

ภาคผนวก ค

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ใบรับรองผลการตรวจวิเคราะห์

## ภาคผนวก ค-1

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ผลการตรวจวัดคุณภาพสิ่งแวดล้อม



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คุณภาพอากาศในบรรยากาศทั่วไป



## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0009

Lot ID: 2416233  
Date Received : Mar 12, 2024  
Date Reported : Mar 19, 2024  
Report Number : 2908315-1

Page 1 of 2

Sample Number 2416233-1  
Sampled Date Mar 07, 2024  
Sample Description Air Quality  
Location บริเวณพื้นที่โครงการ (47N 672452 N, 800003 E)  
Date Analysis Commenced Mar 13, 2024  
Condition of Sample Drawn into one 10-L air sampling bag, one glass filter paper (8x10 inch) placed in plastic bag, one quartz filter paper (8x10 inch)  
Barometric Pressure 756 mmHg  
Atmospheric Temperature 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
<b>Air Testing</b>									
Particulate matter as PM 10	07/03/24 - 08/03/24	mg/m3	-	0.005	0.022	0.12	In - house method : STM 04-052 based on U.S. Environmental Protection Agency 40 CFR, method 50, Appendix J, revised as of July 1, 2008 (Include sampling)	NEB No.24 Bangkok	
Total Hydrocarbon *	01:00 PM - 02:00 PM	ppm	-	1.0	5.0	No Standard	Total Hydrocarbon Analyzer (FID)	-	Bangkok
Total Suspended Particulate	07/03/24 - 08/03/24	mg/m3	-	0.005	0.057	0.33	In - house method : STM 04-051 based on U.S. Environmental Protection Agency 40 CFR, method 50, Appendix B, revised as of July 1, 2008 (Include sampling)	NEB No.24 Bangkok	

Guideline :  
NEB No.24 : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004  
Sampled By : Woravut Deenuk

Remark :  
- LOD : Limit of Detection  
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)  
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.  
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Approved by

*Orawan R.*

Orawan Rakyong  
Scientist (3)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0009

Lot ID: 2416233  
Date Received : Mar 12, 2024  
Date Reported : Mar 19, 2024  
Report Number : 2908315-1

Page 2 of 2

Sample Number 2416233-2  
Sampled Date Mar 07, 2024  
Sample Description Air Quality  
Location บริเวณพื้นที่โครงการ (47N 672349 N, 799616 E)  
Date Analysis Commenced Mar 13, 2024  
Condition of Sample Drawn into one 10-L air sampling bag, one glass filter paper (8x10 inch) placed in plastic bag, one quartz filter paper (8x10 inch)  
Barometric Pressure 756 mmHg  
Atmospheric Temperature 32.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
<b>Air Testing</b>									
Particulate matter as PM 10	07/03/24 - 08/03/24	mg/m3	-	0.005	0.025	0.12	In - house method : STM 04-052 based on U.S. Environmental Protection Agency 40 CFR, method 50, Appendix J, revised as of July 1, 2008 (Include sampling)	NEB No.24 Bangkok	
Total Hydrocarbon *	12:00 PM - 01:00 PM	ppm	-	1.0	3.2	No Standard	Total Hydrocarbon Analyzer (FID)	-	Bangkok
Total Suspended Particulate	07/03/24 - 08/03/24	mg/m3	-	0.005	0.055	0.33	In - house method : STM 04-051 based on U.S. Environmental Protection Agency 40 CFR, method 50, Appendix B, revised as of July 1, 2008 (Include sampling)	NEB No.24 Bangkok	

Guideline :  
NEB No.24 : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004  
Sampled By : Woravut Deenuk

Remark :  
- LOD : Limit of Detection  
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)  
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*Orawan R.*

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2416230  
Date Received : Mar 12, 2024  
Date Reported : Mar 13, 2024  
Report Number: 2935193-1

Page 1 of 1

Sample Description Air Quality  
Location บริเวณพื้นที่โครงการ (47N 672452 N, 800003 E)  
Parameter Carbon monoxide (ppm)  
Measurement Date Mar 07, 2024 - Mar 08, 2024  
Measurement by Woravut Deenuk

Time	2416230-1 Mar 07, 2024	-	-	-	-	-	-
01:00 PM - 02:00 PM	2.2	-	-	-	-	-	-
02:00 PM - 03:00 PM	2.2	-	-	-	-	-	-
03:00 PM - 04:00 PM	2.0	-	-	-	-	-	-
04:00 PM - 05:00 PM	2.1	-	-	-	-	-	-
05:00 PM - 06:00 PM	1.8	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.8	-	-	-	-	-	-
07:00 PM - 08:00 PM	1.6	-	-	-	-	-	-
08:00 PM - 09:00 PM	1.2	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.8	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.8	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.8	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.8	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.8	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.6	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.6	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.6	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.6	-	-	-	-	-	-
06:00 AM - 07:00 AM	0.6	-	-	-	-	-	-
07:00 AM - 08:00 AM	0.6	-	-	-	-	-	-
08:00 AM - 09:00 AM	0.9	-	-	-	-	-	-
09:00 AM - 10:00 AM	1.6	-	-	-	-	-	-
10:00 AM - 11:00 AM	1.6	-	-	-	-	-	-
11:00 AM - 12:00 PM	2.0	-	-	-	-	-	-
12:00 PM - 01:00 PM	2.2	-	-	-	-	-	-
Average	1.3	-	-	-	-	-	-
1hr - Maximum	2.2	-	-	-	-	-	-
Standard 1hr - Average	30	-	-	-	-	-	-

Standard : Notification of the National Environmental Board. No.10, 1995 (B.E.2538).  
Reference Method : EPA 40 CFR Part 50Appendix C

Approved by

*Orawan R.*

Orawan Rakyong  
Scientist (3)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2416230  
Date Received : Mar 12, 2024  
Date Reported : Mar 13, 2024  
Report Number: 2935194-1

Page 1 of 1

Sample Description Air Quality  
Location บริเวณบ้านพักเจ้าหน้าที่ด่านศุลกากร (47N 672349 N, 799616 E)  
Parameter Carbon monoxide (ppm)  
Measurement Date Mar 07, 2024 - Mar 08, 2024  
Measurement by Woravut Deenuk

Time	2416230-2 Mar 07, 2024	-	-	-	-	-	-
12:00 PM - 01:00 PM	1.2	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.2	-	-	-	-	-	-
02:00 PM - 03:00 PM	1.0	-	-	-	-	-	-
03:00 PM - 04:00 PM	1.0	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.0	-	-	-	-	-	-
05:00 PM - 06:00 PM	1.0	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.0	-	-	-	-	-	-
07:00 PM - 08:00 PM	0.8	-	-	-	-	-	-
08:00 PM - 09:00 PM	0.6	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.6	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.6	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.6	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.6	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.6	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.6	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.6	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.6	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.6	-	-	-	-	-	-
06:00 AM - 07:00 AM	0.8	-	-	-	-	-	-
07:00 AM - 08:00 AM	1.0	-	-	-	-	-	-
08:00 AM - 09:00 AM	1.0	-	-	-	-	-	-
09:00 AM - 10:00 AM	1.2	-	-	-	-	-	-
10:00 AM - 11:00 AM	1.2	-	-	-	-	-	-
11:00 AM - 12:00 PM	1.4	-	-	-	-	-	-
Average	0.9	-	-	-	-	-	-
1hr - Maximum	1.4	-	-	-	-	-	-
Standard 1hr - Average	30	-	-	-	-	-	-

Standard : Notification of the National Environmental Board. No.10, 1995 (B.E.2538).  
Reference Method : EPA 40 CFR Part 50Appendix C

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S:\Reports\_Air SOxNOx.rpt ( 3:20PM)



## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2416234  
Date Received : Mar 12, 2024  
Date Reported : Mar 18, 2024  
Report Number : 2908316-1

Page 1 of 2

Sample Number : 2416234-1  
Parameter : Wind Speed / Wind Direction  
Location : บริเวณพื้นที่โครงการ (GPS 47N 0672452 N, 0800003 E)  
Sampling Date : Mar 07 - Mar 08, 2024  
Sampling by : Woravut Deenuk

Time	Mar 07 - Mar 08, 2024																	
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	2.3	12.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	2.5	17.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	2.7	14.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.5	323.0	NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	3.3	29.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	3.1	20.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	3.6	43.0	NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	1.7	61.0	ENE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	2.3	2.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	1.2	63.0	ENE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	1.8	358.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	4.0	22.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	2.5	41.0	NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	2.5	11.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

The above results are valid only for the analyzed/tested sample(s) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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Sarayuth Jitranont  
Assistant General Manager

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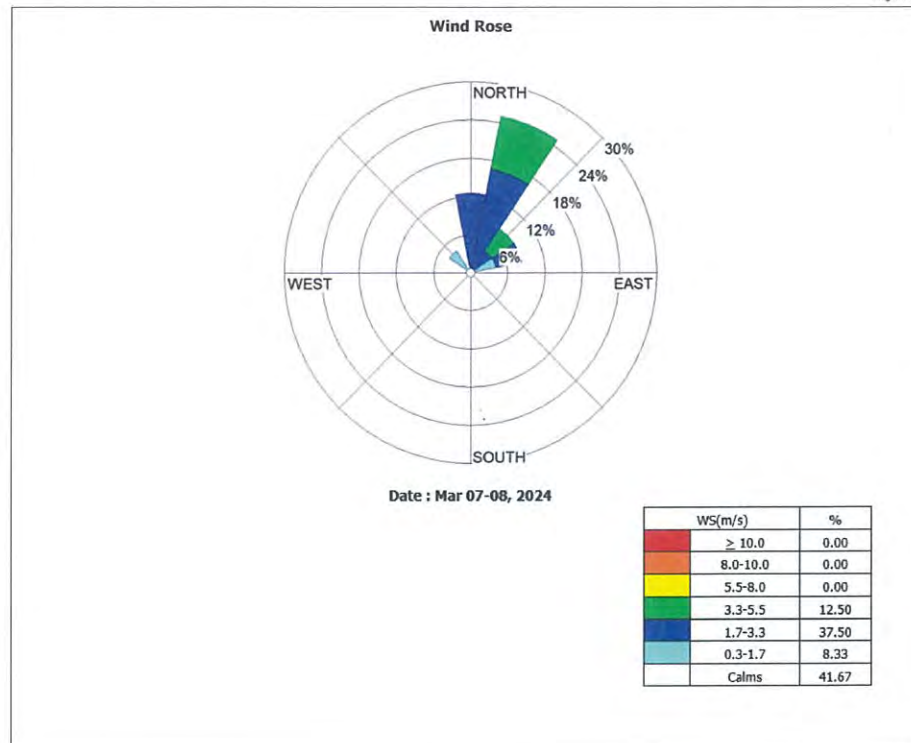


## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2416234  
Date Received : Mar 12, 2024  
Date Reported : Mar 18, 2024  
Report Number : 2908316-1

Page 2 of 2



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## Analysis / Test Report

**Client** : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
**P/O** : 3450040615  
**Project Name** : PSB Songkhla  
**Project Location** :

**Lot ID:** 2416234  
**Date Received** : Mar 12, 2024  
**Date Reported** : Mar 18, 2024  
**Report Number** : 2908316-1

Page 1 of 2

**Sample Number** : 2416234-2  
**Parameter** : Wind Speed / Wind Direction  
**Location** : บริเวณพื้นที่ก่อสร้างท่าเรือ (GPS 47N 0672452 N, 0800003 E)  
**Sampling Date** : Mar 07 - Mar 08, 2024  
**Sampling by** : Woravut Deenuk

Time	Mar 07 - Mar 08, 2024															
	WS (m/s)	WD (deg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	1.5	67.0	ENE	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	2.9	118.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	2.9	99.0	E	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	1.3	114.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.8	105.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	2.3	89.0	E	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.1	105.0	ESE	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	1.5	152.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	1.8	124.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.5	124.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	1.2	131.0	SE	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.3	248.0	WSW	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	1.2	63.0	ENE	-	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	1.8	358.0	N	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	4.0	22.0	NNE	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	2.5	41.0	NE	-	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittrantont  
Assistant General Manager

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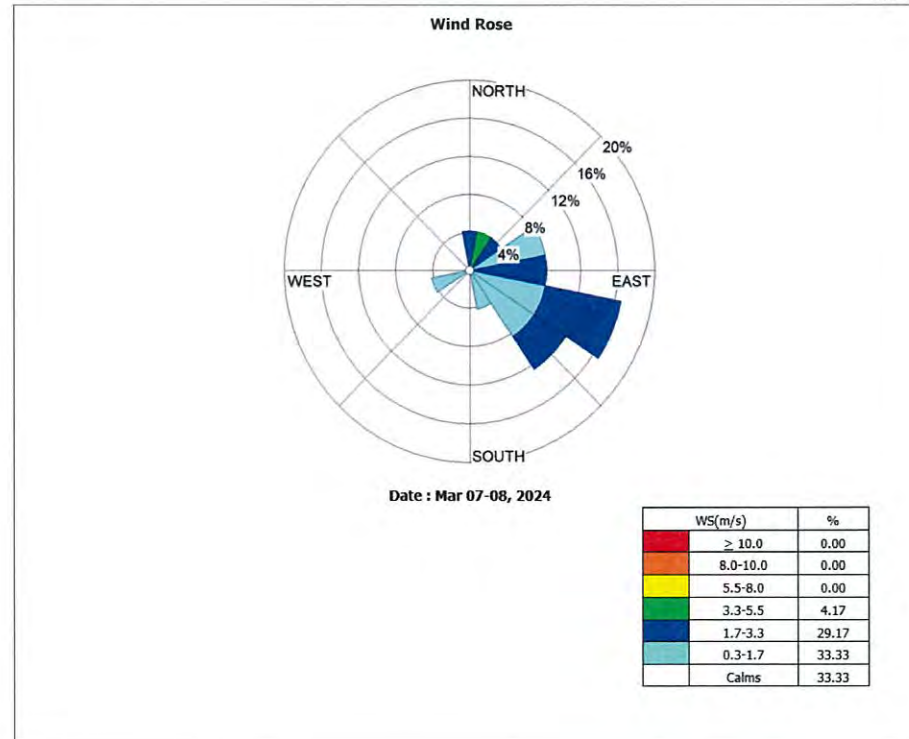


## Analysis / Test Report

**Client** : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
**P/O** : 3450040615  
**Project Name** : PSB Songkhla  
**Project Location** :

**Lot ID:** 2416234  
**Date Received** : Mar 12, 2024  
**Date Reported** : Mar 18, 2024  
**Report Number** : 2908316-1

Page 2 of 2



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Approved by

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ระดับเสียงทั่วไป





## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :

Lot ID: 2416240

Date Received : Mar 12, 2024

Date Reported : Mar 19, 2024

Report Number: 2908319-1

Page 1 of 1

Sample Number 2416240-1  
Parameter Noise (Leq 8 hrs.)  
Location บริเวณพื้นที่โครงการ (47N 672422 E, 800027 N)  
Measurement Date Mar 08, 2024  
Measurement by Apiwat Chanta

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:00 AM - 09:00 AM	55.7	75.9	52.5
09:00 AM - 10:00 AM	54.8	76.9	51.8
10:00 AM - 11:00 AM	55.2	69.8	52.4
11:00 AM - 12:00 PM	54.7	76.5	51.1
12:00 PM - 01:00 PM	54.8	72.5	49.8
01:00 PM - 02:00 PM	56.3	78.5	51.3
02:00 PM - 03:00 PM	52.8	70.0	49.7
03:00 PM - 04:00 PM	54.2	70.0	50.8

Leq Average 8 hrs. (dB(A))

54.9

Lmax (dB(A))

78.5

L90 (dB(A))

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการควบคุมความปลอดภัย  
ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.๒๕๔๖

Technical Management

*Orawan R.*

Orawan Rakyong  
Scientist (3)

Approved by

*Supot S.*

Supot Salamteh  
Section Head

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :

Lot ID: 2416235

Date Received : Mar 12, 2024

Date Reported : Mar 19, 2024

Report Number: 2908318-1

Page 1 of 1

Sample Number 2416235-1  
Parameter Noise (Leq 24 hrs.)  
Location บริเวณพื้นที่โครงการ (47N 672422 E, 800027 N)  
Measurement Date Mar 07 - Mar 08, 2024  
Measurement by Apiwat Chanta  
Sound Level meter Serial No. 331094

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
02:00 PM - 03:00 PM	57.6	83.8	51.7
03:00 PM - 04:00 PM	54.0	70.1	51.4
04:00 PM - 05:00 PM	54.9	79.5	51.5
05:00 PM - 06:00 PM	54.6	74.0	51.5
06:00 PM - 07:00 PM	58.4	74.9	52.9
07:00 PM - 08:00 PM	55.9	77.6	53.4
08:00 PM - 09:00 PM	53.9	70.6	50.8
09:00 PM - 10:00 PM	52.7	70.7	48.1
10:00 PM - 11:00 PM	51.2	72.6	46.1
11:00 PM - 12:00 AM	48.9	73.0	43.7
12:00 AM - 01:00 AM	46.2	61.8	43.6
01:00 AM - 02:00 AM	49.6	63.7	46.1
02:00 AM - 03:00 AM	43.8	59.9	40.7
03:00 AM - 04:00 AM	45.9	70.3	42.6
04:00 AM - 05:00 AM	49.2	67.1	43.7
05:00 AM - 06:00 AM	55.2	72.8	47.7
06:00 AM - 07:00 AM	54.6	75.9	50.0
07:00 AM - 08:00 AM	55.6	75.3	51.1
08:00 AM - 09:00 AM	55.7	75.9	52.5
09:00 AM - 10:00 AM	54.8	76.9	51.8
10:00 AM - 11:00 AM	55.2	69.8	52.4
11:00 AM - 12:00 PM	54.7	76.5	51.1
12:00 PM - 01:00 PM	54.8	72.5	49.8
01:00 PM - 02:00 PM	56.3	78.5	51.3

Leq Average 24 hrs. (dB(A))

54.3

Lmax (dB(A))

83.8

L90 (dB(A))

50.8

Ldn (dB(A))

58.3

Standard (dB(A))

70

115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป  
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ  
โรงงาน พ.ศ. 2548

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :

Lot ID: 2416241

Date Received : Mar 12, 2024

Date Reported : Mar 19, 2024

Report Number: 2940904-1

Page 1 of 1

Sample Number 2416241-1  
Parameter Noise (Leq 24 hrs.)  
Location บริเวณบ้านพักเจ้าหน้าที่ด้านตลาดกร (47N 672422 E, 800027 N)  
Measurement Date Mar 07 - Mar 08, 2024  
Measurement by Apiwat Chanta  
Sound Level meter Serial No. 331095

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
02:00 PM - 03:00 PM	51.8	78.0	46.6
03:00 PM - 04:00 PM	52.0	69.6	47.4
04:00 PM - 05:00 PM	53.8	74.6	48.4
05:00 PM - 06:00 PM	52.0	72.9	48.9
06:00 PM - 07:00 PM	55.9	78.9	49.1
07:00 PM - 08:00 PM	56.9	79.6	47.6
08:00 PM - 09:00 PM	50.7	66.6	46.0
09:00 PM - 10:00 PM	50.1	65.4	44.7
10:00 PM - 11:00 PM	47.8	62.6	41.4
11:00 PM - 12:00 AM	47.2	70.6	39.3
12:00 AM - 01:00 AM	45.8	63.2	38.1
01:00 AM - 02:00 AM	44.0	58.7	37.3
02:00 AM - 03:00 AM	43.6	61.0	36.1
03:00 AM - 04:00 AM	44.3	63.9	36.3
04:00 AM - 05:00 AM	46.0	61.9	37.4
05:00 AM - 06:00 AM	52.9	71.1	42.9
06:00 AM - 07:00 AM	53.6	74.9	48.5
07:00 AM - 08:00 AM	54.0	71.1	49.9
08:00 AM - 09:00 AM	53.8	71.5	48.9
09:00 AM - 10:00 AM	52.4	67.2	48.4
10:00 AM - 11:00 AM	54.0	81.5	48.6
11:00 AM - 12:00 PM	53.4	77.6	48.3
12:00 PM - 01:00 PM	55.1	85.8	46.2
01:00 PM - 02:00 PM	50.9	81.8	45.9

Leq Average 24 hrs. (dB(A))

52.3

Lmax (dB(A))

85.8

L90 (dB(A))

46.2

Ldn (dB(A))

56.3

Standard (dB(A))

70

115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป  
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ  
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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :

Lot ID: 2416241

Date Received : Mar 12, 2024

Date Reported : Mar 19, 2024

Report Number: 2940905-1

Page 1 of 1

Sample Number 2416241-2  
Parameter Noise (Leq 24 hrs.)  
Location บริเวณทางเข้าโครงการหน้าธนาคารอมสิน (47N 671996 E, 799890 N)  
Measurement Date Mar 07 - Mar 08, 2024  
Measurement by Apiwat Chanta  
Sound Level meter Serial No. 331096

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
02:00 PM - 03:00 PM	66.4	93.9	57.8
03:00 PM - 04:00 PM	61.1	80.0	53.9
04:00 PM - 05:00 PM	62.7	90.6	54.1
05:00 PM - 06:00 PM	58.9	85.4	51.6
06:00 PM - 07:00 PM	57.2	77.8	48.7
07:00 PM - 08:00 PM	55.6	75.4	48.8
08:00 PM - 09:00 PM	55.3	75.9	47.8
09:00 PM - 10:00 PM	52.4	69.8	42.6
10:00 PM - 11:00 PM	50.0	70.5	39.9
11:00 PM - 12:00 AM	50.3	75.8	38.5
12:00 AM - 01:00 AM	51.2	86.1	36.6
01:00 AM - 02:00 AM	48.0	70.1	36.9
02:00 AM - 03:00 AM	45.2	66.9	35.1
03:00 AM - 04:00 AM	44.2	65.7	34.9
04:00 AM - 05:00 AM	45.0	67.3	36.0
05:00 AM - 06:00 AM	50.4	72.1	40.4
06:00 AM - 07:00 AM	54.2	73.6	47.1
07:00 AM - 08:00 AM	56.3	74.0	49.1
08:00 AM - 09:00 AM	59.7	80.2	50.3
09:00 AM - 10:00 AM	63.9	93.8	54.6
10:00 AM - 11:00 AM	62.4	84.2	54.4
11:00 AM - 12:00 PM	60.5	81.9	51.8
12:00 PM - 01:00 PM	55.6	73.9	48.6
01:00 PM - 02:00 PM	65.5	93.0	51.4

Leq Average 24 hrs. (dB(A))

59.5

Lmax (dB(A))

93.9

L90 (dB(A))

48.6

Ldn (dB(A))

60.8

Standard (dB(A))

70

115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป  
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการ  
โรงงาน พ.ศ. 2548

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 1 of 8

Sample Number 2416242-1  
Sampled Date Mar 04, 2024 9:26 AM  
Sample Description Seawater  
Location สถานีที่ 1 บริเวณพื้นที่ว่างพหลำมัน คำนโณณบววงพหลำมัน  
Date Analysis Commenced Mar 04, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	5	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	7.8	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	7.4	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.03	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-	-	8.0	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	<0.01	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

Approved by

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 2 of 8

Sample Number 2416242-1  
Sampled Date Mar 04, 2024 9:26 AM  
Sample Description Seawater  
Location สถานีที่ 1 บริเวณพื้นที่ว่างพหลำมัน คำนโณณบววงพหลำมัน  
Date Analysis Commenced Mar 04, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	30.4	Change from lower salinity not more than 10‰	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H2S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	29.9	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	49	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	0.9	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	49.9	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Woravut Deenuk , Sirichai Kleangkern

Remark :

- LOD : Limit of Detection
- "e" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Approved by

Chompoonuch F.

Chompoonuch Funtha  
Supervisor

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 3 of 8

Sample Number	2416242-2						
Sampled Date	Mar 04, 2024 9:53 AM						
Sample Description	Seawater						
Location	สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ตำบลชุมขนบ้านเล						
Date Analysis Commenced	Mar 04, 2024						
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	43	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	110.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	5.4	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.04	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	<0.01	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 4 of 8

Sample Number	2416242-2						
Sampled Date	Mar 04, 2024 9:53 AM						
Sample Description	Seawater						
Location	สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ตำบลชุมขนบ้านเล						
Date Analysis Commenced	Mar 04, 2024						
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	30.2	Change from lower salinity not more than 10%	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H2S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	29.6	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	17	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	0.6	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	17.8	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Woravut Deenuk , Sirichai Kleangkerd

Remark :

- LOD : Limit of Detection
- "LOR" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

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Approved by

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Chompoonuch Funtha  
Supervisor

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 5 of 8

Sample Number 2416242-3  
Sampled Date Mar 04, 2024 10:10 AM  
Sample Description Seawater  
Location สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.  
Date Analysis Commenced Mar 04, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	15	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	17.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	7.0	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.03	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.1	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	<0.01	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

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Supervisor

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 6 of 8

Sample Number 2416242-3  
Sampled Date Mar 04, 2024 10:10 AM  
Sample Description Seawater  
Location สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.  
Date Analysis Commenced Mar 04, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	30.0	Change from lower salinity not more than 10‰	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H2S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	29.9	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	20	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	0.5	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	20.6	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Woravut Deenuk , Sirichai Kleangkerd

Remark :

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- \* < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Chompoonuch Funtha  
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 7 of 8

Sample Number	2416242-4
Sampled Date	Mar 04, 2024 10:30 AM
Sample Description	Seawater
Location	สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ตำบลชุมชนฝั่งคลองน้ำมัน ปตท.
Date Analysis Commenced	Mar 04, 2024
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	43	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	170.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	7.0	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.03	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	<0.01	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416242  
Date Received : Mar 04, 2024  
Date Reported : Mar 21, 2024  
Report Number : 2908323-1

Page 8 of 8

Sample Number	2416242-4
Sampled Date	Mar 04, 2024 10:30 AM
Sample Description	Seawater
Location	สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ตำบลชุมชนฝั่งคลองน้ำมัน ปตท.
Date Analysis Commenced	Mar 04, 2024
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	30.5	Change from lower salinity not more than 10%	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H2S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	29.8	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	16	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	0.5	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	16.4	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Woravut Deenuk , Sirichai Kleangkard

Remark :

- LOD : Limit of Detection
- "c" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040770-1

Page 1 of 2

Sample Number 2459865-1  
Sampled Date Jun 03, 2024 10:15 AM  
Sample Description Seawater  
Location สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านทิศแนววางท่อน้ำมัน  
Date Analysis Commenced Jun 03, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	21	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	27.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	5.1	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.04	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	Not Detected	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040770-1

Page 2 of 2

Sample Number 2459865-1  
Sampled Date Jun 03, 2024 10:15 AM  
Sample Description Seawater  
Location สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านทิศแนววางท่อน้ำมัน  
Date Analysis Commenced Jun 03, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	29.5	Change from lower salinity not more than 10%	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H2S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	31.7	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	10	≤13.97	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	1.2	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	8.38	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Somsak Junkong , Woravut Deenuk

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040771-1

Page 1 of 2

Sample Number	2459865-2
Sampled Date	Jun 03, 2024 9:40 AM
Sample Description	Seawater
Location	สถานีที่ 2 บริเวณที่ทำการเพาะเลี้ยงสัตว์น้ำในกระชัง ตำบลชุมชนบ้านแล
Date Analysis Commenced	Jun 03, 2024
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	17	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	49.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	5.1	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.04	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-	-	8.0	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	Not Detected	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

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Approved by

Tuanjai Thangklang  
Manager

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040771-1

Page 2 of 2

Sample Number	2459865-2
Sampled Date	Jun 03, 2024 9:40 AM
Sample Description	Seawater
Location	สถานีที่ 2 บริเวณที่ทำการเพาะเลี้ยงสัตว์น้ำในกระชัง ตำบลชุมชนบ้านแล
Date Analysis Commenced	Jun 03, 2024
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	29.0	Change from lower salinity not more than 10%	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H2S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	31.3	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	8	≤11.61	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	1.3	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	9.17	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Somsak Junkong , Woravut Deenuk

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.
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Manager

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040772-1

Page 1 of 2

Sample Number 2459865-3  
Sampled Date Jun 03, 2024 9:55 AM  
Sample Description Seawater  
Location สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.  
Date Analysis Commenced Jun 03, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	25	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	27.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	5.2	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-O (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.05	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	Not Detected	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

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Tuanjai Thangkiang  
Manager

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040772-1

Page 2 of 2

Sample Number 2459865-3  
Sampled Date Jun 03, 2024 9:55 AM  
Sample Description Seawater  
Location สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.  
Date Analysis Commenced Jun 03, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	29.8	Change from lower salinity not more than 10%	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H <sub>2</sub> S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	31.7	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Transparency *	m	-	-	0.5	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	44.1	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Somsak Junkong , Woravut Deenuk

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.
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Tuanjai Thangkiang  
Manager

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040772-2

Page 1 of 1

Sample Number 2459865-3  
Sampled Date Jun 03, 2024 9:55 AM  
Sample Description Seawater  
Location สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.  
Date Analysis Commenced Jun 04, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Total Suspended Solids	mg/L	-	2	49	≤9.03	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampling By : Somsak Junkong , Woravut Deenuk

Remark :  
- LOD : Limit of Detection  
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Ananta B.

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459865  
Date Received : Jun 03, 2024  
Date Reported : Jul 01, 2024  
Report Number : 3040773-1

Page 1 of 2

Sample Number 2459865-4  
Sampled Date Jun 03, 2024 10:30 AM  
Sample Description Seawater  
Location สถานีที่ 4 บริเวณพื้นที่การเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งคลองน้ำมัน ปตท.  
Date Analysis Commenced Jun 03, 2024  
Condition of Sample Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Microbiological Testing</b>							
Fecal Coliform	CFU/100mL	-	-	22	≤100	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9222 D	Songkhla
Total Coliform	MPN/100mL	-	-	27.0	≤1000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 9221 B	Songkhla
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
Dissolved Oxygen *	mg/L	-	0.1	5.1	≥4	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 (C)	Songkhla
Nitrate as N *	mg/L	0.003	0.02	0.03	≤0.06	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NO3 E	Bangkok
Oil & Grease *	mg/L	-	3	<3	No Standard	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-	-	7.9	7.0-8.5	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Phosphate as P *	mg/L	0.005	0.01	<0.01	≤0.045	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-P (E)	Bangkok

Approved by

Tuanjai Thangkiang

Tuanjai Thangkiang  
Manager

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :

TESTING

No.0166

Lot ID: 2459865

Date Received : Jun 03, 2024

Date Reported : Jul 01, 2024

Report Number : 3040773-1

Page 2 of 2

**Sample Number** 2459865-4  
**Sampled Date** Jun 03, 2024 10:30 AM  
**Sample Description** Seawater  
**Location** สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งคลองน้ำวน ปตท.  
**Date Analysis Commenced** Jun 03, 2024  
**Condition of Sample** Contained in two BOD bottles, one amber glass bottle and five plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
Salinity *	ppt	-	-	31.2	Change from lower salinity not more than 10%	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2520 B	Songkhla
Sulfide as H <sub>2</sub> S *	mg/L	-	0.01	<0.01	≤0.01	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500-S2 (D)	Bangkok
Temperature *	Degree C	-	-	32.3	Change from natural condition not more than 2 degree C	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Songkhla
Total Suspended Solids *	mg/L	-	2	13	≤14.50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla
Transparency *	m	-	-	1.0	Change from Natural condition not more than 10% of the lowest transparency	Visual Method	Songkhla
Turbidity *	NTU	-	0.1	11.1	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2130 B	Songkhla

**Guideline** : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

**Sampling By** : Somsak Junkong , Woravut Deenuk

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.
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101/12 หมู่ 9 ต. บางพระ

อ. ศรีราชา จ. ชลบุรี 20110

โทร./โทรสาร. (038) 311379

Client : PTTEP International Limited

Address : 222 Moo 1 Tambon Huakao, Amphur Singhanakorn, Songkhla, Thailand, 90280

Project Name : PSB Songkhla

รายงานผลการวิเคราะห์แพลงก์ตอนพืช

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 4 มีนาคม 2567)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
Division Cyanophyta				
Class Cyanophyceae				
Order Nostocales				
Family Nostocaceae				
1. <i>Anabaena</i> sp.	-	-	23,000	-
2. <i>Pseudanabaena</i> sp.	-	-	23,000	-
Division Chlorophyta				
Class Euglenophyceae				
Order Euglenales				
Family Euglenaceae				
3. <i>Phacus</i> hamatus	-	23,000	-	26,000
4. <i>Phacus</i> sp.	-	-	23,000	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 4 มีนาคม 2567)

(ต่อ)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
Division Chromophyta				
Class Bacillariophyceae				
Order Biddulphiales				
Suborder Coscinodiscineae				
Family Thalassiosiraceae				
5. <i>Cyclotella striata</i>	-	-	115,000	-
6. <i>Planktoniella blanda</i>	-	-	23,000	-
7. <i>Planktoniella sol</i>	-	-	23,000	-
8. <i>Skeletonema costatum</i>	25,000	164,000	46,000	78,000
9. <i>Stephanodiscus rotula</i>	-	-	-	26,000
Family Leptocyliodraceae				
10. <i>Corethron criophilum</i>	-	-	23,000	26,000
Family Coscinodiscaceae				
11. <i>Coscinodiscus granii</i>	75,000	70,000	96,000	52,000
12. <i>Coscinodiscus radiatus</i>	50,000	70,000	413,000	207,000
13. <i>Coscinodiscus wailesii</i>	-	-	23,000	26,000
14. <i>Palmeria hardmaniana</i>	-	-	115,000	26,000
Family Heliopeltaceae				
15. <i>Actinopteryx grunleri</i>	50,000	23,000	92,000	78,000
Suborder Rhizosoleniineae				
Family Rhizosoleniaceae				
16. <i>Guinardia delicatula</i>	-	-	46,000	26,000
17. <i>Guinardia flaccida</i>	-	-	46,000	78,000
18. <i>Guinardia striata</i>	-	-	69,000	26,000
19. <i>Proboscia alata</i>	25,000	-	115,000	155,000
20. <i>Pseudosolenia calcar-avis</i>	-	-	23,000	52,000
21. <i>Rhizosolenia imbricata</i>	-	-	-	26,000



ตาราง ผลการวิเคราะห์แฟลกก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 4 มีนาคม 2567)

(ต่อ)

ชนิดแฟลกก์ตอนพืช	ปริมาณแฟลกก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
22. <i>Rhizosolenia robusta</i>	-	23,000	-	-
23. <i>Rhizosolenia setigera</i>	50,000	23,000	184,000	207,000
24. <i>Rhizosolenia simplex</i>	-	-	23,000	-
25. <i>Rhizosolenia striata</i>	-	-	69,000	103,000
<b>Suborder Biddulphiineae</b>				
<b>Family Hemiaulaceae</b>				
26. <i>Cerataulina bicornis</i>	-	-	46,000	26,000
27. <i>Cerataulina pelagica</i>	-	70,000	46,000	-
28. <i>Climacodinium frauenfeldianum</i>	25,000	70,000	252,000	129,000
29. <i>Hemiaulus hauckii</i>	-	-	69,000	-
<b>Family Chaetoceraceae</b>				
30. <i>Bacteriastrum delicatulum</i>	50,000	23,000	115,000	78,000
31. <i>Bacteriastrum furcatum</i>	-	-	23,000	129,000
32. <i>Bacteriastrum</i> sp.	-	-	23,000	-
33. <i>Chaetoceros compressus</i>	-	-	46,000	-
34. <i>Chaetoceros curvisetus</i>	-	47,000	46,000	25,000
35. <i>Chaetoceros didymus</i>	124,000	441,000	2,157,000	1,810,000
36. <i>Chaetoceros diversus</i>	25,000	94,000	505,000	103,000
37. <i>Chaetoceros laciniosus</i>	-	140,000	252,000	155,000
38. <i>Chaetoceros lauderii</i>	-	-	-	2,533,000
39. <i>Chaetoceros lorentzianus</i>	25,000	-	184,000	26,000
40. <i>Chaetoceros mitra</i>	25,000	23,000	161,000	26,000
41. <i>Chaetoceros pseudocurvisetus</i>	-	-	-	52,000
42. <i>Chaetoceros radicans</i>	-	47,000	46,000	181,000
43. <i>Chaetoceros</i> sp.	-	117,000	138,000	207,000
<b>Family Lithodesmaceae</b>				
44. <i>Bellerocha horologicalis</i>	-	70,000	-	26,000
45. <i>Ditylum brightwellii</i>	-	-	-	52,000

ตาราง ผลการวิเคราะห์แฟลกก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 4 มีนาคม 2567)

(ต่อ)

ชนิดแฟลกก์ตอนพืช	ปริมาณแฟลกก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
46. <i>Ditylum sol</i>	-	-	23,000	-
<b>Family Eupodiscaceae</b>				
47. <i>Odontella mobiliensis</i>	25,000	23,000	275,000	310,000
48. <i>Odontella sinensis</i>	-	-	138,000	129,000
<b>Order Bacillariales</b>				
<b>Suborder Fragilariineae</b>				
<b>Family Thalassionemataceae</b>				
49. <i>Thalassionema bacillare</i>	50,000	-	-	-
50. <i>Thalassionema frauenfeldii</i>	273,000	281,000	1,193,000	646,000
51. <i>Thalassionema nitzschioides</i>	25,000	94,000	344,000	465,000
<b>Suborder Bacillariineae</b>				
<b>Family Naviculaceae</b>				
52. <i>Diploneis bombus</i>	-	-	-	26,000
53. <i>Diploneis smithii</i>	-	-	23,000	-
54. <i>Gyrosigma wansbeckii</i>	224,000	23,000	115,000	52,000
55. <i>Haslea tromphii</i>	-	-	46,000	-
56. <i>Mewier membranacea</i>	-	-	46,000	-
57. <i>Navicula</i> sp.	-	-	-	103,000
58. <i>Pleurosigma aestuarii</i>	25,000	-	-	-
59. <i>Pleurosigma angulatum</i>	-	-	23,000	26,000
60. <i>Pleurosigma elongatum</i>	-	-	23,000	52,000
61. <i>Pleurosigma normanii</i>	124,000	-	23,000	155,000
62. <i>Pleurosigma</i> sp.	-	-	23,000	-
<b>Family Bacillariaceae</b>				
63. <i>Bacillaria paxillifer</i>	174,000	117,000	390,000	956,000
64. <i>Cylindrotheca closterium</i>	50,000	-	-	-
65. <i>Nitzschia acicularis</i>	721,000	585,000	1,744,000	491,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 4 มีนาคม 2567)

(ต่อ)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
66. <i>Nitzschia lorenziana</i>	323,000	70,000	367,000	310,000
67. <i>Nitzschia sigma</i>	99,000	-	23,000	-
68. <i>Nitzschia</i> sp.	472,000	70,000	184,000	336,000
69. <i>Pseudo-nitzschia</i> sp.	99,000	70,000	184,000	233,000
<b>Class Dinophyceae</b>				
<b>Order Dinophysiales</b>				
<b>Family Dinophysiaceae</b>				
70. <i>Dinophysis caudata</i>	-	94,000	115,000	181,000
71. <i>Dinophysis miles</i>	-	23,000	23,000	-
<b>Order Noctilucales</b>				
<b>Family Noctilucaeae</b>				
72. <i>Noctiluca scintillans</i>	-	-	298,000	-
<b>Order Gonyaulacales</b>				
<b>Family Ceratiaceae</b>				
73. <i>Ceratium deflexum</i>	-	-	23,000	-
74. <i>Ceratium falcatum</i>	-	-	23,000	-
75. <i>Ceratium furca</i>	-	94,000	597,000	310,000
76. <i>Ceratium fusus</i>	50,000	47,000	69,000	26,000
77. <i>Ceratium macroceros</i>	-	-	46,000	103,000
78. <i>Ceratium porrectum</i>	25,000	23,000	69,000	-
79. <i>Ceratium teres</i>	-	23,000	-	-
80. <i>Ceratium vultus</i>	-	-	69,000	52,000
<b>Family Gonyaulacaceae</b>				
81. <i>Alexandrium</i> sp.	-	-	46,000	-
<b>Order Peridinales</b>				
<b>Family Protoperidiniaceae</b>				
82. <i>Protoperidinium conicum</i>	50,000	-	-	26,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 4 มีนาคม 2567)

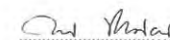
(ต่อ)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
83. <i>Protoperidinium curtipes</i>	-	-	-	26,000
84. <i>Protoperidinium depressum</i>	25,000	47,000	23,000	52,000
85. <i>Protoperidinium pentagonum</i>	-	-	23,000	26,000
86. <i>Protoperidinium</i> sp.	-	-	-	26,000
<b>ชนิดแพลงก์ตอนพืช</b>	<b>30</b>	<b>34</b>	<b>69</b>	<b>58</b>
<b>ปริมาณแพลงก์ตอนพืช</b>	<b>3,383,000</b>	<b>3,222,000</b>	<b>12,333,000</b>	<b>11,894,000</b>
<b>ดัชนีความหลากหลายแพลงก์ตอนพืช</b>	<b>2.7948</b>	<b>3.0361</b>	<b>3.2840</b>	<b>3.1076</b>
<b>ดัชนีความสม่ำเสมอแพลงก์ตอนพืช</b>	<b>0.8217</b>	<b>0.8610</b>	<b>0.7756</b>	<b>0.7653</b>

**Sample Location :**

- สถานี 2416243-1 : สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านใกล้แนววางท่อน้ำมัน
- สถานี 2416243-2 : สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ด้านชุมชนบ้านเล
- สถานี 2416243-3 : สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.
- สถานี 2416243-4 : สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งคลังน้ำมัน ปตท.

