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GRANTS PROGRAMME



NURTURING
GREEN AQUACULTURE
IN MYANMAR

HYDROLOGY ASSESSMENT

PREPARED BY DR. AUNG MYO HSAN
AUG 2022





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Background

About NGA-Myanmar: Mercy Corps and partners implement the EU funded Nurturing Green Aquaculture in Myanmar (NGA-Myanmar) programme to support increased environmental sustainability and resource efficiency in Myanmar's aquaculture sector. The programme supports micro, small, and medium enterprises (MSMEs) engaged in fish production in the Yangon-Ayeyarwady aquaculture corridor including Twantay, Maubin, Nyaungdon, Pantanaw townships to access and adopt cleaner production practices and green technologies, including solutions such as micro circular economies to return nutrients to the ecosystem, and application of both internet of things (IoT) smart devices and lower-end green tech. This will help the target MSMEs to increase their productivity and to better manage waste, thereby reducing water pollution and carbon emissions in the Ayeyarwady delta ecosystem. This vision is captured in the action's overall objective, "To improve resource efficiency and reduce environmental degradation in Myanmar's aquaculture industry, while ensuring improved economic returns in the value chain."

Objective of the assessment: The hydrology assessment was carried out to assess water quality in 16 locations (8 ponds, 8 water streams) across NGA-Myanmar target locations. The water quality assessment include the following parameters: Ammonia (mg/L), Nitrite (mg/L), Nitrate (mg/L), Phosphate (mg/L), Biochemical Oxygen Demand (BOD) (mg/L), Dissolved Oxygen (DO) (mg/L), pH, Temperature (°C) and Salinity (‰).

Materials and Methods

A total of 16 sites were surveyed, including 8 sites of fish farming ponds and other 8 sites from the streams located at each of pond's adjacent area. Sites were proposed based on the pond size ranging from about 1000-3000 square meters (Table 1, 2) by using QGIS software and confirmed by the field investigations (Figure 1, 2). The codes (in Table 1, 2) have been generated for the purpose of sample collection in the field. Sites were arranged by the gradient of latitudes (higher to lower) in each station (see – Table 1 and 2, Appendix 1-16).

Field investigation (*in situ* measurement) of water quality were carried out by using portable calibrated pH meter (HANNA-HI98127), DO meter (HANNA-HI9146) and Refractometer for salinity (HANNA-HI98319). Moreover, Ammonia (HANNA- HI38049), Nitrite (HANNA-HI3873), Nitrate (HANNA-HI3874) and Phosphate (HANNA-HI38061) were measured with relevant test kits. Water temperature (°C) was also recorded in each site by using DO meter (Table 1). Technical methods also followed by the instruction from each manual.

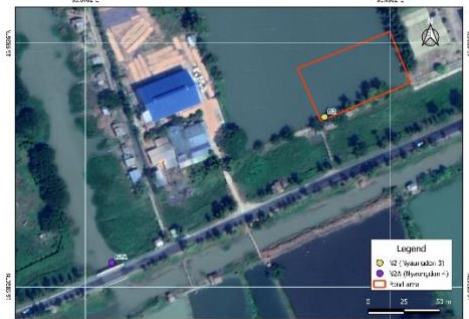
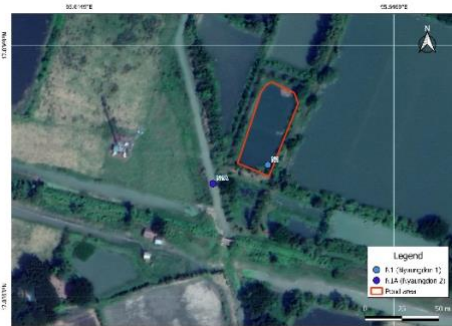
Water quality assessment includes Ammonia (mg/L), Nitrite (mg/L), Nitrate (mg/L), Phosphate (mg/L), Biochemical Oxygen Demand (BOD) (mg/L), Dissolved Oxygen (DO) (mg/L), pH, Temperature (°C) and Salinity (‰). Samples (2 litres) from each station were transported to the Laboratory for further analysis. Detailed description of laboratory analytical methods for the analysis of each water quality parameter were described in Appendix (1-16).

Survey Locations

Figure 1 and Figure 2 below presents the survey, 4 in each of NGA-Myanmar target townships.

