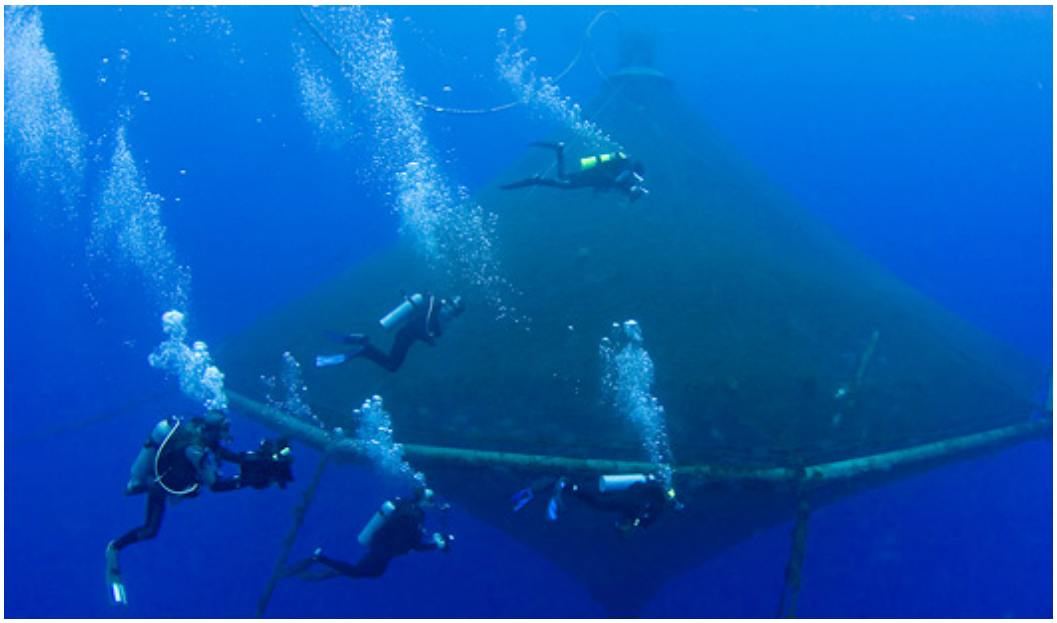
BLUE OCEAN MARICULTURE



11/25/2025

Water Quality Monitoring – Nov. 2025

Prepared by

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BLUE OCEAN MARICULTURE

WATER QUALITY MONITORING – NOV. 2025

SAMPLING REPORT

Survey Date: 11/25/2025

Client: Blue Ocean Mariculture

Current: North

Log Number: BOM-WQ-NOV-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 (2.0ft to 0.6ft) influenced by a 26% waxing moon. Conditions consisted of 1-2kt Southwest winds that stayed consistent throughout the sampling duration. A 1-2ft Northwest swell was present during sampling and stayed consistent throughout the entire sampling event. Overall, sea conditions were very calm with glassy conditions. Skies over the ocean and coastline were clear with no rainclouds visible at higher elevation above Kailua-Kona. The air had high levels of vog from the Kilauea geological activity. There were visible slicks at all sampling stations with moderate amounts visible particulates in the water**.** There were schools of baitfish and Ulua observed at the Effluent site.