**Condition of Sample :** contained in one plastic bottle, sample containers comply to pretreatment-preservation standards (APHA, USEPA)



(นางสาวกนกวรรณ ขวาค่อน)  
ผู้วิเคราะห์



(นายอลงกต อินทรชาติ)  
หัวหน้าสถานีวิจัยประมงศรีราชา





สถานีวิจัยประมงศรีราชา

101/12 หมู่ 9 ต. บางพระ

อ. ศรีราชา จ. ชลบุรี 20110

โทร./โทรสาร. (038) 311379

Client : PTTEP International Limited

Address : 222 Moo 1 Tambon Huakao, Amphur Singhanakorn, Songkhla, Thailand, 90280

Project Name : PSB Songkhla

รายงานผลการวิเคราะห์แพลงก์ตอนสัตว์

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 4 มีนาคม 2567)

ชนิดแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
Phylum Protozoa				
Subphylum Ciliophora				
Class Ciliata				
Subclass Spirotricha				
Order Tintinnida				
Family Tintinnidae				
1. <i>Leprotintinus nordquisti</i>	-	-	-	26,000
Family Codonellidae				
2. <i>Tintinnopsis cylindrica</i>	-	-	-	26,000
Family Cyttarocylidae				
3. <i>Favella panamensis</i>	25,000	23,000	-	52,000
Phylum Annelida				
Class Polychaeta				
4. Polychaete larvae	-	-	23,000	78,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 4 มีนาคม 2567)

(ต่อ)

ชนิดแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	2416243-1	2416243-2	2416243-3	2416243-4
Phylum Arthropoda				
Class Crustacea				
Subclass Copepoda				
5. Copepod nauplii	50,000	257,000	459,000	517,000
Order Calanoida				
6. Calanoid copepod	-	23,000	115,000	-
Order Cyclopoida				
7. Cyclopoid copepod	25,000	94,000	161,000	362,000
Order Harpacticoida				
8. Harpacticoid copepod	-	-	69,000	26,000
Subclass Cirripedia				
9. Cirripede nauplii	-	-	-	129,000
Phylum Mollusca				
Class Gastropoda				
Order Thecosomata				
Suborder Euthecosomata				
Family Limacinidae				
10. <i>Limacina</i> sp.	-	-	-	26,000
Phylum Chordata				
Subphylum Urochordata				
Class Larvacea				
Family Oikopleuridae				
11. <i>Oikopleura</i> sp.	-	-	69,000	-
ชนิดแพลงก์ตอนสัตว์	3	4	6	9
ปริมาณแพลงก์ตอนสัตว์	100,000	397,000	896,000	1,242,000
ดัชนีความหลากหลายแพลงก์ตอนสัตว์	1.0397	0.9527	1.4035	1.5898
ดัชนีความสม่ำเสมอแพลงก์ตอนสัตว์	0.9464	0.6872	0.7833	0.7235

**Sample Location :**

1. สถานี 2416243-1 : สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านใกล้แนววางท่อน้ำมัน
2. สถานี 2416243-2 : สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ด้านชุมชนบ้านเล
3. สถานี 2416243-3 : สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.
4. สถานี 2416243-4 : สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งคลังน้ำมัน ปตท.

**Condition of Sample :** contained in one plastic bottle, sample containers comply to pretreatment-preservation standards (APHA, USEPA)

(นางสาวกนกวรรณ ขาวค้อน)  
ผู้วิเคราะห์

(นายอองกต อินทรชาติ)  
หัวหน้าสถานีวิจัยประมงศรีราชา





สถานีวิจัยประมงศรีราชา

101/12 หมู่ 9 ต. บางพระ

อ. ศรีราชา จ. ชลบุรี 20110

โทร./โทรสาร. (038) 311379

Client : PTTEP International Limited

Address : 222 Moo 1 Tambon Huakao, Amphur Singhanakorn, Songkhla, Thailand, 90280

Project Name : PSB Songkhla

รายงานผลการวิเคราะห์แพลงก์ตอนพืช

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 3 มิถุนายน 2567)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
Division Cyanophyta				
Class Cyanophyceae				
Order Nostocales				
Family Oscillatoriaceae				
1. <i>Lyngbya</i> sp.	-	26,000	-	-
2. <i>Oscillatoria</i> sp.	-	26,000	105,000	-
Family Nostocaceae				
3. <i>Pseudanabaena</i> sp.	79,000	26,000	-	52,000
Division Chromophyta				
Class Bacillariophyceae				
Order Biddulphiales				
Suborder Coscinodiscineae				
Family Thalassiosiraceae				
4. <i>Cyclotella striata</i>	1,467,000	366,000	1,262,000	209,000
5. <i>Planktoniella sol</i>	-	-	132,000	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 3 มิถุนายน 2567)

(ต่อ)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
6. <i>Skeletonema costatum</i>	236,000	209,000	210,000	574,000
7. <i>Stephanodiscus rotula</i>	-	-	79,000	-
Family Melosiraceae				
8. <i>Paralia sulcata</i>	-	105,000	26,000	26,000
Family Coscinodiscaceae				
9. <i>Coscinodiscus concinnus</i>	-	-	-	26,000
10. <i>Coscinodiscus radiatus</i>	-	-	53,000	-
11. <i>Coscinodiscus</i> sp.	52,000	78,000	26,000	52,000
Family Asterolampraceae				
12. <i>Asteromphalus flabellatus</i>	26,000	-	-	78,000
Family Heliopeltaceae				
13. <i>Actinocyclus</i> sp.	-	-	-	26,000
Suborder Rhizosoleniineae				
Family Rhizosoleniaceae				
14. <i>Guinardia striata</i>	-	26,000	-	26,000
15. <i>Proboscia alata</i>	655,000	392,000	79,000	626,000
16. <i>Pseudosolenia calcar-avis</i>	419,000	183,000	132,000	183,000
17. <i>Rhizosolenia clevei</i>	26,000	-	-	-
18. <i>Rhizosolenia pungens</i>	629,000	26,000	79,000	26,000
Suborder Biddulphiineae				
Family Hemiaulaceae				
19. <i>Cerataulina bicornis</i>	-	52,000	26,000	-
20. <i>Cerataulina pelagica</i>	734,000	105,000	-	-
21. <i>Climacodium frauenfeldianum</i>	-	26,000	-	-
Family Chaetoceraeae				
22. <i>Bacteriastrum delicatulum</i>	445,000	418,000	-	131,000
23. <i>Bacteriastrum furcatum</i>	629,000	601,000	210,000	1,044,000

ตาราง ผลการวิเคราะห์แฟลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 3 มิถุนายน 2567)

(ต่อ)

ชนิดแฟลงก์ตอนพืช	ปริมาณแฟลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
24. <i>Bacteriastrium</i> sp.	419,000	157,000	26,000	444,000
25. <i>Chaetoceros affinis</i>	838,000	418,000	736,000	861,000
26. <i>Chaetoceros compressus</i>	2,725,000	1,464,000	421,000	2,140,000
27. <i>Chaetoceros costatus</i>	79,000	392,000	-	-
28. <i>Chaetoceros curvisetus</i>	734,000	157,000	132,000	209,000
29. <i>Chaetoceros didymus</i>	2,751,000	1,464,000	894,000	2,192,000
30. <i>Chaetoceros diversus</i>	26,000	-	-	78,000
31. <i>Chaetoceros furcellatus</i>	52,000	-	-	-
32. <i>Chaetoceros laciniosus</i>	2,175,000	1,308,000	1,788,000	2,610,000
33. <i>Chaetoceros lauderi</i>	3,773,000	366,000	1,184,000	3,550,000
34. <i>Chaetoceros lorenzianus</i>	550,000	366,000	395,000	209,000
35. <i>Chaetoceros mitra</i>	131,000	131,000	53,000	104,000
36. <i>Chaetoceros peruvianus</i>	393,000	209,000	26,000	104,000
37. <i>Chaetoceros pseudocurvisetus</i>	943,000	445,000	105,000	887,000
38. <i>Chaetoceros radicans</i>	288,000	183,000	-	78,000
39. <i>Chaetoceros</i> sp.	1,886,000	628,000	842,000	1,592,000
40. <i>Chaetoceros teres</i>	157,000	131,000	26,000	78,000
41. <i>Chaetoceros tortissimus</i>	26,000	-	-	-
<b>Family Eupodiscaceae</b>				
42. <i>Odontella sinensis</i>	-	52,000	26,000	-
43. <i>Odontella</i> sp.	52,000	-	-	-
<b>Order Bacillariales</b>				
<b>Suborder Fragilariineae</b>				
<b>Family Fragilariaceae</b>				
44. <i>Asterionellopsis glacialis</i>	-	-	-	209,000
45. <i>Fragilaria capucina</i>	1,572,000	183,000	631,000	52,000
46. <i>Synedra ulna</i>	-	-	-	26,000

ตาราง ผลการวิเคราะห์แฟลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 3 มิถุนายน 2567)

(ต่อ)

ชนิดแฟลงก์ตอนพืช	ปริมาณแฟลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
<b>Family Thalassionemataceae</b>				
47. <i>Thalassionema bacillare</i>	-	-	26,000	-
48. <i>Thalassionema frauenfeldii</i>	-	-	26,000	-
49. <i>Thalassionema nitzschioides</i>	79,000	26,000	-	78,000
50. <i>Thalassionema</i> sp.	52,000	-	-	-
51. <i>Thalassiothrix</i> sp.	-	157,000	26,000	-
<b>Family Licmophoriaceae</b>				
52. <i>Licmophora abbreviata</i>	-	-	26,000	-
<b>Suborder Bacillariineae</b>				
<b>Family Achnantheaceae</b>				
53. <i>Cocconeis scutellum</i>	52,000	26,000	-	-
<b>Family Mastogloiaaceae</b>				
54. <i>Mastogloia</i> sp.	-	-	26,000	-
<b>Family Naviculaceae</b>				
55. <i>Amphora exigua</i>	-	-	26,000	-
56. <i>Amphora robusta</i>	-	-	79,000	-
57. <i>Amphora</i> sp.	-	105,000	-	-
58. <i>Craticula cuspidata</i>	-	26,000	-	-
59. <i>Diploneis bombus</i>	-	26,000	-	-
60. <i>Diploneis smithii</i>	-	-	79,000	52,000
61. <i>Gyrosigma balticum</i>	131,000	78,000	1,315,000	104,000
62. <i>Mumier membranacea</i>	-	-	-	26,000
63. <i>Navicula</i> sp.	52,000	131,000	-	131,000
64. <i>Pleurosigma aestuarii</i>	-	-	79,000	-
65. <i>Pleurosigma angulatum</i>	26,000	-	105,000	78,000
66. <i>Pleurosigma elongatum</i>	26,000	52,000	132,000	52,000
67. <i>Pleurosigma normanii</i>	131,000	157,000	552,000	131,000



ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 3 มิถุนายน 2567)

(ต่อ)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
68. <i>Pleurosigma</i> sp.	52,000	-	526,000	-
69. <i>Trachyneis</i> sp.	-	-	26,000	-
<b>Family Bacillariaceae</b>				
70. <i>Cylindrotheca closterium</i>	79,000	-	79,000	496,000
71. <i>Nitzschia lorenziana</i>	52,000	-	184,000	52,000
72. <i>Nitzschia sigma</i>	-	-	79,000	26,000
73. <i>Nitzschia</i> sp.	-	52,000	53,000	78,000
74. <i>Pseudo-nitzschia</i> sp.	52,000	26,000	-	-
75. <i>Tryblionella batmurstensis</i>	-	26,000	-	-
76. <i>Tryblionella victoriorae</i>	-	-	-	52,000
<b>Family Surirellaceae</b>				
77. <i>Entomoneis alata</i>	26,000	26,000	-	-
78. <i>Entomoneis robusta</i>	472,000	78,000	-	-
79. <i>Surirella ovata</i>	131,000	78,000	79,000	470,000
80. <i>Surirella robusta</i>	-	26,000	-	-
<b>Class Dinophyceae</b>				
<b>Order Gymnodiniales</b>				
<b>Family Gymnodiniaceae</b>				
81. <i>Gyrodinium instriatum</i>	-	26,000	-	-
<b>Order Gonyaulacales</b>				
<b>Family Ceratiaceae</b>				
82. <i>Ceratium macroceros</i>	52,000	-	-	-
<b>Order Peridinales</b>				
<b>Family Peridiniaceae</b>				
83. <i>Peridinium quinquecorne</i>	-	26,000	-	-

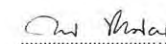
ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างตัวอย่างวันที่ 3 มิถุนายน 2567)

(ต่อ)

ชนิดแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
ชนิดแพลงก์ตอนพืช	48	52	48	46
ปริมาณแพลงก์ตอนพืช	26,432,000	11,867,000	13,227,000	20,328,000
ดัชนีความหลากหลายแพลงก์ตอนพืช	3.0487	3.2529	3.0821	2.8707
ดัชนีความสม่ำเสมอแพลงก์ตอนพืช	0.7875	0.8233	0.7962	0.7498

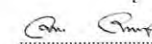
- Sample Location :**
- สถานี 2459867-1 : สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านใกล้แนววางท่อน้ำมัน
  - สถานี 2459867-2 : สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ด้านชุมชนบ้านเล
  - สถานี 2459867-3 : สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.
  - สถานี 2459867-4 : บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งกลิ้งน้ำมัน ปตท.

**Condition of Sample :** contained in one plastic bottle, sample containers comply to pretreatment-preservation standards (APHA, USEPA)



(นางสาวกนกวรรณ ขาวดอน)

ผู้วิเคราะห์



(นายอลงกต อินทรชาติ)

หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา

101/12 หมู่ 9 ต. บางพระ

อ. ศรีราชา จ. ชลบุรี 20110

โทร./โทรสาร. (038) 311379

Client : PTTEP International Limited

Address : 222 Moo 1 Tambon Huakao, Amphur Singhanakorn, Songkhla, Thailand, 90280

Project Name : PSB Songkhla

#### รายงานผลการวิเคราะห์แพลงก์ตอนสัตว์

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 3 มิถุนายน 2567)

ชนิดแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
Phylum Protozoa				
Subphylum Ciliophora				
Class Ciliata				
Subclass Spirotricha				
Order Tintinnida				
Family Tintinnididae				
1. <i>Leprotintinnus nordquisti</i>	131,000	105,000	342,000	104,000
Family Codonellidae				
2. <i>Tintinnopsis gracilis</i>	-	-	-	26,000
3. <i>Tintinnopsis tocaninensis</i>	26,000	-	26,000	52,000
4. <i>Tintinnopsis uruguayensis</i>	26,000	52,000	79,000	78,000
Family Codonellopsidae				
5. <i>Stenosemella nivalis</i>	157,000	26,000	237,000	157,000
Family Ptychocyliidae				
6. <i>Epiplocyliis blanda</i>	26,000	-	-	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 3 มิถุนายน 2567)

(ต่อ)

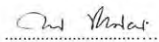
ชนิดแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	2459867-1	2459867-2	2459867-3	2459867-4
Family Tintinnidae				
7. <i>Eutintinnus fraknoi</i>	-	52,000	-	-
Phylum Arthropoda				
Class Crustacea				
Subclass Copepoda				
8. Copepod nauplii	760,000	549,000	342,000	313,000
Order Calanoida				
9. Calanoid copepod	-	78,000	-	26,000
Order Cyclopoida				
10. Cyclopoid copepod	-	78,000	-	-
Order Harpacticoida				
11. Harpacticoid copepod	-	26,000	-	-
Phylum Mollusca				
Class Bivalvia				
12. Pelecypod larvae	-	52,000	-	-
ชนิดแพลงก์ตอนสัตว์	6	9	5	7
ปริมาณแพลงก์ตอนสัตว์	1,126,000	1,018,000	1,026,000	756,000
ดัชนีความหลากหลายแพลงก์ตอนสัตว์	1.0514	1.6041	1.3615	1.6147
ดัชนีความสม่ำเสมอแพลงก์ตอนสัตว์	0.5868	0.7301	0.8459	0.8298

Sample Location : 1. สถานี 2459867-1 : สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านใกล้แนววางท่อน้ำมัน  
2. สถานี 2459867-2 : สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ด้านชุมชนบ้านเล  
3. สถานี 2459867-3 : สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ ปตท.



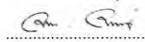
4. สถานี 2459867-4 : บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งกลิ้งน้ำมัน  
ปตท.

**Condition of Sample :** contained in one plastic bottle, sample containers comply to pretreatment-  
preservation standards (APHA, USEPA)



(นางสาวกนกวรรณ ขาวค้อน)

ผู้วิเคราะห์



(นายอลงกต อินทราติ)

หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา  
101/12 หมู่ 9 ต. บางพระ  
อ. ศรีราชา จ. ชลบุรี 20110  
โทร./โทรสาร. (038) 311379

Client : PTTEP International Limited

Address : 222 Moo 1 Tambon Huakao, Amphur Singhanakorn, Songkhla, Thailand, 90280

Project Name : PSB Songkhla

#### รายงานผลการวิเคราะห์สัตว์หน้าดิน

ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 4 มีนาคม 2567)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)			
	2416244-1	2416244-2	2416244-3	2416244-4
Phylum Annelida				
Class Polychaeta				
Order Phyllodocida				
Family Nephtyidae				
<i>Nephtys</i> sp. (ไส้เดือนทะเล)	15	-	-	-
Phylum Mollusca				
Class Gastropoda				
Order Caenogastropoda				
Family Cerithiidae				
<i>Cerithium</i> sp. (หอยฝาเดียวชนิดหนึ่ง)	-	-	-	104
สกุลสัตว์หน้าดิน	1	-	-	1
ปริมาณสัตว์หน้าดิน	15	-	-	104
ค่าดัชนีความหลากหลายสัตว์หน้าดิน	0.0000	-	-	0.0000

- Sample Location :
- สถานี 2416244-1 : สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านใกล้แนววางท่อน้ำมัน
  - สถานี 2416244-2 : สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ด้านชุมชนบ้านเล
  - สถานี 2416244-3 : สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของปตท.
  - สถานี 2416244-4 : สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งกลังน้ำมันปตท.

Condition of Sample : contained in one plastic zip bag

อรรถพล นิธิวรา  
(นายอรรถพล นิธิวรา)  
ผู้วิเคราะห์

อ. อรรถพล  
(นายอรรถพล นิธิวรา)  
หัวหน้าสถานีวิจัยประมงศรีราชา





สถานีวิจัยประมงศรีราชา  
101/12 หมู่ 9 ต. บางพระ  
อ. ศรีราชา จ. ชลบุรี 20110  
โทร./โทรสาร. (038) 311379

Client : PTTEP International Limited

Address : 222 Moo 1 Tambon Huakao, Amphur Singhanakorn, Songkhla, Thailand, 90280

Project Name : PSB Songkhla

#### รายงานผลการวิเคราะห์สัตว์หน้าดิน

ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 3 มิถุนายน 2567)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)			
	2459868-1	2459868-2	2459868-3	2459868-4
Phylum Annelida				
Class Polychaeta				
Order Phyllodocida				
Family Glyceridae				
<i>Glycera</i> sp. (ไส้เดือนทะเล)	15	-	-	-
Family Nephtyidae				
<i>Nephtys</i> sp. (ไส้เดือนทะเล)	-	-	15	-
Family Nereididae				
<i>Nereis</i> sp. (แม่เพรียง)	15	-	-	-
Phylum Arthropoda				
Class Malacostraca				
Order Decapoda				
Family Diogenidae				
<i>Diogenes</i> sp. (ปูเสฉวน)	163	-	-	-

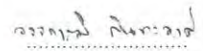
ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 3 มิถุนายน 2567)


(ต่อ)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)			
	2459868-1	2459868-2	2459868-3	2459868-4
Phylum Mollusca				
Class Gastropoda				
Order Caenogastropoda				
Family Cerithiidae				
<i>Cerithium</i> sp. (หอยฝาเดียวชนิดหนึ่ง)	-	30	-	30
Family Potamididae				
<i>Cerithidea</i> sp. (หอยจู้บแจง)	-	30	-	-
Class Bivalvia				
Order Mytilida				
Family Mytilidae				
<i>Arcuatula</i> sp. (หอยกะพง)	15	-	15	-
Order Nuculanida				
Family Nuculanidae				
<i>Nuculana</i> sp. (หอยสองฝาชนิดหนึ่ง)	-	-	15	-
Order Venerida				
Family Veneridae				
<i>Meretrix</i> sp. (หอยตลับ)	15	-	-	-
<i>Redicirce</i> sp. (หอยสองฝาชนิดหนึ่ง)	15	-	-	-
สกุลสัตว์หน้าดิน	6	2	3	1
ปริมาณสัตว์หน้าดิน	238	60	45	30
ค่าดัชนีความหลากหลายสัตว์หน้าดิน	1.1303	0.6931	1.0986	0.0000

**Sample Location :** 1. สถานี 2459868-1 : สถานีที่ 1 บริเวณพื้นที่วางท่อน้ำมัน ด้านใกล้แนววางท่อน้ำมัน  
2. สถานี 2459868-2 : สถานีที่ 2 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำในกระชัง ด้านชุมชน  
บ้านเล  
3. สถานี 2459868-3 : สถานีที่ 3 บริเวณแหล่งน้ำธรรมชาติ ด้านสะพานรับ-ส่งน้ำมันของ  
ปตท.  
4. สถานี 2459868-4 : สถานีที่ 4 บริเวณที่มีการเพาะเลี้ยงสัตว์น้ำ ด้านชุมชนฝั่งคลองน้ำมัน  
ปตท.

**Condition of Sample :** contained in one plastic zip bag

  
.....  
(นายอรรถวุฒิ กัทะวงษ์)  
ผู้วิเคราะห์

  
.....  
(นายอลงกต อินทรชาติ)  
หัวหน้าสถานีวิจัยประมงศรีราชา



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คุณภาพน้ำทิ้ง





## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 23139527  
Date Received : Jan 09, 2024  
Date Reported : Jan 16, 2024  
Report Number : 2851062-1

Page 1 of 3

Sample Number 23139527-1  
Sampled Date Jan 09, 2024 9:47 AM  
Sample Description Wastewater  
Location ปลอกน้ำทิ้งบริเวณท่าเทียบเรือ 1 (Manhole 1)  
Date Analysis Commenced Jan 09, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	120	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).  
**Sampling By :** Woravut Deenuk ทะเบียนเลขที่ ๖-204-๖-8608 , Yongsil Rangsee ทะเบียนเลขที่ ๖-267-๖-0008

Remark :  
- LOD : Limit of Detection  
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)  
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.  
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Ananta B.  
Ananta Boonphet  
Scientist (2)  
ทะเบียนเลขที่ ๖-267-๖-0004

Approved by

Kanitta H.  
Kanitta Hemprasatporn  
Section Head  
ทะเบียนเลขที่ ๖-267-๖-0001

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 249984  
Date Received : Feb 01, 2024  
Date Reported : Feb 07, 2024  
Report Number : 2895188-1

Page 1 of 3

Sample Number 249984-1  
Sampled Date Feb 01, 2024 9:38 AM  
Sample Description Wastewater  
Location ปลอกน้ำทิ้งบริเวณท่าเทียบเรือ 1 (Manhole 1)  
Date Analysis Commenced Feb 01, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	108	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).  
**Sampling By :** Wutthichai Taucharoen ทะเบียนเลขที่ ๖-267-๖-0007 , Yongsil Rangsee ทะเบียนเลขที่ ๖-267-๖-0008

Remark :  
- LOD : Limit of Detection  
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)  
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.  
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Ananta B.  
Ananta Boonphet  
Scientist (2)  
ทะเบียนเลขที่ ๖-267-๖-0004

Approved by

Kanitta H.  
Kanitta Hemprasatporn  
Section Head  
ทะเบียนเลขที่ ๖-267-๖-0001

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416245  
Date Received : Mar 01, 2024  
Date Reported : Mar 08, 2024  
Report Number : 2908329-1

Page 1 of 3

Sample Number	2416245-1						
Sampled Date	Mar 01, 2024 9:57 AM						
Sample Description	Wastewater						
Location	ปลั๊กน้ำทิ้งบริเวณท่าเทียบเรือ 1 (Manhole 1)						
Date Analysis Commenced	Mar 01, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤5	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.1	5.5-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	114	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Wuthichai Taucharoen , Woravut Deenuk

Remark :  
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Approved by

Ananta B

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2430790  
Date Received : Apr 05, 2024  
Date Reported : Apr 12, 2024  
Report Number : 2940526-1

Page 1 of 3

Sample Number	2430790-1						
Sampled Date	Apr 05, 2024 9:45 AM						
Sample Description	Wastewater						
Location	ปลั๊กน้ำทิ้งบริเวณท่าเทียบเรือ 1 (Manhole 1)						
Date Analysis Commenced	Apr 05, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤5	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	7.8	5.5-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	118	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Apiwat Chanta , Woravut Deenuk

Remark :  
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Ananta B

Ananta Boonphet  
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## Analysis / Test Report

TESTING  
No.0166

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2445734  
Date Received : May 09, 2024  
Date Reported : May 16, 2024  
Report Number : 2973505-1

Page 1 of 3

Sample Number 2445734-1  
Sampled Date May 09, 2024 9:50 AM  
Sample Description Wastewater  
Location ปลัดน้ำทิ้งบริเวณท่าเทียบเรือ 1 (Manhole 1)  
Date Analysis Commenced May 09, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-	-	7.7	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	132	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Somsak Junkong ทะเบียนเลขที่ ๖-๒๖๗-๖-๐๐๑๑, Narathorn Keawpongsa ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๙๓

**Remark :**

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Technical Management

Ananta B.

Ananta Boonphet  
Scientist (2)

ทะเบียนเลขที่ ๖-๒๖๗-๖-๐๐๐๔

Approved by

Kanitta H.

Kanitta Hemprasatporn  
Section Head

ทะเบียนเลขที่ ๖-๒๖๗-๖-๐๐๐๑

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## Analysis / Test Report

TESTING  
No.0166

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

Lot ID: 2459869  
Date Received : Jun 05, 2024  
Date Reported : Jun 12, 2024  
Report Number : 3004452-1

Page 1 of 3

Sample Number 2459869-1  
Sampled Date Jun 05, 2024 9:55 AM  
Sample Description Wastewater  
Location ปลัดน้ำทิ้งบริเวณท่าเทียบเรือ 1 (Manhole 1)  
Date Analysis Commenced Jun 05, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-	-	7.6	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	66	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Woravut Deenuk ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๑๕, Thanawut Pinthong ทะเบียนเลขที่ ๖-๒๖๗-๖-๐๐๒๒

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Technical Management

Ananta B.

Ananta Boonphet  
Scientist (2)

ทะเบียนเลขที่ ๖-๒๖๗-๖-๐๐๐๔

Approved by

Kanitta H.

Kanitta Hemprasatporn  
Section Head

ทะเบียนเลขที่ ๖-๒๖๗-๖-๐๐๐๑

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 23139527

Date Received : Jan 09, 2024  
Date Reported : Jan 16, 2024  
Report Number : 2851062-1

Page 2 of 3

Sample Number	23139527-2
Sampled Date	Jan 09, 2024 9:43 AM
Sample Description	Wastewater
Location	ปล่องน้ำทิ้งบริเวณท่าเทียบเรือ 2 (Manhole 2)
Date Analysis Commenced	Jan 09, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	7.7	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	116	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Woravut Deenuk ทะเบียนเลขที่ 7-204-3-8608 , Yongsil Rangsee ทะเบียนเลขที่ 7-267-3-0008

### Remark :

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Technical Management

Ananta B.

Ananta Boonphet  
Scientist (2)

ทะเบียนเลขที่ 7-267-3-0004

Approved by

Kanitta H.

Kanitta Hemprasatporn  
Section Head  
ทะเบียนเลขที่ 7-267-3-0001

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 249984

Date Received : Feb 01, 2024  
Date Reported : Feb 07, 2024  
Report Number : 2895188-1

Page 2 of 3

Sample Number	249984-2
Sampled Date	Feb 01, 2024 9:35 AM
Sample Description	Wastewater
Location	ปล่องน้ำทิ้งบริเวณท่าเทียบเรือ 2 (Manhole 2)
Date Analysis Commenced	Feb 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	5.3	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	26	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	7.9	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	442	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	8	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Wuttichai Taucharoen ทะเบียนเลขที่ 7-267-3-0007 , Yongsil Rangsee ทะเบียนเลขที่ 7-267-3-0008

### Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Technical Management

Ananta B.

Ananta Boonphet  
Scientist (2)  
ทะเบียนเลขที่ 7-267-3-0004

Approved by

Kanitta H.

Kanitta Hemprasatporn  
Section Head  
ทะเบียนเลขที่ 7-267-3-0001

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416245  
Date Received : Mar 01, 2024  
Date Reported : Mar 08, 2024  
Report Number : 2908329-1

Page 2 of 3

Sample Number	2416245-2						
Sampled Date	Mar 01, 2024 9:54 AM						
Sample Description	Wastewater						
Location	บ่อกักน้ำทิ้งบริเวณท่าเทียบเรือ 2 (Manhole 2)						
Date Analysis Commenced	Mar 01, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	4.4	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	39	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤5	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.0	5.5-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	512	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	9	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Wuttichai Taucharoen , Woravut Deenuk

Remark :  
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Approved by

Ananta B.

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2430790  
Date Received : Apr 05, 2024  
Date Reported : Apr 12, 2024  
Report Number : 2940526-1

Page 2 of 3

Sample Number	2430790-2						
Sampled Date	Apr 05, 2024 9:40 AM						
Sample Description	Wastewater						
Location	บ่อกักน้ำทิ้งบริเวณท่าเทียบเรือ 2 (Manhole 2)						
Date Analysis Commenced	Apr 05, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	3.2	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	36	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤5	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	7.8	5.5-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	452	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	6	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Apiwat Chanta , Woravut Deenuk

Remark :  
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Approved by

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Ananta Boonphet  
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2445734  
Date Received : May 09, 2024  
Date Reported : May 16, 2024  
Report Number : 2973505-1

Page 2 of 3

Sample Number	2445734-2
Sampled Date	May 09, 2024 9:45 AM
Sample Description	Wastewater
Location	บ่อกักน้ำทิ้งบริเวณท่าเทียบเรือ 2 (Manhole 2)
Date Analysis Commenced	May 09, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	14.6	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	66	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	8.0	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	536	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Somsak Junkong ทะเบียนเลขที่ ๖-267-๖-0011 , Narathorn Keawpongsa ทะเบียนเลขที่ ๖-204-๖-0193

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Technical Management

Ananta B

Ananta Boonphet

Scientist (2)

ทะเบียนเลขที่ ๖-267-๖-0004

Approved by

Kanitta H.

Kanitta Hemprasatporn

Section Head

ทะเบียนเลขที่ ๖-267-๖-0001

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459869  
Date Received : Jun 05, 2024  
Date Reported : Jun 12, 2024  
Report Number : 3004452-1

Page 2 of 3

Sample Number	2459869-2
Sampled Date	Jun 05, 2024 9:45 AM
Sample Description	Wastewater
Location	บ่อกักน้ำทิ้งบริเวณท่าเทียบเรือ 2 (Manhole 2)
Date Analysis Commenced	Jun 05, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	7.7	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	118	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Woravut Deenuk ทะเบียนเลขที่ ๖-204-๖-0115 , Thanawat Pinthong ทะเบียนเลขที่ ๖-267-๖-0022

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Technical Management

Ananta B

Ananta Boonphet

Scientist (2)

ทะเบียนเลขที่ ๖-267-๖-0004

Approved by

Kanitta H.

Kanitta Hemprasatporn

Section Head

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :



TESTING  
No.0166

Lot ID: 23139527

Date Received : Jan 09, 2024

Date Reported : Jan 16, 2024

Report Number : 2851062-1

Page 3 of 3

Sample Number	23139527-3
Sampled Date	Jan 09, 2024 9:38 AM
Sample Description	Wastewater
Location	ปลักน้ำทิ้งบริเวณท่าเทียบเรือ 3 (Manhole 3)
Date Analysis Commenced	Jan 09, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-		7.5	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	230	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Woravut Deenuk ทะเบียนเลขที่ 2-204-2-8608 , Yongsil Rangsee ทะเบียนเลขที่ 2-267-2-0008

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Technical Management

**Ananta B.**

Ananta Boonphet  
Scientist (2)

ทะเบียนเลขที่ 2-267-2-0004

Approved by

**Kanitta H.**

Kanitta Hemprasatporn  
Section Head

ทะเบียนเลขที่ 2-267-2-0001

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :



TESTING  
No.0166

Lot ID: 249984

Date Received : Feb 01, 2024

Date Reported : Feb 07, 2024

Report Number : 2895188-1

Page 3 of 3

Sample Number	249984-3
Sampled Date	Feb 01, 2024 9:30 AM
Sample Description	Wastewater
Location	ปลักน้ำทิ้งบริเวณท่าเทียบเรือ 3 (Manhole 3)
Date Analysis Commenced	Feb 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *		-		7.6	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	228	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Wuttichai Taucharoen ทะเบียนเลขที่ 2-267-2-0007 , Yongsil Rangsee ทะเบียนเลขที่ 2-267-2-0008

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Technical Management

**Ananta B.**

Ananta Boonphet  
Scientist (2)

ทะเบียนเลขที่ 2-267-2-0004

Approved by

**Kanitta H.**

Kanitta Hemprasatporn  
Section Head

ทะเบียนเลขที่ 2-267-2-0001

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416245  
Date Received : Mar 01, 2024  
Date Reported : Mar 08, 2024  
Report Number : 2908329-1

Page 3 of 3

Sample Number	2416245-3
Sampled Date	Mar 01, 2024 9:46 AM
Sample Description	Wastewater
Location	บ่อกักน้ำทิ้งบริเวณท่าเทียบเรือ 3 (Manhole 3)
Date Analysis Commenced	Mar 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤5	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	7.7	5.5-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	260	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Wuttichai Taucharoen , Woravut Deenuk

**Remark :**

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Ananta B.

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2430790  
Date Received : Apr 05, 2024  
Date Reported : Apr 12, 2024  
Report Number : 2940526-1

Page 3 of 3

Sample Number	2430790-3
Sampled Date	Apr 05, 2024 9:35 AM
Sample Description	Wastewater
Location	บ่อกักน้ำทิ้งบริเวณท่าเทียบเรือ 3 (Manhole 3)
Date Analysis Commenced	Apr 05, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤5	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	7.6	5.5-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	146	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

**Sampling By :** Apiwat Chanta , Woravut Deenuk

**Remark :**

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Approved by

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Ananta Boonphet  
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2445734  
Date Received : May 09, 2024  
Date Reported : May 16, 2024  
Report Number : 2973505-1

Page 3 of 3

Sample Number 2445734-3  
Sampled Date May 09, 2024 9:40 AM  
Sample Description Wastewater  
Location บ่อพักน้ำทิ้งบริเวณหน้าเหมืองเรือ 3 (Manhole 3)  
Date Analysis Commenced May 09, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	7.8	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	216	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).  
**Sampling By :** Somsak Junkong ทะเบียนเลขที่ 7-267-ก-0011 , Narathorn Keawpongsa ทะเบียนเลขที่ 7-204-ก-0193

Remark :

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- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Ananta B.

Ananta Boonphet  
Scientist (2)  
ทะเบียนเลขที่ 7-267-ก-0004

Approved by

Kanitta H.

Kanitta Hemprasatporn  
Section Head  
ทะเบียนเลขที่ 7-267-ก-0001

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459869  
Date Received : Jun 05, 2024  
Date Reported : Jun 12, 2024  
Report Number : 3004452-1

Page 3 of 3

Sample Number 2459869-3  
Sampled Date Jun 05, 2024 9:44 AM  
Sample Description Wastewater  
Location บ่อพักน้ำทิ้งบริเวณหน้าเหมืองเรือ 3 (Manhole 3)  
Date Analysis Commenced Jun 05, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	<2.0	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	<25	≤120	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease *	mg/L	-	3	<3	≤5	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C *	-	-	-	7.6	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	68	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).  
**Sampling By :** Woravut Deenuk ทะเบียนเลขที่ 7-204-ก-0115 , Thanawat Pinthong ทะเบียนเลขที่ 7-267-ก-0022

Remark :

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Technical Management

Ananta B.

Ananta Boonphet  
Scientist (2)  
ทะเบียนเลขที่ 7-267-ก-0004

Approved by

Kanitta H.