Figure 1: Maps of the surveyed locations in each township

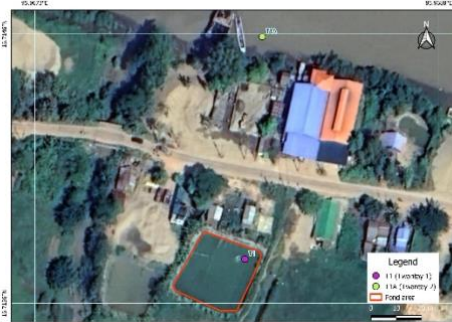
Nyaungdon



Pantanaw



Maubin



Twantay



Figure 2: Map of the surveyed location



Results

The results of water quality assessment were described in the following table. It is important to note that the data collection was during monsoon season and in the middle of fish/shrimp growing season, therefore water quality data tend to show better results than during the dry season or after harvest time (i.e., monsoon rains dilute the polluted water from ponds). As it can be seen from the table, data that were able to be analyzed both *in situ* and at laboratory shows different values. It is recommended that the green highlighted datasets are those recommended to use. For temperature and salinity, datasets from the field can be used since the laboratory did not test these parameters. While laboratory analysis done by the laboratory has a better accuracy in general, specifically for DO and pH, the average values of *in situ* and laboratory data are recommended to be used as reference, because accuracy of field test kits for both parameters deems to be as high as the laboratory. Otherwise for other parameters, results from the laboratory are recommended to be used.

Table 1: Hydrology assessment results.

No	Site	Code	Lat	Long	Area (m2)	Temp (°C)		Salinity (‰)		pH			Nitrite (mg/L)		Nitrate (mg/L)		Ammonia (mg/L)		Phosphate (mg/L)		DO (mg/L)			BOD (mg/L)	
						In situ	Lab	In situ	Lab	In situ	Lab	Avg	In situ	Lab	In situ	Lab	In situ	Lab	In situ	Lab	In situ	Lab	Avg	In situ	Lab
1	Nyaungdon 1	N 1	17°02'10"N	95°38'46"E	1,499	31.00	ND	0.00	ND	6.70	6.73	6.72	ND*	2.10	ND	6.70	0.12	<0.4	0.26	0.35	4.20	3.22	3.71	ND	14.45
2	Nyaungdon 2	N 1A	17°02'10"N	95°38'46"E	-	31.00	ND	0.00	ND	7.00	6.91	6.96	ND	1.20	ND	3.30	0.12	<0.4	0.19	0.06	3.50	4.52	4.01	ND	15.50
3	Nyaungdon 3	N 2	16°58'59"N	95°41'53"E	2,802	32.00	ND	0.00	ND	8.00	6.18	7.09	ND	<0.03	ND	6.90	0.36	<0.4	-	Nil	8.00	4.80	6.40	ND	14.15
4	Nyaungdon 4	N 2A	16°58'55"N	95°41'46"E	-	32.00	ND	0.00	ND	6.60	6.72	6.66	ND	<0.03	ND	1.20	0.24	1.00	0.23	0.10	0.60	3.19	1.90	ND	15.45
5	Pantanaw 1	P 2	17°01'55"N	95°23'24"E	758	32.00	ND	0.00	ND	8.50	6.81	7.66	ND	<0.03	ND	6.20	-	0.60	-	Nil	8.00	3.10	5.55	ND	10.65
6	Pantanaw 2	P 2A	17°01'52"N	95°23'28"E	-	30.00	ND	0.00	ND	6.70	6.71	6.71	ND	<0.03	ND	<0.1	0.12	<0.4	0.10	Nil	0.50	3.58	2.04	ND	11.35
7	Pantanaw 3	P 1	16°59'35"N	95°27'51"E	2,126	31.00	ND	0.00	ND	7.60	7.07	7.34	ND	<0.03	ND	0.80	-	<0.4	0.19	0.09	6.20	3.98	5.09	ND	12.75
8	Pantanaw 4	P 1A	16°59'28"N	95°27'15"E	-	30.00	ND	0.00	ND	7.50	6.81	7.16	ND	<0.03	ND	<0.1	-	<0.4	0.10	0.10	5.40	4.45	4.93	ND	3.10
9	Maubin 1	M 1	16°46'48"N	95°39'32"E	1,870	30.60	ND	0.00	ND	7.90	7.03	7.47	ND	<0.03	ND	0.50	0.12	<0.4	0.03	Nil	4.90	2.89	3.90	ND	16.70
10	Maubin 2	M 1A	16°46'52"N	95°39'29"E	-	30.00	ND	0.00	ND	6.80	7.22	7.01	ND	<0.03	ND	<0.10	0.12	<0.4	0.10	0.10	4.20	5.67	4.94	ND	13.10
11	Maubin 3	M 2	16°44'06"N	95°36'54"E	3,001	30.90	ND	0.00	ND	7.60	7.39	7.50	ND	<0.03	ND	<0.10	0.12	0.50	0.10	Nil	5.00	5.87	5.44	ND	16.20
12	Maubin 4	M 2A	16°44'06"N	95°36'54"E	-	29.50	ND	0.00	ND	6.10	6.76	6.43	ND	0.11	ND	0.40	0.61	<0.4	0.32	0.83	0.10	3.78	1.94	ND	27.45
13	Twantay 1	T2	16°42'50"N	95°58'05"E	718	30.10	ND	0.00	ND	6.60	6.77	6.69	ND	0.22	ND	<0.1	0.24	<0.4	0.32	1.46	5.60	2.41	4.01	ND	52.24
14	Twantay 2	T 2A	16°42'54"N	95°58'05"E	-	29.30	ND	0.00	ND	7.00	7.23	7.12	ND	<0.03	ND	<0.1	0.12	<0.4	0.03	0.15	4.70	5.35	5.03	ND	4.90
15	Twantay 3	T 1	16°36'47"N	95°49'30"E	2,408	30.50	ND	0.00	ND	6.50	6.61	6.56	ND	0.49	ND	<0.1	0.12	<0.4	0.03	Nil	2.60	3.20	2.90	ND	5.78
16	Twantay 4	T 1A	16°36'47"N	95°49'26"E	-	28.90	ND	0.00	ND	7.00	7.02	7.01	ND	<0.03	ND	<0.1	0.12	<0.4	0.03	0.22	3.70	5.15	4.43	ND	11.55

