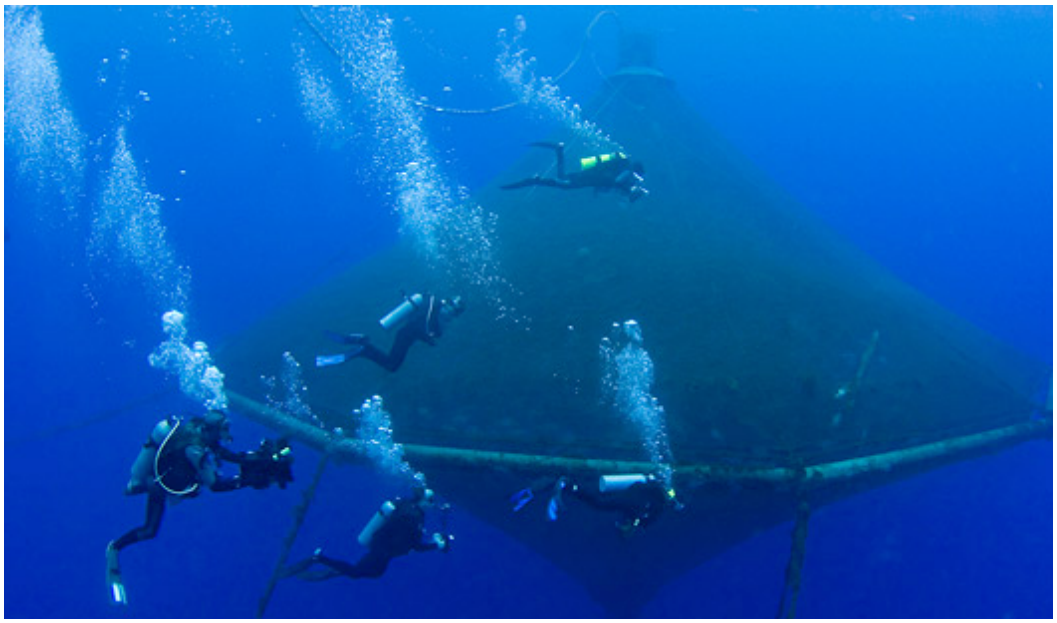
Blue Ocean MARICULTURE

BLUE OCEAN MARICULTURE



2/21/2025

Water Quality Monitoring – Feb. 2025

Prepared by

MEGA Lab
UHH – CNHS
200 W. Kawili St.
Hilo, HI 96720

BLUE OCEAN MARICULTURE

WATER QUALITY MONITORING – FEB. 2025

SAMPLING REPORT

Survey Date: 2/21/2025

Client: Blue Ocean Mariculture

Current: North

Log Number: BOM-WQ-FEB-2025

Environmental Conditions

Effluent samples were collected adjacent to the net pen containing the highest biomass of fish. Sample collection occurred approximately 2-hours after a feeding event at a distance of 3-meters from the pen. The pen was partially raised prior to sampling. The water was clear with no evidence of high turbidity, discoloration, visible sheen, foam, solids, or floating debris near the pen during the sampling event.

Samples were collected during a dropping tide (1.4ft to 0.2ft) influenced by a 39% waning moon. Conditions consisted of 7-9kt Southwest winds that stayed relatively consistent throughout the duration of the sampling. A 5-7ft West-Northwest swell was present during sampling and stayed consistent throughout the entire sampling event. Overall, sea conditions were choppy with moderate winds. Skies were mostly clear with patchy cloud cover and rainclouds visible offshore. The swell conditions produced visible foam along the shoreline. The air had high levels of vog from the Kilauea geological activity. There were several large visible slicks at all sampling stations with moderate amounts of foam and particulates observed in the water**.** There were schools of baitfish and dolphins observed at the Effluent site.

A strong North current was evident during the time of sampling.