Kanitta Hemprasatporn  
Section Head  
ทะเบียนเลขที่ 7-267-ก-0001

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :



TESTING  
No.0166

Lot ID: 23139528

Date Received : Jan 09, 2024

Date Reported : Jan 16, 2024

Report Number : 2851065-1

Page 1 of 2

Sample Number	23139528-1
Sampled Date	Jan 09, 2024 11:27 AM
Sample Description	Wastewater
Location	บริเวณอาคารบัญชาการ
Date Analysis Commenced	Jan 09, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C) *	mg/L	-	2	15.3	≤40	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B	Songkhla
COD	mg/L	-	25	90	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	8.0	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	436	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	18	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Woravut Deenuk , Yongsil Rangsee

Remark :

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## Analysis / Test Report

Client : PTTEP International Limited

222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280

P/O : 3450040615

Project Name : PSB Songkhla

Project Location :



TESTING  
No.0166

Lot ID: 249985

Date Received : Feb 01, 2024

Date Reported : Feb 08, 2024

Report Number : 2895189-1

Page 1 of 2

Sample Number	249985-1
Sampled Date	Feb 01, 2024 11:30 AM
Sample Description	Wastewater
Location	บริเวณอาคารบัญชาการ
Date Analysis Commenced	Feb 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	17.7	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	113	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	7.9	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	404	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	22	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Wuthichai Taucharoen , Yongsil Rangsee

Remark :

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416249  
Date Received : Mar 01, 2024  
Date Reported : Mar 08, 2024  
Report Number : 2908331-1

Page 1 of 2

Sample Number 2416249-1  
Sampled Date Mar 01, 2024 11:27 AM  
Sample Description Wastewater  
Location บริเวณอาคารบัญชาการ  
Date Analysis Commenced Mar 01, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
COD	mg/L	-	25	112	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	8.0	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	424	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	17	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

Guideline : Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

Sampling By : Wutthichai Taucharoen , Woravut Deenuk

Remark :

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O :  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2429552  
Date Received : Mar 26, 2024  
Date Reported : Apr 03, 2024  
Report Number : 2937793-1

Page 1 of 1

Sample Number 2429552-1  
Sampled Date Mar 26, 2024 10:15 AM  
Sample Description Wastewater  
Location บริเวณอาคารบัญชาการ  
Date Analysis Commenced Mar 27, 2024  
Condition of Sample Contained in one plastic bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	11.2	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla

Guideline : Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

Sampling By : Somsak Junkong

Remark :

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Ananta B.

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2430792  
Date Received : Apr 05, 2024  
Date Reported : Apr 12, 2024  
Report Number : 2940528-1

Page 1 of 2

Sample Number 2430792-1  
Sampled Date Apr 05, 2024 11:35 AM  
Sample Description Wastewater  
Location บริเวณอาคารบำบัดน้ำ  
Date Analysis Commenced Apr 05, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	37.3	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	142	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.1	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	524	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	23	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Apiwat Chanta , Woravut Deenuk

Remark :

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Ananta B

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2445735  
Date Received : May 09, 2024  
Date Reported : May 16, 2024  
Report Number : 2973506-1

Page 1 of 2

Sample Number 2445735-1  
Sampled Date May 09, 2024 11:40 AM  
Sample Description Wastewater  
Location บริเวณอาคารบำบัดน้ำ  
Date Analysis Commenced May 09, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	29.3	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	126	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.2	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	384	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	27	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Somsak Junkong , Narathorn Keawpongna

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Approved by

Ananta B

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2459870  
Date Received : Jun 05, 2024  
Date Reported : Jun 18, 2024  
Report Number : 3004453-1 Rev. No.1

Page 3 of 4

Sample Number 2459870-2  
Sampled Date Jun 05, 2024 11:37 AM  
Sample Description Wastewater  
Location บริเวณอาคารปฏิบัติการ  
Date Analysis Commenced Jun 05, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	103	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	210	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	8	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.1	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	344	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	36	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Note :** This Analysis test report is Reissued to supersede report No.3004453-1, Date Reported : Jun 12, 2024 due to revise sample information.

**Sampling By :** Woravut Deenuk , Thanawut Pinthong

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Ananta B.

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 23139528  
Date Received : Jan 09, 2024  
Date Reported : Jan 16, 2024  
Report Number : 2851065-1

Page 2 of 2

Sample Number 23139528-2  
Sampled Date Jan 09, 2024 11:33 AM  
Sample Description Wastewater  
Location จครวมน้ำทิ้งจากอาคารปฏิบัติการและโรงอาหาร  
Date Analysis Commenced Jan 09, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C) *	mg/L	-	2	9.3	≤40	Based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B	Songkhla
COD	mg/L	-	25	35	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	7.6	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	192	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	9	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Woravut Deenuk , Yongsil Rangsee

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Approved by

Ananta B.

Ananta Boonphet  
Scientist (2)

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 249985

Date Received : Feb 01, 2024  
Date Reported : Feb 08, 2024  
Report Number : 2895189-1

Page 2 of 2

Sample Number	249985-2
Sampled Date	Feb 01, 2024 11:35 AM
Sample Description	Wastewater
Location	จุดรวมน้ำทิ้งจากอาคารปฏิบัติการและโรงอาหาร
Date Analysis Commenced	Feb 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	12.1	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	48	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	7.9	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	300	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	6	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November, 7, B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Wutthichai Taucharoen , Yongsil Rangsee

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Ananta Boonphet  
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2416249

Date Received : Mar 01, 2024  
Date Reported : Mar 08, 2024  
Report Number : 2908331-1

Page 2 of 2

Sample Number	2416249-2
Sampled Date	Mar 01, 2024 11:30 AM
Sample Description	Wastewater
Location	จุดรวมน้ำทิ้งจากอาคารปฏิบัติการและโรงอาหาร
Date Analysis Commenced	Mar 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	16.3	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	74	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C	-	-	-	7.8	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	360	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	<5	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November, 7, B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Sampling By :** Wutthichai Taucharoen , Woravut Deenuk

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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Ananta B.

Ananta Boonphet  
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2430792  
Date Received : Apr 05, 2024  
Date Reported : Apr 12, 2024  
Report Number : 2940528-1

Page 2 of 2

Sample Number	2430792-2						
Sample Date	Apr 05, 2024 11:45 AM						
Sample Description	Wastewater						
Location	จุดรวมน้ำทิ้งจากอาคารปฏิบัติการและโรงอาหาร						
Date Analysis Commenced	Apr 05, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	13.3	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	49	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	7.9	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	364	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	16	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

Guideline : Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

Sampling By : Apiwat Chanta , Woravut Deemuk

### Remark :

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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :



TESTING  
No.0166

Lot ID: 2445735  
Date Received : May 09, 2024  
Date Reported : May 16, 2024  
Report Number : 2973506-1

Page 2 of 2

Sample Number	2445735-2						
Sample Date	May 09, 2024 11:45 AM						
Sample Description	Wastewater						
Location	จุดรวมน้ำทิ้งจากอาคารปฏิบัติการและโรงอาหาร						
Date Analysis Commenced	May 09, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	14.8	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	75	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	<3	≤20	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.0	5.0-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	320	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	14	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

Guideline : Notification of Ministry of Natural Resources and Environment November,7 ,B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

Sampling By : Somsak Junkong , Narathorn Keawpongsa

### Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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## Analysis / Test Report

Client : PTTEP International Limited  
222 Moo 1, Tambon Huakao, Amphur Singhanakorn, Songkhla Thailand 90280  
P/O : 3450040615  
Project Name : PSB Songkhla  
Project Location :

TESTING  
No.0166  
Lot ID: 2459870  
Date Received : Jun 05, 2024  
Date Reported : Jun 18, 2024  
Report Number : 3004453-1 Rev. No.1

Page 1 of 4

Sample Number 2459870-1  
Sampled Date Jun 05, 2024 11:40 AM  
Sample Description Wastewater  
Location จตุรรมบรณำที่งจากอาคารบัญชาการและโรงพยาบาล  
Date Analysis Commenced Jun 05, 2024  
Condition of Sample Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
<b>Water Testing</b>							
BOD (5 days at 20 degree C)	mg/L	-	2.0	18.2	≤40	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Songkhla
COD	mg/L	-	25	75	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Songkhla
Oil & Grease	mg/L	-	3	4	≤20	In-house method : STM 13-006 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Songkhla
pH at 25 degree C		-	-	8.0	5.0-9.0	In-house method : STM 13-001 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Songkhla
Total Dissolved Solids Dried at 103-105 degree C *	mg/L	-	5	204	(1)	In-house method : STM 04-010 based on Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Songkhla
Total Suspended Solids	mg/L	-	5	19	≤50	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Songkhla

**Guideline :** Notification of Ministry of Natural Resources and Environment November, 7, B.E. 2548 on Effluent Control Standard from Types and Sized of Buildings, Type C.

(1) : The values are in addition to the Total Dissolved Solids of the water used not more than 500 mg/L.

**Note :** This Analysis test report is reissued to supersede report No.3004453-1, Date Reported : Jun 12, 2024 due to revise sample information.

**Sampling By :** Woravut Deenuk , Thanawut Pinthong

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked \* is/are not included in scope of Accreditation ISO/IEC 17025.

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

Approved by

Ananta B

Ananta Boonphet  
Scientist (2)

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## ภาคผนวก ค-2

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รายงานผลการสำรวจบริเวณชายฝั่งทะเล ประจำปี 2567



## รายงานผลการสำรวจบริเวณชายฝั่งทะเล

อำเภอสิงหนคร - อำเภอเมือง จังหวัดสงขลา

### 1. วัตถุประสงค์

สำรวจหาระดับแนวชายฝั่งและความลึกของท้องน้ำเพื่อดูความเปลี่ยนแปลงของชายหาดจากผลกระทบของธรรมชาติและสิ่งแวดลอม

### 2. ขอบเขตของงานและระยะเวลาสำรวจ

ดำเนินการสำรวจ ตั้งแต่วันที่ 4 ถึง 14 เมษายน 2567 บริเวณสำรวจ ตั้งแต่อำเภอสิงหนคร ถึงอำเภอเมือง จังหวัดสงขลา

#### 2.1 ขอบเขตของการสำรวจ

พื้นที่สำรวจเริ่มจากบริเวณท่าเทียบเรือ บริษัท ปตท.สผ. จำกัด (มหาชน) อำเภอสิงหนคร จังหวัดสงขลา สำรวจไปตามแนวชายฝั่งทะเลด้านทิศเหนือระยะทางประมาณ 5,000 เมตร สิ้นสุดที่ค่าพิกัด N-804312 E-669336 และสำรวจลงไปทางด้านทิศใต้ระยะทางประมาณ 5,000 เมตร สิ้นสุดที่ค่าพิกัด N-794209 E-678612 สำรวจออกจากแนวชายฝั่งออกไปทะเลประมาณ 1000 เมตร โดยกำหนดแนวสำรวจทุก ๆ 100 เมตร พร้อมทำรูปตัดแนวชายฝั่ง รวมพื้นที่สำรวจประมาณ 10 ตารางกิโลเมตร แสดงดังรูปที่ 1



รูปที่ 1 พื้นที่บริเวณสำรวจ

### 3. ระบบพิกัดแผนที่

#### 3.1 ระบบพิกัดทางราบ

ใช้ระบบพิกัดแผนที่ ยู.ที.เอ็ม.กริด WGS.1984 Zone 47 (No Datum)

#### 3.2 ระดับอ้างอิงทางตั้ง

ระดับทางตั้งอ้างอิงจากค่าระดับทะเลปานกลาง (MSL.)

### 4. มาตรฐานแผนที่และหมุดอ้างอิงตามชายหาด

#### 4.1 งานตรวจสอบหมุดหลักฐาน

ตรวจสอบหมุดหลักฐานที่สร้างไว้เมื่อเดือนเมษายน 2550 และซ่อมแซมหรือสร้างใหม่ทดแทนของเก่า หากพบว่าชำรุดหรือสูญหาย แสดงดังภาพที่ 1



ภาพที่ 1 งานตรวจสอบหมุดหลักฐาน และหมุดอ้างอิงแนวชายฝั่ง



#### ขั้นตอนและวิธีการสำรวจตรวจสอบหมุดหลักฐาน

ทำการตรวจสอบหมุดหลักฐานโดยเครื่องมือรังวัด ซึ่งจากการตรวจสอบหมุดหลักฐานต่างๆ หมุด BM01, BM02 ซึ่งสภาพทั่วไปของหมุดยังคงมีความสมบูรณ์ ผลจากการตรวจสอบหมุดหลักฐานในงานสำรวจ ตำแหน่งค่าพิกัดและค่าระดับยังอยู่ในตำแหน่งเดิม แสดงดังภาพที่ 2 และรูปที่ 2

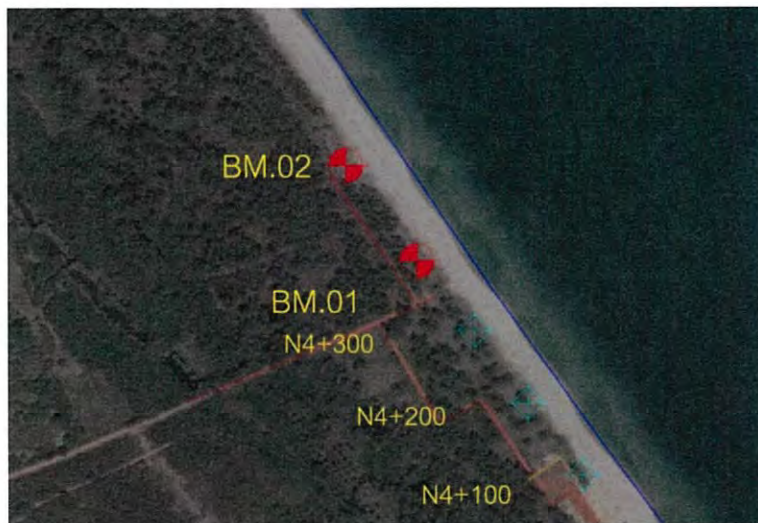


BM01



BM02

ภาพที่ 2 หมุดหลักฐาน BM01,BM02



รูปที่ 2 แผนที่สังเขปหมุดหลักฐาน BM01,BM02 ด้านทิศเหนือ

หมุด BM03,BM04 ซึ่งสภาพทั่วไปของหมุดยังคงมีความสมบูรณ์ ผลจากการตรวจสอบหมุดหลักฐานในงานสำรวจ ตำแหน่งค่าพิกัดและค่าระดับยังอยู่ในตำแหน่งเดิม แสดงดังภาพที่ 3 และรูปที่ 3 และแสดงตำแหน่งค่าพิกัดหมุดหลักฐาน ดังตารางที่ 1



BM03



BM04

ภาพที่ 3 หมุดหลักฐาน BM03,BM04



รูปที่ 3 แผนที่สังเขปหมุดหลักฐาน BM03, BM04



ตารางที่ 1 ตำแหน่งพิกัดหมุดหลักฐาน

ชื่อหมุด	ค่าพิกัด		ระดับ (MSL)
	เหนือ (N)	ตะวันออก (E)	
BM.01	804201.768	669409.486	1.993
BM.02	804311.327	669335.832	2.018
BM.03	795238.916	677807.640	2.841
BM.04	794209.223	678602.346	2.064

หมายเหตุ : อ้างอิงระบบค่าพิกัดจาก WGS.84

#### 4.2 งานหมุดอ้างอิงตามชายหาด

จากการตรวจสอบหมุดอ้างอิงตามแนวชายหาดด้านทิศเหนือและทิศใต้ พบว่า ด้านทิศเหนือจากหมุด N4+300 ถึง N3+900 ถูกคลื่นกัดเซาะพังทลาย ทำการหล่อและฝังหมุดใหม่ สำรวจตรวจสอบค่าพิกัดและค่าระดับใหม่ แสดงดังภาพที่ 4

หมุด N3+800 ถึง หมุด N1+300 มีการทับถมของตะกอนบนเขื่อนกันคลื่นพัง ทำการตรวจสอบค่าพิกัดและค่าระดับใหม่ แสดงดังภาพที่ 5

หมุด N3+000 ถึง หมุด N1+300 มีสภาพใช้งานได้ สำรวจตรวจสอบค่าพิกัดและค่าระดับใหม่ มีค่าพิกัดและค่าระดับเท่าเดิม แสดงดังภาพที่ 6

หมุด N1+200 ถึง N0+000 หล่อและฝังหมุดบนเขื่อนกันคลื่น สำรวจตรวจสอบค่าพิกัดและค่าระดับใหม่ มีค่าพิกัดและค่าระดับเท่าเดิม แสดงดังภาพที่ 7



ภาพที่ 4 หมุด N4+300 ถึง หมุด N3+900



ภาพที่ 5 หมุด N3+800 ถึง หมุด N1+300



ภาพที่ 6 หมุด N3+000 ถึง หมุด N1+300





ภาพที่ 7 หมด N1+200 ถึง หมด N0+000

ด้านทิศใต้ บริเวณเขื่อนกันคลื่น หมด S0+100, S0+200, S0+300 มีสภาพใช้งานได้ จากการตรวจสอบ หมดทั้ง 3 หมดมีค่าพิกัดและค่าระดับเท่าเดิม

หมดอ้างอิงตามแนวชายฝั่งจากหมด S0+800, S2+400 สูญหาย ได้สร้างหมดใหม่ขึ้นมาแทนหมดเดิม สำหรับตรวจสอบค่าพิกัดและค่าระดับใหม่ แสดงดังภาพที่ 8

หมด S2+500 ถึง S6+000 มีสภาพที่ยังใช้งานได้ ทำการตรวจสอบค่าพิกัดและค่าระดับใหม่ แสดงดังภาพที่ 9

สำหรับพิกัดหมดอ้างอิงตามแนวชายหาดด้านทิศเหนือและทิศใต้ แสดงดังตารางที่ 2 และตารางที่ 3 ตามลำดับ



ภาพที่ 5 หมด S0+800 ถึงหมด S2+400



ภาพที่ 9 หมด S2+500 ถึงหมด S6+000



ตารางที่ 2 ตำแหน่งค่าพิกัดหมุดอ้างอิงแนวชายหาดด้านทิศเหนือ

ชื่อหมุด	ค่าพิกัด		ระดับ (MSL)
	เหนือ (N)	ตะวันออก (E)	
BM02	804311.327	669335.832	2.018
BM01	804201.768	669409.486	1.993
N4+300	804095.460	669454.608	1.893
N4+200	804018.446	669506.770	1.589
N4+100	803937.721	669567.575	2.046
N4+000	803848.421	669615.822	1.590
N3+900	803774.510	669675.537	1.984
N3+800	803720.222	669796.293	2.617
N3+700	803644.994	669852.044	2.541
N3+600	803569.011	669907.637	2.604
N3+500	803494.603	669960.747	2.588
N3+400	803416.552	670018.586	2.041
N3+300	803338.939	670076.554	2.080
N3+200	803253.356	670142.848	2.026
N3+100	803182.589	670200.212	1.992
N3+000	803104.374	670264.962	1.936
N2+900	803044.098	670317.323	2.022
N2+800	802957.438	670394.532	1.998
N2+700	802878.712	670464.444	2.017
N2+600	802803.570	670536.535	1.986
N2+500	802737.488	670594.339	2.007
N2+400	802658.193	670667.032	1.982
N2+300	802584.880	670732.132	2.001
N2+200	802508.316	670798.871	1.982
N2+100	802408.847	670881.748	2.023
N2+000	802308.946	670960.980	2.105
N1+900	802188.308	671058.081	2.145
N1+800	802100.980	671130.758	2.163
N1+700	801966.575	671248.533	2.201
N1+600	801864.982	671362.950	2.153
N1+500	801801.956	671448.704	2.140
N1+400	801714.025	671595.532	4.493
N1+300	801659.272	671769.373	4.452

ตารางที่ 2 (ต่อ) ตำแหน่งค่าพิกัดหมุดอ้างอิงแนวชายหาดด้านทิศเหนือ

ชื่อหมุด	ค่าพิกัด		ระดับ (MSL)
	เหนือ (N)	ตะวันออก (E)	
N1+200	801565.851	672084.206	2.964
N1+100	801408.091	672106.107	3.212
N1+000	801296.531	672165.948	3.283
N0+900	801174.706	672231.354	3.233
N0+800	801091.643	672276.306	3.031
N0+700	800987.175	672331.964	3.033
N0+600	800895.464	672379.873	2.822
N0+500	800798.414	672432.994	2.874
N0+400	800700.601	672484.942	2.561
N0+300	800580.322	672549.111	2.832
N0+200	800469.278	672615.755	2.690
N0+100	800383.259	672692.494	2.982
N0+000	800345.123	672866.222	2.752

ตารางที่ 3 ตำแหน่งค่าพิกัดหมุดอ้างอิงแนวชายหาดด้านทิศใต้

ชื่อหมุด	ค่าพิกัด		ระดับ (MSL.)
	เหนือ (N)	ตะวันออก (E)	
S0+100	800197.359	673539.350	2.870
S0+200	800096.264	673615.373	2.880
S0+300	799998.031	673691.391	2.810
S0+800	799560.797	674518.773	1.680
S0+900	799468.398	674670.128	1.380
S1+000	799357.550	674705.108	1.710
S1+100	799249.560	674737.912	1.740
S1+200	799126.392	674798.514	1.760
S1+300	799029.910	674836.829	2.110
S1+400	798953.959	674883.680	1.710
S1+500	798831.668	674919.764	1.780
S1+600	798756.603	674958.708	2.230
S1+700	798645.626	674977.392	1.800
S1+800	798535.031	675027.431	1.770
S1+900	798414.566	675081.706	1.820
S2+000	798317.886	675126.637	1.940
S2+100	798241.277	675182.153	2.090
S2+200	798132.220	675244.702	2.390
S2+300	797999.736	675257.709	2.720
S2+400	797899.457	675340.536	1.940
S2+500	797830.318	676303.058	3.945
S2+600	797702.620	676377.411	3.360
S2+700	797601.180	676421.186	3.269
S2+800	797501.424	676475.145	3.291
S2+900	797401.413	676528.615	3.380
S3+000	797302.357	676582.632	3.495
S3+100	797194.213	676641.161	3.694
S3+200	797104.094	676691.099	3.840
S3+300	797003.332	676748.362	3.924
S3+400	796905.048	676804.618	3.900
S3+500	796798.800	676853.463	3.790
S3+600	796698.515	676911.020	3.910
S3+700	796601.372	676967.162	3.654

ตารางที่ 3 (ต่อ) ตำแหน่งค่าพิกัดหมุดอ้างอิงแนวชายหาดด้านทิศใต้

ชื่อหมุด	ค่าพิกัด		ระดับ (MSL.)
	เหนือ (N)	ตะวันออก (E)	
S3+800	796501.121	677022.257	3.724
S3+900	796396.932	677080.050	3.801
S4+000	796299.904	677132.725	3.822
S4+100	796200.415	677190.209	3.886
S4+200	796097.513	677246.362	3.798
S4+300	795995.439	677303.303	3.829
S4+400	795900.019	677356.461	3.729
S4+500	795817.921	677405.908	3.305
S4+600	795708.053	677468.164	3.211
S4+700	795597.840	677534.815	2.910
S4+800	795499.091	677600.982	2.544
S4+900	795400.232	677668.797	2.796
S5+000	795296.545	677738.652	3.078
S5+100	795196.049	677806.776	2.974
S5+200	795098.422	677874.165	2.989
S5+300	794999.206	677946.740	3.199
S5+400	794895.879	678012.547	3.193
S5+500	794797.874	678077.847	3.038
S5+600	794696.103	678148.054	2.942
S5+700	794600.012	678224.589	3.116
S5+800	794498.248	678284.018	3.308
S5+900	794396.921	678353.338	3.259
S6+000	794300.310	678462.966	2.727
BM03	795238.916	677807.640	2.841
BM04	794209.223	678602.346	2.064



## 5. งานสำรวจภูมิประเทศและงานสำรวจหยั่งน้ำ

### 5.1 เครื่องมือและอุปกรณ์การสำรวจ

- กล้อง Total Station พร้อมอุปกรณ์ จำนวน 1 ชุด
- กล้องระดับ พร้อมอุปกรณ์ จำนวน 1 ชุด
- เครื่องหาพิกัดด้วยดาวเทียม จำนวน 2 ชุด
- เครื่องหยั่งน้ำพร้อมอุปกรณ์ จำนวน 1 ชุด
- โปรแกรมสำรวจและคอมพิวเตอร์
- เครื่องวัดระดับน้ำขึ้น-ลง แบบดิจิตอล
- อุปกรณ์งานสนามและอื่นๆ

### 5.2 วิธีการขั้นตอนการสำรวจ

#### 1. งานสำรวจเก็บรายละเอียดแนวชายฝั่ง มีขั้นตอนดังนี้

1) ตรวจสอบหมุดหลักฐาน BM.01-BM.02-BM.03 และ BM.04 ใช้ค่าพิกัดหมุดหลักฐานดังกล่าวเป็นพิกัดเริ่มต้น ทำวงรอบตรวจสอบพิกัดทางราบและทางตั้งของหมุดอ้างอิงตามแนวชายหาด เพื่อใช้ในการตั้งกล้องสำหรับเก็บรายละเอียด ตามแนวสำรวจที่กำหนดไว้

2) ตั้งกล้อง ตรงตามหมุดหลักฐานอ้างอิงแนวชายฝั่ง ส่องเก็บรายละเอียดตามแนวสำรวจในแต่ละแนว จากหมุดอ้างอิงลงไปในทะเลให้ได้ตำแหน่งที่เรือสำรวจเข้ามาได้ เก็บรายละเอียดบริเวณตามแนวชายฝั่งตามจุดเปลี่ยนของระดับตามแนวสำรวจ จัดบันทึกข้อมูลจากกล้องสำรวจให้ได้ค่า มุมราบ ระยะแนวราบ ระยะสูงต่างแนวตั้ง เพื่อนำมาคำนวณหาค่าพิกัดและค่าระดับในตำแหน่งนั้นๆ

3) ทำการสำรวจในบริเวณพื้นที่สำรวจตามแนวชายฝั่งที่กำหนดจนแล้วเสร็จ นำข้อมูลที่ได้ไปประมวลผลเพื่อใช้ในการทำงานขั้นตอนต่อไป แสดงดังภาพที่ 10



ภาพที่ 10 งานสำรวจเก็บรายละเอียดชายฝั่ง

## 2. งานสำรวจหยั่งน้ำ มีขั้นตอนดังนี้

1) ใช้ระดับน้ำขึ้นน้ำลง ที่สถานีวัดระดับน้ำอัตโนมัติของกรมเจ้าท่า ที่ติดตั้งไว้ที่ท่าเทียบเรือศูนย์ขุดลอกบำรุงรักษาร่องน้ำสงขลา และบันทึกน้ำขึ้น-น้ำลงทุก 10 นาที ตลอดระยะเวลาที่สำรวจหยั่งน้ำ เพื่อใช้เป็นเกณฑ์หักลบกับระดับน้ำที่ยังได้ แสดงดังภาพที่ 11



ภาพที่ 11 เครื่องวัดระดับน้ำอัตโนมัติ

2) ติดตั้ง GPS.BASE STATION ทำการติดตั้ง GPS.BASE STATION ที่หมุดหลักฐาน BM.03 เพื่อส่งสัญญาณค่าแก่ด้วย RADIO MODEM ให้กับ GPS.ROVER ที่อยู่บนเรือสำรวจ แสดงดังภาพที่ 12



ภาพที่ 12 การติดตั้ง GPS.BASE STATION

## 3) ติดตั้งอุปกรณ์สำรวจในเรือสำรวจ

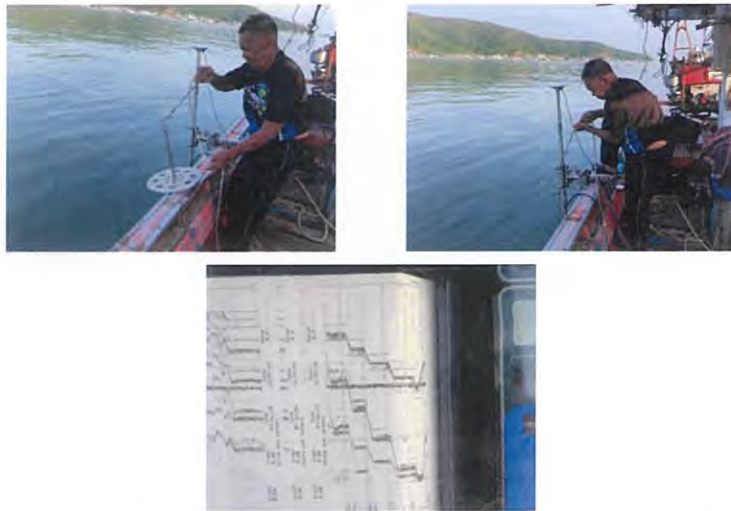
- ติดตั้งหัวรับส่งคลื่นความถี่เสียงใต้น้ำ (Transducer) ไว้ที่บริเวณกัปเรือ โดยให้หัวรับส่งคลื่นความถี่เสียงใต้น้ำลงไปในน้ำนับจากผิวน้ำ 0.76 เมตร ต่อสายสัญญาณเข้ากับตัวเครื่อง Echo Sounder
- ติดตั้งเสาอากาศเครื่องรับดาวเทียม ให้ตรงกับตำแหน่งที่ติดตั้ง Transducer ของเครื่อง Echo Sounder เพื่อจะทำให้ค่าพิกัดตรงกันกับตำแหน่งค่าความลึก
- ติดตั้ง Echo Sounder, GPS.Rover และคอมพิวเตอร์โน้ตบุ๊ก ไว้ในเรือ ตั้งเวลาของ Echo Sounder, GPS และคอมพิวเตอร์โน้ตบุ๊กให้ตรงกัน ต่อสายสัญญาณรับ/ส่งข้อมูลของเครื่อง GPS. และเครื่อง Echo Sounder เข้ากับคอมพิวเตอร์ ที่ติดตั้งโปรแกรมสำรวจทางอุทกศาสตร์ (Hydro Pro2.3) และทดสอบการทำงานของระบบ ก่อนการสำรวจ แสดงดังภาพที่ 13



ภาพที่ 13 ติดตั้งอุปกรณ์สำรวจในเรือสำรวจ



4) ทำการตรวจสอบความถูกต้องของค่าความลึกที่ได้จากเครื่องหยั่งน้ำด้วยการทำ Bar Check คือ การนำเอาแผ่นโลหะ (Bar) ที่สะท้อนสัญญาณคลื่นเสียงซึ่งผูกด้วยลวดสลิงมีเครื่องหมายบอกระยะทุก ๆ 1 เมตร หย่อนลงไปใต้น้ำให้แนวดิ่งตรงกับบริเวณที่ติดตั้ง Transducer ของเครื่องหยั่งน้ำ แผ่นโลหะจะสะท้อนสัญญาณเสียงที่ส่งออกไปกลับคืนมายังเครื่องหยั่งน้ำ ทำให้ทราบค่าระดับในระยะที่หย่อนแผ่นลงไป หากเครื่องหยั่งน้ำอ่านค่าความลึกไม่ตรงกับระยะที่แผ่นโลหะ ให้ปรับแต่งเครื่องหยั่งน้ำให้อ่านค่าความลึกให้ตรงกับระยะที่ลวดสลิง ทำการทดสอบทุกๆ ระยะ 1 เมตร จนถึงความลึกท้องน้ำ แสดงดังภาพที่ 14



ภาพที่ 14 ตรวจสอบความถูกต้องของเครื่องหยั่งน้ำ

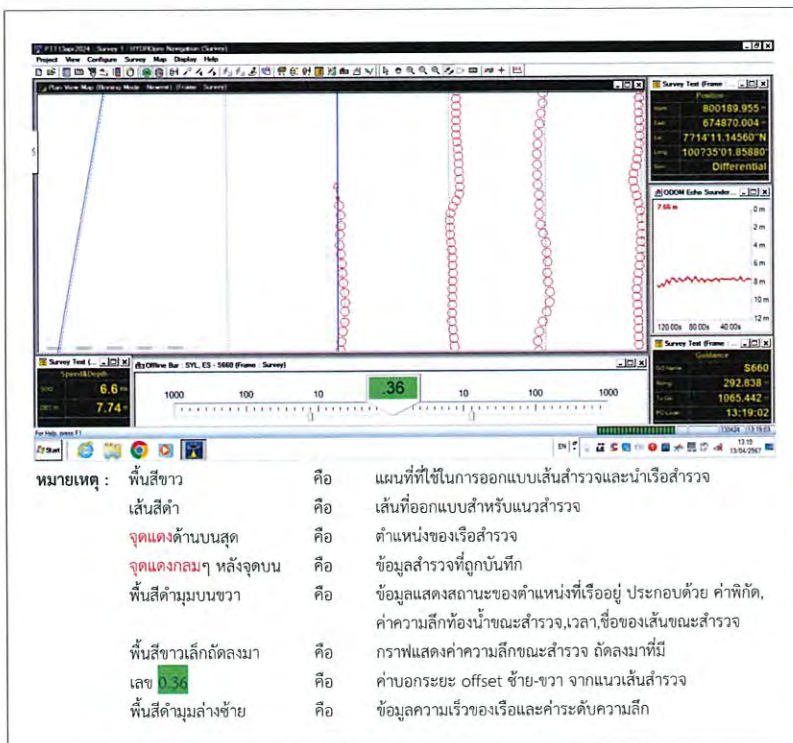
5) หยั่งน้ำและบันทึกข้อมูลออกแบบแนวหยั่งน้ำในพื้นที่สำรวจตามแบบที่กำหนดด้วยการกำหนดค่าพิกัดจุดเริ่มต้น (Start Point) และจุดสิ้นสุด (End Point) ของแต่ละแนวตามที่กำหนดอย่างถูกต้องตามแนวชายฝั่งทะเลที่สร้างไว้ โดยใช้โปรแกรมสำรวจทางอุทกศาสตร์ โดยกำหนดแนวสำรวจทุกๆ 100 เมตร ตามแนวเส้นตัดขวางตลอดระยะทาง 10 กิโลเมตร ตามแนวชายฝั่ง แสดงดังรูปที่ 4



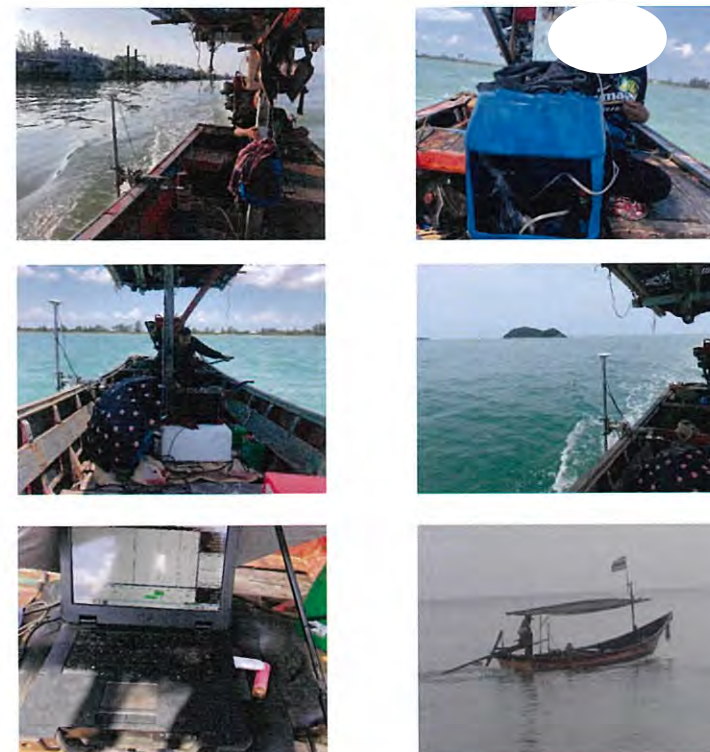
หมายเหตุ : เส้นสีน้ำเงินคือเส้นที่ออกแบบสำหรับนำเรือสำรวจ

รูปที่ 4 การออกแบบเส้นแนวสำรวจเก็บข้อมูล

6) สำรวจและบันทึกข้อมูล โดยการควบคุมเรือสำรวจให้อยู่ในแนวสำรวจที่ออกแบบไว้ รับข้อมูลค่าพิกัดเรือสำรวจจากเครื่อง GPS ซึ่งจะมีการ Update ข้อมูลทุก 1 วินาที โปรแกรมสำรวจจะแจ้งทิศทางและตำบลที่เรือให้ผู้ควบคุมเรือทราบจากคอมพิวเตอร์ ซึ่งจะทำให้ผู้ควบคุมเรือสามารถควบคุมเรือให้อยู่ในแนวสำรวจที่ออกแบบไว้ได้ตลอดเวลา สำรวจบันทึกข้อมูลในแต่ละแนวสำรวจ โดยโปรแกรมสำรวจจะบันทึกข้อมูลของเวลา ตำบล และความลึกของน้ำในแต่ละแนว โดยจะเก็บข้อมูลต่อเนื่องตลอดแนวในขณะที่ทำการสำรวจ ทำการสำรวจหยั่งตามที่ออกแบบไว้ทุกแนวจนแล้วเสร็จ แสดงดังรูปที่ 5 และภาพที่ 15



รูปที่ 5 การเก็บข้อมูลของโปรแกรมสำรวจ

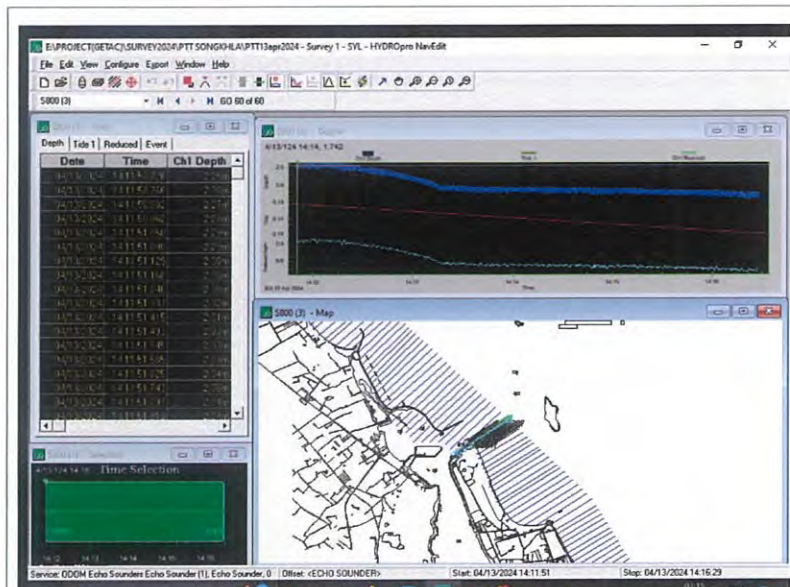


ภาพที่ 15 การสำรวจหยั่งน้ำเก็บข้อมูลตามแนวสำรวจ



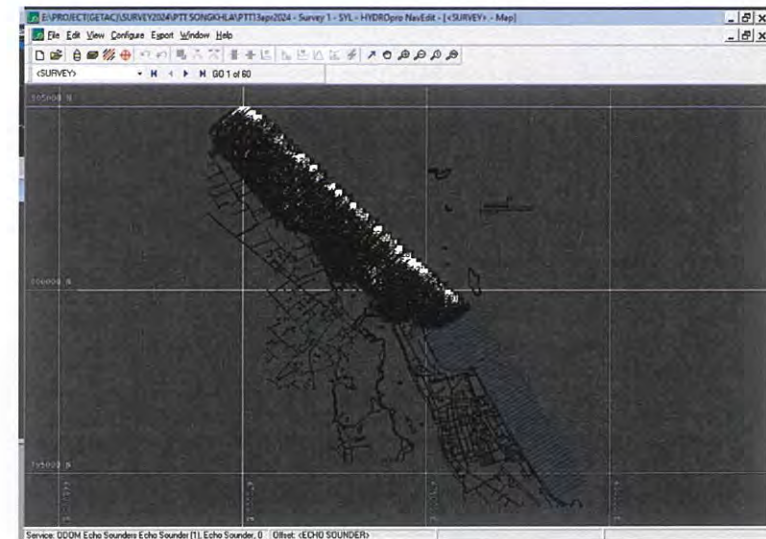
### 3. ประมวลผลและจัดทำแบบแผนที่-รูปตัด

1) ประมวลผล นำข้อมูลสำรวจที่บันทึกไว้มาตรวจสอบความถูกต้องของข้อมูลด้วยโปรแกรมการสำรวจโดยเรียกดูข้อมูลที่ถูกบันทึกไว้ในแต่ละแนวสำรวจ ตรวจสอบและเปรียบเทียบกับกระดานกราฟที่พล็อตจากเครื่องหยั่งน้ำว่ามีข้อมูลที่แก้ไขข้อมูลที่แท้จริงจากการสำรวจหรือไม่ เช่น ข้อมูลความลึกที่ลึกหรือตื้นผิดไปจากปกติหรือลึกเกินปกติซึ่งจะถูกคัดออกไป นำข้อมูลที่ผ่านการตรวจสอบแล้วมาห้กลับกับค่าระดับน้ำขึ้น-ลงที่ได้จากการบันทึกของเครื่องวัดระดับน้ำดิจิตอล ซึ่งกำหนดบันทึกทุกๆ 10 นาที อ้างอิงค่าระดับน้ำจากระดับทะเลปานกลางโดยการป้อนข้อมูลค่าระดับน้ำขึ้น-ลง ตามวันที่และเวลาที่ทำการสำรวจ โปรแกรมจะคำนวณและห้กลับค่าความลึกระดับน้ำโดยอัตโนมัติ นำข้อมูลที่ห้กลับระดับน้ำแล้วไปใช้ในการทำงานต่อไป แสดงดังรูปที่ 6 และรูปที่ 7