*ND = Not detected

Table 4. Average results by township and overall.

Location	DO (mg/L)	pH	Nitrite (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)	Phosphate (mg/L)
Nyaungdon	4.00	6.9	0.84	4.53	0.55	0.17
Pantanaw	4.40	7.2	0.03	1.80	0.45	0.10
Maubin	4.05	7.1	0.05	0.28	0.45	0.47
Twantay	4.09	6.8	0.19	0.10	0.40	0.61
Total (average)	4.14	7.0	0.28	1.68	0.46	0.34

The laboratory test results are attached.

Recommendations

1. Precipitations, in terms of intensity and timing can affect water quality. In addition, limited sunshine (i.e., rainy season) may limit oxygen production and may also affect surface water quality. Therefore, analysis during other seasons (i.e., pre-monsoon and post-monsoon) should be carried out to understand seasonal fluctuations of water quality.
2. In the present study, test kits being used to analyse Nitrite and Nitrate did not work properly as such those parameters were not detected. Likewise, the use of colour gradients of the test kits used to measure Ammonia and Phosphate data were also difficult to read. Therefore, other kits or methods (i.e., lab tests) should be used during the next measurements.
3. Although the values of salinity were resulted as not detected in the study, this parameter should still be assessed to look at salinity fluctuations over time. It was observed that some mangroves grow along some river banks and tidal creeks that indicates of salinity intrusion.
4. Site selections were based on the area of fish farming ponds between 1,000 – 3,000 square meters. Mostly, these ponds were used as nursery ponds. For future water quality assessments, site selection should also include larger ponds used for grow-out production.

Appendix 1. Laboratory analysis report of Nyaungdon 1.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd
Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : N - 1
- 4 Sample No. : 00584/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	14.45	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	3.22	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	6.7	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	2.1	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.73	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.35	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 2. Laboratory analysis report of Nyaungdon 2.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : N - 1a
- 4 Sample No. : 00585/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	15.50	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	4.52	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	3.3	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	1.2	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.91	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.06	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 3. Laboratory analysis report of Nyaungdon 3.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : N - 2
- 4 Sample No. : 00586/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	14.15	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	4.80	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	6.9	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.81	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	Nil	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 4. Laboratory analysis report of Nyaungdon 4.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : N - 2a
- 4 Sample No. : 00587/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	1.0	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	15.45	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	3.19	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	1.2	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.72	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.10	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 5. Laboratory analysis report of Pantanaw 1.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : P - 2
- 4 Sample No. : 00582/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	0.6	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	10.65	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	3.10	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	6.2	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.81	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	Nil	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 6. Laboratory analysis report of Pantanaw 2.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : P - 2a
- 4 Sample No. : 00583/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	11.35	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	3.58	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.71	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	Nil	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