Description of sampling methods

Water samples are collected at the monitoring sites monthly throughout the year. Monitoring sites are at the effluent discharge location near the pen containing the highest biomass of fish, four zone of mixing sites, and two control sites. Effluent samples are collected down current from the net pen containing the highest biomass at the surface, mid-pen, and bottom of the receiving water two hours after feeding. Surface samples are collected no less than 1 meter or more than 5 meters below the surface, and no farther than 10 meters down current from the net pen. Mid-pen samples are collected at the mid-pen depth no farther than one 1 meter down current from the net pen. Bottom samples are collected no less than 1 meter or more than five 5 meters above the sea floor, and no farther than 10 meters down current from the net pen. Zone of Mixing (ZOM) samples are collected down-current from the facility at the boundaries of the ZOM. Samples are collected at the north or south locations depending on the dominant current during the day of sampling. Samples are collected at the surface, mid-pen depth, and bottom of the receiving waters. Surface samples are collected not less than 1 meter or more than 5 meters below the surface. Bottom samples are collected not less than 1 meter nor more than 5 meters above the sea floor.

Water samples collected from the monitoring sites are filtered through pre-combusted (500° C, 6h) GF/F (Whatman) filters (pore size 0.7-µm), as well as directly collected for RAW samples. These water samples are transported to the laboratory on ice and stored at -20°C until analysis. Samples are analyzed for nitrate + nitrite (NO3- + NO2-), ammonium (NH4+), phosphate (PO43-), total dissolved phosphorus (TDP), and total dissolved nitrogen (TDN). The nutrient values are measured using standard autoanalyzer methods. Inorganic nitrogen and phosphorus will be considered indirect measure of terrigenous effluents. Values recorded below the minimum detection limit (MDL) are presented as '<MDL.'. The MDL is calculated with analysis of seven of the same samples (Gravimetric Standard C4, 10, 100, 10, 10 ug/L for NH3, Si, PO4, NO3, and NO2 respectively). These samples are analyzed in order to determine the standard deviation, which is multiplied by the degree of freedom in order to calculate the precise MDL. The gravimetric standards are analyzed throughout the runs to determine calibration drift. Copper values are determined with inductively coupled plasma—mass spectrometry (ICP-MS). Analytical mass and instrumental parameters are selected to ensure accurate and precise determination of copper by using known standards. Turbidity is measured for all samples collected from these locations using a turbidimeter. The turbidimeter is calibrated with known standards prior to analyzing the collected samples to ensure accuracy.

To characterize the conditions at each monitoring station during sampling events, physiochemical parameters (temperature, salinity, conductivity, dissolved oxygen concentration, dissolved oxygen percent saturation, pH) are measured on site using multi-parameter YSI and pH meters. The multi-parameter sonde sensors are calibrated prior to taking measurements using known standards.

LABORATORY TEST RESULTS

			Reported in µg/L				
ID	**DATE**	**LAB ID**	**NO2+ NO3**	**NH3 +NH4**	**PO4**	**TDP**	**TDN**
		MDL	***1.4***	***4.9***	***1.0***	***1.0***	***1.4***
Z1B	2/21/25	31	<MDL	<MDL	1.10	6.40	89.10
Z1M	2/21/25	34	<MDL	<MDL	<MDL	6.60	89.10
Z1S	2/21/25	35	1.70	<MDL	1.10	7.10	93.10
Z2B	2/21/25	36	<MDL	<MDL	1.00	6.60	91.00
Z2M	2/21/25	37	1.40	<MDL	<MDL	6.90	95.00
Z2S	2/21/25	38	1.70	<MDL	1.20	7.30	98.20
Z3B	2/21/25	43	<MDL	<MDL	<MDL	6.90	87.70
Z3M	2/21/25	44	<MDL	<MDL	<MDL	7.10	91.20
Z3S	2/21/25	45	<MDL	<MDL	1.10	6.50	81.70
Z4B	2/21/25	46	<MDL	<MDL	<MDL	6.40	81.20
Z4M	2/21/25	47	1.50	<MDL	<MDL	5.80	83.20
Z4S	2/21/25	50	1.60	<MDL	1.00	6.80	86.00
EB	2/21/25	59	<MDL	<MDL	<MDL	6.50	87.80
EM	2/21/25	60	<MDL	<MDL	<MDL	6.70	86.00
ES	2/21/25	61	2.30	<MDL	<MDL	6.90	82.30
C1B	2/21/25	51	<MDL	<MDL	1.20	6.60	87.10
C1M	2/21/25	52	<MDL	<MDL	1.30	6.30	289.00
C1S	2/21/25	53	<MDL	<MDL	1.10	6.60	89.80
C2B	2/21/25	54	<MDL	<MDL	<MDL	6.60	86.90
C2M	2/21/25	57	<MDL	<MDL	1.10	6.80	88.60
C2S	2/21/25	58	<MDL	<MDL	<MDL	6.90	90.70