หมายเหตุ : หน้าต่างด้านซ้ายบน	คือ	ข้อมูลของงานสำรวจ ประกอบด้วย ตารางวันที่ เวลา ระดับความลึก ระดับน้ำขึ้น-ลง ค่าพิกัดและ ระดับที่ห้กลับระดับน้ำแล้ว
หน้าต่างด้านซ้ายล่าง	คือ	ช่วงของระยะเวลาที่สำรวจ
หน้าต่างด้านบนขวา	คือ	กราฟแสดงแสดงค่าข้อมูลสำรวจ
สีน้ำเงินด้านบน	คือ	ระดับท้องทะเลขณะสำรวจ
สีฟ้า	คือ	ระดับท้องทะเลที่ห้กลับระดับน้ำแล้ว
หน้าต่างด้านล่างขวาสีเทา	คือ	แผนที่ของบริเวณสำรวจ
เส้นปะสีฟ้า	คือ	เส้นที่ออกแบบแนวสำรวจ
เส้นสีเขียวทับ	คือ	แนวเก็บข้อมูลที่สำรวจ

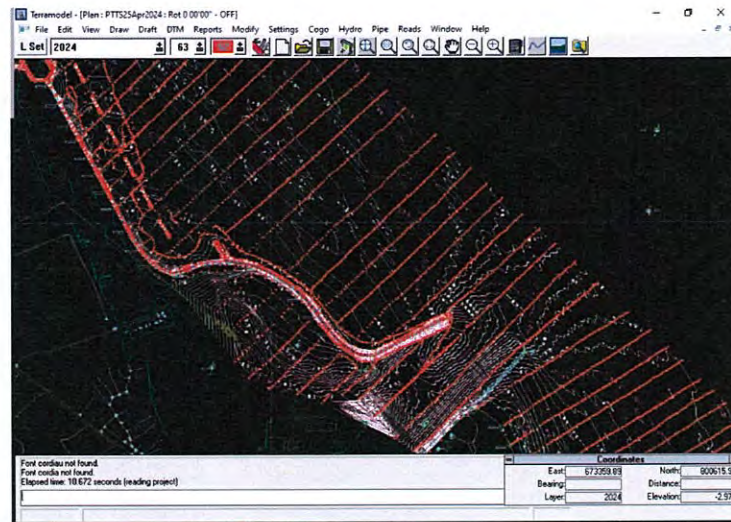
รูปที่ 6 การตรวจสอบข้อมูลสำรวจ



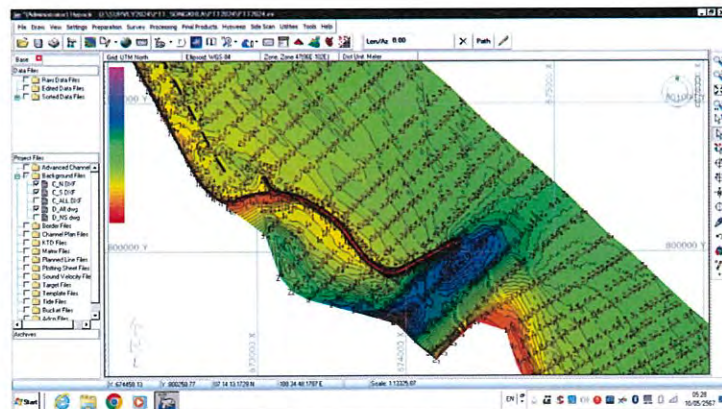
รูปที่ 7 แผนที่ของบริเวณสำรวจ



2) งานสร้างแผนที่และเส้นระดับความสูง (Contour) นำข้อมูลที่ได้จากการสำรวจ (Points) มาทำเป็นเลขแสดงระดับท้องน้ำ พร้อมกำหนดเส้นแสดงค่าระดับ (Contour) ซึ่งจะกำหนดไว้ทุกๆ 1.00 เมตร แสดงดังรูปที่ 8 และรูปที่ 9

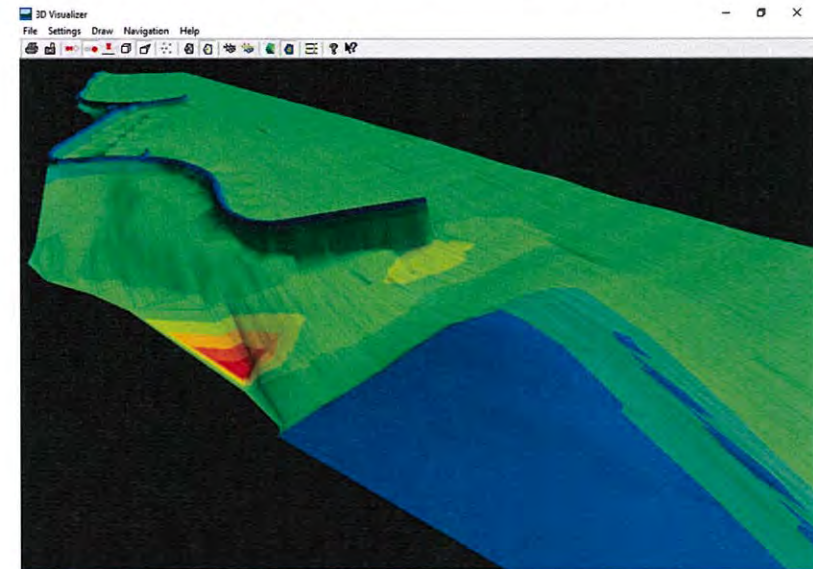


รูปที่ 8 การสร้างเลขระดับน้ำและเส้นชั้นความสูงจากโปรแกรมสำรวจ



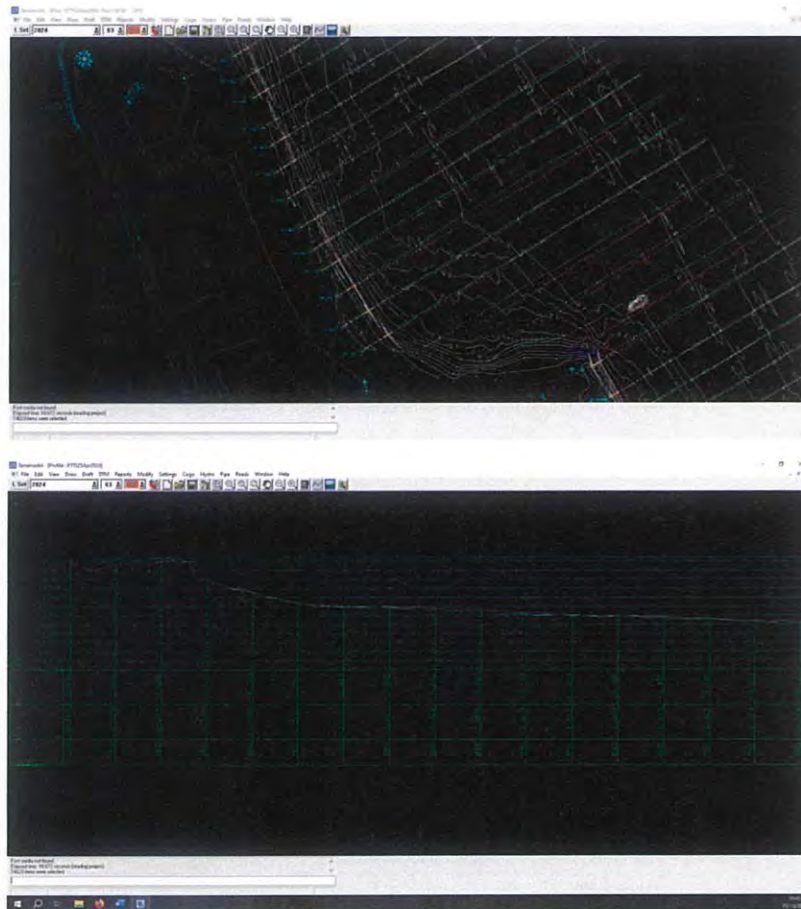
รูปที่ 9 การสร้างเลขระดับน้ำจากโปรแกรมสำรวจ

3) การทำรูปตัดแนวชายหาด จากข้อมูลที่ได้จากการสำรวจ (Points) นำมาสร้างพื้นผิว (Surface หรือ DTM) ซึ่งคุณลักษณะของ Points จะประกอบด้วย ค่า X, Y และ Z ดังนั้น โปรแกรมก็สามารถรวม Points และสร้างเป็นพื้นผิวขึ้นมา สร้างเส้นแนวตัด (Alignments) ในตำแหน่งที่ต้องการทำรูปตัดแนวชายหาด ใส่พิกัดจุดเริ่มต้นและพิกัดจุดสิ้นสุดของเส้นแนวตัด ในตำแหน่งและระยะที่ต้องการ คำนวณและพล็อตรูปตัดจากค่าสั่งในโปรแกรมสำรวจ โปรแกรมจะคำนวณและสร้างรูปตัดขึ้นมา แสดงดังรูปที่ 10 และรูปที่ 11



รูปที่ 10 พื้นผิวจำลองบริเวณสำรวจ





รูปที่ 11 โปรแกรมสำรวจ การสร้างรูปตัดแนวชายหาด

### 5.3 ผลการสำรวจ

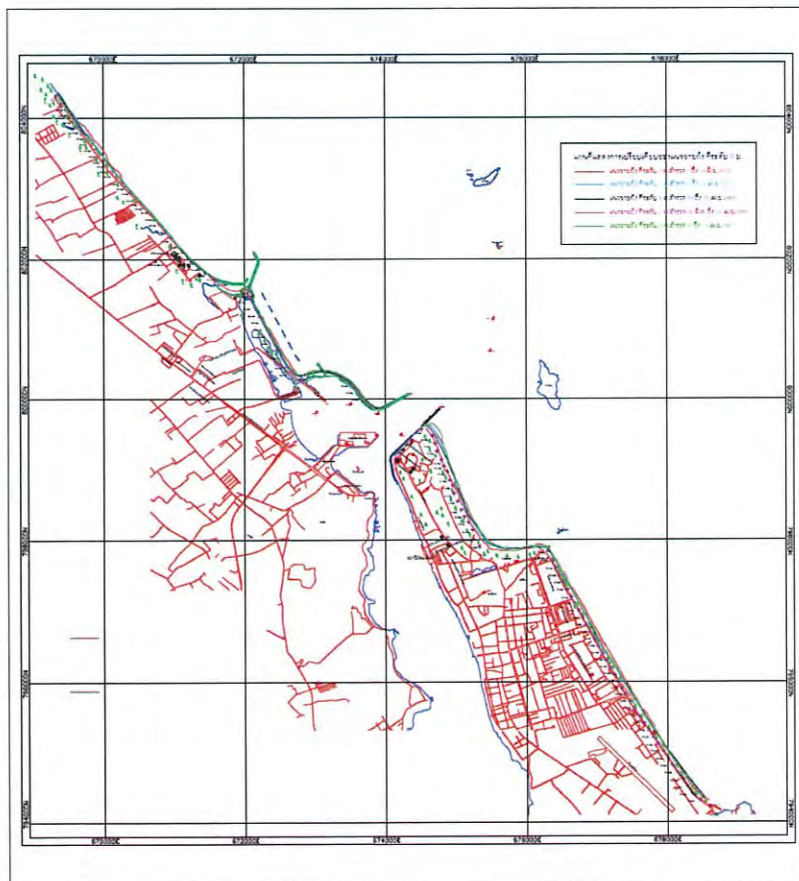
นำเอารูปตัดที่สำรวจในปี 2566 มาวางซ้อนทับรูปตัดที่สำรวจในปี 2567 เปรียบเทียบหาความแตกต่างของพื้นที่ท้องน้ำ แสดงแผนที่เปรียบเทียบของแนวชายฝั่งที่สำรวจ ที่ระดับ 0 เมตร และแผนที่ระดับความลึกท้องน้ำบริเวณที่สำรวจ ดังรูปที่ 12 และ 13 ตามลำดับ และสามารถสรุปผลได้ดังนี้

#### 1) บริเวณแนวชายหาดด้านทิศเหนือ

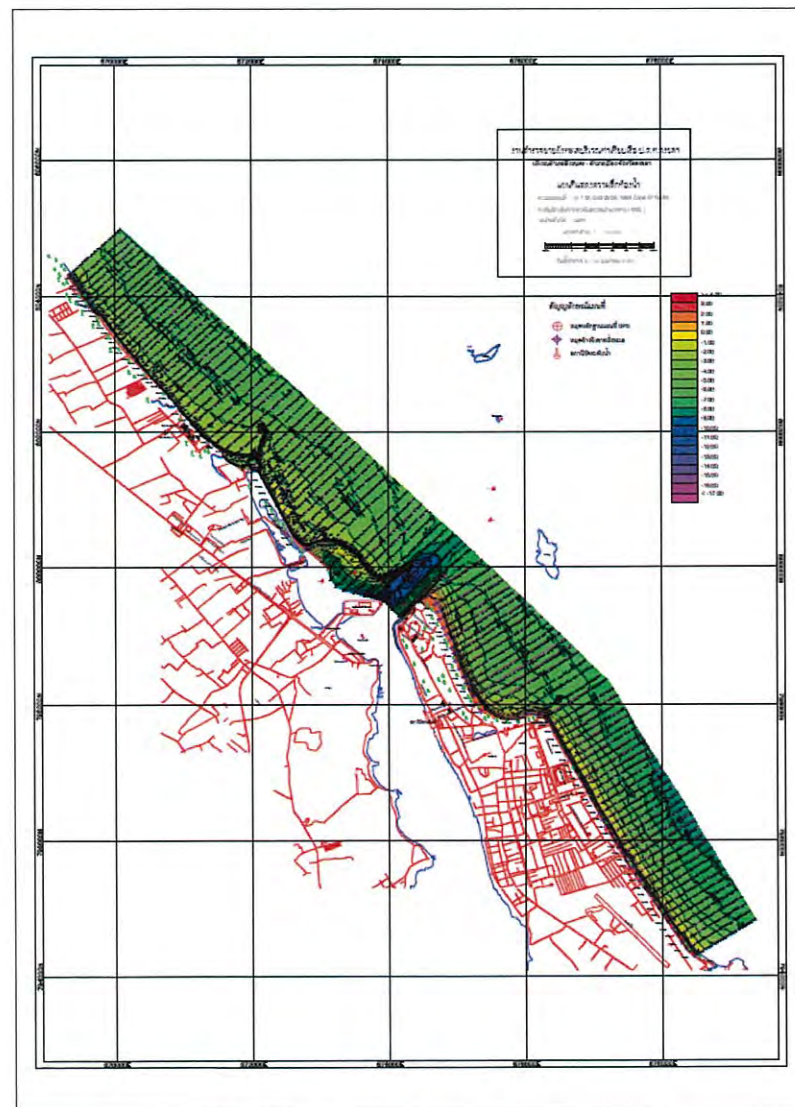
บริเวณตั้งแต่ BM.02 ถึง N3+900 เปรียบเทียบกับปี 2566 สภาพพื้นที่จากหมุดอ้างอิงออกไปมีการกัดเซาะของชายฝั่งเข้ามาประมาณ 25 เมตร ค่าระดับลดลงประมาณ 1.00-1.50 เมตร ระยะจาก 25 เมตรออกไปจนสุดแนวสำรวจ สภาพพื้นที่มีการทับถมของตะกอนเพิ่มขึ้น ค่าระดับเพิ่มขึ้นประมาณ 10-20 ซม. ความลาดเอียงของท้องทะเล จากเส้น Contour ที่ระดับ 2.50 ม. ออกไปถึงระยะที่ 400 เมตร มีความลาดเอียงประมาณ 1 ต่อ 250 (ทางดิ่งต่อราบ) จากระยะที่ 400 เมตร ออกไปมีความลาดเอียงประมาณ 1 ต่อ 400 (ทางดิ่งต่อราบ) แสดงดังภาพที่ 16



ภาพที่ 16 สภาพชายหาดช่วง BM02 ถึง N3+800



รูปที่ 12 แผนที่เปรียบเทียบของแนวชายฝั่งที่สำรวจ ที่ระดับ 0 เมตร



รูปที่ 13 แผนที่ระดับความลึกของน้ำบริเวณที่สำรวจ



บริเวณตั้งแต่ N3+800 ถึง N3+000 เปรียบเทียบกับปี 2566 สภาพพื้นที่บริเวณหมุดอ้างอิงมีการทับถมของตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 80-100 ซม. จากหมุดอ้างอิงออกไปจนสุดแนวสำรวจ มีการทับถมของตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 20-30 ซม. ความลาดเอียงของท้องทะเล จากเส้น Contour ที่ระดับ 2.50 ม. ออกไปถึงระยะที่ 400 เมตร มีความลาดเอียงประมาณ 1 ต่อ 250 (ทางฝั่งตอราบ) จากระยะที่ 450 เมตร ออกไปมีความลาดเอียงประมาณ 1 ต่อ 420 (ทางฝั่งตอราบ) แสดงดังภาพที่ 17

บริเวณตั้งแต่ N3+000 ถึง N1+900 เปรียบเทียบกับปี 2566 สภาพพื้นที่เป็นเขื่อนกันคลื่นทั้ง พื้นคอนกรีตบริเวณหมุดถูกกัดเซาะแตกพัง จากหมุดอ้างอิงออกไปจนสุดแนวสำรวจ มีการทับถมของตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 20-30 ซม. จากเส้น Contour ที่ระดับ 2.50 ม. ออกไปถึงระยะที่ 500 เมตร มีความลาดเอียงประมาณ 1 ต่อ 300 (ทางฝั่งตอราบ) จากระยะที่ 500 เมตร ออกไปจนสุดแนวสำรวจมีความลาดเอียงประมาณ 1 ต่อ 450 แสดงดังภาพที่ 18



ภาพที่ 17 สภาพชายหาดช่วง N3+800 ถึง N3+000



ภาพที่ 18 สภาพชายหาดช่วง N3+000 ถึง N2+000

บริเวณตั้งแต่ N1+900 ถึง N1+500 เปรียบเทียบกับปี 2566 สภาพพื้นที่เป็นเขื่อนกันคลื่นทั้ง มีการสร้างเขื่อนกันคลื่นซ้อนเขื่อนกันคลื่นทั้ง จากหมุดอ้างอิงออกไปจนสุดแนวสำรวจ มีการทับถมของตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 20-30 ซม. จากเส้น Contour ที่ระดับ 2.50 ม. ออกไปถึงระยะที่ 500 เมตร มีความลาดเอียงประมาณ 1 ต่อ 300 (ทางฝั่งตอราบ) จากระยะที่ 550 เมตร ออกไปจนสุดแนวสำรวจมีความลาดเอียงประมาณ 1 ต่อ 440 แสดงดังภาพที่ 19



ภาพที่ 19 สภาพชายหาดช่วง N1+900 ถึง N1+500

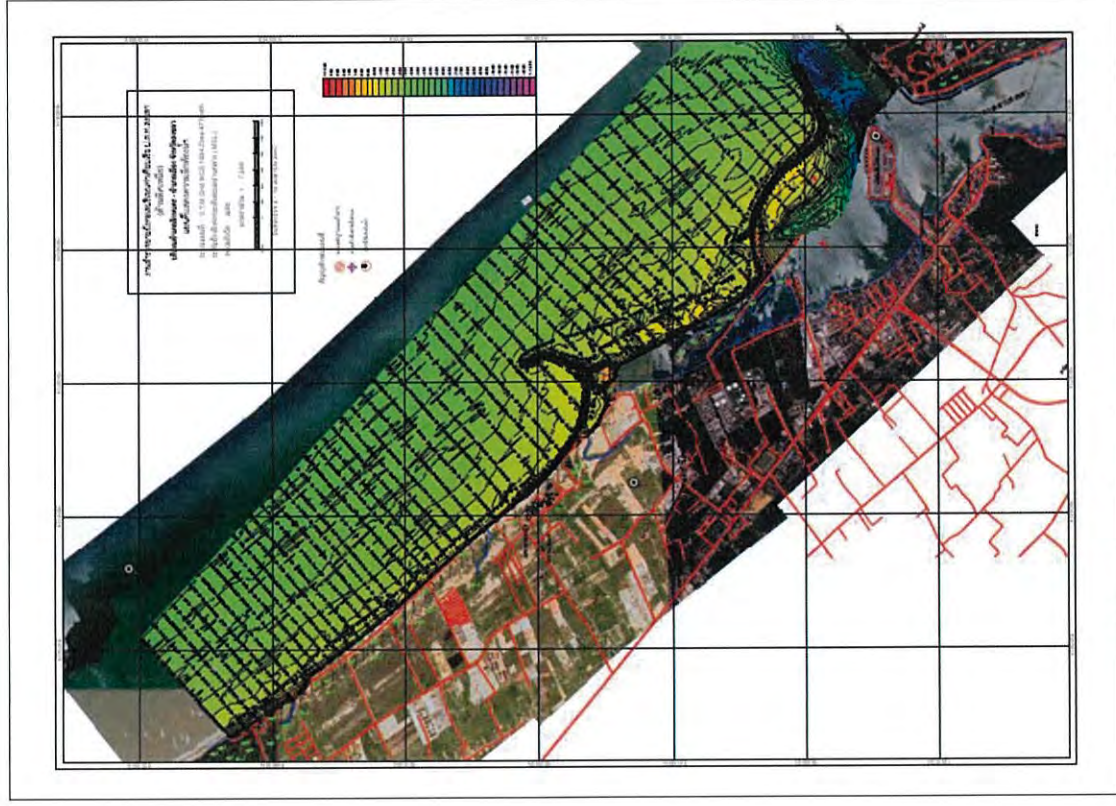


บริเวณตั้งแต่ N1+400 ถึง N1+300 เปรียบเทียบกับปี 2566 สภาพพื้นที่ที่มีการจากหนุดอ่างอิง  
ออกไปจนสุดแนวสำรวจ สภาพพื้นที่ที่มีการทับถมของตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 20-30 ซม  
ความลาดเอียงของทะเลประมาณ 1 ต่อ 480

บริเวณตั้งแต่ N1+200 ถึง N0+000 บริเวณตั้งแต่ริมสะพานหาดทรายแก้ว เมื่อเปรียบเทียบกับ  
ปี 2566 บริเวณหนุดอ่างอิงสภาพพื้นที่เป็นเขื่อนกันคลื่นจากหนุดอ่างอิงออกไประยะ 150 เมตร มีการทับถมของ  
ตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 20-30 ซม จากระยะที่ 150 เมตร ออกไป สภาพพื้นที่มีการเปลี่ยนแปลงเพิ่มขึ้น  
ลดลงของตะกอนเล็กน้อย ความลาดเอียงของทะเลมีความลาดเอียงประมาณ 1 ต่อ 400 (ทางฝั่งตอราบ)  
แสดงดังภาพที่ 20 และแสดงแผนที่ความลึกของต่อน้ำบริเวณแนวชายหาดทางด้านทิศเหนือ ดังรูปที่ 14



ภาพที่ 20 สภาพชายหาดช่วง N1+200, N0+000



รูปที่ 14 แผนที่ความลึกของต่อน้ำบริเวณแนวชายหาดทางด้านทิศเหนือ



## 2) บริเวณแนวชายหาดด้านทิศใต้

แนวสำรวจที่ S0+100 S0+200 S0+300 เมื่อเปรียบเทียบรูปตัดกับปี 2566 ค่าระดับมีการเปลี่ยนแปลงเล็กน้อย มีการทับถมของตะกอนเพิ่มขึ้นประมาณ 20-30 ซม. ความลาดเอียงของท้องทะเลมีความลาดเอียงประมาณ 1 ต่อ 390 (ทางดิ่งต่อราบ)

บริเวณตั้งแต่ S0+800 ถึง S1+200 เมื่อเปรียบเทียบรูปตัดกับปี 2566 บริเวณตั้งแต่หมุดอ้างอิงออกไปประมาณ 150 ม. มีการทับถมของทรายเพิ่มขึ้นประมาณ 80-100 ซม. จากระยะที่ 150 เมตร ออกไปจนสุดแนวสำรวจมีการทับถมของตะกอนเพิ่มขึ้นประมาณ 20-30 ซม. ความลาดชันของท้องทะเลมีความลาดเอียงประมาณ 1 ต่อ 380 (ทางดิ่งต่อราบ) **ภาพที่ 21**



ภาพที่ 21 สภาพชายหาดช่วง S0+800, S1+200

บริเวณตั้งแต่ S1+200 ถึง S2+000 เมื่อเปรียบเทียบรูปตัดกับปี 2566 บริเวณตั้งแต่หมุดอ้างอิงออกไปประมาณ 100 ม. มีการทับถมของทรายเพิ่มขึ้นประมาณ 80-100 ซม. จากระยะที่ 100 เมตร ออกไปจนสุดแนวสำรวจมีการทับถมของตะกอนเพิ่มขึ้นประมาณ 20-30 ซม. ความลาดชันของท้องทะเลมีความลาดเอียงประมาณ 1 ต่อ 390 (ทางดิ่งต่อราบ) **ภาพที่ 22**



ภาพที่ 22 สภาพชายหาดช่วง S1+200, S2+000

บริเวณตั้งแต่ S2+000 ถึง S2+400 เมื่อเปรียบเทียบรูปตัดกับปี 2566 สภาพพื้นที่มีตั้งแต่หมุดอ้างอิงออกไปประมาณ 200 เมตร มีการทับถมของทรายเพิ่มขึ้น-ลดลงเล็กน้อยประมาณ 30-40 ซม. จากระยะที่ 300 เมตร ออกไปจนสุดแนวสำรวจมีการทับถมของตะกอนเพิ่มขึ้นประมาณ 20-30 ซม. ความลาดเอียงของท้องทะเลมีความลาดเอียงประมาณ 1 ต่อ 400 (ทางดิ่งต่อราบ)

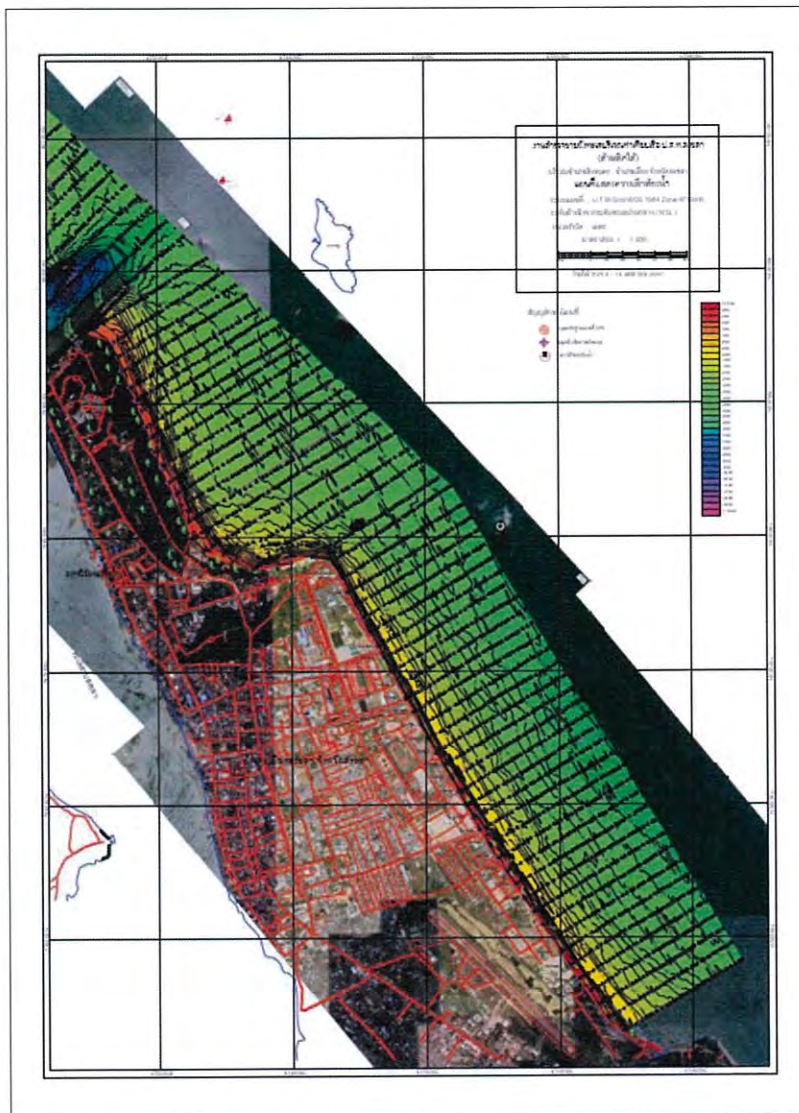
บริเวณตั้งแต่ S2+500 ถึง S4+700 เปรียบเทียบกับปี 2566 สภาพพื้นที่จากหมุดอ้างอิงออกไปประมาณ 300 เมตร มีการทับถมของตะกอนเพิ่มขึ้นเฉลี่ยประมาณ 20-30 ซม. จากระยะที่ 300 เมตร ออกไปจนสุดแนวสำรวจมีการทับถมของตะกอนเพิ่มขึ้นและลดลงเล็กน้อยประมาณ 10-20 ซม. ความลาดเอียงของท้องทะเลมีความลาดเอียงประมาณ 1 ต่อ 380 (ทางดิ่งต่อราบ)

บริเวณตั้งแต่ S4+700 ถึง S5+700 เมื่อเปรียบเทียบรูปตัดกับปี 2566 บริเวณตั้งแต่หมุดอ้างอิงออกไปประมาณ 200 เมตร มีค่าระดับเพิ่มขึ้นเฉลี่ยประมาณ 10-20 ซม. จากระยะที่ 300 เมตร ออกไปจนสุดแนวสำรวจค่าระดับเพิ่มขึ้นเล็กน้อยประมาณ 15-25 ซม. ความลาดเอียงของท้องทะเลประมาณ 1 ต่อ 400 (ทางดิ่งต่อราบ)

บริเวณตั้งแต่ S5+700 ถึง S6+000 เมื่อเปรียบเทียบรูปตัดกับปี 2566 บริเวณตั้งแต่หมุดอ้างอิงออกไปประมาณ 80 เมตร มีการกัดเซาะตลิ่ง ค่าระดับลดลงประมาณ 100-150 ซม. จากระยะที่ 80 เมตร ออกไปจนสุดแนวสำรวจ ค่าระดับเพิ่มขึ้นและลดลงเล็กน้อยประมาณ 15-25 ซม. ความลาดเอียงของท้องทะเลประมาณ 1 ต่อ 380 (ทางดิ่งต่อราบ) แสดงดัง**ภาพที่ 23** และแสดงแผนที่ความลึกของท้องน้ำบริเวณแนวชายหาดทางด้านทิศเหนือ ดัง**รูปที่ 15**



ภาพที่ 23 สภาพชายหาดช่วง S2+500, S6+000



รูปที่ 15 แผนที่ความลึกของท้องน้ำบริเวณแนวชายหาดทางด้านทิศใต้

#### เอกสารประกอบรายงาน

- แบบแผนที่ มาตราส่วน 1 : 7,500 จำนวน 2 แผ่น ( Auto Cad File)
- แบบแผนที่ มาตราส่วน 1 : 15,000 จำนวน 1 แผ่น ( Auto Cad File)
- แบบแผนที่เปรียบเทียบเส้นชั้นความสูง มาตราส่วน 1 : 15,000 จำนวน 1 แผ่น ( Auto Cad File)
- แบบรูปตัดตามแนวชายหาด มาตราส่วน แนวนอน 1 : 1,000 มาตราส่วนแนวตั้ง 1 : 100  
จำนวน 34 แผ่น ( Auto Cad File)
- ข้อมูลระดับน้ำ (Text File)
- ข้อมูลสำรวจ X,Y,Z (Text File)



## รายละเอียดคุณลักษณะของเครื่องมือสำรวจ

### 1. GPS.

#### KEY FEATURES

Industry-leading technology provides superior performance

Flexible configurations put you in total control

Rugged, high-performance hardware is built to last

With the Trimble controller and software of your choice, enjoy seamless integrated surveying



#### ONE RECEIVER, MANY CONFIGURATIONS, FOR GREATER FLEXIBILITY AND CHOICE

The Trimble® 5700 GPS receiver is an advanced, but easy-to-use, surveying instrument that is rugged and versatile enough for any job.

Combine your 5700 with the antenna and radio that best suit your needs, and then add the Trimble controller and software of your choice for a total surveying solution. The powerful 5700 GPS system will provide all the advanced technological power and unparalleled flexibility you need to increase your efficiency and productivity in any surveying environment.

#### ADVANCED GPS RECEIVER TECHNOLOGY

The 5700 is a 24-channel dual-frequency RTK GPS receiver featuring the advanced Trimble Maxwell™ technology for superior tracking of GPS satellites, increased measuring speed, longer battery life through less power use, and optimal precision in tough environments. WAAS and EGNOS capability lets you perform real-time differential surveys to GIS grade without a base station.

#### MODULAR DESIGN FOR VERSATILITY

For topographic, boundary, or engineering surveying, clip the receiver to your belt, carry it in a comfortable backpack, or configure it with all components on a lightweight range pole. With the receiver attached to your site vehicle, you can survey a surface as fast as you can drive! For control applications, attach the receiver to a tripod ... it's designed to work the way your job requires.

#### FULL METAL JACKET ... AND LIGHTWEIGHT

The 5700 GPS receiver boasts the toughest mechanical and waterproofing specs in the business. Its magnesium alloy case is stronger than aluminum, but also 30% lighter—the 5700 weighs just 1.4 kg (3 lb) with batteries. Whether you're collecting control points on a tripod, or scrambling down a steep slope collecting real-time kinematic data, the receiver is light enough and tough enough to carry on performing.

#### FAST AND EFFICIENT DATA STORAGE AND COMMUNICATIONS

Use the receiver's CompactFlash memory to store more than 3,400 hours of continuous L1/L2 data collection at an average of 15-second intervals. Transfer data to a PC at speeds of more than 1 megabit per second through the super-fast USB port. Your choice of UHF radio modem is built in to the receiver to provide RTK communications receiving without the need for cables or extra power!

#### YOUR CHOICE OF TRIMBLE ANTENNA

Choose the high-accuracy Trimble GPS antenna that best suits your needs: the lightweight and portable Zephyr™ antenna for RTK roving, or the Zephyr Geodetic™ antenna for geodetic surveying.

The Zephyr Geodetic antenna offers submillimeter phase center repeatability and excellent low-elevation tracking, while the innovative design of its Trimble Stealth™ ground plane literally burns up multipath energy using technology similar to that used by stealth aircraft to hide from radar. The Zephyr Geodetic antenna thus provides unsurpassed accuracy from a portable antenna.



