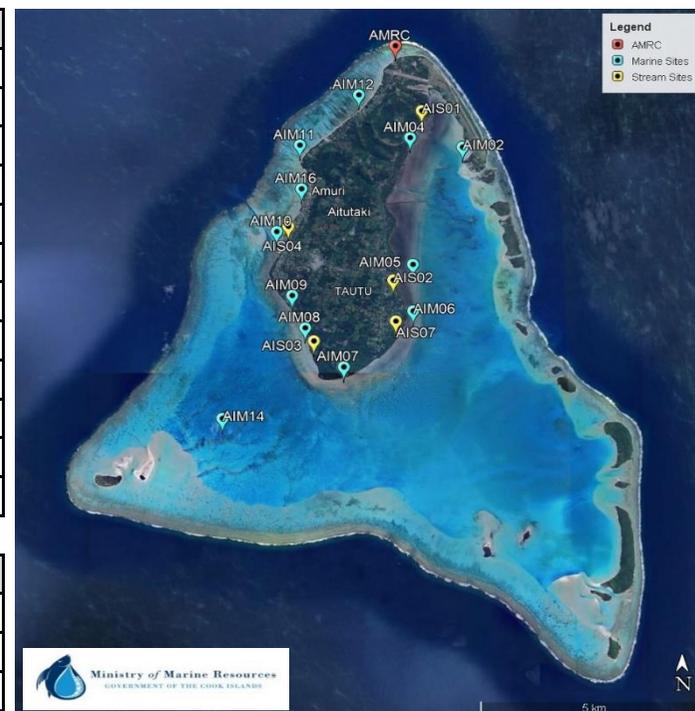
Bacteria Standards GRADING SCALE	< 41	41 ≥ 100	101 ≥ 200	201 ≥ 350	351 ≥ 500	> 500
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

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	Jan	Feb	Mar	Apr	May	Jun
Ootu	AIM02	8.0	2.3	9.3			
Vaipeka	AIM04	2.0	3.5	6.7			
Vaipae Wharf	AIM05	4.0	4.3	6.0			
Tautu Wharf	AIM06	4.0	2.3	3.0			
Taravao	AIM07	7.8	6.3	7.0			
Vainamu	AIM08	9.7	7.1	8.9			
Vainamu Wharf	AIM09	5.7	3.3	3.0			
Arutanga Wharf	AIM10	4.0	3.3	4.0			
Rapae	AIM11	1.0	2.3	1.0			
Maunga Pu	AIM12	3.0	3.2	2.0			
Maina Nursery	AIM14	0.3	2.3	1.0			
Amuri Wharf	AIM16	9.0	3.3	0.3			

Stream Site	Site ID	Jan	Feb	Mar	Apr	May	Jun
Vaitiare	AIS01	0.3	NW	3.1			
Vaipae	AIS02	NW	NW	NW			
Pata	AIS03	NW	NW	NW			
Arutanga	AIS04	3.0	NW	NW			
Tautu	AIS07	11.1	5.8	4.5			



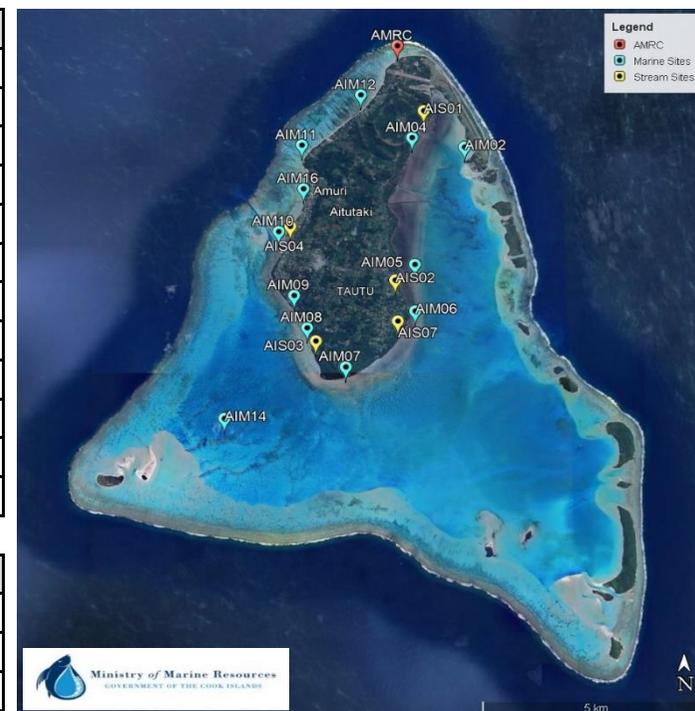
Total Suspended Solids Standards GRADING SCALE	< 1.0	1.0 ≥ 2.5	2.5 ≥ 5.0	5 ≥ 10	10 ≥ 20	> 20
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