Appendix 7. Laboratory analysis report of Pantanaw 3.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : P - 1
- 4 Sample No. : 00580/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	12.75	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	3.98	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	0.8	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	7.07	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.09	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 8. Laboratory analysis report of Pantanaw 4.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut. Tsp
- 3 Type of Sample : P - 1a
- 4 Sample No. : 00581/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 18.07.2022
- 8 Date of Test Performed : 18.07.2022
- 9 Date of Issued : 05.08.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	3.10	mg/L	NA	(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	4.45	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.81	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.10	mg/L	NA	(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : MAY THU NAING

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 9. Laboratory analysis report of Maubin 1.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Maubin - I
- 4 Sample No. : 00541/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	16.70	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	2.89	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	0.5	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	7.03	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	Nil	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :



Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :

LAB-FO-024-00

Appendix 10. Laboratory analysis report of Maubin 2.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Maubin - 1a
- 4 Sample No. : 00542/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	13.10	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	5.67	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	7.22	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.10	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 11. Laboratory analysis report of Maubin 3.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Maubin - 2
- 4 Sample No. : 00543/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	0.5	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	16.20	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	5.87	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	7.39	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	Nil	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 12. Laboratory analysis report of Maubin 4.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Maubin - 2a
- 4 Sample No. : 00544/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	27.45	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	3.78	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	0.4	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	0.11	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.76	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.83	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :

Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :



LAB-FO-024-00

Appendix 13. Laboratory analysis report of Twantay 1.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Twantay - 2
- 4 Sample No. : 00539/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	52.24	mg/L	NA	(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	2.41	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	0.22	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.77	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	1.46	mg/L	NA	(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :



Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :

LAB-FO-024-00

Appendix 14. Laboratory analysis report of Twantay 2.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Twantay - 2a
- 4 Sample No. : 00540/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	4.90	mg/L	NA	(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	5.35	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	7.23	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.15	mg/L	NA	(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :



Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :

LAB-FO-024-00

Appendix 15. Laboratory analysis report of Twantay 3.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Twantay - 1
- 4 Sample No. : 00537/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	5.78	mg/L	NA	(a) 5210 B, 5 - Day BOD Test Method
3	Dissolved Oxygen	3.20	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	0.49	mg/L	3 mg/L	SpectroDirect Methods
6	pH	6.61	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	Nil	mg/L	NA	(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :



Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :

LAB-FO-024-00

Appendix 16. Laboratory analysis report of Twantay 4.



ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd

Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.

Tel : 09-893 767 424

E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

- 1 Client Name : Mercy Corps Myanmar
- 2 Location : No. 659, Mya Kan Thar 1st Street, Kamayut Tsp
- 3 Type of Sample : Twantay - 1a
- 4 Sample No. : 00538/2022
- 5 Contact Person : Ma Zin Me Me Nyunt
- 6 Phone No. : 09-969992576
- 7 Date Received : 13.07.2022
- 8 Date of Test Performed : 13.07.2022
- 9 Date of Issued : 28.07.2022
- 10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	NA	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Biochemical Oxygen Demand	11.55	mg/L	NA	^(a) 5210 B. 5 - Day BOD Test Method
3	Dissolved Oxygen	5.15	mg/L	6 mg/L	Hanna HI 98193 - DO and BOD meter
4	Nitrate	< 0.1	mg/L	50 mg/L	Hach DR 3900 Spectrophotometer, Cadmium Reduction Method
5	Nitrite	< 0.03	mg/L	3 mg/L	SpectroDirect Methods
6	pH	7.02	-	6.5-8.5	Hanna (HI 2211) - pH & Temperature Meter
7	Phosphate	0.22	mg/L	NA	^(a) 4500E Ascorbic Acid Method

Remark:

This certificate is issued only for the receipt of the test sample.

^(a) American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By

Name : HTET HTET KYAW

Position : Laboratory Technician

Signature :



Approved By

Name : KYAWT KYAWT YIN

Position : Technical Consultant Manager

Signature :

LAB-FO-024-00

CONTACT

PHOE CHO

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pcho@mercycorps.org

WAHYU NUGROHO

Team Leader | NGA-Myanmar
wnugroho@mercycorps.org

About Mercy Corps

Mercy Corps is a leading global organization powered by the belief that a better world is possible. In disaster, in hardship, in more than 40 countries around the world, we partner to put bold solutions into action — helping people triumph over adversity and build stronger communities from within. Now, and for the future.



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