#### General

- Front panel for on/off, one button push data logging, CompactFlash card formatting, ephemeris and application file deletion, and restoring default controls
- LED indicators for satellite tracking, radio-link, data logging, and power monitoring
- Tripod clip or integrated base case

#### PERFORMANCE SPECIFICATIONS

##### Measurements

- Advanced Trimble Maxwell technology
- High precision multiple correlator L1 and L2 pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurement data for low noise, low multipath error, low time domain correlation, and high dynamic response
- Very low noise L1 and L2 carrier phase measurements with <1 mm precision at a 1 Hz bandwidth
- L1 and L2 Signal-to-Noise ratios reported in dB-Hz
- Proven Trimble low-elevation tracking technology
- 24 Channels L1 C/A Code, L1/L2 Full Cycle Carrier, WAAS/EGNOS

##### Code differential GPS positioning<sup>1</sup>

- Horizontal ..... ±0.25 m + 1 ppm RMS
- Vertical ..... ±0.5 m + 1 ppm RMS
- WAAS differential positioning accuracy typically <5 m 3D RMS<sup>2</sup>

##### Static and FastStatic GPS surveying<sup>3</sup>

- Horizontal ..... ±5 mm + 0.5 ppm RMS
- Vertical ..... ±5 mm + 1 ppm (± baseline length) RMS

##### Kinematic surveying<sup>4</sup>

- Real time and postprocessed kinematic surveys
- Horizontal ..... ±(10 mm + 1 ppm) (± baseline length) RMS
- Vertical ..... ±20 mm + 1 ppm RMS
- Initialization time ..... Single/Multi-base minimum 10 sec + 0.5 times baseline length in km, up to 30 km
- Scalable GPS infrastructure initialization time ..... <30 seconds typical anywhere within coverage area
- Initialization reliability<sup>5</sup> ..... Typically >99.9%

#### HARDWARE

##### 5700 GPS receiver

- Physical:
- Casing ..... Tough, lightweight, fully sealed magnesium alloy
- Water/dustproof ..... IP67 Dustproof, protected from temporary immersion to depth of 1 m (3.28 ft)
- Shock and vibration ..... Tested and meets the following environmental standards:
- Shock ..... MIL-STD-883C to survive a 1 m (3.28 ft) drop onto concrete
- Vibration ..... MIL-STD-883C on each axis
- Weight ..... With internal batteries, internal radio, internal battery charger, standard UHF antenna: 1.4 kg (3 lb) As enter RTK rover with batteries for greater than 7 hours, less than 4 kg (8.8 lb)
- Dimensions (W×H×U) ..... 13.5 cm × 8.5 cm × 24 cm (5.3 in × 3.4 in × 9.5 in)
- Electrical:
- Power ..... DC input 11 V DC to 28 V DC with over voltage protection
- Power consumption ..... 2.5 W receiver only, 3.75 W including internal radio
- Battery ..... Greater than 10 hours data logging, or greater than 7 hours of RTK operation on two internal 2.0 Ah lithium-ion batteries
- Battery weight ..... 0.1 kg (0.1 kg oz)

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- Battery charger ..... Internal with external AC power adapter; no requirement for external charger
- Power output ..... 11.5 V to 20 V DC (Port 1), 11.5 V DC to 27.5 V DC (Port 2) on external power input
- Certification ..... Class B Part 15 FCC certification, CE Mark approved, C-Tick approved, Canadian FCC

##### Environmental:

- Operating temperature ..... -40 °C to 65 °C (-40 °F to 149 °F)
- Storage temperature ..... -40 °C to 80 °C (-40 °F to 176 °F)
- Humidity ..... 100%, condensing

##### Communications and data storage:

- 2 external power ports, 2 internal battery ports, 3 RS232 serial ports
- Integrated USB for data download speeds in excess of 1 Mb per second
- External GPS antenna connector
- CompactFlash advanced lightweight and compact removable data storage. Options of 64 MB or 128 MB from Trimble
- More than 3,400 hours continuous L1/L2 logging at 15 seconds with 6 satellites typical with 128 MB card
- Fully integrated, fully sealed internal UHF radio modem option
- GSM, GPRS, and CDMA modem support
- Dual event marker input capability
- 1 Hz, 2 Hz, 5 Hz, and 10 Hz positioning and data logging
- 1 pulse per second output capability
- CMR, CMR+, RTCM 2.0 and 3.0 input and output standard
- 15 NMEA outputs

##### Zephyr antenna

- Dimensions ..... 16.2 cm × 6.2 cm diameter height (6.38 in × 2.44 in)
- Weight ..... 0.55 kg (1.29 lb)
- Operating temperature ..... -40 °C to 70 °C (-40 °F to 158 °F)
- Humidity ..... 100% humidity proof, fully sealed
- Shock and vibration ..... Tested and meets the following environmental standards:
- Shock ..... MIL-STD-883C to survive a 2 m (6.56 ft) drop onto concrete
- Vibration ..... MIL-STD-883C on each axis
- 4-point antenna feed for submillimeter phase center repeatability
- Integral low noise amplifier
- 50 dB antenna gain

##### Zephyr Geodetic antenna

- Dimensions ..... 34.3 cm (13.5 in) diameter × 7.6 cm (3 in) height
- Weight ..... 1.31 kg (2.88 lb)
- Operating temperature ..... -40 °C to 70 °C (-40 °F to 158 °F)
- Humidity ..... 100% humidity proof, fully sealed
- Shock and vibration ..... Tested and meets the following environmental standards:
- Shock ..... MIL-STD-883C to survive a 2 m (6.56 ft) drop onto concrete
- Vibration ..... MIL-STD-883C on each axis
- 4-point antenna feed for submillimeter phase center repeatability
- Integral low noise amplifier
- 50 dB antenna gain
- Trimble Stealth ground plane for reduced multipath

<sup>1</sup> Accuracy may be subject to conditions such as multipath, obstructions, satellite geometry, and atmospheric parameters. Always follow recommended survey practices.  
<sup>2</sup> Excludes ionospheric delay correction.  
<sup>3</sup> May be affected by atmospheric conditions, signal multipath, and satellite geometry.  
<sup>4</sup> Initialization reliability is continuously monitored to ensure highest quality.  
<sup>5</sup> Receiver operation normally to -40 °C (-40 °F). Not some other-based functions such as USB download or internal battery charging are not recommended at temperatures below freezing.

Specifications subject to change without notice.





## 2. ECHO SOUNDER

Hydrotrac II

Teledyne Odom Hydrographic

# Hydrotrac II

Single-Frequency  
Portable Hydrographic  
Echo Sounder

Precise Data  
Collection in  
Adverse Conditions

Specifically designed for work in less-than-ideal circumstances on all survey boats and inflatable watercraft, the HYDROTRAC II is a compact, portable and the confidence of knowing you're using a proven Odom product. It is completely waterproof and comes equipped with the same advanced features you've come to trust and depend on in Odom echo sounders.



Frequency Agile	Operable through menu - 24, 28, 33, 40, 100, 120, 200, 210 and 340 kHz	
Output Power	600 watts	
Power Regulation	11.28 VDC	
Resolution	0.1 ft/0.01m	
Accuracy	200 kHz - 1cm 0.1% of depth value (corrected forward velocity) 33 kHz - 10cm 0.1% of depth value (corrected forward velocity)	
Maximum Depth Range	600m or 1800 ft.	
Operating Temperature	0° - 45° C	
Storage Temperature	-20° - 45° C	
Communication	2 RS232 ports or 1 RS232 and 1 RS422 Ethernet port	8 bit data 1600 samples/sec
Printer	High resolution 8 dot/inch 600 dpi, 16 grey shades, 216mm x 85 mm wide thermal paper Batteries ON/OFF switch, paper advance control	
Dimensions	368 mm x 445 mm x 149 mm 14.5 in x 17.5 in x 5.9 in	
Weight	22.5 lbs (10.2 kg)	
Display Panel Layout	4 Line x 20 character display OFF/STBY/LOW MED/HIGH power settings Chart ON/OFF with LED indicator Chart Advance Sensitivity	Chart Plot Separate parallel overlay ECDIS display and chart control Keypad (arrow keys) Power Gain
Sensor I/O	GPS Analogous chart Bathymetric position in Ethernet packet	MRU Hose connects data Outputs MRU data in Ethernet packet
Software	TEHAWA industrial software included - Chart Display, Control & Logging Software	
Options	200 kHz or 340 kHz transducer Wide selection of transducers Remote display Lithium ion battery Transducer with wheels Internal GPS with WAAS differential correction and RS reference signal Antenna upgrade	

## 3. โปรแกรมสำรวจ



### Applications

- Port and harbor surveys and maintenance
- General hydrographic surveys
- Environmental surveys
- Cable and pipe maintenance surveys
- Mooring buoy installation
- Industrial marine applications

### Features

- HYDROpro Navigation software
- Operates on Windows operating systems for simple point-and-click operation
- Fully configurable geodetic database with many pre-defined ellipsoids and coordinate systems
- Coordinate Calculator for points and files
- Built-in site calibration and adjustment
- Graphical vessel shape editor
- Automatic switching to backup (secondary) position and attitude sensors
- Powerful multiple 'steerby' facility and vessel to vessel guidance
- Multiple vessels and guidance objects (targets, runlines, routes)
- Interactive, real-time Plan View Map with rotation including Line Up
- DIF and raster image background display files supported
- Configurable survey test displays (data from Data Tree)
- Log of operator's notes and system alarms
- Multiple sensor inputs (limited by hardware only)
  - Heave and tide data from RIK
- Real-time depth profile and channel cross section display
- User-defined echosounder annotations
- Navigation data output to multibeam systems
- Project information and survey data all stored in a single Microsoft Access database file
- Heading from dual positioning devices
- Fully configurable equipment timing (latency, pulse-per-second, 'timeouts')
- Time stamping to 1 millisecond precision
- Output of data to printer, file, or serial ports in real-time
- On-line help and training

### HYDROpro NavEdit software (included)

- Position, depth, heave, and tide editing by interactive graphics or batch processing
- Graphical displays show both the raw and composite data on same screen

- Sounding Selection to reduce processed data volume
- User definable ASCII format and proprietary data files for postprocessing (import and export)

Teramod HDMS software (optional)

- Rapid contouring, plotting, cross sections, and volumes

### Technical Specifications

#### Minimum Configuration

Processor	Pentium II 300 MHz
RAM	128 MB
Hard drive	4 GB
Monitor	SVGA color 1024 x 768
Data device	CD-ROM drive
Operating system	Windows NT, 2000, or XP Professional

### Options

- Components such as radio telemetry can be ordered through Trimble.
- Fix box for triggering and receiving events
- Training

### Ordering Information

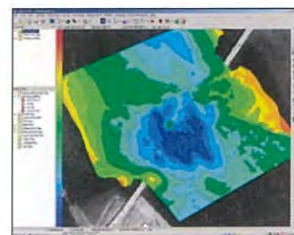
HYDROpro Navigation software is available standard with quick reference guide, security key, and software manuals on CD.

HYDROpro Navigation	Part Number 44292-00
HYDROpro Construction upgrade	Part Number 44296-00
Teramod HDMS	Part Number 44290-00
Teramod Channel Design	Part Number 45164-00
Teramod Visualizer	Part Number 44261-00

For further information contact your local Trimble office or representative. You may also visit our website at <http://www.trimble.com>.

Specifications subject to change without notice.





HYPACK® is a Windows™-based software package used primarily for hydrographic surveying and data processing.

It is optimized to run under:

- Windows 2000™
- Windows XP™

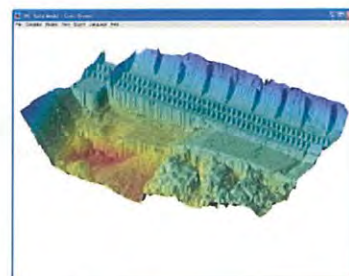
HYPACK® performs all of the tasks necessary to complete your survey from beginning to end.

- Geodetic Parameters
- Planned Line Design
- Equipment Configuration
- Data Collection supporting over 200 sensors
- Data Processing
- Tides and Sound Velocity
- Sounding Reduction
- Export to DXF/DGN
- Plotting of Smooth Sheets
- Volumes by Section
- Volumes by Surface Model
- Contouring to DXF
- 3D Visualization
- Side Scan Collection and Processing
- ACDP Collection and Display

The optional HYSWEEP® module allows for the configuration, calibration, collection and processing of multibeam and multiple transducer sonar systems.

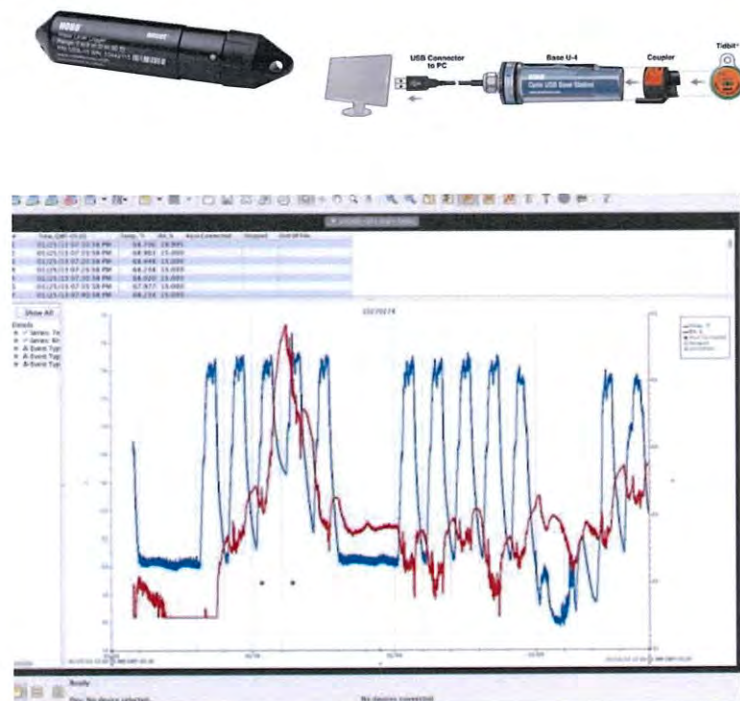
The DREDGEPAK® version allows you to maximize the efficiency of your dredge operations by tracking and maintaining a history of where the cutting tool has passed and how deep it was.

HYPACK®, HYSWEEP® and DREDGEPAK® are all developed by HYPACK, Inc.



A 3D Model of Boreville Dam  
(Data courtesy David Evans and Assoc., Portland, OR)

#### 4. เครื่องวัดระดับน้ำ



#### HOBOT20L Water Level Logger – U20L

The HOBOT20L is a low-cost, research-grade water level data logger for continuously measuring water level and temperature in a wide range of underwater environments. It features 0.1% measurement accuracy, a polypropylene housing for use in both fresh and salt water, and a non-vented design for convenient and hassle-free deployment.

This data logger requires either the U-DTW-1 Waterproof Shuttle or the Base-U-4 Base Station for configuration and data offload, HOBOWare software (free download). NOTE: HOBOWare Pro is required when using the U-DTW-1 Waterproof Shuttle. See compatible items below.

#### 5. กล้องสำรวจ



##### 5.1. ระบบกล้องเล็ง

- กำลังขยาย 30 เท่า
- ขนาดความกว้างของภาพ 1 องศา 30 ลิปดา (26 เมตร ที่ระยะ 1 กิโลเมตร)
- ระยะเห็นภาพชัดใกล้สุดไม่เกิน 1.7 เมตร
- ตัวกล้องถอดจากฐานกล้องได้
- Laser Plummet ค่าความถูกต้อง 1.5 มิลลิเมตร ที่ระยะ 1.5 เมตร

##### 5.2. ระบบการวัดมุม

- ระบบวัดมุมแบบ Absolute, Continuous, Diametric แสดงผลบนจอ LCD ทั้งสองด้าน
- ความละเอียด (Accuracy) 5 ฟิลิปดา
- มีระบบ Compensator แบบ Quadruple axis
- โครงสร้างกล้อง ป้องกันละอองน้ำและฝุ่นได้ ตามมาตรฐาน IP54

##### 5.3. ระบบการวัดระยะทาง

- วัดระยะทางได้ 1.7 ถึง 250 เมตร โดยไม่ใช้เป้าสะท้อน และในสภาวะอากาศปกติ วัดระยะทางได้ 3,000 เมตร โดยใช้เป้าสะท้อนแบบ 1 ดวง
- แสดงค่าการวัดได้ละเอียด 1 มิลลิเมตร (Precise mode)
- ความถูกต้องของการวัดระยะใหม่ ใช้เป้าสะท้อน เท่ากับ  $\pm(2\text{mm} + 2\text{ppm})$  และโหมด Reflectless เท่ากับ  $\pm(3\text{mm} + 2\text{ppm})$



ภาคผนวก ง

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ใบรับรองการสอบเทียบเครื่องมือ



right solutions.  
right partner.

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	SGK_FS0084	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	SGK_FS0120	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0403	8-Jun-23	8-Jun-24	12
Ambient	Particulate Matter (PM-10)	High Volume	SGK_FS0086	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	SGK_FS0122	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BKK_EN0403	8-Jun-23	8-Jun-24	12
Ambient	Carbon Monoxide	CO Analyzer	SGK_FS0068	3-Jan-24	3-Jul-24	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0742	3-Jan-24	3-Jul-24	6
Ambient	Total Hydrocarbon	Total Hydrocarbon Analyzer	BKK_FS1068	11-Dec-23	11-Jun-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0089	13-Jan-23	13-Jul-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0088	13-Jan-23	13-Jul-24	18
Noise	Leq 24 hrs	Sound Calibrator	SGK_FS0011	19-Oct-23	19-Oct-24	12
Noise	Leq 24 hrs	Sound Level Meter	SGK_FS0131	27-Mar-23	27-Mar-24	12
Noise	Leq 24 hrs	Sound Level Meter	SGK_FS0132	27-Mar-23	27-Mar-24	12
Noise	Leq 24 hrs	Sound Level Meter	SGK_FS0133	27-Mar-23	27-Mar-24	12
Noise	Leq 8 hrs	Sound Calibrator	SGK_FS0011	19-Oct-23	19-Oct-24	12
Noise	Leq 8 hrs	Sound Level Meter	SGK_FS0131	27-Mar-23	27-Mar-24	12
Sea Water	BOD	Incubator	SGK_CL0028	13-Jul-23	13-Jan-25	18
Sea Water	BOD	DO/BOD Analyser	SGK_CL0073	21-May-24	21-Nov-25	18
Sea Water	pH at 25 °C	pH meter	SGK_CL0030	28-Apr-23	28-Oct-24	18
Sea Water	Oil & Grease	Electronic Top-Loading Balance	SGK_CL0045	15-Jan-24	15-Jan-25	12
Sea Water	Oil & Grease	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Sea Water	Oil & Grease	Water Bath	SGK_CL0035	13-Jul-23	13-Jan-25	18
Sea Water	Temperature	pH meter	SGK_FS0019	15-Feb-24	15-Feb-25	12
Sea Water	Total Suspended Solids	Electronic Top-Loading Balance	SGK_CL0045	15-Jan-24	15-Jan-25	12
Sea Water	Total Suspended Solids	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Sea Water	Salinity	Conductivity meter	SGK_CL0032	6-May-24	6-May-25	12
Sea Water	Turbidity	Turbidity Meter	SGK_FS0045	22-May-24	22-May-25	12
Sea Water	Total Coliform	Autoclave	SGK_ML0001	5-Jan-23	5-Jul-24	18
Sea Water	Total Coliform	Incubator	SGK_ML0013	15-Jan-24	15-Jul-25	18
Sea Water	Total Coliform	pH Meter	SGK_ML0016	5-Jan-23	5-Jul-24	18
Sea Water	Total Coliform	Water Bath	SGK_ML0021	30-Jan-23	30-Jul-24	18
Sea Water	Fecal Coliform	Autoclave	SGK_ML0001	5-Jan-23	5-Jul-24	18
Sea Water	Fecal Coliform	Incubator	SGK_ML0013	15-Jan-24	15-Jul-25	18
Sea Water	Fecal Coliform	pH Meter	SGK_ML0016	5-Jan-23	5-Jul-24	18
Sea Water	Fecal Coliform	Water Bath	SGK_ML0021	30-Jan-23	30-Jul-24	18
Sea Water	Sulfide	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Sea Water	Sulfide	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Sea Water	Nitrate	Ion Chromatography	BKK_EN0069	12-Jan-24	12-Jan-25	12
Sea Water	Phosphate	Ion Chromatography	BKK_EN0069	12-Jan-24	12-Jan-25	12
Songkhla Lab	BOD	Incubator	SGK_CL0028	13-Jul-23	13-Jan-25	18
Songkhla Lab	BOD	DO/BOD Analyser	SGK_CL0073	21-May-24	21-Nov-25	18
Songkhla Lab	COD	COD Reactor	SGK_CL0085	24-Jan-24	24-Jan-25	12
Songkhla Lab	COD	Spectrophotometer	SGK_CL0038	24-Jan-24	24-Jan-25	12
Songkhla Lab	pH at 25 °C	pH meter	SGK_CL0030	28-Apr-23	28-Oct-24	18
Songkhla Lab	Oil & Grease	Electronic Top-Loading Balance	SGK_CL0045	15-Jan-24	15-Jan-25	12
Songkhla Lab	Oil & Grease	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Songkhla Lab	Oil & Grease	Water Bath	SGK_CL0035	13-Jul-23	13-Jan-25	18
Songkhla Lab	Total Dissolved Solids 103-105°C	Electronic Top-Loading Balance	SGK_CL0045	15-Jan-24	15-Jan-25	12
Songkhla Lab	Total Dissolved Solids 103-105°C	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Songkhla Lab	Total Suspended Solids	Electronic Top-Loading Balance	SGK_CL0045	15-Jan-24	15-Jan-25	12
Songkhla Lab	Total Suspended Solids	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18



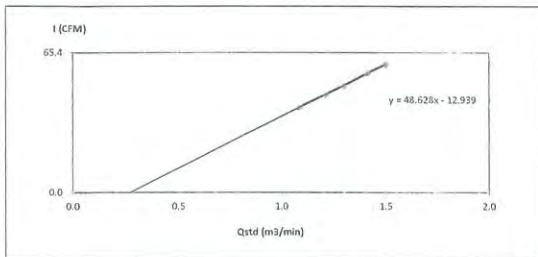




### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf JP NK2 Co.,Ltd Barometric Pressure (mm Hg): 756.5  
Calibrate Location: บ้านใหม่เจริญ Temperature (°C): 36.1  
Calibrate Date: 14-May-24 High Volume ID: BKK\_FS1376  
Calibration Sheet No.: C-140524-BKK\_FS1376 High Volume Model: TE-5009X  
Calibrator ID: RYG\_FS0415 High Volume S/N: 6257  
Calibrator Model: TE-5028A Calibrator Slope: 1.66431  
Calibrator S/N: 3494 Calibrator Intercept: -0.03482

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.2	1.0877	40	Slope: 48.6204 Intercept: -12.9395 Correlation Coefficient: 0.9999
2	4.0	1.2120	46	
3	4.6	1.2972	50	
4	5.5	1.4152	56	
5	6.2	1.5004	60	



Calibrated by: Auth A.  
(Mr. Autit Aonsim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppog Juntarupan)  
Enviro Field Coordinator Scientist (3)

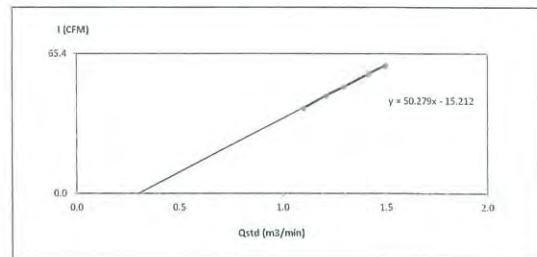
FORM NO. F 06-073 REVISION NO.2 ISSUE DATE: 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf JP NK2 Co.,Ltd Barometric Pressure (mm Hg): 756.5  
Calibrate Location: บ้านใหม่เจริญ Temperature (°C): 36.5  
Calibrate Date: 14-May-24 High Volume ID: BKK\_FS1056  
Calibration Sheet No.: C-140524-BKK\_FS1056 High Volume Model: TE-5009X  
Calibrator ID: RYG\_FS0415 High Volume S/N: 5499  
Calibrator Model: TE-5028A Calibrator Slope: 1.66431  
Calibrator S/N: 3494 Calibrator Intercept: -0.03482

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1034	40	Slope: 50.2791 Intercept: -15.2124 Correlation Coefficient: 0.9996
2	4.0	1.2113	46	
3	4.6	1.2964	50	
4	5.5	1.4143	56	
5	6.2	1.4995	60	



Calibrated by: Auth A.  
(Mr. Autit Aonsim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppog Juntarupan)  
Enviro Field Coordinator Scientist (3)

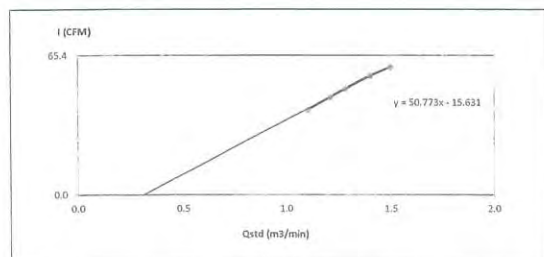
FORM NO. F 06-073 REVISION NO.2 ISSUE DATE: 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf JP NK2 Co.,Ltd Barometric Pressure (mm Hg): 756.5  
Calibrate Location: โรงเรียนบ้านใหม่เจริญ Temperature (°C): 36.1  
Calibrate Date: 14-May-24 High Volume ID: BKK\_FS1058  
Calibration Sheet No.: C-140524-BKK\_FS1058 High Volume Model: TE-5009X  
Calibrator ID: RYG\_FS0415 High Volume S/N: 5689  
Calibrator Model: TE-5028A Calibrator Slope: 1.66431  
Calibrator S/N: 3494 Calibrator Intercept: -0.03482

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1041	40	Slope: 50.7731 Intercept: -15.6307 Correlation Coefficient: 0.9902
2	4.0	1.2120	46	
3	4.5	1.2834	50	
4	5.4	1.4026	56	
5	6.2	1.5004	60	



Calibrated by: Auth A.  
(Mr. Autit Aonsim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppog Juntarupan)  
Enviro Field Coordinator Scientist (3)

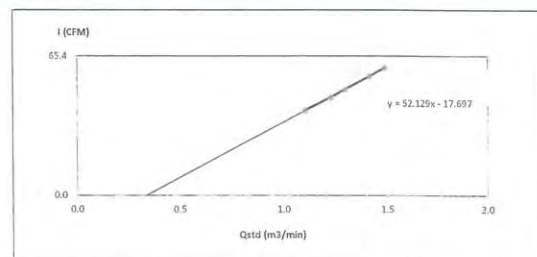
FORM NO. F 06-073 REVISION NO.2 ISSUE DATE: 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf JP NK2 Co.,Ltd Barometric Pressure (mm Hg): 756.5  
Calibrate Location: โรงเรียนบ้านใหม่เจริญ Temperature (°C): 36.1  
Calibrate Date: 14-May-24 High Volume ID: BKK\_FS0373  
Calibration Sheet No.: C-140524-BKK\_FS0373 High Volume Model: G1051  
Calibrator ID: RYG\_FS0415 High Volume S/N: 1330  
Calibrator Model: TE-5028A Calibrator Slope: 1.66431  
Calibrator S/N: 3494 Calibrator Intercept: -0.03482

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1041	40	Slope: 52.1386 Intercept: -17.6975 Correlation Coefficient: 0.9998
2	4.1	1.2266	46	
3	4.6	1.2972	50	
4	5.5	1.4152	56	
5	6.1	1.4086	60	



Calibrated by: Auth A.  
(Mr. Autit Aonsim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppog Juntarupan)  
Enviro Field Coordinator Scientist (3)

FORM NO. F 06-073 REVISION NO.2 ISSUE DATE: 20/11/23



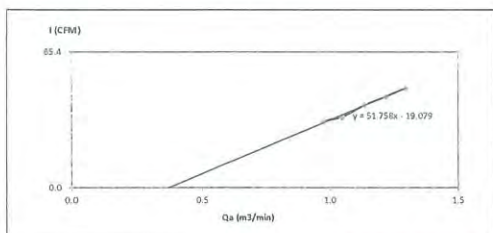




### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf IP HKZ Co., Ltd. Barometric Pressure (mm Hg): 756.5  
Calibrate Location: โรงเก็บขยะมูลฝอย Temperature (°C): 36.5  
Calibrate Date: 14-May-24 High Volume ID: BKK FS1060  
Calibration Sheet No.: C-140524-BKK FS1060 High Volume Model: TE-5009X  
Calibrator ID: RYG FS0415 High Volume S/N: 5503  
Calibrator Model: TE-5028A Calibrator Slope: 1.04247  
Calibrator S/N: 3494 Calibrator Intercept: -0.02167

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>a</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.4	0.972	32	Slope: 51.7501 Intercept: -19.0780 Correlation Coefficient: 0.9942
2	2.8	1.040	34	
3	3.3	1.136	40	
4	3.8	1.219	44	
5	4.3	1.294	48	



Calibrated by: Aut A.  
(Mr. Autit Aoomim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

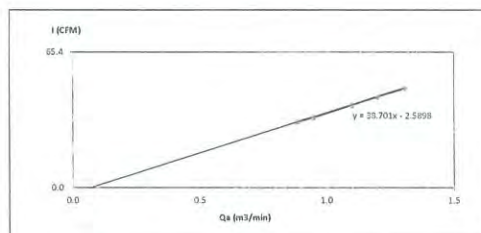
FORM NO. F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf IP HKZ Co., Ltd. Barometric Pressure (mm Hg): 756.5  
Calibrate Location: โรงเก็บขยะมูลฝอย Temperature (°C): 36.1  
Calibrate Date: 14-May-24 High Volume ID: BKK FS1378  
Calibration Sheet No.: C-140524-BKK FS1378 High Volume Model: TE-5009X  
Calibrator ID: RYG FS0415 High Volume S/N: 6263  
Calibrator Model: TE-5028A Calibrator Slope: 1.04247  
Calibrator S/N: 3494 Calibrator Intercept: -0.02167

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>a</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.6	0.989	32	Slope: 30.7014 Intercept: -2.5996 Correlation Coefficient: 0.9997
2	2.3	0.952	34	
3	3.1	1.101	40	
4	3.7	1.201	44	
5	4.4	1.308	48	



Calibrated by: Aut A.  
(Mr. Autit Aoomim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

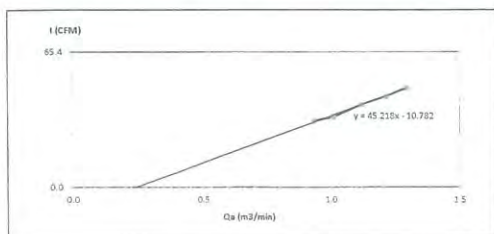
FORM NO. F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Gulf IP HKZ Co., Ltd. Barometric Pressure (mm Hg): 756.5  
Calibrate Location: โรงเก็บขยะมูลฝอย Temperature (°C): 36.2  
Calibrate Date: 14-May-24 High Volume ID: BKK FS0385  
Calibration Sheet No.: C-140524-BKK FS0385 High Volume Model: TE-5009X  
Calibrator ID: RYG FS0415 High Volume S/N: 4789  
Calibrator Model: TE-5028A Calibrator Slope: 1.04247  
Calibrator S/N: 3494 Calibrator Intercept: -0.02167

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>a</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.931	32	Slope: 45.2177 Intercept: -10.7023 Correlation Coefficient: 0.9959
2	2.6	1.011	34	
3	3.2	1.119	40	
4	3.8	1.217	44	
5	4.3	1.293	48	



Calibrated by: Aut A.  
(Mr. Autit Aoomim)  
Field Scientist(2)

Approved by: [Signature]  
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

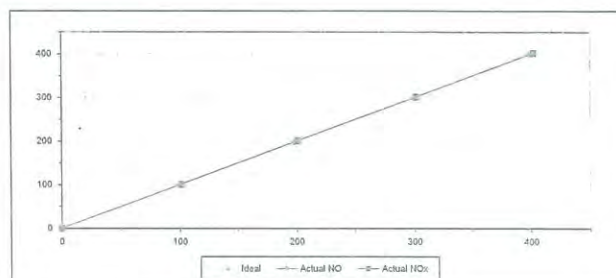
FORM NO. F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



### MULTIPOINT CALIBRATION REPORT

Calibration Date: 3-Jan-24 Equipment Name: NOx Analyzer  
Manufacturer: HORIBA Model: APNA-370  
Serial No.: XLTWRBSJ Equipment ID: BKK FS1062  
Calibrator Manufacturer: Teledyne API Model: 700  
Serial No.: 947  
Std. Gas Concentration (PPM): 55.88 Cylinder No.: GN0027222  
Cylinder Pressure (psi): 1800 Certified By: Aingaa Inc.  
Certified Date: 9-Feb-22 Expired Date: 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	101.10	1.10	1.10
2	200.00	198.10	-1.90	-0.95	201.20	1.20	0.60
3	300.00	299.20	-0.80	-0.27	301.40	1.40	0.47
4	400.00	398.20	-1.80	-0.45	402.10	2.10	0.53
AVERAGE (%)				-0.37			0.56



Calibrated By: [Signature]

(Mr. Jirawat Sakam)  
Field Environmental Scientist (3)

Approved By: [Signature]

(Mr. Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group  
FORM NO. F 06-065 REVISION NO.1 ISSUE DATE: 02/04/12

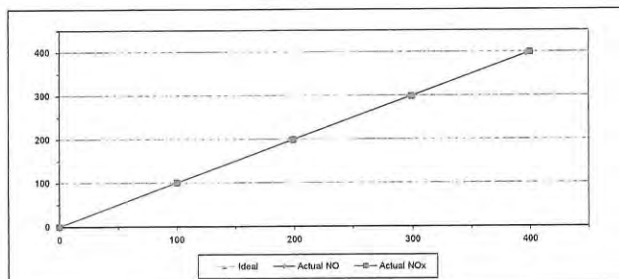




## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	R0A0GWJC	Equipment ID	BKK_FS0794
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.40	-0.60	-0.60	100.20	0.20	0.20
2	200.00	198.50	-1.50	-0.75	198.80	-1.20	-0.60
3	300.00	297.50	-2.50	-0.83	298.70	-1.30	-0.43
4	400.00	396.70	-3.30	-0.83	399.50	-0.50	-0.13
AVERAGE (%)				-0.58			-0.17



Calibrated By

(Mr.Jirawut Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittrantont)  
Assistant General Manager

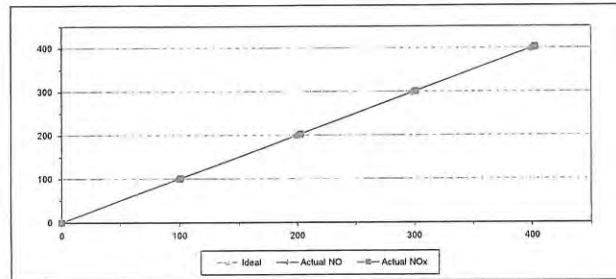
ALS Laboratory Group  
FORM NO. F 06-056 REVISION NO. - ISSUE DATE 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	200E
Serial No.	4378	Equipment ID	BKK_FS0773
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	101.10	1.10	1.10
2	200.00	199.60	-0.40	-0.20	202.70	2.70	1.35
3	300.00	298.20	-1.80	-0.60	301.30	1.30	0.43
4	400.00	398.60	-1.40	-0.35	402.50	2.50	0.63
AVERAGE (%)				-0.39			0.72



Calibrated By

(Mr.Jirawut Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittrantont)  
Assistant General Manager

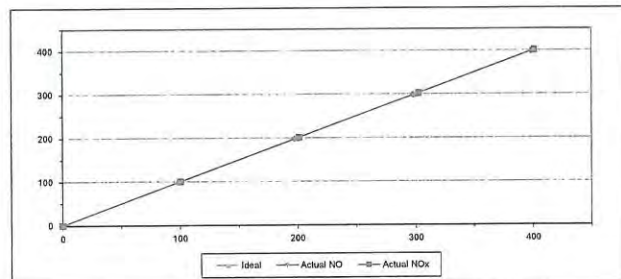
ALS Laboratory Group  
FORM NO. F 06-056 REVISION NO. - ISSUE DATE 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	HCWSR681	Equipment ID	BKK_FS0800
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.50	0.50	0.50
2	200.00	197.60	-2.40	-1.20	201.40	1.40	0.70
3	300.00	298.00	-2.00	-0.67	302.50	2.50	0.83
4	400.00	398.70	-1.30	-0.33	401.30	1.30	0.33
AVERAGE (%)				-0.60			0.49



Calibrated By

(Mr.Jirawut Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittrantont)  
Assistant General Manager

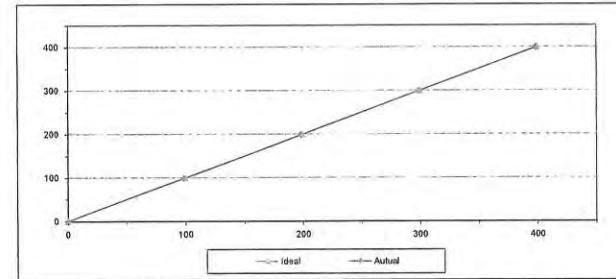
ALS Laboratory Group  
FORM NO. F 06-056 REVISION NO. - ISSUE DATE 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	6BVW9P1K	Equipment ID	BKK_FS1091
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.50	-1.50	-1.50
2	200.00	198.30	-1.70	-0.85
3	300.00	298.70	-1.30	-0.43
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.61



Calibrated By

(Mr.Jirawut Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittrantont)  
Assistant General Manager

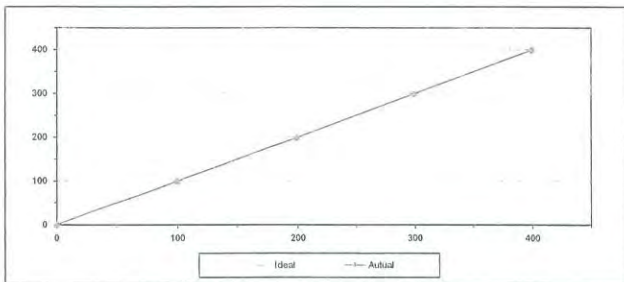
ALS Laboratory Group  
FORM NO. F 06-056 REVISION NO. - ISSUE DATE 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	2BGDABSF	Equipment ID	BKK_FS0793
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90
2	200.00	198.70	-1.30	-0.65
3	300.00	298.50	-1.50	-0.50
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.47



Calibrated By

(Mr.Jirawat Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jitranont)  
Assistant General Manager

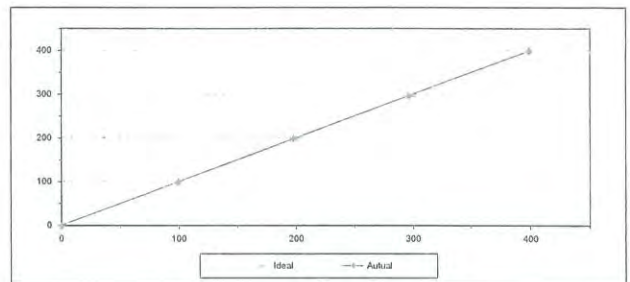
ALS Laboratory Group  
FORM NO. F-05-056 REVISION NO. - ISSUE DATE 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	100E
Serial No.	3488	Equipment ID	BKK_FS0772
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.40	-0.60	-0.60
2	200.00	197.70	-2.30	-1.15
3	300.00	296.50	-3.50	-1.17
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.63



Calibrated By

(Mr.Jirawat Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jitranont)  
Assistant General Manager

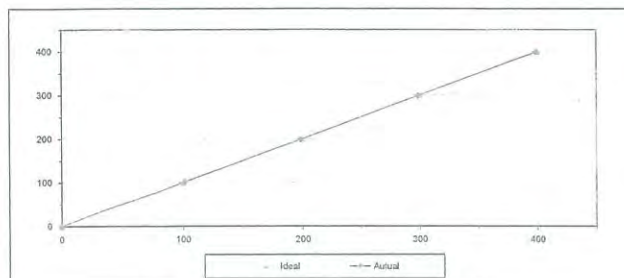
ALS Laboratory Group  
FORM NO. F-05-056 REVISION NO. - ISSUE DATE 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	YU9BY0F9	Equipment ID	BKK_FS0790
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	101.30	1.30	1.30
2	200.00	198.10	-1.90	-0.95
3	300.00	298.50	-1.50	-0.50
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.08



Calibrated By

(Mr.Jirawat Sakam)  
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group  
FORM NO. F-05-056 REVISION NO. - ISSUE DATE 02/04/12



Authorized calibration laboratory  
NAC TIS 17025:2017  
NAC TIS 101:2015  
CALIBRATION 0367

Accepted measurement laboratory  
Calibration services department



NAC - TIS 17025  
CALIBRATION 0367

Certificate Number

CW-013-05

## CERTIFICATE OF CALIBRATION

Page 1 of 1 Pages

MEASUREMENT ITEM  
MANUFACTURER  
MODEL/TYPE

Cup Anemometer  
Novamys  
Sensor: WS-C27  
Data logger: 130-WS-254-D

SERIAL NUMBER  
ID NUMBER  
CONDITION AS RECEIVED  
CUSTOMER

Sensor: WS-C27  
Data logger: WS-C27  
BKK\_FS0774  
106488888

ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phraechanin 40, Phraechanin Rd, Khwaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE  
MEASUREMENT DATE  
ISSUE DATE

15 Dec 2023  
15 Dec 2023  
19 Dec 2023

ENVIRONMENTAL CONDITIONS  
Ambient condition in the laboratory are as follows:  
Temperature  
Relative humidity  
Atmospheric Pressure

23.0 ± 3.5 °C  
55.0 ± 15.0 %RH  
1010 ± 10 hPa

PLACE OF CALIBRATION

10th-type wind tunnel of Novamys Associates Co., Ltd.