A mild 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 (NO_3^- + NO_2^-), ammonium (NH_4^+), phosphate (PO_4^{3-}), 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 NH_3, Si, PO_4, NO_3, and NO_2 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	***0.2***	***0.1***	***0.1***	***0.1***	***0.2***
Z1B	11/25/25	31	0.30	0.48	<MDL	6.27	66.50
Z1M	11/25/25	34	0.03	<MDL	<MDL	6.75	64.28
Z1S	11/25/25	35	0.43	0.63	<MDL	7.16	78.97
Z2B	11/25/25	36	1.23	0.48	<MDL	7.35	72.42
Z2M	11/25/25	37	<MDL	0.52	<MDL	6.89	69.03
Z2S	11/25/25	38	0.47	0.42	<MDL	6.87	82.48
Z3B	11/25/25	43	<MDL	<MDL	<MDL	6.57	69.55
Z3M	11/25/25	44	<MDL	0.24	<MDL	6.91	68.05
Z3S	11/25/25	45	0.29	0.45	<MDL	6.92	75.05
Z4B	11/25/25	46	<MDL	0.28	<MDL	6.39	67.85
Z4M	11/25/25	47	0.21	0.52	<MDL	6.01	64.90
Z4S	11/25/25	50	0.36	0.68	<MDL	7.30	79.74
EB	11/25/25	59	0.87	<MDL	<MDL	7.30	69.62
EM	11/25/25	60	0.53	<MDL	<MDL	7.33	68.71
ES	11/25/25	61	0.72	0.53	<MDL	6.93	62.19
C1B	11/25/25	51	0.34	<MDL	<MDL	6.66	63.28
C1M	11/25/25	52	0.36	<MDL	<MDL	7.01	65.03
C1S	11/25/25	53	<MDL	0.62	<MDL	6.74	68.88
C2B	11/25/25	54	0.72	<MDL	<MDL	6.99	70.69
C2M	11/25/25	57	0.46	<MDL	<MDL	7.24	70.02
C2S	11/25/25	58	<MDL	0.21	<MDL	7.27	80.83

LAB QUALITY CONTROL AND QUALITY ASSURANCE

HOST PARK

Natural Energy Laboratory
Water Quality Laboratory

General

Name of Run	BOM Offshore Fish Cages Novembe	Name of Analysis	Low Level Ocean Curve R2.
Date of Report	11/28/2025	System	SEAL CFA System
Run Start	11/26/2025 9:52:19 AM	Run Stop	12:31:14 PM
Operator Run/Rec.		Software Version	AACE 8.06 alpha30
Comment			

Parameters

Channel	1	2	3	4	
Method	Nitrate	Silicate	Phosphate	Ammonia	Dilution
Unit	µg/L	µg/L	µg/L	µg/L	
Calib. Fit	Linear	Linear	Linear	Linear	
Corr.Coeff.(r)	1.0000	1.0000	0.9999	0.9998	
Gain	48	49	354	585	Data
Offset	-332	1274	4849	-2491	Field
Sensitivity	**0.1636**	**0.1619**	**0.0232**	**0.0118**	'#2
Sample Limit 1	-	-	-	-	
Sample Limit 2	-	-	-	-	

Results

PK	Cup	Type	Sample ID	Value	Value	Value	Value	Data
0	0	B	Initial Base	0.00	0.00	0.00	0.00	0
1	921	P	Primer	0.00	0.00	0.00	0.00	1
2	921	D	Drift	0.00	0.00	0.00	0.00	1
3	901	C	Calibration Blank	0.00	0.00	0.00	0.00	1
4	902	C	Calibration 1%	1.00	10.00	0.62	0.70	1
5	903	C	Calibration 2.5%	2.50	25.00	1.55	1.75	1
6	904	C	Calibration 5%	5.00	50.00	3.10	3.50	1
7	905	C	Calibration 12.5%	12.50	125.00	7.75	8.75	1
8	906	C	Calibration 25%	25.00	250.00	15.50	17.50	1
9	907	C	Calibration 50%	50.00	500.00	31.00	35.00	1
10	908	C	Calibration 75%	75.00	750.00	46.50	52.50	1
11	909	C	Calibration 100%	100.00	1000.00	62.00	70.00	1
12	0	B	Baseline	0.00Z	0.00Z	0.00Z	0.00Z	1
13	921	D	Drift	99.76	998.50	61.48	70.64	1
14	921	H1	Carryover High	99.90	999.02	61.71	71.34	1
15	922	L1	Carryover Low	1.25	11.56	0.63	0.10	1
16	922	L1	Carryover Low	1.10	11.17	0.17	0.00Z	1
17	919	QC1	Low Check Std	22.93P	254.85P	15.25P	16.83P	1
18	920	QC2	High Check Std	69.26P	746.00P	46.27P	50.66P	1
63	919	QC1	Low Check Std	23.78P	291.78P	16.49P	16.99P	1
64	920	QC2	High Check Std	70.65P	770.89P	47.68P	50.67P	1
65	0	B	Baseline	0.22	0.00Z	0.66	0.00Z	1
66	921	D	Drift	102.14	1008.00	62.91	71.64	1
67	0	B	Final Base	0.00	0.00	0.00	0.00	1