LAB QUALITY CONTROL AND QUALITY ASSURANCE

FASPac II

Run date: 2/27/25
Configuration: BOM Offshore
Run Name: BOM Offshore February 2025

	Position	Identifier	Type	Si µg/l	PO4 µg/l	NO_3 & NO_2 µg/l	Total NH_3 & NH_4 µg/l
22	2:54	GravStd C4	Unknown	98.2	9.4	10.1	9.5
23	2:55	GravStd C4	Unknown	97.8	10.0	11.1	12.7
24	2:56	GravStd C4	Unknown	97.8	9.7	11.3	10.2
27	2:57	GravStd C4	Unknown	97.3	9.1	10.2	7.9
28	2:58	GravStd C4	Unknown	98.1	9.2	10.6	9.3
29	2:59	GravStd C4	Unknown	97.6	9.6	10.6	8.4
30	0.125	GravStd C4	Unknown	97.4	9.8	10.8	10.4
Mean				97.7	9.5	10.7	9.8
std dev				0.336	0.326	0.439	1.572
MDL				1.1	1.0	1.4	4.9
18	SR:19	GravStd C3	Check Cal	246.8	21.4	24.5	24.7
39	SR:19	GravStd C3	Check Cal	246.3	21.8	26.1	26.5
62	SR:19	GravStd C3	Check Cal	250.5	21.6	25.7	23.4
85	SR:19	GravStd C3	Check Cal	251.2	22.3	26.9	23.1
104	SR:19	GravStd C3	Check Cal	257.4	21.7	28.2	22.4
Mean				250.4	21.8	26.3	24.0
std dev				4.456	0.336	1.379	1.618

MDL Calculations: Analysis of seven of the same samples (Gravimetric Standard C4 10, 100, 10, 10 ug/L for NH3, Si, PO4, NO3 & NO2 respectively), determine Std Dev, multiply Std Dev by degree of freedom (3.14)

Gravimetric standards (different from the calibration standards) are analyzed throughout the run to determine calibration drift.

GRAB SAMPLE RESULTS

Sample ID	Time	Date	Dissolved Oxygen	Dissolved Oxygen	Temperature
Z1B	8:29	2/21/25	6.85	93.79	78.80
Z1M	8:35	2/21/25	6.85	95.70	78.80
Z1S	8:38	2/21/25	6.70	93.54	78.98
Z2B	8:49	2/21/25	6.85	97.47	78.80
Z2M	8:54	2/21/25	6.20	97.54	78.80
Z2S	8:57	2/21/25	6.59	96.36	78.98
Z3B	9:12	2/21/25	6.57	97.90	78.80
Z3M	9:15	2/21/25	6.19	94.98	78.80
Z3S	9:16	2/21/25	6.24	96.89	78.98
Z4B	9:22	2/21/25	6.20	94.79	78.80
Z4M	9:26	2/21/25	6.18	92.97	78.80
Z4S	9:29	2/21/25	6.27	92.50	78.98
EB	9:47	2/21/25	6.69	98.16	78.80
EM	9:56	2/21/25	6.46	96.92	78.80
ES	10:01	2/21/25	6.74	94.48	78.98
C1B	10:14	2/21/25	6.36	94.63	78.80
C1M	10:18	2/21/25	6.82	97.93	78.80
C1S	10:20	2/21/25	6.91	92.62	78.98
C2B	10:31	2/21/25	6.73	92.42	78.80
C2M	10:33	2/21/25	6.56	93.23	78.80
C2S	10:36	2/21/25	6.19	95.25	78.98
Units			mg/mL	% Saturation	Fahrenheit
DL			0.01	0.01	0.01