CALIBRATION CONDITIONS

Wind tunnel cross section area: 500 cm<sup>2</sup>  
Wind tunnel air flow rate: 100 m/s  
Diameter of measuring pipe: 10 mm  
Blockage ratio of test object: 0.111 (-)

Preconditioning  
Measurement Condition

24 hours at ambient conditions  
The average values during measurement are (24.2) °C, (48.2) %RH and (1015.4) hPa

TABULATION OF RESULTS  
The table on next page give the measured values

Calibrated by:  
Checked by:  
Approved by:

(Mr. Jirawat Sakam)  
(Mr. Sarayuth Jitranont)  
(Mr. Jirawat Sakam)

Remarks:  
1. Refer to the instruction manual of the wind tunnel.  
2. The table on next page give the measured values including the uncertainty.  
3. The table on next page give the measured values including the uncertainty.

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY



Certificate Number

CWD-013-66

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>5</sup>

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate or corner of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 30 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V <sub>std</sub> (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V <sub>UUC</sub> (m/s)	Error (m/s)	U (k=2) (m/s)
1.014	23.90	24.15	0.9	-0.1	0.31
2.004	24.40	24.15	1.9	-0.2	0.31
2.998	24.10	24.15	2.9	-0.1	0.31
4.185	24.05	24.15	4.0	-0.2	0.31
5.04	23.94	24.15	5.0	0.0	0.31
5.58	24.48	24.15	6.0	0.0	0.31
7.04	23.80	24.15	7.1	0.1	0.31
7.86	24.36	24.15	8.0	0.3	0.31
8.93	23.80	24.15	9.1	0.2	0.31
10.01	24.03	24.15	10.2	0.2	0.31
11.03	23.80	24.15	11.3	0.3	0.31
12.03	24.00	24.15	12.2	0.2	0.31
13.01	23.82	24.15	13.3	0.3	0.31
13.97	23.82	24.15	14.3	0.3	0.35
14.99	23.82	24.15	15.3	0.3	0.35
16.00	23.90	24.15	16.4	0.4	0.31

## Remarks:

<sup>5</sup> Calibration results only count for the tested circumstances and environmental conditions during which calibration took place.

<sup>6</sup> Velocity of standard.

Velocity of Unit Under Calibration.

## PHOTO OF CALIBRATION SET-UP



Calibration set up of the Cup anemometer calibration in the wind tunnel of Jiratanatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibration one. Remarks: The position of the set up is subject to standardizing margin priority.

\*\*\*End of Certificate of Calibration\*\*\*

Certificate Number

CWD-013-66

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>1</sup>

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counter-clockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D <sub>1std</sub> Degree (°)	D <sub>UUC</sub> Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.00	45.000	42	-3	0.20
	90.000	89	-3	0.30
	135.000	132	-3	0.30
	180.000	180	0	0.50
	225.000	227	2	0.30
	270.000	274	4	0.30
	315.000	320	5	0.30
	360.000	355	-1	0.20

## Remarks:

Calibration results only count for the tested circumstances and environmental conditions during which calibration took place.

Direction of standard.

Direction of Unit Under Calibration.

\*\*\*End of Certificate of Calibration\*\*\*



Jiratanatee Associates Co., Ltd.  
63/14 11, 87/32 36  
Pattana 27/1, Ba Maitrak, Bangkok  
Bangkok 10200 (Thailand)  
Tel: +662030321  
Mobile: +662030321  
E-mail: ntc\_calibration@jiratanatee.com  
Web site: www.jiratanatee.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC TIS TIS 17025  
CALIBRATION 0367

Wind direction measurement laboratory  
Calibration services department



NSC - TIS - TIS 17025  
CALIBRATION 0367

Certificate Number

CWD-013-66

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

## MEASUREMENT ITEM

: Wind Direction Sensor

## MANUFACTURER

: Novalyns

## MODEL/TYPE

: Sensor WS-02F

## SERIAL NUMBER

: Data logger: 110 WS-25DL-D

## ID NUMBER

: Sensor: NSD-AS439

## CONDITION AS-RECEIVED

: BKK\_F50974

## CUSTOMER

: Used Item  
: ALS Laboratory group (Thailand) Co., Ltd.  
: 104 Phatthanaburi 40, Phatthanaburi Rd., Khwaeng Suan Luang,  
: Khet Suan Luang, Bangkok 10250 Thailand.

## RECEIVED DATE

: 15 Dec 2023

## MEASUREMENT DATE

: 18 Dec 2023

## ISSUE DATE

: 19 Dec 2023

## ENVIRONMENTAL CONDITIONS:

: Ambient condition in the laboratory are as follows:

: Temperature: 23.0 ± 3.0 °C

: Relative Humidity: 55.0 ± 15.0 %RH

: Atmospheric Pressure: 1010 ± 10 hPa

## PLACE OF CALIBRATION

: Full-type wind tunnel of Jiratanatee Associates Co., Ltd.

## CALIBRATION CONDITION

: Wind tunnel cross section area<sup>1</sup>: 900 cm<sup>2</sup>  
: Win direction frontal area<sup>2</sup>: 119 cm<sup>2</sup>  
: Diameter of mounting pipe<sup>3</sup>: 1.14 m  
: Blockage ratio of test object<sup>4</sup>: 0.143 [-]

## Preconditioning

: 24 hours at ambient conditions.

## Measurement Condition

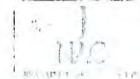
: The average values during measurement are (24.5 °C, 60.9 %RH and 1012.1 hPa).

## TABULATION OF RESULTS:

The table on next page give the measured values.

## Calibrated by:

: Mr. Siravit Thichakul  
: Miss Anurupa Lertchompul



Approved signature

Mr. Panyo Booncharoen  
Calibration Department Manager

## Remarks:

<sup>1</sup> Nuclei cross-section area of the tested item.

<sup>2</sup> Projected cross-section area of the tested object exclude mounting pipe.

<sup>3</sup> Diameter of mounting pipe.

<sup>4</sup> Ratio "a"/"b".

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.



Jiratanatee Associates Co., Ltd.  
63/14 11, 87/32 36  
Pattana 27/1, Ba Maitrak, Bangkok  
Bangkok 10200 (Thailand)  
Tel: +662030321  
Mobile: +662030321  
E-mail: ntc\_calibration@jiratanatee.com  
Web site: www.jiratanatee.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC TIS TIS 17025  
CALIBRATION 0367

Temperature measurement laboratory  
Calibration services department



NSC - TIS - TIS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : CDT-051-66

Page 1 of 2 Pages

## MEASUREMENT ITEM

: Data Logger with Temperature sensor

## MANUFACTURER

: Novalyns

## MODEL/TYPE

: 110 WS-25DL-D

## SERIAL NUMBER

: AS439

## ID NUMBER

: BKK\_F50974

## CONDITION AS-RECEIVED

: Used Item

## CUSTOMER

: ALS Laboratory group (Thailand) Co., Ltd.  
: 104 Phatthanaburi 40, Phatthanaburi Rd., Khwaeng Suan Luang,  
: Khet Suan Luang, Bangkok 10250 Thailand.

## RECEIVED DATE

: 15 Dec 2023

## MEASUREMENT DATE

: 18 Dec 2023

## ISSUE DATE

: 19 Dec 2023

## ENVIRONMENTAL CONDITIONS:

: Ambient condition in the laboratory are as follows:

: Temperature: 23.0 ± 3.0 °C

: Relative Humidity: 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

## TABULATION OF RESULTS:

The table on next page give the measured values.

## Calibrated by:

: Mr. Siravit Thichakul  
: Miss Anurupa Lertchompul  
: Miss Anurupa Lertchompul



Approved signature

Mr. Panyo Booncharoen  
Calibration Department Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 30 - 40 °C

**Function**

Table B: This equipment was connected with temperature sensor Model: HM1605/NLH131110  
Dimension: Diameter 12 mm, Length 60 mm

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
10	20.642	19.8	-0.2	0.099
20	25.647	24.5	-0.5	0.099
30	30.641	29.4	-0.6	0.099
40	35.624	34.2	-0.8	0.098
50	40.630	39.1	-0.9	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*



Relative humidity measurement laboratory  
Calibration services department

**CERTIFICATE OF CALIBRATION**

Certificate No.: CDT-011-06

Page 1 of 2 Pages

**MEASUREMENT ITEM**

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Relative humidity with data logger

Model/Type

AS433

ID Number

Used item

Customer: AIS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanaburi Rd. Phatthanaburi, Phraewang San Luang,  
Khao San Luang, Bangkok 13250 Thailand

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

16 Dec 2023

18 Dec 2023

19 Dec 2023

**ENVIRONMENTAL CONDITIONS**

Ambient condition in the laboratory is as follows:

Temperature: 23.0 ± 0.5 °C

Relative humidity: 55.0 ± 2.0 %RH

**Calibration procedure:**

The Relative Humidity calibration was done by in-house calibration method using 3-point calibration comparison method with Standard Certified Metrology Approved and Standard Humidity generator (model).

**Traceability:**

This instrument was calibrated using standard instrument whose accuracy is traceable through the National Metrology Institute of Thailand to the international system of units (SI) via Certificate number TH-0017-23.

**Uncertainty of Measurement:**

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which provides a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM Evaluation of measurement data, based on the method of an analysis of measurement.

NOTE: The certificate is valid only for the item calibrated on date and place of calibration.

**TABULATION OF RESULTS:**

The table on next page give the measured values.

Calibrated by:

Mr. Jiraporn Phachana  
TAM of Metrology Services Unit  
Metrology Services Department

Approved signature:

Mr. Pichai Booncharoen  
Calibration Services Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

**Measurement Results:**

This equipment was calibrated with Relative Humidity Sensor of Model: HM1605/NLH131110

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20%RH to 80%RH

The results of Calibration of relative humidity are reported in table below

Determined (RH)	Standard Reading (RH)	UUC Reading (RH)	Error (RH)	Uncertainty (RH)
20.0	20.64	19.9	-2.4	0.24
40.0	41.42	40.1	-4.6	0.32
60.0	62.55	60.6	-4.5	0.24

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*



Pressure measurement laboratory  
Calibration services department

**CERTIFICATE OF CALIBRATION**

Certificate No.: CDT-011-06

Page 1 of 2 Pages

**MEASUREMENT ITEM**

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Digital barometer

Model/Type

Sensor: 110-W5-250-P

Data logger: 110-W5-250-D

Sensor: BP-A5433

Data logger: AS433

Used item

Customer: AIS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanaburi Rd. Phatthanaburi, Phraewang San Luang,  
Khao San Luang, Bangkok 13250 Thailand

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

16 Dec 2023

18 Dec 2023

19 Dec 2023

**Calibration procedure:**

The pressure calibration was done by in-house calibration method using 2-point calibration comparison method with Digital pressure calibration based on GUM B.6.1

**Traceability:**

The measurement result is traceable to the international system of units (SI) through the NIMT National Metrology Institute of Thailand via Certificate number TH-0017-22

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

**CONDITION OF THIS RESULT OF CALIBRATION:**

1. Reference Standard Instrument

Instrument: Model: Serial No: Certificate No: Due Date:

Absolute Pressure Transducer: CDT-011-06: 41001762: MP-005-12: 07 Dec 2022

2. Calibration effort for calibration sequence:

3. The UUC was installed in vertical orientation above reference standard instrument and serial of UUC was used as the reference level.

4. Calibration conditions:

5. Condition:

6. Pressure transmitting medium:

7. Ambient condition:

8. Humidity:

9. Temperature:

10. Measurement point:

11. The result is valid only for the item calibrated on date and place of calibration.

Calibrated by:

Mr. Jiraporn Phachana  
TAM of Metrology Services Unit  
Metrology Services Department

Approved signature:

Mr. Pichai Booncharoen  
Calibration Services Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY





Instrument Calibration Co. Ltd.  
63/14-15, 67/35-36, Soi Petchkasem 7, 7/1, Petchkasem Rd,  
Wattana, Bangkok 10600 Thailand  
Tel: 02-86808128 Fax: 02-8680860  
Email: info@jiranatec.com  
Website: www.jiranatec.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC TIS-TIS 17025  
CALIBRATION 0367



NSC - TIS - TIS 17025  
CALIBRATION 0367

Pressure measurement laboratory  
Calibration services department

## CERTIFICATE OF CALIBRATION

Certificate No. CPR-011-66

Page 2 of 2 Pages

MEASUREMENT RESULTS: ☒ Without adjustment ☐ With adjustment

CALIBRATION IN THE RANGE OF: ± 950 mbar to 1050 mbar

The results of calibration and associated measurement uncertainties are reported in the table below

STD (mbar)	UUC <sup>1</sup> (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.00	950.3	0.3	0.37
970.00	970.1	0.2	0.37
990.00	989.9	-0.1	0.37
1009.99	1009.9	-0.1	0.37
1030.01	1029.0	-1.0	0.37
1050.00	1049.5	-1.5	0.37

Note: UUC<sup>1</sup> Unit Under Calibration

<sup>1</sup> To convert the result in report unit to Pa should be multiply by 100

\*End of certificate\*



63/14-15, 67/35-36, Soi Petchkasem 7, 7/1, Petchkasem Rd,  
Wattana, Bangkok 10600 Thailand  
Tel: (66) 02-86808128 Fax: (66) 02-8680860 www.jiranatec.com

## CALIBRATION REPORT

Calibration Number: RC-02122023

Page 1 of 2 Pages

Measurement Item: Rain gauge with data logger

Manufacturer: Data logger: Novatek  
Rain gauge: Novatek

Model/Type: Data logger: I10-WS-25DL-D  
Rain gauge: I10-WS-25R0

Serial Number: Data logger: A5430  
Rain gauge: R0-A5430

ID NO: BHN\_P00074

Customer: ALS laboratory group (Thailand) co., Ltd.  
104 Phatthanakarn 40, Phatthanakarn Rd Khwaeng Thung Luang, Nuea Suwan Luang,  
Bangkok 10260, Thailand

Environmental Condition:

The measurement was carried out in an ambient temperature of (25 ± 3)°C and relative humidity of (50 ± 10)%

Measurement Method:

The Rain gauge, Unit Under Calibration (UUC) was calibrated by Precision reference bottle with flow adjuster at low rate 0.6 mm per minute or 1 tipping every 20 seconds. The tipping number was determined by procedures below

- Calibrate rain gauge inlet area  
Rain gauge precise diameter in mm =  $\pi \times \text{radius}^2 \times \pi$  (radius)  
Rain gauge area =  $\pi \times R^2 \times 14$  (UUC diameter = 2.53 cm, UUC radius = 10.16 mm)  
Rain gauge area = 323.6 cm<sup>2</sup>
- Calculate theoretical correct rate gauge answer (number of tipping) using 323.6 cm<sup>2</sup> inlet area and 0.5 L of rain  
a)  $10,000 \text{ cm}^3 / 323.6 \text{ cm}^2$  inlet area = 30.90 (rain gauge area = 1/30.90 of square meter)  
b)  $30.90 \times 0.5 \text{ L volume} = 15.45 \text{ mm}$  (sum of rain over 1 m<sup>2</sup> surface) 500 mm of rain volume on the rain gauge area = 15.45 mm of rain  
c) Number of tipping =  $15.45 / 0.25 \text{ mm} = 62$  tipplings

Note: Rain gauge is fully cleaned and leveling prior the calibration performed

Measurement Date: Dec 18, 2023

Issued Date: Dec 19, 2023

Performed by:  
☒ Mr. Sorasit Indrakiat  
☒ Mrs. Jittaporn Lertnongphat



Approved Signature:  
Mr. Panvut Booncharoen  
Calibration Department Manager



63/14-15, 67/35-36, Soi Petchkasem 7, 7/1, Petchkasem Rd  
Wattana, Bangkok 10600 Thailand  
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Continuation of Calibration of Calibration Number

Calibration Number: RC-02122023  
Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment  
The results of calibration are reported in table below

Quantity of H <sub>2</sub> O (ml)	Determined tipping	Tipping count	Acceptable Tipping count
500	62	60	60 - 64
500	62	60	60 - 64
500	62	60	60 - 64
500	62	60	60 - 64
500	62	60	60 - 64

Remark: The procedure is made to verify the correct reading of the Unit under Calibration rain gauge when a precise volume of water falls into its cone. We suggest that the number of tipping should be within ±2% percent from the 62 tipping (correct range: 60-64 tipping) it means that the rain gauge meets the manufacturer acceptable limit

\*\*End of calibration report\*\*



Lot No: 2442705-1

## ANALYZER CALIBRATION DATA

Client: Gulf JP NK2 Co., Ltd. Location: Jaba HRSG 12

Date: 16 May 24 Test Operator: Anuvat M.

O<sub>2</sub> ANALYZER  
Model: TELEDYNE API T200H Serial No.: 922

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	7.98	8.00	8.00	0.00
Span Gas	16.04	16.00	16.10	0.40

NO<sub>x</sub> ANALYZER  
Model: TELEDYNE API T200H Serial No.: 922

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	55.88	56.80	56.30	0.50
Span Gas	80.49	81.20	81.70	0.50

CO ANALYZER  
Model: TELEDYNE API T300M Serial No.: 844

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	55.22	55.00	55.77	0.77
Span Gas	79.95	80.10	80.10	0.00

Calibrated by

(Mr. Anuvat Mounpair)  
Environmental Field Scientist (2)





Lot No. 2442795-1

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Gulf JP NK2 Co. Ltd. Location : Jalefa HRSG 12  
Date : 16 May 24 Test Operator : Anuvut M.O<sub>2</sub> ANALYZER  
Cylinder Conc. (%) : 16.04

Span (%) : 25

	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	0.10	0.40	0.10	0.00
Upscale Gas	16.00	16.11	0.44	16.15	0.16

NO<sub>x</sub> ANALYZER  
Cylinder Conc. (ppm) : 80.49

Span (ppm) : 100

	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	0.10	0.10	0.10	0.00
Upscale Gas	81.20	80.60	0.00	80.50	0.20

CO ANALYZER  
Cylinder Conc. (ppm) : 79.95

Span (ppm) : 100

	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	0.10	0.10	0.10	0.00
Upscale Gas	80.10	79.50	0.60	79.90	0.50

Calibrated by

(Mr. Anuvut Moungpair)

Environmental Field Scientist ( 2 )

FORMING F-05-053 REVISION NO. 4 ISSUE DATE 18/01/24

ALS Laboratory Group



## CEMs Data

Client Name : Gulf JP NK2 Co. Ltd. Date : 10 May 24  
Plant Name : GUNZ Location : GUNZ HRSG 12

Run No. 1										Run No. 2									
Time & Date 21-n-08										Time & Date 21-n-08									
Time	Sec	SO <sub>2</sub>	NO <sub>x</sub>	CO	CO <sub>2</sub>	O <sub>2</sub>	CO <sub>2</sub>	O <sub>2</sub>	CO <sub>2</sub>	Time	Sec	SO <sub>2</sub>	NO <sub>x</sub>	CO	CO <sub>2</sub>	O <sub>2</sub>	CO <sub>2</sub>	O <sub>2</sub>	CO <sub>2</sub>
10May24	9:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:07	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:09	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:13	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:15	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:19	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:21	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	9:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:25	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:27	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:31	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:33	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:37	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:39	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	10:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:43	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:45	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:49	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:51	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:55	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:57	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	9:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:01	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	11:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:03	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:07	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:09	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:13	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
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10May24	12:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:19	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:21	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	12:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
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10May24	13:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:27	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:31	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:33	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:37	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:39	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	13:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:43	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:05	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:45	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:11	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:17	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:49	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:23	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:51	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:29	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:35	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:55	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:41	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:57	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:47	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	10:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:53	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	11:01	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	14:59	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00	10May24	11:03	20.00	2.00	14.15	45.00	15.00	15.00	15.00	15.00
10May24	15:05</																		





Plant Name CH2 Location DESA RIG 12

Run No. 11						Run No. 12					
Time Base 21.6h						Time Base 21.6h					
Date	Time	NO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	CO <sub>2</sub>	Date	Time	NO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub>	CO <sub>2</sub>
		ppb	ppb	ppm	ppm			ppb	ppb	ppm	ppm
15 Mar 24	13.10	22.02	1.00	14.12	3.30	15 Mar 24	13.31	19.56	1.27	14.02	3.30
15 Mar 24	13.11	22.26	1.12	14.06	3.31	15 Mar 24	13.32	19.59	1.25	14.03	3.30
15 Mar 24	13.12	21.74	1.10	13.98	3.30	15 Mar 24	13.33	19.59	1.25	14.03	3.30
15 Mar 24	13.13	21.18	1.24	13.53	4.03	15 Mar 24	13.34	19.68	1.29	14.03	3.30
15 Mar 24	13.14	20.91	1.22	13.91	4.05	15 Mar 24	13.35	19.66	1.23	14.04	3.30
15 Mar 24	13.15	20.50	1.20	13.93	4.05	15 Mar 24	13.36	19.66	1.23	14.04	3.30
15 Mar 24	13.16	18.02	1.14	13.93	4.02	15 Mar 24	13.37	19.72	1.24	14.03	3.30
15 Mar 24	13.17	16.40	1.05	14.00	4.00	15 Mar 24	13.38	19.73	1.25	14.03	3.30
15 Mar 24	13.18	16.80	1.01	14.04	3.98	15 Mar 24	13.39	19.75	1.30	14.02	3.30
15 Mar 24	13.19	17.20	1.07	14.06	3.97	15 Mar 24	13.40	19.72	1.30	14.04	3.30
15 Mar 24	13.20	17.60	1.09	13.93	3.97	15 Mar 24	13.41	19.72	1.30	14.04	3.30
15 Mar 24	13.21	18.00	1.11	14.04	3.98	15 Mar 24	13.42	19.72	1.30	14.04	3.30
15 Mar 24	13.22	18.11	1.24	13.99	4.00	15 Mar 24	13.42	19.82	1.30	14.02	3.30
15 Mar 24	13.23	18.17	1.25	14.00	3.98	15 Mar 24	13.43	19.82	1.30	14.02	3.30
15 Mar 24	13.24	18.22	1.27	14.00	3.98	15 Mar 24	13.44	19.82	1.30	14.02	3.30
15 Mar 24	13.25	18.33	1.27	14.00	3.98	15 Mar 24	13.45	19.82	1.30	14.02	3.30
15 Mar 24	13.26	18.43	1.27	14.00	3.98	15 Mar 24	13.46	19.82	1.30	14.02	3.30
15 Mar 24	13.27	18.50	1.25	14.00	3.99	15 Mar 24	13.47	19.82	1.30	14.02	3.30
15 Mar 24	13.28	19.06	1.23	14.00	3.99	15 Mar 24	13.48	19.82	1.30	14.02	3.30
15 Mar 24	13.29	19.20	1.25	14.01	3.98	15 Mar 24	13.49	19.82	1.30	14.02	3.30
15 Mar 24	13.30	19.35	1.25	14.01	3.98	15 Mar 24	13.50	19.81	1.26	14.06	3.30
15 Mar 24	13.31	19.50	1.26	14.03	3.98	15 Mar 24	13.51	19.82	1.25	14.04	3.30
Mean		20.87	1.22	14.12	4.00	Mean		19.81	1.30	14.04	4.00
Max		22.26	1.24	14.06	4.03	Max		19.82	1.30	14.04	4.00

FORM NO. F-06-063 REVISION NO. 4 ISSUE DATE 16/01/24

A/S Laboratory Group



## ANALYZER CALIBRATION DATA

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	Plant. Anthonomus	Plant. Anthonomus	Plant. Anthonomus	Differences
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Calibrated by

( Mr.Anuvat Moungpair )

Environmental Field Scientist ( 2 )

FORM NO. F-06-052 REVISION NO. 4 ISSUE DATE 12/01/24

ALS Laboratory Group



## SYSTEM CALIBRATION BIAS AND DRIFT DATA

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	Q- Analyzer	Initial Values	Final Values	
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Upscale Gas	80.10	79.50	0.60	79.00	1.10	0.50
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Calibrated by \_\_\_\_\_

Calibrated by

( Mr.Anuvat Moungpair )

Environmental Field Scientist ( 2 )



Run No. 1	Time Base	21 min	Run No. 2	Time Base	21 min
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Avg		20.41	1.54	14.15	41.90	Avg		20.50	1.54	14.09	41.90
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FORM NO. F-06-063 REVISION NO. 4 ISSUE DATE 16/01/24

A/S Laboratory Group









## CEMs Opacity Data

Client Name : Gulf JP NK2 Co., Ltd.  
Plant Name : GNK2

Date : 16-May-24  
Location : Uda HRSG 12

Run No.1		Run No.2		Run No.3		Run No.4		Run No.5	
Time	Dust (mg/m3)	Time	Dust (mg/m3)	Time	Dust (mg/m3)	Time	Dust (mg/m3)	Time	Dust (mg/m3)
9:30	0.00	10:13	0.00	11:06	0.00	12:00	0.00	12:53	0.00
9:31	0.00	10:14	0.00	11:07	0.00	12:01	0.00	12:54	0.00
9:32	0.00	10:15	0.00	11:08	0.00	12:02	0.00	12:55	0.00
9:33	0.00	10:16	0.00	11:09	0.00	12:03	0.00	12:56	0.00
9:34	0.00	10:17	0.00	11:10	0.00	12:04	0.00	12:57	0.00
9:35	0.00	10:18	0.00	11:11	0.00	12:05	0.00	12:58	0.00
9:36	0.00	10:19	0.00	11:12	0.00	12:06	0.00	12:59	0.00
9:37	0.00	10:20	0.00	11:13	0.00	12:07	0.00	13:00	0.00
9:38	0.00	10:21	0.00	11:14	0.00	12:08	0.00	13:01	0.00
9:39	-	10:22	0.00	11:15	0.00	12:09	0.00	13:02	0.00
9:40	-	10:23	0.00	11:16	0.00	12:10	0.00	13:03	0.00
9:41	-	10:24	0.00	11:17	0.00	12:11	0.00	13:04	0.00
9:42	-	10:25	0.00	11:18	0.00	12:12	0.00	13:05	0.00
9:43	-	10:26	0.00	11:19	0.00	12:13	0.00	13:06	0.00
9:44	-	10:27	0.00	11:20	0.00	12:14	0.00	13:07	0.00
9:45	0.00	10:28	0.00	11:21	0.00	12:15	0.00	13:08	0.00
9:46	0.00	10:29	0.00	11:22	0.00	12:16	0.00	13:09	0.00
9:47	0.00	10:30	0.00	11:23	0.00	12:17	0.00	13:10	0.00
9:48	0.00	10:31	0.00	11:24	0.00	12:18	0.00	13:11	0.00
9:49	0.00	10:32	0.00	11:25	0.00	12:19	0.00	13:12	0.00
9:50	0.00	10:33	0.00	11:26	0.00	12:20	0.00	13:13	0.00
9:51	0.00	10:34	0.00	11:27	0.00	12:21	0.00	13:14	0.00
9:52	0.00	10:35	0.00	11:28	0.00	12:22	0.00	13:15	0.00
9:53	0.00	10:36	0.00	11:29	0.00	12:23	0.00	13:16	0.00
9:54	0.00	10:37	0.00	11:30	0.00	12:24	0.00	13:17	0.00
9:55	0.00	10:38	0.00	11:31	0.00	12:25	0.00	13:18	0.00
9:56	0.00	10:39	0.00	11:32	0.00	12:26	0.00	13:19	0.00
9:57	0.00	10:40	0.00	11:33	0.00	12:27	0.00	13:20	0.00
9:58	0.00	10:41	0.00	11:34	0.00	12:28	0.00	13:21	0.00
9:59	0.00	10:42	0.00	11:35	0.00	12:29	0.00	13:22	0.00
10:00	0.00	10:43	0.00	11:36	0.00	12:30	0.00	13:23	0.00
10:01	0.00	10:44	0.00	11:37	0.00	12:31	0.00	13:24	0.00
10:02	0.00	10:45	0.00	11:38	0.00	12:32	0.00	13:25	0.00
10:03	0.00	10:46	0.00	11:39	0.00	12:33	0.00	13:26	0.00
10:04	0.00	10:47	0.00	11:40	0.00	12:34	0.00	13:27	0.00
10:05	0.00	10:48	0.00	11:41	0.00	12:35	0.00	13:28	0.00
10:06	0.00	10:49	0.00	11:42	0.00	12:36	0.00	13:29	0.00
10:07	0.00	10:50	0.00	11:43	0.00	12:37	0.00	13:30	0.00
10:08	0.00	10:51	0.00	11:44	0.00	12:38	0.00	13:31	0.00
-	-	10:52	0.00	11:45	0.00	12:39	0.00	13:32	0.00
-	-	10:53	0.00	11:46	0.00	12:40	0.00	13:33	0.00
-	-	10:54	0.00	11:47	0.00	12:41	0.00	13:34	0.00
-	-	10:55	0.00	11:48	0.00	12:42	0.00	13:35	0.00
-	-	10:56	0.00	11:49	0.00	12:43	0.00	13:36	0.00
-	-	10:57	0.00	11:50	0.00	12:44	0.00	13:37	0.00
-	-	10:58	0.00	11:51	0.00	12:45	0.00	13:38	0.00
-	-	10:59	0.00	11:52	0.00	12:46	0.00	13:39	0.00
-	-	11:00	0.00	11:53	0.00	12:47	0.00	13:40	0.00
-	-	11:01	0.00	11:54	0.00	12:48	0.00	13:41	0.00
Avg.	0.00	Avg.	0.00	Avg.	0.00	Avg.	0.00	Avg.	0.00



Lot No : 2442801-1

## ANALYZER CALIBRATION DATA

Client : Gulf JP NK2 Co., Ltd. Location : Uda HRSG 11  
Date : 15 May 24 Test Operator : Anuvrat M.

O<sub>2</sub> ANALYZER : TELEDYNE API T200H Serial No. : 922  
Model : Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.10	0.20
Low-Level Gas	7.98	8.00	8.10	0.40
Span Gas	16.04	16.00	16.10	0.40

NO<sub>x</sub> ANALYZER : TELEDYNE API T200H Serial No. : 922  
Model : Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.10	0.10	0.00
Low-Level Gas	55.88	56.50	56.30	0.50
Span Gas	80.49	81.20	81.70	0.50

SO<sub>2</sub> ANALYZER : TELEDYNE API T100H Serial No. : 534  
Model : Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	55.30	56.77	57.00	0.23
Span Gas	79.51	80.00	79.20	0.20

CO ANALYZER : TELEDYNE API T300M Serial No. : 844  
Model : Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	55.22	55.00	55.77	0.77
Span Gas	79.95	80.10	80.10	0.00

Calibrated by

(Mr. Anuvrat Mounspair)  
Environmental Field Scientist (2)



Lot No : 2442801-1

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Gulf JP NK2 Co., Ltd. Location : Uda HRSG 11  
Date : 15 May 24 Test Operator : Anuvrat M.

O<sub>2</sub> ANALYZER : 16.04 Span (%) : 25

	O <sub>2</sub> Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	Final Values	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upscale Gas	16.00	15.11	0.44	16.15	0.90	0.16	0.16

NO<sub>x</sub> ANALYZER : 80.49 Span (ppm) : 100

	NO <sub>x</sub> Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	Final Values	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.10	0.00	0.10	0.00	0.10	0.00	0.00
Upscale Gas	81.20	80.60	0.00	80.80	0.40	0.20	0.20

SO<sub>2</sub> ANALYZER : 79.51 Span (ppm) : 100

	SO <sub>2</sub> Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	Final Values	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upscale Gas	80.00	79.80	0.20	79.70	0.30	0.10	0.10

CO ANALYZER : 79.95 Span (ppm) : 100

	CO Analyzer Calibration Response	System Calibration Response	System Cal Bias (% of Span)	Final Values	System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.10	0.10	0.00	0.00	0.10	0.10
Upscale Gas	80.10	79.50	0.60	79.00	1.10	0.50	0.50

Calibrated by

(Mr. Anuvrat Mounspair)  
Environmental Field Scientist (2)



## EMISSION TEST RESULT

Client : Gulf JP NK2 Co., Ltd. Run # : 1  
Date : 15 May 24 Location : Uda HRSG 11  
Start Time : 11:08 Test Operator : Anuvrat M.  
SO<sub>2</sub> Analyzer Model : TELEDYNE API T100H Finish Time : 11:24  
NO<sub>x</sub>/O<sub>2</sub> Analyzer Model : TELEDYNE API T200H Serial No. : 922  
CO/CO<sub>2</sub> Analyzer Model : TELEDYNE API T300M Serial No. : 844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
11:08	14.17	3.91	19.96	0.21	0.98	
11:09	14.17	3.90	20.23	0.21	0.99	
11:10	14.17	3.90	20.31	0.21	0.99	
11:11	14.18	3.89	20.17	0.21	1.02	
11:12	14.17	3.90	20.18	0.21	1.00	
11:13	14.18	3.91	20.24	0.21	0.99	
11:14	14.16	3.89	20.18	0.21	0.98	
11:15	14.17	3.89	20.08	0.21	1.01	
11:16	14.16	3.89	20.17	0.21	0.97	
11:17	14.15	3.91	20.36	0.21	0.98	
11:18	14.15	3.90	20.55	0.21	0.99	
11:19	14.21	3.88	20.67	0.21	0.98	
11:20	14.16	3.88	20.83	0.21	0.97	
11:21	14.11	3.90	21.49	0.22	1.04	
11:22	14.08	3.95	22.41	0.22	1.06	
11:23	14.11	3.88	23.97	0.22	1.05	
11:24	14.20	3.91	22.88	0.22	1.04	
11:25	14.16	3.88	22.18	0.22	0.98	
11:26	14.18	3.88	20.09	0.21	0.98	
11:27	14.18	3.89	20.56	0.21	0.97	
11:28	14.19	3.89	20.69	0.21	0.93	
Average	14.16	3.90	20.87	0.21	0.99	

(Mr. Anuvrat Mounspair)  
Environmental Field Scientist (2)





## EMISSION TEST RESULT

Client	Gulf JP NK2 Co., Ltd.	Run #	2
Date	15 May 24	Location	Ulae HRSG 11
Start Time	11:29	Test Operator	Anuvut M.
SO <sub>2</sub> Analyzer Model	TELEDYNE API T100H	Serial No.	534
NO <sub>x</sub> /O <sub>2</sub> Analyzer Model	TELEDYNE API T200H	Serial No.	922
CO/CO <sub>2</sub> Analyzer Model	TELEDYNE API T300M	Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
11:29	14.18	3.89	20.77	0.21	0.99	
11:30	14.18	3.89	20.81	0.21	1.03	
11:31	14.16	3.88	20.54	0.21	1.03	
11:32	14.18	3.88	20.80	0.21	1.00	
11:33	14.15	3.88	20.52	0.21	1.01	
11:34	14.29	3.89	20.75	0.21	0.99	
11:35	14.19	3.89	20.54	0.21	0.98	
11:36	14.17	3.88	21.06	0.21	0.93	
11:37	14.19	3.88	20.52	0.21	0.94	
11:38	14.18	3.90	20.50	0.21	0.92	
11:39	14.17	3.90	20.33	0.21	0.94	
11:40	14.21	3.90	20.43	0.21	0.95	
11:41	14.18	3.89	20.54	0.21	0.95	
11:42	14.19	3.88	20.70	0.21	0.94	
11:43	14.19	3.88	20.62	0.21	0.94	
11:44	14.18	3.88	20.58	0.21	0.95	
11:45	14.18	3.90	20.57	0.21	0.95	
11:46	14.17	3.88	20.71	0.21	0.97	
11:47	14.19	3.88	20.66	0.21	0.98	
11:48	14.16	3.89	20.71	0.21	0.99	
11:49	14.14	3.91	20.64	0.21	0.96	
Average	14.16	3.89	20.70	0.21	0.97	

( Mr. Anuvut Moungpair )  
Environmental Field Scientist (2)

FORM NO. P-68-003 REVISION NO. 1 ISSUE DATE 18/01/24  
ALS Laboratory Group



## EMISSION TEST RESULT

Client	Gulf JP NK2 Co., Ltd.	Run #	3
Date	15 May 24	Location	Ulae HRSG 11
Start Time	11:50	Test Operator	Anuvut M.
SO <sub>2</sub> Analyzer Model	TELEDYNE API T100H	Serial No.	534
NO <sub>x</sub> /O <sub>2</sub> Analyzer Model	TELEDYNE API T200H	Serial No.	922
CO/CO <sub>2</sub> Analyzer Model	TELEDYNE API T300M	Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
11:50	14.20	3.90	20.68	0.21	1.00	
11:51	14.20	3.89	20.99	0.21	1.01	
11:52	14.23	3.87	21.38	0.22	0.99	
11:53	14.17	3.87	21.50	0.22	0.98	
11:54	14.17	3.89	21.63	0.22	0.98	
11:55	14.21	3.89	22.07	0.22	0.97	
11:56	14.20	3.89	21.55	0.22	0.97	
11:57	14.21	3.88	21.04	0.21	0.98	
11:58	14.22	3.86	20.87	0.21	1.00	
11:59	14.23	3.86	20.83	0.21	1.01	
12:00	14.21	3.87	20.88	0.21	1.00	
12:01	14.19	3.87	20.99	0.21	1.01	
12:02	14.21	3.88	21.11	0.22	1.01	
12:03	14.23	3.87	20.94	0.21	0.97	
12:04	14.20	3.87	20.77	0.21	0.95	
12:05	14.20	3.88	20.85	0.21	1.02	
12:06	14.21	3.86	20.97	0.21	0.98	
12:07	14.23	3.87	21.08	0.22	0.99	
12:08	14.25	3.87	21.51	0.22	1.00	
12:09	14.24	3.86	21.67	0.22	0.98	
12:10	14.20	3.87	21.45	0.22	0.99	
Average	14.21	3.88	21.19	0.22	0.99	

( Mr. Anuvut Moungpair )  
Environmental Field Scientist (2)

FORM NO. P-68-003 REVISION NO. 1 ISSUE DATE 18/01/24  
ALS Laboratory Group



Lot No. 2442802-1

## ANALYZER CALIBRATION DATA

Client	Gulf JP NK2 Co., Ltd.	Location	Ulae HRSG 12
Date	16 May 24	Test Operator	Anuvut M.
O <sub>2</sub> ANALYZER Model	TELEDYNE API T200H	Serial No.	922
Span (%)	25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	7.98	8.00	8.00	0.00
Span Gas	10.04	10.00	10.10	0.10

NO <sub>x</sub> ANALYZER Model	TELEDYNE API T200H	Serial No.	922
Span (ppm)	100		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	55.88	56.00	56.30	0.50
Span Gas	60.40	61.20	61.70	0.50

SO <sub>2</sub> ANALYZER Model	TELEDYNE API T100H	Serial No.	534
Span (ppm)	100		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	50.30	50.77	51.00	0.23
Span Gas	70.51	69.00	70.80	0.20

CO ANALYZER Model	TELEDYNE API T300M	Serial No.	844
Span (ppm)	100		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	55.22	55.00	55.77	0.77
Span Gas	70.95	69.10	70.10	0.00

Calibrated by

( Mr. Anuvut Moungpair )  
Environmental Field Scientist (2)

FORM NO. P-68-042 REVISION NO. 4 ISSUE DATE 18/01/24  
ALS Laboratory Group



Lot No. 2442802-1

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	Gulf JP NK2 Co., Ltd.	Location	Ulae HRSG 12
Date	16 May 24	Test Operator	Anuvut M.
O <sub>2</sub> ANALYZER Cylinder Conc. (%)	16.04	Span (%)	25