Corrections

Channel	1	2	3	4
Baseline	none	none	none	none
Drift	none	none	none	none
Carryover	none	none	none	none
%	0.00	0.00	0.00	0.00

GRAB SAMPLE RESULTS

Sample ID	Time	Date	Dissolved Oxygen	Dissolved Oxygen	Temperature
Z1B	8:51	11/25/25	6.46	96.04	81.14
Z1M	8:58	11/25/25	6.56	95.91	81.14
Z1S	9:02	11/25/25	6.53	95.16	81.32
Z2B	9:13	11/25/25	6.70	95.99	81.14
Z2M	9:16	11/25/25	6.43	96.00	81.14
Z2S	9:18	11/25/25	6.68	95.15	81.32
Z3B	9:27	11/25/25	6.52	94.89	81.14
Z3M	9:32	11/25/25	6.59	95.47	81.14
Z3S	9:33	11/25/25	6.56	94.54	81.32
Z4B	9:44	11/25/25	6.72	95.94	81.14
Z4M	9:51	11/25/25	6.72	94.95	81.14
Z4S	9:52	11/25/25	6.61	96.03	81.32
EB	10:09	11/25/25	6.69	95.35	81.14
EM	10:16	11/25/25	6.51	95.74	81.14
ES	10:21	11/25/25	6.66	94.48	81.32
C1B	10:32	11/25/25	6.75	94.78	81.14
C1M	10:36	11/25/25	6.71	94.66	81.14
C1S	10:38	11/25/25	6.54	96.26	81.32
C2B	10:50	11/25/25	6.58	95.00	81.14
C2M	10:58	11/25/25	6.59	95.40	81.14
C2S	11:02	11/25/25	6.56	95.56	81.32
Units			mg/mL	% Saturation	Fahrenheit
DL			0.01	0.01	0.01

GRAB SAMPLE RESULTS

Sample ID	Time	Date	pH	Salinity	Turbidity
Z1B	8:51	11/25/25	8.10	35.40	0.06
Z1M	8:58	11/25/25	8.10	35.38	0.10
Z1S	9:02	11/25/25	8.10	35.34	0.11
Z2B	9:13	11/25/25	8.10	35.36	0.08
Z2M	9:16	11/25/25	8.10	35.36	0.09
Z2S	9:18	11/25/25	8.10	35.35	0.14
Z3B	9:27	11/25/25	8.10	35.39	0.07
Z3M	9:32	11/25/25	8.10	35.33	0.19
Z3S	9:33	11/25/25	8.10	35.34	0.33
Z4B	9:44	11/25/25	8.10	35.38	0.09
Z4M	9:51	11/25/25	8.10	35.33	0.10
Z4S	9:52	11/25/25	8.10	35.37	0.31
EB	10:09	11/25/25	8.10	35.32	0.08
EM	10:16	11/25/25	8.10	35.34	0.10
ES	10:21	11/25/25	8.10	35.33	0.22
C1B	10:32	11/25/25	8.10	35.40	0.09
C1M	10:36	11/25/25	8.10	35.40	0.18
C1S	10:38	11/25/25	8.10	35.33	0.11
C2B	10:50	11/25/25	8.10	35.30	0.20
C2M	10:58	11/25/25	8.10	35.34	0.25
C2S	11:02	11/25/25	8.10	35.33	0.08
Units				PPT	NTU
DL			0.01	0.01	0.01