GRAB SAMPLE RESULTS

Sample ID	Time	Date	pH	Salinity	Turbidity
Z1B	8:29	2/21/25	8.10	35.34	0.05
Z1M	8:35	2/21/25	8.10	35.39	0.08
Z1S	8:38	2/21/25	8.10	35.42	0.10
Z2B	8:49	2/21/25	8.10	35.21	0.07
Z2M	8:54	2/21/25	8.10	35.56	0.06
Z2S	8:57	2/21/25	8.10	35.56	0.32
Z3B	9:12	2/21/25	8.10	35.20	0.09
Z3M	9:15	2/21/25	8.10	35.56	0.13
Z3S	9:16	2/21/25	8.10	35.21	0.19
Z4B	9:22	2/21/25	8.10	35.37	0.06
Z4M	9:26	2/21/25	8.10	35.51	0.07
Z4S	9:29	2/21/25	8.10	35.27	0.12
EB	9:47	2/21/25	8.10	35.23	0.18
EM	9:56	2/21/25	8.10	35.43	0.27
ES	10:01	2/21/25	8.10	35.54	0.34
C1B	10:14	2/21/25	8.10	35.53	0.18
C1M	10:18	2/21/25	8.10	35.48	0.16
C1S	10:20	2/21/25	8.10	35.48	0.21
C2B	10:31	2/21/25	8.10	35.33	0.06
C2M	10:33	2/21/25	8.10	35.49	0.13
C2S	10:36	2/21/25	8.10	35.35	0.16
Units				PPT	NTU
DL			0.01	0.01	0.01

ICP RESULTS

Laboratory Test Results

Description: February 2025, 4 water samples for copper, zinc, selenium.
Job 2294

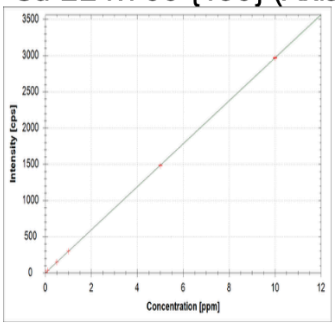
			mg/L		
Site	**Month**	**UHH Lab ID**	**Cu**	**Zn**	**Se**
ES	February	2294-9	ND	ND	ND
ES duplicate	February	2294-9d	ND	ND	ND
EM	February	2294-10	ND	ND	ND
EM duplicate	February	2294-10d	ND	ND	ND
EB	February	2294-11	ND	ND	ND
EB duplicate	February	2294-11d	ND	ND	ND
Control	February	2294-12	ND	ND	0.02
Control duplicate	February	2294-12d	ND	ND	0.02
		Method Blank	ND	ND	ND
		Detection Limit	**0.01**	**0.01**	**0.01**

Method used: EPA 200.8

ICP QA/QC

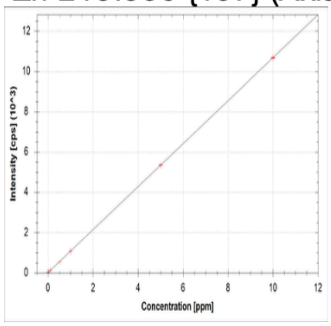
Curves for 4, 9-16

Cu 224.700 {450} (Axial)