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

### 3. DISSOLVED OXYGEN - AITUTAKI - Percent (%)

Lagoon Site	Site ID	Jan	Feb	Mar	Apr	May	Jun
Ootu	AIM02	71.9	75	66			
Vaipaka	AIM04	58.0	38	50			
Vaipae Wharf	AIM05	65.7	68	57			
Tautu Wharf	AIM06	59.2	68	54			
Taravao	AIM07	70.0	44	58			
Vainamu	AIM08	64.5	53	47			
Vainamu Wharf	AIM09	45.1	30	78			
Arutanga Wharf	AIM10	70.3	75	73			
Rapae	AIM11	72.9	71	73			
Maunga Pu	AIM12	55.3	64	68			
Maina Nursery	AIM14	62.8	90	74			
Amuri Wharf	AIM16	58.1	69	56			

Stream Site	Site ID	Jan	Feb	Mar	Apr	May	Jun
Vaitiare	AIS01	41.7	NW	40			
Vaipae	AIS02	NW	NW	NW			
Pata	AIS03	NW	NW	NW			
Arutanga	AIS04	42.4	NW	NW			
Tautu	AIS07	22.0	28	19			



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.



Report Date: 27.03.2025		AITUTAKI LAB STUDY REPORT – MARCH 2025				Lab Report No.: 03L5110 – 03L5123		
SAMPLE DESCRIPTION								
Date Samples Collected:		Name of Sample:	Collected By:	Submitted By:	Time of Receipt:	Physical Description:		Quantity Per Site Received:
Tuesday 11 <sup>th</sup> March		Marine	MMR		5:30pm (Airport arrival)	Clear		2.5L
		Stream				Slightly turbid		
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	03L5110	ND	29.5	34.9	66.3	4.17	7.79	9.3
AIM04	03L5111	ND	26.2	32.3	49.5	3.33	7.59	6.7
AIM05	03L5112	ND	28.9	32.6	57.4	3.69	7.88	6.0
AIM06	03L5113	ND	29.3	33.3	54.1	3.44	7.82	3.0
AIM07	03L5114	ND	27.5	19.3	58.1	4.12	7.58	7.0
AIM08	03L5115	ND	28.8	29.2	47.0	3.09	7.45	8.9
AIM09	03L5116	ND	29.4	34.1	77.8	4.93	7.80	3.0
AIM10	03L5117	ND	27.6	35.1	73.1	4.74	7.93	4.0
AIM11	03L5118	ND	28.5	34.3	73.3	4.70	7.83	1.0
AIM12	03L5119	ND	30.7	32.9	68.2	4.25	7.88	2.0
AIM14	03L5120	ND	28.1	35.3	73.9	4.75	8.04	1.0
AIM16	03L5121	ND	28.4	31.9	55.9	3.64	7.70	0.3
STREAM								
AIS01	03L5122	ND	27.2	0.2	40.0	3.2	7.0	3.1
AIS07	03L5123	ND	26.3	0.2	18.8	1.5	6.9	4.5
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<sup>#</sup>  
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<sup>^</sup>  
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<sup>@</sup>  
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<sup>β</sup>  
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.

<sup>#</sup>EPA Quality Criteria for Water Gold Book 1986

<sup>^</sup>EPA Ambient Aquatic Life Water Quality Criteria for DO (Saltwater): Cape Cod to Cape Hatteras Nov 2000

<sup>@</sup>EPA Quality Criteria for Water Red Book 1976

<sup>β</sup>WHO Guidelines on Recreational Water Quality for Coastal and Fresh Waters 2021

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