ICP RESULTS

Burns2025 (6)
251211

n.a.:	below MDL (method detection limit)
e:	eliminated (over calibration range, failed qc, interference, etc)
Primary:	Primary/preferred wavelength for elements measured at multiple wavelengths
IS:	internal standard, yttrium
Note:	
Analsyst:	IG,NS

	Primary ppb Cu3247	Primary ppb Se1960	Primary ppb Zn2062	Comments
MDL	2.9	2	4	
Nov-C	n.a.	n.a.	n.a.	
Nov-EB	n.a.	n.a.	4.198	
Nov-EM	n.a.	n.a.	19.42	
Nov-ES	n.a.	n.a.	7.699	

ICP QA/QC

	Y_2243	Y_3710
Sept-ES	2476.7	2807.2
Sept-EM	2478.1	2824.9
Sept-ES	2484.9	2874.9
Oct-ES	2486.9	2883.7
Oct-EM	2489.2	2846.3
Oct-ES	2481.4	2880.5
MeanIS_SW	2482.9	2852.9

	Ag3280	Ag3382	As1890	As1937	Cr2055	Cr2677	Cr2835	Cu2247	Cu3247	Se1960	Se2039	Y_2243	Y_3710	Zn2062	Zn2138	
MDL1	0.5698	0.9961	9.297	8.367	1.577	1.885	0.7865	6.948	9.779	4.055	5.749	4070.8	3566	9.873	9.674	*Zn background contamination
MDL2	0.5804	0.7866	8.951	7.801	1.502	1.768	0.5203	4.023	9.129	4.842	3.943	4108.7	3549.3	3.774	3.588	
MDL3	0.7971	0.7996	9.41	8.458	1.541	1.993	0.7386	2.567	10.46	4.868	2.069	4123.2	3538.4	3.07	2.853	
MDL4	0.7443	0.8875	9.74	7.051	1.582	2.097	0.4002	3.924	10.96	5.304	5.58	4123.7	3563.1	3.071	2.776	
MDL5	1.025	0.8257	10.62	7.566	1.679	2.031	0.7028	2.359	10.93	4.796	4.317	4123.4	3512.5	3.049	2.784	
MDL6	1.101	0.8551	9.935	7.632	1.528	1.957	0.507	1.713	10.63	4.861	4.809	4142	3533.2	3.346	3.03	
MDL7	0.841	1.129	10.65	7.393	1.538	1.948	0.581	0.7272	9.664	4.686	5.251	4124.9	3528.5	3.275	3.026	
											MeanIS	4116.7	3541.6			
SD	0.2028	0.124	0.651	0.508	0.0578	0.1059	0.1412	2.0281	0.7037	0.3713	1.2671					
MDL	0.7	0.4	2.1	1.6	0.2	0.4	0.5	6.4	2.3	1.2	4					
MDL_SW	0.9	0.5	3.5	2.7	0.4	0.5	0.7	10.7	2.9	2	6.7			4	4	

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
200 W. Kawili St.
Hilo, HI 96720

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: BOM
Address:
Phone: 808-854-4057
Fax:
Contact Name: J. Burns
Email:

Project Information: Monthly water quality monitoring
Project Location: Keahole Point
Turn-Around Time: 5-10days
Notes:

Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Test(s) Requested:	Bottle Quantity	Comments / Field Data:
E, ZOM, C	11/25/25	8:51	O	JB	Nutrients and turbidity	21	

Relinquished By:	Date/Time	Received By:	Date/Time	Temp °C:	Matrix Key:
J.BURNS JB	11/25/25 12:30		11/25/25 1250	8.0	E = effluent
					GW = groundwater
					O = ocean water
					X= other/unknown