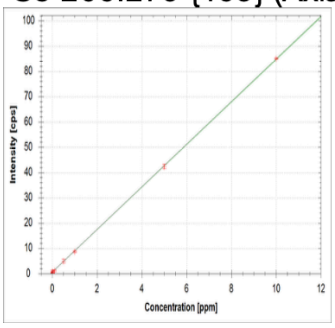
R^2 = 1.0000

Zn 213.856 {457} (Axial)



R^2 = 1.0000

Se 206.279 {463} (Axial)



R^2 = 0.9999

QC utilized MTL 62

Quality control samples

	mg/L		
	Cu	**Zn**	**Se**
Quality Control (QC) Sample	0.098	0.135	0.035
Accepted Range of QC	*0.087-0.113*	*0.107-0.143*	*0.026-0.044*

Please call if you have any questions regarding the water quality monitoring report.

Sincerely,

John Burns, Ph.D.
Associate Professor - Marine Science and Data Science
University of Hawai‘i at Hilo
Affiliate Researcher - NOAA Papahānaumokuākea Marine National Monument
200 W. Kawili St.
Hilo, HI 96720
Lab website: www.themegalab.org/

1/1

Natural Energy Laboratory
of Hawaii Authority
Water Quality Laboratory

NELHA

Sample Chain of Custody

73-4460 Queen Kaahumanu Hwy, #101, Kailua-Kona, HI 96740
808-327-9585 http://nelha.hawaii.gov

Client Name: BLUE OCEAN MARICULTURE
Address: _____ Phone: 854-4057
_____ Fax: _____
Contact Name: J. BURNS Email: johnhr@hawaii.edu

Project Information: _____
Project Location: _____
Turn-Around Time: _____
Notes: _____

Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Test(s) Requested:	Bottle Quantity	Comments / Field Data:
ZOM, E, C	2/21/25	8:39	O	JB	NUTRIENTS + TURBIDITY	21	

Relinquished By:	Date/Time	Received By:	Date/Time	Temp °C:	Matrix Key:
J. BURNS	2/21/25 12:40		2/21/25 1240	5.9	E = effluent
					GW = groundwater
					O = ocean water
					X= other/unknown

University of Hawai'i at Hilo Analytical Lab
Sample Submission/Analysis Request Form

UNIVERSITY of HAWAI'I HILO

Lab information: 200 W. Kawili St. Hilo, HI 96720 – Marine Science Building – Room 109

Hours: 8am – 4pm; M-F, closed most state and federal holidays

Email: analytic@hawaii.edu **Website:** https://hilo.hawaii.edu/analytic/ **Phone:** (808) 932-7590

Client Information	
Client Name	John Burns
Project Title	BOM
Phone number	
Email address	

Billing Information	
Name/ Organization	MEGA-BOM
Phone number	
Email address	
Funding type	☐ Private ☐ Non-profit ☐ Federal ☐ State ☐ County

Sample Information

Number of Samples	Sample Type	Sample Date	Analyses Requested
4	Sea H_2O	1/25	HM (Cu, Zn, Cr, Se, As, Ag)
12	Sea H_2O	12/24 2/25 3/25	HM (Cu, Zn, Se)
Example 4	Fresh Water	3/17/25	Total Phosphorus NO_3, NH_4 pH

Email Sample Sheet with Sample IDs to analytic@hawaii.edu

Chain of Custody

Samples Relinquished by (Client): [signature] Date: 3/4/25

By relinquishing the sample(s) to the UH Hilo Analytical Lab, I indicate that the information provided is accurate and complete and the samples are in the best quality for analysis. By submitting these samples, I agree to pay for all services rendered. I understand that the samples will be disposed of 30 days after the final report is completed, unless otherwise arranged.

Samples Received by (Technician): [signature] Date: 03/04/25

For Lab Use Only		
Sample Received Condition	(1) Drop off Mail (2) Fresh Frozen Dried Other	
Water Type	Fresh Brackish (Sea) Filtered? Y N	
Sample location post arrival	Fridge	Comments
Job Number	2294	

V1 - 2/2025