	O <sub>2</sub> Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.10	0.40	0.10	0.40	0.00
Upscale Gas	16.00	16.11	0.44	16.15	0.60	0.16

NO <sub>x</sub> ANALYZER Cylinder Conc. (ppm)	80.49	Span (ppm)	100
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	NO <sub>x</sub> Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.10	0.10	0.10	0.10	0.00
Upscale Gas	81.20	80.60	0.90	80.80	0.40	0.20

SO <sub>2</sub> ANALYZER Cylinder Conc. (ppm)	79.51	Span (ppm)	100
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	SO <sub>2</sub> Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00
Upscale Gas	80.00	79.50	0.20	79.70	0.30	0.10

CO ANALYZER Cylinder Conc. (ppm)	79.95	Span (ppm)	100
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	CO Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	0.00	0.10	0.10	0.10	0.10	0.00
Upscale Gas	80.10	79.50	0.60	79.00	1.10	0.50

Calibrated by

( Mr. Anuvut Moungpair )  
Environmental Field Scientist (2)

FORM NO. P-68-083 REVISION NO. 4 ISSUE DATE 18/01/24  
ALS Laboratory Group





## EMISSION TEST RESULT

Client	Gulf JP NK2 Co., Ltd.	Run #	1
Date	16 May 24	Location	Udaa HRSG 12
Start Time	10:13	Test Operator	Anuvut M.
SO <sub>2</sub> Analyzer Model	TELEDYNE API T100H	Finish Time	10:33
NO <sub>x</sub> /O <sub>2</sub> Analyzer Model	TELEDYNE API T200H	Serial No.	534
CO/CO <sub>2</sub> Analyzer Model	TELEDYNE API T300M	Serial No.	922
		Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
10:13	13.99	4.01	17.10	0.16	1.13	
10:14	13.99	4.01	16.88	0.16	1.09	
10:15	13.99	4.02	16.85	0.16	1.09	
10:16	14.00	4.02	16.92	0.16	1.11	
10:17	14.00	4.00	17.00	0.16	1.14	
10:18	13.99	4.00	17.03	0.16	1.17	
10:19	14.01	4.01	17.01	0.16	1.14	
10:20	14.01	4.01	16.95	0.16	1.16	
10:21	14.00	4.02	16.95	0.16	1.17	
10:22	14.00	4.01	16.85	0.16	1.10	
10:23	13.99	4.00	16.80	0.16	1.16	
10:24	13.99	4.01	16.79	0.16	1.13	
10:25	14.00	4.00	16.74	0.16	1.18	
10:26	14.01	4.01	16.79	0.16	1.14	
10:27	14.01	4.00	16.76	0.16	1.11	
10:28	13.99	4.00	16.64	0.16	1.12	
10:29	14.00	4.00	16.78	0.16	1.15	
10:30	14.01	4.00	16.90	0.16	1.13	
10:31	14.00	4.00	16.95	0.16	1.13	
10:32	14.02	4.00	17.02	0.16	1.12	
10:33	14.01	3.99	17.08	0.16	1.10	
Average	14.00	4.01	16.88	0.16	1.13	

(Mr. Anuvut Mounspair)

Environmental Field Scientist (2)

FORM NO. F-09-080 REVISION NO. 1 ISSUE DATE 18/01/24

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Page 3 of 5



## EMISSION TEST RESULT

Client	Gulf JP NK2 Co., Ltd.	Run #	2
Date	16 May 24	Location	Udaa HRSG 12
Start Time	10:34	Test Operator	Anuvut M.
SO <sub>2</sub> Analyzer Model	TELEDYNE API T100H	Finish Time	10:54
NO <sub>x</sub> /O <sub>2</sub> Analyzer Model	TELEDYNE API T200H	Serial No.	534
CO/CO <sub>2</sub> Analyzer Model	TELEDYNE API T300M	Serial No.	922
		Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
10:34	14.02	3.99	17.11	0.16	1.16	
10:35	13.97	4.00	17.10	0.16	1.17	
10:36	13.99	4.00	17.08	0.16	1.16	
10:37	13.99	4.01	17.08	0.16	1.19	
10:38	13.99	4.00	17.08	0.16	1.19	
10:39	14.00	4.00	17.16	0.16	1.21	
10:40	14.02	3.99	16.89	0.16	1.15	
10:41	14.00	4.00	16.73	0.16	1.18	
10:42	14.00	4.00	16.76	0.16	1.19	
10:43	14.00	4.00	16.97	0.16	1.13	
10:44	14.01	3.99	17.09	0.16	1.18	
10:45	14.02	3.98	17.25	0.16	1.16	
10:46	14.02	3.98	17.16	0.16	1.17	
10:47	14.00	3.99	17.08	0.16	1.15	
10:48	14.00	4.00	17.15	0.16	1.14	
10:49	14.02	4.00	17.11	0.16	1.17	
10:50	14.01	3.99	17.07	0.16	1.20	
10:51	13.97	3.99	17.13	0.16	1.20	
10:52	14.00	4.00	17.02	0.16	1.17	
10:53	14.01	4.00	16.94	0.16	1.22	
10:54	14.01	4.01	17.03	0.16	1.21	
Average	14.00	3.99	17.05	0.16	1.17	

(Mr. Anuvut Mounspair)

Environmental Field Scientist (2)

FORM NO. F-09-080 REVISION NO. 1 ISSUE DATE 18/01/24

ALS Laboratory Group

Page 4 of 5



## EMISSION TEST RESULT

Client	Gulf JP NK2 Co., Ltd.	Run #	3
Date	16 May 24	Location	Udaa HRSG 12
Start Time	10:55	Test Operator	Anuvut M.
SO <sub>2</sub> Analyzer Model	TELEDYNE API T100H	Finish Time	11:15
NO <sub>x</sub> /O <sub>2</sub> Analyzer Model	TELEDYNE API T200H	Serial No.	534
CO/CO <sub>2</sub> Analyzer Model	TELEDYNE API T300M	Serial No.	922
		Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
10:55	13.99	3.99	17.20	0.16	1.22	
10:56	13.99	4.00	17.21	0.16	1.17	
10:57	13.98	4.00	17.04	0.16	1.16	
10:58	14.03	4.00	16.93	0.16	1.25	
10:59	13.99	4.00	16.93	0.16	1.19	
11:00	13.95	4.00	16.94	0.16	1.21	
11:01	13.98	4.00	16.89	0.16	1.23	
11:02	14.01	4.00	16.85	0.16	1.18	
11:03	14.01	4.00	16.81	0.16	1.24	
11:04	14.00	4.00	16.79	0.16	1.21	
11:05	14.01	4.01	16.82	0.16	1.21	
11:06	14.01	4.01	16.78	0.16	1.19	
11:07	14.01	4.00	16.71	0.16	1.23	
11:08	14.01	3.99	16.81	0.16	1.19	
11:09	14.01	4.00	16.89	0.16	1.19	
11:10	13.99	4.00	16.96	0.16	1.22	
11:11	14.01	4.00	17.00	0.16	1.25	
11:12	14.00	4.00	17.31	0.16	1.28	
11:13	14.03	3.99	17.89	0.16	1.22	
11:14	13.99	4.00	17.93	0.16	1.25	
11:15	14.01	4.00	17.88	0.16	1.27	
Average	14.00	4.00	17.06	0.16	1.22	

(Mr. Anuvut Mounspair)

Environmental Field Scientist (2)

FORM NO. F-09-080 REVISION NO. 1 ISSUE DATE 18/01/24

ALS Laboratory Group

Page 5 of 5



Airgas Specialty Gases  
Airgas USA LLC  
6441 Eastern Road  
Plumsteadville, PA 19399  
Airgas.com

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer:	AIR LIQUIDE (THAILAND) LTD E04N199E3H-A0085	Reference Number:	160-402340012-1
Part Number:	GN0027222	Cylinder Volume:	247.2 CF
Cylinder Number:	124 - Plumsteadville - PA	Cylinder Pressure:	2215 PSIG
Laboratory:	A12022	Valve Outlet:	660
PGVP Number:	CO,NO,NOX,SO2,BALN	Certification Date:	Feb 09, 2022
Gas Code:		Expiration Date:	Feb 09, 2030

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasflow Calibration Standards (May 2012)" document EPA 820/R-12/013, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration machine. All concentrations are on a mole/mole basis unless otherwise noted.

Do not use this cylinder below 160 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	55.00 PPM	55.88 PPM	C1	+/- 1.0% NIST Traceable	02/02/2022, 02/09/2022
CARBON MONOXIDE	55.00 PPM	55.22 PPM	G1	+/- 0.6% NIST Traceable	02/02/2022
NITRIC OXIDE	55.00 PPM	55.88 PPM	G1	+/- 1.0% NIST Traceable	02/02/2022, 02/09/2022
SULFUR DIOXIDE	55.00 PPM	55.30 PPM	G1	+/- 0.8% NIST Traceable	02/02/2022, 02/09/2022
NITROGEN	Detect				

Type	Lot ID	Cylinder No.	Concentration	Uncertainty	Expiration Date
NTRM	09010212	KAL004777	98.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 16, 2024
NTRM	200916-15	CC733106	99.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Oct 06, 2026
GMAS	12426660139	CC323701	4.007 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Sep 03, 2024
NTRM	11010415	KAL004812	99.6 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.5%	Jul 28, 2023

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Nicolet 650 FTIR AUP2010245 CO	FTIR	Jan 06, 2022
Nicolet 650 FTIR AUP2010245 NO	FTIR	Jan 12, 2022
Nicolet 650 FTIR AUP2010245 NO2	FTIR	Jan 27, 2022
Nicolet 650 FTIR AUP2010245 SO2	FTIR	Jan 20, 2022

Triad Data Available Upon Request

NOTES: Gross Weight 49.4 Kg

Net Weight 5.4 Kg



Approved for Release

Page 1 of 160-402340012-1





Airgas Specialty Gases  
Airgas USA LLC  
6141 Easton Road  
Plumsteadville, PA 18949  
Airgas.com

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE  
(THAILAND) LTD  
Part Number: E02N192E3HA0002  
Cylinder Number: GN0027214  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12022  
Gas Code: CO, NO, NOX, SO2, BALN  
Reference Number: 160-402340013-1  
Cylinder Volume: 247.2 CF  
Cylinder Pressure: 2215 PSIG  
Valve Outlet: 590  
Certification Date: Feb 11, 2022  
Expiration Date: Feb 11, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasolub Calibration Standards (May 2012)" document EPA 820/P-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.19 PPM	G1	+/- 1.0% NIST Traceable	02/04/2022 02/11/2022
CARBON MONOXIDE	50.00 PPM	79.55 PPM	G1	+/- 0.6% NIST Traceable	02/04/2022
NITRIC OXIDE	50.00 PPM	50.47 PPM	G1	+/- 1.0% NIST Traceable	02/04/2022 02/11/2022
SULFUR DIOXIDE	50.00 PPM	79.51 PPM	G1	+/- 0.8% NIST Traceable	02/04/2022 02/11/2022
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	00010112	KAL04777	99.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 16, 2024
NTRM	00010115	C073109	98.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Oct 06, 2025
NTRM	00010124	C070044	99.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Oct 06, 2025
GMIS	12420282130	C023270	4.00 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Dec 03, 2024
NTRM	11010419	KAL04813	99.8 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.5%	Jul 28, 2023

ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Model 1250 FTR AUP2010245 CO	FTR		Feb 03, 2022		
Model 1250 FTR AUP2010245 NO	FTR		Feb 10, 2022		
Model 650 FTR AUP2010245 NO	FTR		Jan 27, 2022		
Model 1250 FTR AUP2010245 SO2	FTR		Jan 29, 2022		

Triad Data Available Upon Request  
NOTES: Gross Weight: 48.5 Kg  
Net Weight: 8.1 Kg



Approved for Release

Page 1 of 160-402340013-1



Airgas Specialty Gases  
Airgas USA LLC  
6141 Easton Road  
Plumsteadville, PA 18949  
Airgas.com

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE  
(THAILAND) LTD  
Part Number: E02N192E3HA0000  
Cylinder Number: GN0027033  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12022  
Gas Code: O2, BALN  
Reference Number: 160-402340009-1  
Cylinder Volume: 248.4 CF  
Cylinder Pressure: 2214 PSIG  
Valve Outlet: 590  
Certification Date: Feb 10, 2022  
Expiration Date: Feb 10, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasolub Calibration Standards (May 2012)" document EPA 820/P-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	8.000 %	7.975 %	G1	+/- 0.4% NIST Traceable	02/10/2022
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	10010835	K022176	5.967 % OXYGEN/NITROGEN	+/- 0.3%	Apr 19, 2022

ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
SIEMENS OXYMAT 6 - N1-W5-951 - O2	PARAMAGNETIC		Jan 27, 2022		

Triad Data Available Upon Request  
NOTES: Gross Weight: 43.3 Kg  
Net Weight: 8.1 Kg



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Page 1 of 160-402340009-1



Airgas Specialty Gases  
Airgas USA LLC  
6141 Easton Road  
Plumsteadville, PA 18949  
Airgas.com

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE  
(THAILAND) LTD  
Part Number: E02N192E3HA0001  
Cylinder Number: GN0027201  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12022  
Gas Code: O2, BALN  
Reference Number: 160-402340010-1  
Cylinder Volume: 249.8 CF  
Cylinder Pressure: 2214 PSIG  
Valve Outlet: 590  
Certification Date: Feb 02, 2022  
Expiration Date: Feb 02, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasolub Calibration Standards (May 2012)" document EPA 820/P-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	18.00 %	18.04 %	G1	+/- 0.4% NIST Traceable	02/02/2022
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	08010230	K009228	23.20 % OXYGEN/NITROGEN	+/- 0.4%	Jan 01, 2022

ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
SIEMENS OXYMAT 6 - N1-W5-951 - O2	PARAMAGNETIC		Jan 27, 2022		

Triad Data Available Upon Request  
NOTES: Gross Weight: 48.6 Kg  
Net Weight: 8.2 Kg



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Page 1 of 160-402340010-1

### CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Barometric Pressure (mmHg):  
Relative Humidity (%):  
Temperature (°C):  
Reference Dry Gas Meter ID:  
Serial No.:  
Correction Factor (Y):  
Next Calibration Date:

Calibration No.:  
Dry Gas Meter ID:  
Serial No.:  
Model No.:

Console Control - Drygas Meter			
Vr (Liters)	Tr (C)	Total	
		Initial	Final
1113140.0	25.0	1113140.0	144.40
1113254.4	25.0	1113254.4	30.0
1113254.8	25.0	1113254.8	31.0
1113254.8	25.0	1113254.8	32.0
1113254.8	25.0	1113254.8	33.0
1113254.8	25.0	1113254.8	34.0
1113254.8	25.0	1113254.8	35.0
1113254.8	25.0	1113254.8	36.0
1113254.8	25.0	1113254.8	37.0
1113254.8	25.0	1113254.8	38.0
1113254.8	25.0	1113254.8	39.0
1113254.8	25.0	1113254.8	40.0
1113254.8	25.0	1113254.8	41.0
1113254.8	25.0	1113254.8	42.0
1113254.8	25.0	1113254.8	43.0
1113254.8	25.0	1113254.8	44.0
1113254.8	25.0	1113254.8	45.0
1113254.8	25.0	1113254.8	46.0
1113254.8	25.0	1113254.8	47.0
1113254.8	25.0	1113254.8	48.0
1113254.8	25.0	1113254.8	49.0
1113254.8	25.0	1113254.8	50.0
1113254.8	25.0	1113254.8	51.0
1113254.8	25.0	1113254.8	52.0
1113254.8	25.0	1113254.8	53.0
1113254.8	25.0	1113254.8	54.0
1113254.8	25.0	1113254.8	55.0
1113254.8	25.0	1113254.8	56.0
1113254.8	25.0	1113254.8	57.0
1113254.8	25.0	1113254.8	58.0
1113254.8	25.0	1113254.8	59.0
1113254.8	25.0	1113254.8	60.0
1113254.8	25.0	1113254.8	61.0
1113254.8	25.0	1113254.8	62.0
1113254.8	25.0	1113254.8	63.0
1113254.8	25.0	1113254.8	64.0
1113254.8	25.0	1113254.8	65.0
1113254.8	25.0	1113254.8	66.0
1113254.8	25.0	1113254.8	67.0
1113254.8	25.0	1113254.8	68.0
1113254.8	25.0	1113254.8	69.0
1113254.8	25.0	1113254.8	70.0
1113254.8	25.0	1113254.8	71.0
1113254.8	25.0	1113254.8	72.0
1113254.8	25.0	1113254.8	73.0
1113254.8	25.0	1113254.8	74.0
1113254.8	25.0	1113254.8	75.0
1113254.8	25.0	1113254.8	76.0
1113254.8	25.0	1113254.8	77.0
1113254.8	25.0	1113254.8	78.0
1113254.8	25.0	1113254.8	79.0
1113254.8	25.0	1113254.8	80.0
1113254.8	25.0	1113254.8	81.0
1113254.8	25.0	1113254.8	82.0
1113254.8	25.0	1113254.8	83.0
1113254.8	25.0	1113254.8	84.0
1113254.8	25.0	1113254.8	85.0
1113254.8	25.0	1113254.8	86.0
1113254.8	25.0	1113254.8	87.0
1113254.8	25.0	1113254.8	88.0
1113254.8	25.0	1113254.8	89.0
1113254.8	25.0	1113254.8	90.0
1113254.8	25.0	1113254.8	91.0
1113254.8	25.0	1113254.8	92.0
1113254.8	25.0	1113254.8	93.0
1113254.8	25.0	1113254.8	94.0
1113254.8	25.0	1113254.8	95.0
1113254.8	25.0	1113254.8	96.0
1113254.8	25.0	1113254.8	97.0
1113254.8	25.0	1113254.8	98.0
1113254.8	25.0	1113254.8	99.0
1113254.8	25.0	1113254.8	100.0

Ratio of reading of reference to dry gas meter. Tolerance for individual values: ± 0.02 from average.  
ΔVr: Office pressure differential that equates to 21.24 mm of air at 25 °C and 100 mm of mercury. mmH2O: Tolerance for individual values: ± 5.091

Procedure: 80 GPT (APP) METH SEC 5.3.2 T

Calculated by: (Mechanical) Woonchuan T

Approved by: (Mechanical) Woonchuan T

Field Sp: (Mechanical) Woonchuan T





### Stopwatch Calibration Test Report

Calibration Date : 4 Jan 24      Next Cal. Date : 4 Jul 24  
Barometric Pressure (mmHg) : 760      Temperature (°C) : 29.0  
Relative Humidity (%) : 48.0

#### Reference Stopwatch Data

Stopwatch ID No. : E18061  
Model : F808  
Serial No. : -  
Calibration Date : 8 Sep 20  
Certificate No. : E-2009018

#### Console Control Meter Data

Dry Gas Meter No. : BKK\_FS0485  
Model : XC-572-V  
Serial No. : 1310055

Run No.	Time Actual (m:ss.ms)	Time Reading (m:ss)	Diff. (ms)	Diff. (min)
1	5:00:10	5:00	10	0.00017
2	5:00:11	5:00	11	0.00018
3	5:00:09	5:00	9	0.00015
4	5:00:11	5:00	11	0.00018
5	5:00:10	5:00	10	0.00017
6	5:00:10	5:00	10	0.00017
7	5:00:10	5:00	10	0.00017
8	5:00:11	5:00	11	0.00018
9	5:00:10	5:00	10	0.00017
10	5:00:10	5:00	10	0.00017
			Average	0.00017
			SD	0.00001

Calibrate by :

Mr Prasert Surakhan

Field Scientist (3)

Approved by :

Mr. Samart Roo-ngan

Specialist (1)



### DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 4 Jan 24		Ambient Temperature (°C) : 29			
Calibration sheet No. : C-040124-BKK_FS0486		Relative Humidity (%) : 48			
Digital Temperature ID : BKK_FS0486		Reference Temperature ID : BKK_FS1144			
Serial No. : 1310055		Serial No. : 201090000013			
Model : XC-572-V		Model : Digicon-CC-VT-MS			
Next Calibrate : 14 Aug 24					
Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	99	-1	±3	Pass
	150	149	-1	±3	Pass
	200	199	-1	±3	Pass
	250	248	-2	±3	Pass
Probe	300	298	-2	±3	Pass
	500	498	-2	±3	Pass
	100	99	-1	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Oven	100	99	-1	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Filter	100	99	-1	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Exit	0	1	1	±3	Pass
	10	10	0	±3	Pass
	20	20	0	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความคลาดเคลื่อนสูงสุดที่อนุญาต

Calibrated by :

( Mr. Prasert Surakhan )  
Field Scientist (3)

Approved by :

( Mr. Samart Roo-ngan )  
Specialist (1)

FORM NO. : F-06-027 REVISION NO. 2 ISSUE DATE : 9 Feb 23



### PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

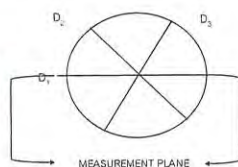
Calibration Date : 4 Jan 24			Nozzle Set ID : BKK_FS0485		
Calibration Sheet No. : C-040124-BKK_FS0485			Vernier Caliper ID : RYG_FS0539		
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) \div 3$
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	$\Delta D$	D <sub>avg</sub>
1	0.315	0.315	0.315	0.000	0.315
2	0.475	0.475	0.475	0.000	0.475
3	0.530	0.530	0.530	0.000	0.530
4	0.635	0.635	0.635	0.000	0.635
5	0.790	0.790	0.790	0.000	0.790
6	0.950	0.950	0.950	0.000	0.950
7	1.110	1.110	1.110	0.000	1.110
8	1.270	1.270	1.270	0.000	1.270
9	1.600	1.600	1.600	0.000	1.600

Where :

D<sub>1</sub>, D<sub>2</sub>, D<sub>3</sub> = Three different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D<sub>avg</sub> = (D<sub>1</sub> + D<sub>2</sub> + D<sub>3</sub>) ÷ 3



Calibrated by :

( Mr. Worawich Tangmoon )  
Field Scientist (2)

Approved by :

( Mr. Samart Roo-ngan )  
Field Specialist (1)

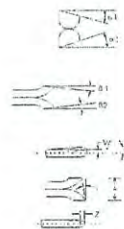
FORM NO. : F-06-124 REVISION NO. 2 ISSUE DATE : 25/12/23



### Type S Pitot Tube Calibration

Date Calibration : 3-Jan-24  
Pitot ID : BKK\_FS0551  
Pitot SN : -

Due Date : 3-Jul-24  
Inclinometer ID : BKK\_FS1131  
Vernier ID : SGK\_FS0113



Parameter	Value	Allowable Range	Check
α1	-2.4	-10° < α1 < +10°	OK
α2	-1.2	-10° < α2 < +10°	OK
β1	-2.0	-5° < β1 < +5°	OK
β2	1.3	-5° < β2 < +5°	OK
γ	0.3	-	-
θ	0.2	-	-
Z = A tan γ	0.005	Z ≤ 0.125"	OK
W = A tan θ	0.003	W ≤ 0.031"	OK
Dt	0.310	0.188" to 0.375"	OK
A/2Dt	1.468	1.05 ≤ PA/Dt ≤ 1.5	OK
A	0.91	2.1Dt ≤ A ≤ 3Dt	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by :

( Mr. Prasert Surakhan )  
Enviro Field Services Scientist (3)

Approved by :

( Mr. Samart Roo-ngan )  
Enviro Field Services Specialist (1)

FORM NO. : F-06-124 REVISION NO. 0 ISSUE DATE : 25/12/23







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Cert. No. : ACC24010  
Job No. : VC67AC0059  
Pages : 3 of 3

## Result of calibration :

### 1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.94	-0.06	0.14	0.40

### 2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.1	0.1	0.1	1.0

### 3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.48	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

*T. Petchur*

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Cert. No. : ACL24087  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 00558526 / 175176 / 85721  
ID No. : BKK\_FS0116

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 11 JANUARY 2024  
Calibration Date : 22-24 JANUARY 2024  
Date of Issue : 24 JANUARY 2024

Calibrated by : Nattakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

*Nattakorn P.*  
*21/1/24*

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Cert. No. : ACL24087  
Job No. : VC67AC0055  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY-48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY-52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY-53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY-53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	33461A	MY-60034273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

*T. Petchur*

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Cert. No. : ACL24087  
Job No. : VC67AC0055  
Pages : 3 of 8

## Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
5000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

*T. Petchur*

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Cert. No. : ACL24087  
Job No. : VC67AC0055  
Pages : 4 of 5

**Result of calibration:**

**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

**2. Self-generated noise**

**2.1 Normal test**

Measured Value (dB)
14.8

**2.2 The microphone of the sound level meter was replaced by electrical signal input device.**

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.7
Flat	23.4

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
8000	2.5	2.6	2.6	±5.0

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Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz**

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

**5.2 Time weighting at 1 kHz**

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

**6. Long-term stability**

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Job No. : VC67AC0055  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.1	0.1	±1.1
79.0	79.0	0.0	±1.1
74.0	74.1	0.1	±1.1
69.0	69.1	0.1	±1.1
64.0	64.0	0.0	±1.1
59.0	59.1	0.1	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.1	0.1	±1.1
29.0	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.2	0.2	±1.1
25.0	25.1	0.1	±1.1

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Job No. : VC67AC0055  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

**9. Tone burst response**

Time	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Weighing	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Fast	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.3	-0.1	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

*T. Petch*



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Cert. No. : ACL24087  
Job No. : VC67AC0055  
Pages : 5 of 8

**11. Overload indication**

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

**12. High level stability**

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

*T. Petchurai*

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Cert. No. : ACL24016  
Pages : 1 of 8

**Calibration Certificate**

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42 / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00572565 / 170402 / 72903  
**ID No.:** BKK\_FS0874

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAEANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :** -  
**Ambient Temperature :** ( 23.0 ± 3 ) °C  
**Pressure :** ( 101.3 ± 3 ) kPa  
**Relative Humidity :** ( 50.0 ± 20 ) %

**Received Date :** 22 DECEMBER 2023  
**Calibration Date :** 10-11 JANUARY 2024  
**Date of Issue :** 12 JANUARY 2024

**Calibrated by :** Nuthakorn Pisutpaisan

**Approved by :** *T. Petchurai*  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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**CALIBRATION LABORATORY**

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Tel: +66 2433 8331 Email: calibration@sithiporn.com

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Cert. No. : ACL24016  
Job No. : VC67AC0045  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting, with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

**1. Reference Standard Instruments :**

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220676	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.  
3. This certificate is traceable to the international system of unit maintained at :  
3.1 National Institute of Metrology (Thailand).  
3.2 Thailand Institute of Scientific and Technological Research (TISTR).

*T. Petchurai*

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Cert. No. : ACL24016  
Job No. : VC67AC0045  
Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Cert. No. : ACL24016  
Job No. : VC67AC0045  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

**2. Self-generated noise**

**2.1 Normal test**

Measured Value (dB)
17.2

**2.2 The microphone of the sound level meter was replaced by electrical signal input device.**

Frequency Weighting	Measured value (dB)
A-weight	13.1
C-weight	19.4
Flat	25.1

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 81 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.3	0.7	0.3	±5.0

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Cert. No. : ACL24016  
Job No. : VC67AC0045  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz**

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

**5.2 Time weightings at 1 kHz**

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
1eq	94.0	94.0	0.0	±0.1

**6. Long-term stability**

Frequency Weighting	SUM Display at initial (dB)	SUM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Job No. : VC67AC0045  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	27.9	-0.1	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated	Measured	Deviated	Acceptance
			Value (dB)	Value (dB)	Value (dB)	Limits (dB)
Fast	0.25	1	108.9	107.9	-0.1	1.5, -5.0
	2	8	117.0	117.0	0.0	1.0, -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5, -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5, -5.0
SFL	2	8	108.0	108.0	0.0	1.0, -2.5
	200	800	128.0	128.0	0.0	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Cert. No. : ACL24016  
Job No. : VC67AC0045  
Pages : 8 of 8

**11. Overload indication**

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

**12. High level stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation providing a level of confidence of approximately 95 %.

End of Calibration Certificate

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Cert. No. : ACL24003  
Pages : 1 of 8

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00572562 / 170409 / 72901  
ID No. : BKK\_FS0878

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 19 DECEMBER 2023  
Calibration Date : 05-08 JANUARY 2024  
Date of Issue : 09 JANUARY 2024

Calibrated by : Nathakorn Pimpraporn

Approved by : *T. Petchurai*  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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Cert. No. : ACL24003  
Job No. : VC67AC0043  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

**1. Reference Standard Instruments :**

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY46017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY532302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60034773	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977500	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL24003  
Job No. : VC67AC0043  
Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted
		uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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ISO 15187:2015  
CALIBRATION 0254

Cert. No. : ACL24003  
Job No. : VC67AC0043  
Pages : 4 of 5

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.5

**2. Self-generated noise**

**2.1 Normal test**

Measured Value (dB)
15.1

**2.2 The microphone of the sound level meter was replaced by electric signal input device.**

Frequency Weighting	Measured value (dB)
A-weight	13.4
C-weight	19.9
Flat	25.5

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.1	0.2	0.2	± 5.0

*T. Petch*

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Cert. No. : ACL24003  
Job No. : VC67AC0043  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz**

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	± 0.2
C-weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

**5.2 Time weightings at 1 kHz**

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

**6. Long-term stability**

Frequency Weighting	SLM Display at initial (dB)	SUM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	± 0.3

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Job No. : VC67AC0043  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

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Cert. No. : ACL24003  
Job No. : VC67AC0043  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	93.9	-0.1	±1.1

**9. Tone burst response**

Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; 2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.5	-0.9	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Cert. No. : ACL24003  
Job No. : VC67AC0043  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

*T. Petchurai*

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Cert. No. : ACL24019  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00558520 / 158771 / 58772  
ID No. : BKK\_FS0110

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 22 DECEMBER 2023  
Calibration Date : 10-11 JANUARY 2024  
Date of Issue : 12 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : *T. Petchurai*  
( Thanakul Petchurai )

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# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Tel : +66 2433 8331 Email : calibration@sithiporn.com

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Cert. No. : ACL24019  
Job No. : VC67AC0045  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with: Anechoic chamber and Reference  
Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Job No. : VC67AC0045  
Pages : 3 of 8

## Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Job No. : VC67AC0045  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	93.9	0.0	±0.3

**2. Self-generated noise**

**2.1 Normal test**

Measured Value ( dB )
16.1

**2.2 The microphone of the sound level meter was replaced by electrical signal input device.**

Frequency Weighting	Measured value ( dB )
A - weight	10.8
C - weight	16.3
Flat	22.6

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.2	-0.2	-0.2	±5.0

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Job No. : VC67AC0045  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz**

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

**5.2 Time weighting at 1 kHz**

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
1 eq	94.0	94.0	0.0	± 0.1

**a. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

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Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, T <sub>b</sub> ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; 5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.5	-0.9	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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Pages : 8 of 8

**11. Overload indication**

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

**12. High level stability**

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

*T. Petchum*

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Cert. No. : ACL24006  
Pages : 1 of 8

**Calibration Certificate**

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RJON  
**Model :** NL-42 / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00858521 / 158765 / 58767  
**ID No.:** BKK\_FS0111

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
101 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :**  
**Ambient Temperature :** ( 23.0 ± 3 ) °C  
**Pressure :** ( 101.3 ± 3 ) kPa  
**Relative Humidity :** ( 50.0 ± 20 ) %

**Received Date :** 19 DECEMBER 2023  
**Calibration Date :** 05-08 JANUARY 2024  
**Date of Issue :** 09 JANUARY 2024

**Calibrated by :** Nathakorn Pisupaisan

**Approved by :**

*T. Petchum*  
( Thanakorn Petchum )

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Cert. No. : ACL24006  
Job No. : VC67AC0043  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

**1. Reference Standard Instruments :**

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-9009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand),

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Job No. : VC67AC0043  
Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Cert. No. : ACL24006  
Job No. : VC67AC0043  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.58)	93.9	0.0	±0.3

**2. Self-generated noise**

**2.1 Normal test**

Measured Value ( dB )
14.6

**2.2 The microphone of the sound level meter was replaced by electrical signal input device.**

Frequency Weighting	Measured value ( dB )
A - weight	12.6
C - weight	19.2
Flat	24.8

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 94 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.5	-1.5	-1.4	±5.0

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Job No. : VC67AC0043  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz:**

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

**5.2 Time weighting at 1 kHz**

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

**6. Long - term stability**

Frequency Weighting	SI M Display at initial ( dB )	SI M Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

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Job No. : VC67AC0043  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
126.0	126.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	124.0	124.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.0	-0.1	1.5 ; -5.0
SH	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	135.0	133.0	-2.0	±3.0
One	136.4	126.1	-10.3	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	135.0	133.0	-2.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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**11. Overload indication**

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

**12. High level stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

*T. Petchurai*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

451-451/1 Srinthorn Rd., Bangbunru, Bangkok 10700 THAILAND  
Tel: 0-2433-8800 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23336  
Pages : 1 of 8

**Calibration Certificate**

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42 / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00572609 / 170133 / 72947  
**ID No.:** BKK\_FS024

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND

**Location :** -  
**Ambient Temperature :** ( 23.0 ± 3 ) °C  
**Pressure :** ( 101.3 ± 3 ) kPa  
**Relative Humidity :** ( 50.0 ± 20 ) %

**Received Date :** 20 OCTOBER 2023  
**Calibration Date :** 01-02 NOVEMBER 2023  
**Date of Issue :** 03 NOVEMBER 2023

**Calibrated by :** Nuthakorn Pitsutpaisan

**Approved by :** *T. Petchurai*  
( Thanakul Petchurai )

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QT-1812-00-01-020604

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

**Continuation of Calibration Certificate**

Cert. No. : ACL23336  
Job No. : VC67AC0014  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each instruments display and also with SLM's display.

**Condition of this result of calibration :**

**1. Reference Standard Instruments :**

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QT-1812-00-01-020604

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**SITHIPORN ASSOCIATES CO., LTD.**  
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**Continuation of Calibration Certificate**

Cert. No. : ACL23336  
Job No. : VC67AC0014  
Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QT-1812-00-01-020604

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221



## Continuation of Calibration Certificate

Cert. No. : ACL23336  
Job No. : VC67AC0014  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.5	89.4	-0.1	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

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QI-TS12-04-03-020604

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Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiphom.com http://www.sithiphom.comCert. No. : ACL23347  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00623386 / 198633 / 26414  
ID No. : BKK\_FS1218

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 01 NOVEMBER 2023  
Calibration Date : 07-08 NOVEMBER 2023  
Date of Issue : 14 NOVEMBER 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petch*  
( Thanakul Peichurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 2 of 3

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weightings with Anechoic chamber and Reference  
Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EELBP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EELBP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EELBP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QI-TS12-04-03-020604

## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 3 of 3

## Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,  
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-TS12-04-03-020604

## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
14.8

## 2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value ( dB )
A - weight	10.8
C - weight	17.0
Flat	22.8

## 3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 84 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.1	-0.1	0.0	± 5.0

Q1-1512-01-04-020604

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SI M Display at initial ( dB )	SI M Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

Q1-1512-01-04-020604

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## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
28.0	28.9	0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

Q1-1512-01-04-020604

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## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lcpk ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

Q1-1512-01-04-020604

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## Continuation of Calibration Certificate

Cert. No. : ACL23347  
Job No. : VC67AC0022  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value	Acceptance Limits
Positive one-half cycle	Negative one-half cycle	( dB )	( dB )
89.7	89.6	-0.1	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

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Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23363  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00222486 / 198967 / 15317  
ID No. : BKK\_FS1222

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 07 NOVEMBER 2023  
Calibration Date : 29-30 NOVEMBER 2023  
Date of Issue : 06 DECEMBER 2023

Calibrated by : Nithakorn Pisutpaisan

Approved by :

*T. Petchurai*  
( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53229076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60034773	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QI-TS12-04-04-020604

## Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 3 of 8

## Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-TS12-04-04-020604

## Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
14.7

## 2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	11.3
C-weight	17.7
Flat	23.5

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.6	0.7	0.7	±1.5
1000	0.1	0.1	0.1	±1.0
8000	0.1	0.2	0.2	±5.0

QF-TS-2404-02/0001

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## Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
1eq	94.0	94.0	0.0	±0.1

## 6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QF-TS-2404-02/0001

T. Betch

## Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.1	0.1	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

QF-TS-2404-02/0001

T. Betch

## Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, 1b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEI	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	126.4	125.4	-1.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	125.1	-10.3	±2.0
Negative half cycle	135.4	125.1	-10.3	±2.0

QF-TS-2404-02/0001

T. Betch



Continuation of Calibration Certificate

Cert. No. : ACL23363  
Job No. : VC67AC0025  
Pages : 8 of 8

11. Overload indication

Measured value ( dB )		Deviated Value	Acceptance Limits
Positive one-half cycle	Negative one-half cycle	( dB )	( dB )
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.  
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC23046  
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-74  
Serial No. : 34425567  
ID No. : BKK\_FS0618

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK. 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 28 NOVEMBER 2023  
Calibration Date : 19 DECEMBER 2023  
Date of Issue : 22 DECEMBER 2023

Calibrated by : Nakhorn Pisutpaisan

Approved by : *T. Petchum*  
( Thanakul Petchumai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACC23046  
Job No. : VC67AC0035  
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	12-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977800	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V744B6069	EF-0012-23	10-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACC23046  
Job No. : VC67AC0035  
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.03	0.03	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value ( % )	Uncertainty ( % )	Acceptance limit ( % )
1000	1004.3	0.4	0.1	1.0

3. Total distortion

Measured value ( % )	Uncertainty ( % )	Acceptance limit ( % )
1.86	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Srinakharin Rd.,Bangna, Bangkok 10700 THAILAND  
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23371  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01122504 / 169436 / 72457  
ID No. : BKK\_FS0033

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KHWAENG PHATHANAKAN, KHET SUAN LUANG,  
BANGKOK 10250 THAILAND

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 07 NOVEMBER 2023  
Calibration Date : 29-30 NOVEMBER 2023  
Date of Issue : 06 DECEMBER 2023

Calibrated by : Nattakorn Pongpisan

Approved by : *T. Petch*  
( Thanikul Petchurai )

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other than in full, except with the prior written approval of the head of Calibration Laboratory.

QI-FS-204-014-0004

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference  
Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY 48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY 52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY 53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY 53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY 60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

QI-FS-204-014-0004

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 4 of 8

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 3 of 8

### Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,  
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-FS-204-014-0004

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

### Result of calibration :

#### 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	93.9	0.0	±0.3

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value ( dB )
16.1

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value ( dB )
A-weight	13.8
C-weight	19.8
Flat	25.6

#### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.8	0.7	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-0.8	-0.7	-0.7	±5.0

QI-FS-204-014-0004



## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	-0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.1	0.1	± 0.3

QI-TS12-04-01-020061

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.8	-0.2	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

QI-TS12-04-01-020061

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.1	-0.3	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	132.9	-0.1	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QI-TS12-04-01-020061

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23371  
Job No. : VC67AC0025  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QI-TS12-04-01-020061

T. Petch

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthorn Rd., Bangumru, Bangplud Bangkok 10700 THAILAND  
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cali-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL23334  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00572457 / 170214 / 72795  
ID No. : BKK\_FS0923

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 29 OCTOBER 2023  
Calibration Date : 01-02 NOVEMBER 2023  
Date of Issue : 03 NOVEMBER 2023

Calibrated by : Natthakorn Pisutaporn

Approved by :

*T. Petcharat*  
( Thansakul Petcharat )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced  
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01-1512-0000023334

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference  
Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53270104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

01-1512-0000023334

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 3 of 8

### Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.2
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter.  
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

01-1512-0000023334

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 4 of 8

### Result of calibration :

#### 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	93.9	0.0	±0.3

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value ( dB )
18.0

##### 2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured value ( dB )
A-weight	9.9
C-weight	16.4
Flat	22.3

#### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve ( dB )			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.7	1.7	-1.7	±5.0

01-1512-0000023334



## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

QH-TS12-03-04-020664

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	25.0	0.0	± 1.1

QH-TS12-03-04-020664

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C' sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lepack ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QH-TS12-03-04-020664

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23334  
Job No. : VC67AC0014  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QH-TS12-03-04-020664

T. Petch

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Srinthom Rd.,Bangbunru, Banglad Bangkok 10700 THAILAND  
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Cert. No. : ACL23342  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00584982 / 175177 / 85722  
ID No. : BKK\_FS0925

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAI AND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 01 NOVEMBER 2023  
Calibration Date : 07-08 NOVEMBER 2023  
Date of Issue : 14 NOVEMBER 2023

Calibrated by : Nathakorn Pitsaporn

Approved by : *T. Petchurai*  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QI-1512-04-01-0200-4

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	EP-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EP-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220164	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024773	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EP-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QI-1512-04-01-0200-4

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 3 of 8

### Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-1512-04-01-0200-4

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 4 of 8

### Result of calibration :

#### 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value (dB)
14.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency (Hz)	Measured value (dB)
A-weight	10.8
C-weight	16.9
Flat	22.5

#### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	I-1a	C-weight	A-weight	Acceptance Limit
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.5	0.6	0.6	±5.0

QI-1512-04-01-0200-4



## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020604

7. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.1	0.1	± 1.1
136.0	136.1	0.1	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.1	0.1	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.1	0.1	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020604

7. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>epk</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020604

7. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL23342  
Job No. : VC67AC0022  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020604

7. Petch



# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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Tel:0-2435-8900 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23309  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone LC-52 / Pre-amplifier R1-24  
Serial No. : 00584983 / 157761 48096  
ID No. : BKK\_PS0926

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHAT THANAKAN 40, PHATTHANAKAN ROAD,  
KHUWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 22 SEPTEMBER 2021  
Calibration Date : 16-18 OCTOBER 2021  
Date of Issue : 19 OCTOBER 2021

Calibrated by : Nathakorn Pisurapaisan

Approved by : *T. Petchurai*  
( Thamasul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

08-1512-004010260-4

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2015) standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP-309266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP-290266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP-310286	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42EAI	34560495	AA-2002-23	14-FEB-24

- This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
- This certificate is traceable to the international system of unit maintained at:
  - National Institute of Metrology (Thailand),
  - Thailand Institute of Scientific and Technological Research (TISTR).

08-1512-004010260-4

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 3 of 8

### Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

08-1512-004010260-4

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 4 of 8

### Result of calibration :

#### 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.2

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value (dB)
16.5

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	12.6
C-weight	18.8
Flat	24.5

#### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	+0.3	-0.2	-0.2	± 5.0

08-1512-004010260-4



## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

## 5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

QI-TS12-04-04-020664

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## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.1	0.1	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.1	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.1	0.1	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

QI-TS12-04-04-020664

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## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lepeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.1	0.1	±3.0
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.3	-0.1	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

QI-TS12-04-04-020664

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## Continuation of Calibration Certificate

Cert. No. : ACL23309  
Job No. : VC66AC0101  
Pages : 8 of 8

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.5	89.7	0.2	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %.

End of Calibration Certificate

QI-TS12-04-04-020664

T. Petch

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

451/4511 Sarinham Road, Bangkum, Bangkok, 10120 Thailand  
Tel : +66 2433 8321 Email : calibration@sithiporn.com

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Cert. No. : ACL24004  
Pages : 1 of 8

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00672737 / 158772 / 58773  
ID No. : BKK FS0927

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 46, PHATHANAKAN ROAD,  
KHUWAENG PHATHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 19 DECEMBER 2023  
Calibration Date : 05-08 JANUARY 2024  
Date of Issue : 09 JANUARY 2024

Calibrated by : Hathakorn Phaisatit

Approved by : *T. Petchum*  
( Thanakul Petchum )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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Cert. No. : ACL24004  
Job No. : VC67AC0043  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

**1. Reference Standard Instruments :**

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EP-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EP-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 300266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29 0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31 0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EP-0011-23	08-FEB-24
Condenser Microphone	4150	29779600	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34560495	AA-2002 23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL24004  
Job No. : VC67AC0043  
Pages : 3 of 8

**Summary of Measurement Result :**

Parameter	Uncertainty (dB)	Maximum-permitted
		uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Job No. : VC67AC0043  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

**2. Self-generated noise**

**2.1 Normal test**

Measured Value (dB)
13.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.4
Flat	22.2

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limit
125	0.3	0.3	9.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.6	-0.6	-0.5	±5.0



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Job No. : VC67AC0043  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	-0.1	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	93.9	-0.1	± 0.2
C - weight	94.0	93.9	-0.1	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	93.9	-0.1	± 0.1
Slow	94.0	93.9	-0.1	± 0.1
Leq	94.0	94.0	0.0	± 0.1

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

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Cert. No. : ACL24004  
Job No. : VC67AC0043  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.1	0.1	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

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Cert. No. : ACL24004  
Job No. : VC67AC0043  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, T <sub>b</sub> ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 : -5.0
	2	8	117.0	116.9	-0.1	1.0 : -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 : -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 : -5.0
SEL	2	8	108.0	108.0	0.0	1.0 : -2.5
	200	800	128.0	128.0	0.0	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Job No. : VC67AC0043  
Pages : 8 of 8

**11. Overload indication**

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.7	89.5	-0.2	±1.5

**12. High level stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$   
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

*T. Petch*



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67 0231

MTC No. EFL BP. 165/0167

### CALIBRATION CERTIFICATE

Submitted by : AT S I Laboratory Group (Thailand) Co., Ltd.

Address : 104 Phantakan 40, Phantakan Rd., Khwaeng Phantakan, Khet Suan Luang, Bangkok, 10250

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre  
Sri IC, Bangpoo Industrial Estate, Sukhumvit Rd., A Muang, Samutprakan 10280.

#### Instrument Calibrated

Description : Sound Level Meter

Manufacturer : Rion

Model : NI-42

Serial No. : 00672769 (ID : BKK PS6929)

Microphone : UC-52 No.170666

Preamplifier : NH-24 No.73129

#### Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494
2. Condenser Microphone Bruel&Kjaer 4120 S/N 2889871
3. Decade Attenuator Ando AI-205 S/N 00464602
4. Function Arbitrary Waveform Generator Agilent 33220A S/N MY44042668
5. Digital Function Synthesizer NI Electronic Instruments DI-193A S/N 122037
6. Digital Multimeter Fluke 8520A S/N 4985007
7. Piezophone Rion NC-72 S/N 00402446
8. Measuring Amplifier Bruel&Kjaer 2636 S/N 1535484

Date of Receipt : 24 Jan. 2024

Date of Calibration : 21 Feb. 2024

Calibration Certificate No. : 21-67 0231

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67 0231

MTC No. EFL BP. 165/0167

9. Power Amplifier Bruel&Kjaer 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tanigawa TPA-203A S/N 2212.

#### Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Date of Calibration : 21 Feb. 2024

Calibration Certificate No. : 21-67 0231

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67 0231

MTC No. EFL BP. 165/0167

#### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation value (dB)	Acceptance limit class 2 (dB)	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
113.91	114.7	113.9	0.0	1.0	0.30

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.9 (dB).

#### 2. Self-generated noise

##### 2.1 Normal test

Measured value (dB)	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
26.2	0.10	N/A

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency (Hz)	Measured value (dB)	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
A-Weight	12.5	0.10	N/A
C-Weight	17.9	0.10	N/A
Flat	22.5	0.10	N/A

Date of Calibration : 21 Feb. 2024

Calibration Certificate No. : 21-67 0231

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67 0231

MTC No. EFL BP. 165/0167

#### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)			Acceptance limit class 2 (dB)	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
	A-weight	C-weight	Flat			
125	0.1	0.3	0.3	1.5	0.45	0.6
1000	0.1	0.0	0.0	1.0	0.45	0.6
8000	-0.7	-0.7	-0.7	5.0	0.45	0.7

#### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)			Acceptance limit class 2 (dB)	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
	A-weight	C-weight	Flat			
63	0.0	0.1	0.0	2.0	0.20	0.6
125	0.0	0.1	0.0	1.5	0.20	0.6
250	0.0	0.1	0.0	1.5	0.20	0.6
500	0.0	0.1	0.0	1.5	0.20	0.6
1000	0.0	0.0	0.0	1.0	0.20	0.6
2000	-0.1	-0.1	-0.2	2.0	0.20	0.6
4000	-0.2	-0.3	-0.3	3.0	0.20	0.6
8000	0.0	0.0	0.0	5.0	0.20	0.7

Date of Calibration : 21 Feb. 2024

Calibration Certificate No. : 21-67 0231

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THAI INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67-0231

MTC No. FFL-BP. 165-0167

### 10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (-dB)	Uncertainty (-dB)	Maximum-permitted uncertainty of measurement (-dB)
Complete cycle	125.4	125.3	-0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

### 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (-dB)	Uncertainty (-dB)	Maximum-permitted uncertainty of measurement (-dB)
Positive one-half cycle	Negative one-half cycle				
137.0	137.0	0.0	1.5	0.20	0.25

### 12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (-dB)	Uncertainty (-dB)	Maximum-permitted uncertainty of measurement (-dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by:   
(Mr. Wutawat Supanuch)

Approved by:   
(Mr. Panyas Braacharom)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre  
Ref: 20126701240346003

Date of Calibration: 21 Feb 2024  
Date of Issue: 22 Feb 2024

End of Certificate 0/0

Head Office: 65/14-16, 67/35-36, Soi Petchbassam 7/71, Petchbassam Rd., Walthapa, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812 Fax: (66) 02-8680860 www.jnatec.co.th  
E-mail: jnatec@jnatec.co.th  
Branch Office: 101/101, 101/102, 101/103, 101/104, 101/105, 101/106, 101/107, 101/108, 101/109, 101/110, 101/111, 101/112, 101/113, 101/114, 101/115, 101/116, 101/117, 101/118, 101/119, 101/120, 101/121, 101/122, 101/123, 101/124, 101/125, 101/126, 101/127, 101/128, 101/129, 101/130, 101/131, 101/132, 101/133, 101/134, 101/135, 101/136, 101/137, 101/138, 101/139, 101/140, 101/141, 101/142, 101/143, 101/144, 101/145, 101/146, 101/147, 101/148, 101/149, 101/150, 101/151, 101/152, 101/153, 101/154, 101/155, 101/156, 101/157, 101/158, 101/159, 101/160, 101/161, 101/162, 101/163, 101/164, 101/165, 101/166, 101/167, 101/168, 101/169, 101/170, 101/171, 101/172, 101/173, 101/174, 101/175, 101/176, 101/177, 101/178, 101/179, 101/180, 101/181, 101/182, 101/183, 101/184, 101/185, 101/186, 101/187, 101/188, 101/189, 101/190, 101/191, 101/192, 101/193, 101/194, 101/195, 101/196, 101/197, 101/198, 101/199, 101/200, 101/201, 101/202, 101/203, 101/204, 101/205, 101/206, 101/207, 101/208, 101/209, 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101/1188, 101/1189, 101/1190, 101/1191, 101/1192, 101/1193, 101/1194, 101/1195, 101/1196, 101/1197, 101/1198, 101/1199, 101/1200, 101/1201, 101/1202, 101/1203, 101/1204, 101/1205, 101/1206, 101/1207, 101/1208, 101/1209, 101/1210, 101/1211, 101/1212, 101/1213, 101/1214, 101/1215, 101/1216, 101/1217, 101/1218, 101/1219, 101/1220, 101/1221, 101/1222, 101/1223, 101/1224, 101/1225, 101/1226, 101/1227, 101/1228, 101/1229, 101/1230, 101/1231, 101/1232, 101/1233, 101/1234, 101/1235, 101/1236, 101/1237, 101/1238, 101/1239, 101/1240, 101/1241, 101/1242, 101/1243, 101/1244, 101/1245, 101/1246, 101/1247, 101/1248, 101/1249, 101/1250, 101/1251, 101/1252, 101/1253, 101/1254, 101/1255, 101/1256, 101/1257, 101/1258, 101/1259, 101/1260, 101/126





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Watthana, Bangkok, Bangkok 10600 Thailand  
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Certificate No. CD1-027-96  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

#### Functions

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15009779.  
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
90	20.093	20.0	0.0	0.009
80	25.049	25.0	0.0	0.009
50	30.045	30.0	0.0	0.009
30	35.041	35.0	0.0	0.009
10	40.039	40.0	0.0	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 18009595.  
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.023	20.1	0.1	0.009
110	25.049	25.1	0.1	0.009
110	30.045	30.1	0.1	0.009
110	35.042	35.1	0.1	0.009
110	40.038	40.1	0.1	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 13033275.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.033	20.1	0.1	0.009
75	25.049	25.0	0.0	0.009
75	30.045	29.5	-0.5	0.009
75	35.042	34.7	-0.3	0.009
75	40.038	39.6	-0.4	0.009

UUC\*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

★ End of Certificate ★



63/14-15,67/35-36, Soi Petchkasem 7/71, Petchkasem Rd,  
Watthana, Bangkok, Bangkok 10600 Thailand  
Tel: (66) 02-8680812 Fax: (66) 02-8680860 www.jnatec.com

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No: 17030553  
ID Number: BKK\_F50653  
Condition As-Received  
Customer: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthana 40, Phatthana Rd.,  
Khwaeng Suan Luang, Khwaeng Suan Luang,  
Bangkok 10250 Thailand.

Accredited calibration laboratory  
ISO/IEC 17025:2017  
MSC-TS-16 17025  
CALIBRATION 0367

Temperature measurement laboratory  
Calibration services department



MSC-TS-16 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : CD1-059-66

Page 1 of 2 Pages

MEASUREMENT ITEM: Heat Stress Monitor  
MANUFACTURER: Delta OHM  
MODEL/TYPE: HD32.2  
SERIAL NUMBER: 17030553  
ID NUMBER: BKK\_F50653  
CONDITION AS-RECEIVED  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthana 40, Phatthana Rd.,  
Khwaeng Suan Luang, Khwaeng Suan Luang,  
Bangkok 10250 Thailand.

RECEIVED DATE: 20 Dec 2023  
MEASUREMENT DATE: 20 Dec 2023  
ISSUE DATE: 20 Dec 2023

#### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 3.0 °C  
Relative Humidity: 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

#### TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:  
The temperature calibration was done by in-house calibration method as WI-G-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:  
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT 0035-23. Certificate number: ER-0101-23.

Reference Used During Calibration:  
1. Standard Temperature Probe Model: S15 100 A500, Serial No: 67E582 09, Due date: 28 Mar 2024  
2. Digital Temperature Indicator Model: DTI 1000 A Mk II, Serial No: 671407 00591 Due date: 14 Sep 2024

Uncertainty of Measurement:  
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM Evaluation of measurement data Guide to the expression of uncertainty in measurement.

Calibrated by:  
☒ Mr. Sereawit Techarat  
☒ Miss Jitrasorn Lertsomphon  
☒ Miss Rattaporn Pannuwan



Approved Signature

Mr. Parinya Booncharon  
Calibration Department Manager

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Continuation of Certificate of Calibration Number CD1-059-66

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

#### Functions

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15035270.  
Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
90	20.056	20.2	0.1	0.009
90	25.045	25.2	0.2	0.009
90	30.044	30.2	0.2	0.009
90	35.036	35.2	0.2	0.009
90	40.035	40.2	0.2	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 15044155.  
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.056	20.2	0.1	0.009
110	25.045	25.2	0.2	0.009
110	30.044	30.2	0.2	0.009
110	35.036	35.2	0.2	0.009
110	40.035	40.2	0.2	0.009

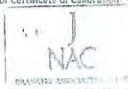
Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 13044775.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.056	19.7	-0.4	0.009
75	25.045	24.6	-0.4	0.009
75	30.044	29.6	-0.4	0.009
75	35.036	34.6	-0.4	0.009
75	40.035	39.6	-0.4	0.009

UUC\*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

★ End of Certificate of Calibration ★



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## CERTIFICATE OF CALIBRATION

Certificate No. CL 066-66  
Page 1 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No: 15036018  
ID No: BKK\_F50677

Customer: ALS Laboratory group (Thailand) Co., Ltd.  
Address: 104 Phatthana 40, Phatthana Rd.,  
Khwaeng Suan Luang, Khwaeng Suan Luang, Bangkok,  
10250 Thailand.

Received date: 11 May 2023  
Calibration date: 15 May 2023  
Issue date: 15 May 2023

Reference Used During Calibration:  
1. Standard Temperature Probe Model: S15 100 A500, Serial No: 667082 09, Due date: 26 Mar 2024  
2. Digital Temperature Indicator Model: DTI 1000 A Mk II, Serial No: 671407 00591 Due date: 22 Jul 2023

Calibration Condition:  
Temperature: (23±3) °C  
Relative Humidity: (55±15)%

#### Calibration Procedure

The temperature calibration was done by in-house calibration method as WI-CL-003 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

#### Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT 0035-23. Certificate number: ER 0002-22

NOTED: The certificate is valid only to the item calibrated on date and place of calibration

Calibrated by:  
☒ Mr. Sereawit Techarat  
☒ Miss Jitrasorn Lertsomphon



Approved Signature

Mr. Parinya Booncharon  
Calibration Department Manager



63/14-16/67/35-36, Soi Petchkasem 7/71, Petchkasem Rd,  
Wathapra, Bangkokya, Bangkok 10500 Thailand.  
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Certificate No. CL-055-66  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb globe Model HF3201.2 S/N: 10005219  
Dimension: Diameter 3.8 mm Length 170 mm

Immersion Depth (mm)	Standard Reading (°C)	W/G Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.004	20.0	0.0	0.009
30	25.004	25.0	0.0	0.009
30	30.000	30.0	0.0	0.009
30	35.000	35.0	0.0	0.009
30	40.001	40.0	0.0	0.009

Table 2: This equipment was connected with globe thermometer probe Model HF2276.2 S/N: 10005002  
Dimension: Diameter 3.8 mm Length 205 mm

Immersion Depth (mm)	Standard Reading (°C)	W/G Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.004	20.0	0.0	0.009
110	25.004	25.0	0.0	0.009
110	30.000	30.0	0.0	0.009
110	35.000	35.0	0.0	0.009
110	40.001	40.0	0.0	0.009

Table 3: This equipment was connected with triple column probe Model TP3274.2 S/N: 15017315  
Dimension: Diameter 3 mm Length 150 mm

Immersion Depth (mm)	Standard Reading (°C)	W/G Reading (°C)	Error (°C)	Uncertainty (°C)
25	20.004	20.1	0.1	0.009
25	25.004	25.1	0.1	0.009
25	30.000	29.5	-0.5	0.009
25	35.000	34.7	-0.3	0.009
25	40.001	39.5	-0.5	0.009

W/G: Wet Bulb Globe  
The reported expanded uncertainty is based on standard uncertainty calculated by using GUM 1.2 procedure level 1 and level of expansion is 95%

★ End of Certificate ★



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## CERTIFICATE OF CALIBRATION

Certificate No. CL-055-66  
Page 1 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No.: 15035132  
ID No: EN-150350

Customer:  
Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Address: 104 Phraibutangkajon 20, Phrasakulrajit Rd.,  
Phraeng Sub District, Bang Sue Sub District, Bangkok  
10250 Thailand

Received date: 01 Mar 2023  
Calibration date: 07 Apr 2023  
Issue date: 07 Apr 2023

Reference Used During Calibration  
1. Standard Temperature Probe Model: 975-100-A300  
Serial No.: 60258209 Due date: 28 Mar 2024  
2. Digital Temperature Indicator Model: DIT 1000-A100  
Serial No.: 671407-00501 Due date: 22 Aug 2023

Calibration Condition  
Temperature: 22±0.1 °C  
Relative Humidity: 45±1.0%

Calibration Procedure  
The temperature calibration was done by reference method as W/G, W/G according to temperature indicator with standard digital temperature indicator with standard temperature probe. The temperature scale was based on ITS-90

Traceability  
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology (NIM) of Thailand. Certificate number: IT 16/38/23, Certificate number: IT 16/38/23

Calibrated by:  
Mr. Sorawit Thichchote  
Mr. Maneechai Chachorn



Approved Signature:  
Mr. Pannakorn Chachorn  
Calibration Department Manager

THIS CERTIFICATE AND THE EQUIPMENT IT REFERS TO ARE VALID ONLY IF THE EQUIPMENT IS USED IN ACCORDANCE WITH THE INSTRUCTIONS FOR USE PROVIDED BY THE MANUFACTURER.



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Certificate No. CL-055-66  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with triple column probe Model HF3201.2 S/N: 10005219  
Dimension: Diameter 3.8 mm Length 170 mm

Immersion Depth (mm)	Standard Reading (°C)	W/G Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.004	20.1	0.1	0.009
30	25.004	25.1	0.1	0.009
30	30.000	29.1	-0.9	0.009
30	35.000	34.1	-0.9	0.009
30	40.001	39.1	-0.9	0.009

Table 2: This equipment was connected with globe thermometer probe Model HF2276.2 S/N: 15017315  
Dimension: Diameter 3.8 mm Length 205 mm

Immersion Depth (mm)	Standard Reading (°C)	W/G Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.004	20.0	0.0	0.009
110	25.004	25.0	0.0	0.009
110	30.000	30.0	0.0	0.009
110	35.000	35.0	0.0	0.009
110	40.001	40.0	0.0	0.009

Table 3: This equipment was connected with triple column probe Model TP3274.2 S/N: 15017315  
Dimension: Diameter 3 mm Length 150 mm

Immersion Depth (mm)	Standard Reading (°C)	W/G Reading (°C)	Error (°C)	Uncertainty (°C)
25	20.004	20.2	0.2	0.009
25	25.004	25.1	0.1	0.009
25	30.000	29.9	-0.1	0.009
25	35.000	34.8	-0.2	0.009
25	40.001	39.7	-0.3	0.009

W/G: Wet Bulb Globe  
The reported expanded uncertainty is based on standard uncertainty calculated by using GUM 1.2 procedure level 1 and level of expansion is 95%

★ End of Certificate ★



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## CERTIFICATE OF CALIBRATION

Certificate No. CL-055-66  
Page 1 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No.: 15035132  
ID No: EN-150350

Customer:  
Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Address: 104 Phraibutangkajon 20, Phrasakulrajit Rd.,  
Phraeng Sub District, Bang Sue Sub District, Bangkok  
10250 Thailand

Received date: 22 May 2023  
Calibration date: 31 May 2023  
Issue date: 01 Jun 2023

Reference Used During Calibration  
1. Standard Temperature Probe Model: 975-100-A300  
Serial No.: 60258209 Due date: 28 Mar 2024  
2. Digital Temperature Indicator Model: DIT 1000-A100  
Serial No.: 671407-00501 Due date: 22 Aug 2023

Calibration Condition  
Temperature: 22±0.1 °C  
Relative Humidity: 45±1.0%

Calibration Procedure  
The temperature calibration was done by reference method as W/G, W/G according to temperature indicator with standard digital temperature indicator with standard temperature probe. The temperature scale was based on ITS-90

Traceability  
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology (NIM) of Thailand. Certificate number: IT 16/38/23, Certificate number: IT 16/38/23

NOTED: This equipment should not be used for any other purpose than the one for which it was calibrated.

Calibrated by:  
Mr. Sorawit Thichchote  
Mr. Maneechai Chachorn



Approved Signature:  
Mr. Pannakorn Chachorn  
Calibration Department Manager

THIS CERTIFICATE AND THE EQUIPMENT IT REFERS TO ARE VALID ONLY IF THE EQUIPMENT IS USED IN ACCORDANCE WITH THE INSTRUCTIONS FOR USE PROVIDED BY THE MANUFACTURER.





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Certificate No. CT 002 66  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 13030230.  
Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
50	19.998	20.0	0.0	0.099
80	24.999	25.0	0.0	0.099
80	30.000	30.0	0.0	0.099
80	34.999	35.0	0.0	0.099
80	40.003	40.0	0.0	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 70032627.  
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	19.998	19.9	-0.1	0.099
110	24.999	25.0	0.0	0.099
110	30.000	30.0	0.0	0.099
110	34.999	35.0	0.0	0.099
110	40.003	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 12035136.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	19.998	20.1	0.1	0.099
75	24.999	24.8	-0.1	0.099
75	30.000	29.8	-0.2	0.099
75	34.999	34.7	-0.3	0.099
75	40.003	39.5	-0.5	0.099

UUC\*: Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

\*\*\* End of Certificate \*\*\*



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CALIBRATION 0367

Temperature measurement laboratory  
Calibration services department



MSC - TIS - TIS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : CDI-043-66

Page 1 of 2 Pages

MEASUREMENT ITEM: Heat Stress Monitor  
MANUFACTURER: Delta OHM  
MODEL/TYPE: HD32.2  
SERIAL NUMBER: 15006301  
ID NUMBER: BNC\_F50655  
CONDITION AS-RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwang Suan Luang, Khos Suan Luang,  
Bangkok 10250 Thailand

RECEIVED DATE: 26 Oct 2023  
MEASUREMENT DATE: 27 Oct 2023  
ISSUE DATE: 27 Oct 2023

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:  
Temperature:  $23.0 \pm 3.0$  °C  
Relative Humidity:  $55.0 \pm 15.0$  %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

### TABULATION OF RESULTS:

The table on next page give the measured values.

Signature P  
27 Oct 23



Calibrated by:  
☒ Mr. Sorawat Thuchabul  
☐ Mr. Aniraporn Lertsomphol  
☐ Mr. Pichapong Pichomont

Approved signature

Mr. Panyia Boonchroen  
Calibration Department Manager

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Continuation of Certificate of Calibration Number CDI-043-66

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15001233.  
Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
50	20.057	20.1	0.0	0.099
80	25.048	25.1	0.1	0.099
80	30.042	30.1	0.1	0.099
80	35.040	35.1	0.1	0.099
80	40.033	40.1	0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20025734.  
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.057	20.0	-0.1	0.099
110	25.048	25.0	0.0	0.099
110	30.043	30.0	0.0	0.099
110	35.040	35.0	0.0	0.099
110	40.033	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15008014.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.057	20.1	0.0	0.099
75	25.048	25.0	0.0	0.099
75	30.042	30.0	0.0	0.099
75	35.035	34.5	-0.5	0.099
75	40.033	39.9	-0.1	0.099

UUC\*: Unit Under Calibration

\*\*\* End of Certificate \*\*\*



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MSC TIS 15 17025  
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Temperature measurement laboratory  
Calibration services department



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CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : CDI-076-67

Page 1 of 2 Pages

MEASUREMENT ITEM: Heat Stress Monitor  
MANUFACTURER: Delta OHM  
MODEL/TYPE: HD32.2  
SERIAL NUMBER: 15006301  
ID NUMBER: BNC\_F50652  
CONDITION AS-RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwang Suan Luang, Khos Suan Luang,  
Bangkok 10250 Thailand

RECEIVED DATE: 19 Apr 2024  
MEASUREMENT DATE: 26 Apr 2024  
ISSUE DATE: 26 Apr 2024

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:  
Temperature:  $23.0 \pm 3.0$  °C  
Relative humidity:  $55.0 \pm 15.0$  %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

### TABULATION OF RESULTS:

The table on next page give the measured values.

Signature P  
26 Apr 24



Calibrated by:  
☒ Mr. Sorawat Thuchabul  
☐ Mr. Aniraporn Lertsomphol  
☐ Mr. Pichapong Pichomont

Approved signature

Mr. Panyia Boonchroen  
Calibration Department Manager

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Continuation of Certificate of Calibration Number CDT-049-56

Page 7 of 7 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

#### Function

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 1600227.  
Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.040	20.0	0.0	0.009
30	25.052	25.0	-0.1	0.009
30	30.016	30.0	0.0	0.009
30	35.030	35.0	0.0	0.009
30	40.034	40.0	0.0	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.7 S/N: 16015594.  
Dimension: Diameter 8.8 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.040	20.0	0.0	0.009
110	25.052	25.1	0.0	0.009
110	30.046	30.0	0.0	0.009
110	35.038	35.0	0.0	0.009
110	40.034	40.0	0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 16015555.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.040	20.1	0.1	0.009
75	25.052	25.0	-0.1	0.009
75	30.016	29.9	-0.1	0.009
75	35.030	34.9	-0.1	0.009
75	40.034	39.7	-0.3	0.009

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*



MesaLabs



NVLAP Lab Code 200661-0  
Calibration

#### Calibration Certificate

Certificate No. 551422

Sold To:

Product 200-510M Defender 510 Medium Flow

Serial No. 208345

Cal. Date 18-Aug-2023

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#### As Received Calibration Data

Technician	Aaron Schwartz	Lab. Pressure	620.1 mmHg
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
4523.09 ccm	4519.02 ccm	0.09%	1.00%
969.43 ccm	969.31 ccm	0.01%	1.00%
245.22 ccm	245.88 ccm	-0.27%	1.00%
			As Received In Tolerance In Tolerance In Tolerance

#### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	205307	25-May-2023	25-May-2024

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1 of 2

FM-00226 Rev. D



MesaLabs



NVLAP Lab Code 200661-0  
Calibration

#### As Shipped Calibration Data

Certificate No	551422	Lab. Pressure	610.6 mmHg
Technician	Xiem Ly	Lab. Temperature	24.2 °C
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
4516.81 ccm	4515.50 ccm	0.02%	1.00%
1000.87 ccm	1000.67 ccm	0.02%	1.00%
249.84 ccm	249.93 ccm	-0.04%	1.00%
			In Tolerance In Tolerance In Tolerance

#### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	100439	14-Sep-2022	14-Sep-2023

#### Calibration Notes

The expanded uncertainty of flow has a coverage factor of  $k = 2$  for a confidence interval of approximately 95%.  
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

#### Technician Notes

By

Approved By

Xiem Ly

Norma Aragon

Production Technician II

Norma Aragon  
QC Inspector

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibration process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

Mesa Laboratories Inc. 12100 W. 6th Ave., Lakewood, CO 80226 USA  
(303) 987-9000 www.mesalabs.com Symbol "MLAB" on the NASDAQ

2 of 2

FM-00226 Rev. B



MesaLabs



NVLAP Lab Code 200661-0  
Calibration

#### Calibration Certificate

Certificate No. 561587

Sold To:

Product 200-510L Defender 510 Low Flow

Serial No. 130026

Cal. Date 25-Sep-2023

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave., Lakewood, CO 80226, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

#### As Received Calibration Data

Technician	Aaron Schwartz	Lab. Pressure	616.1 mmHg
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
0 ccm	456.41 ccm	-100.0%	1.00%
0 ccm	101.19 ccm	-100.0%	1.00%
0 ccm	30.35 ccm	-100.0%	1.00%
			As Received Out of Tolerance Out of Tolerance Out of Tolerance

#### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_10	103743	25-Jan-2023	25-Jan-2024

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1 of 2

FM-00226 Rev. B



### As Shipped Calibration Data

Certificate No	561587	Lab. Pressure	622.2 mmHg	
Technician	Aaron Schwartz	Lab. Temperature	23.6 °C	
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
449.76 ccm	466.46 ccm	-0.16%	1.00%	In Tolerance
100.96 ccm	100.62 ccm	0.14%	1.00%	In Tolerance
30.83 ccm	30.38 ccm	0.82%	0.5%	In Tolerance

### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_10	101743	25-Jan-2023	25-Jan-2024

### Calibration Notes

The expanded uncertainty of flow has a coverage factor of  $k = 2$  for a confidence interval of approximately 95%.  
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high purity nitrogen or filtered laboratory air.  
Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

### Technician Notes

By: Approved By:

Aaron Schwartz  
Assembler I

David Thomas  
Quality Engineer

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibration process has a Test Uncertainty Ratio (TUR) of 4.1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

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(303) 987-8000 www.mesalabs.com Synchro LAB on the MESAQ

FM-00228 Rev. B



### Calibration Certificate

Certificate No. 561558  
Product 200-510M Defender 510 Medium Flow  
Serial No. 151114  
Cal. Date 30-Sep-2023

Sold To:

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc. 12100 W 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

### As Received Calibration Data

Technician	Sam Ly	Lab. Pressure	616.8 mmHg	
		Lab. Temperature	25.0 °C	
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
0 ccm	449.86 ccm	-100.0%	1.00%	Out of Tolerance
0 ccm	997.38 ccm	-100.0%	1.00%	Out of Tolerance
0 ccm	250.32 ccm	-100.0%	1.00%	Out of Tolerance

### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	117991	16-Aug-2023	16-Aug-2024

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FM-00228 Rev. B



### As Shipped Calibration Data

Certificate No	561558	Lab. Pressure	616.2 mmHg	
Technician	Xiern Ly	Lab. Temperature	23.1 °C	
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
449.74 ccm	449.43 ccm	0.05%	1.00%	In Tolerance
997.03 ccm	997.16 ccm	-0.01%	1.00%	In Tolerance
249.84 ccm	250.5 ccm	-0.26%	1.00%	In Tolerance

### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	117991	05-Dec-2022	05-Dec-2023

### Calibration Notes

The expanded uncertainty of flow has a coverage factor of  $k = 2$  for a confidence interval of approximately 95%.  
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.  
Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

### Technician Notes

By: Approved By:

Xiern Ly  
Production Technician II

Norma Aragon  
QC Inspector

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibration process has a Test Uncertainty Ratio (TUR) of 4.1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

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FM-00228 Rev. B

INNOVATIVE

ANAB



### Certificate of Calibration

Customer: MESA Laboratories, Inc. (MesaLabs)  
Name: MESA Laboratories, Inc. (MesaLabs)  
Address: 12100 W 6th Ave, Lakewood, CO 80228 USA  
Unit Under Calibration Details:

Equipment: Air Flow Meter  
Manufacturer: GSC  
Model: GSC 510 E  
Serial Number: 151114  
Pressure: 616.2 mmHg  
Flow: 449.74 ccm

Calibration Environment and Details  
Temperature: 23.1 °C  
Humidity: 45% RH  
Barometric Pressure: 1013.25 hPa  
Period of Use: 1 Year  
Calibration Date: 29 January 2024  
Calibration Procedure: In-house method (P-001) by Competent Authority (Xiern Ly, QC Inspector)

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibration Standard	105100000	Yes	12 July 2024
Air Flow Meter	Calibration Standard	105100001	Yes	12 July 2024
Temperature	23.1 °C	105100001	Yes	12 July 2024
Pressure	616.2 mmHg	105100001	Yes	12 July 2024

Traceability: The calibration is traceable to the International System of Units (SI) through the use of the following standards:  
Air Flow Meter: Calibration Standard 105100000  
Air Flow Meter: Calibration Standard 105100001  
Temperature: 23.1 °C  
Pressure: 616.2 mmHg

Calibration By: Approved By:   
Xiern Ly  
Production Technician II  
Norma Aragon  
QC Inspector

Mesa Laboratories Inc. 12100 W 6th Ave, Lakewood, CO 80228 USA  
(303) 987-8000 www.mesalabs.com Synchro LAB on the MESAQ



Certificate No : 24-AFM-015 Rev.1

Request No : Req-2024-0943

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (ml/min)	UUC (ml/min)	Error (ml/min)	Uncertainty (ml/min)
25.00	101.60	20	20.148	0.1	1.3
25.00	101.67	100	99.409	-0.6	2.8
24.90	101.63	199	197.46	-1.5	5.6
25.00	101.61	300	298.15	-1.8	8.4
24.90	101.60	399	399.13	1	11
24.90	101.59	499	478.02	-2.0	6.8

Note : STD : Standard UUC : Unit Under Calibration  
UUC Reference Condition : At atmospheric pressure and room temperature condition  
Flow Rate was corrected for non-standard operating condition by using equation

$$Q_{1150} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{ref}}{T_{ref}}$$

where : Q : Flow Rate P : Absolute Pressure T : Absolute Temperature  
Meas : Measurement Condition ref : Standard Condition

\* Indicates non accredited

End of Certificate

This result related only to the item calibrated. This certificate shall not be reproduced except in full without written approval of the Innovate Instrument Co., Ltd.

FM-705-AFM-01 Rev 01 Issue Date 25/01/24

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 104 Soi Phatthakan 40, Phatthakan Road, Suan Luang, Bangkok 10250

Certificate No : 24-AFM-033

Request No : Req-2024-0241

Unit Under Calibration Details

Measurement Item : Primary Flow Calibration

Manufacturer : BWS

Model : Defender S10-L

Sensor Model :

Serial Number : 130027

Sensor Serial Number :

ID : RYG-F50206

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23.0 ± 0.5 °C

Humidity : 55% RH ± 20% RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 31 January 2024

Calibration Date : 13 February 2024

Calibration Procedure : In-house method (P-AFM-01) by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Low Flow	18501010006	Sensodyne	12 July 2024
Air Flow Meter	Calibrator 3 Standard flow	19031011003	Sensodyne	12 July 2024
Temperature meter	GT 11	00000057	Qtechom	27 February 2024
Pressure meter	CPG2400	410006KD/651082	IPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensodyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibration By :

Mr. Noppasorn Luangrat

Service Calibration Engineer

Approved By :

Mr. Pasi Matharom

Calibration Engineer Supervisor

Issue Date : 13 February 2024

This result related only to the item calibrated. This certificate shall not be reproduced except in full without written approval of the Innovate Instrument Co., Ltd.

FM-705-AFM-01 Rev 01 Issue Date 25/01/24

Certificate No : 24-AFM-033

Request No : Req-2024-0241

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.90	101.20	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.00	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	499	493.51	-5.5	7.0

Note : STD : Standard UUC : Unit Under Calibration  
UUC Reference Condition : At atmospheric pressure and room temperature condition  
Flow Rate was corrected for non-standard operating condition by using equation

$$Q_{1150} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{ref}}{T_{ref}}$$

where : Q : Flow Rate P : Absolute Pressure T : Absolute Temperature  
Meas : Measurement Condition ref : Standard Condition

\* Indicates non accredited

End of Certificate

This result related only to the item calibrated. This certificate shall not be reproduced except in full without written approval of the Innovate Instrument Co., Ltd.

FM-705-AFM-01 Rev 01 Issue Date 25/01/24

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 104 Soi Phatthakan 40, Phatthakan Road, Suan Luang, Bangkok 10250

Certificate No : 24-AFM-032

Request No : Req-2024-0240

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Manufacturer : BWS

Model : Defender S10-M

Sensor Model :

Serial Number : 129155

Sensor Serial Number :

ID : RYG-F50209

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23.0 ± 0.5 °C

Humidity : 55% RH ± 20% RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 31 January 2024

Calibration Date : 13 February 2024

Calibration Procedure : In-house method (P-AFM-01) by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Low Flow	18501010006	Sensodyne	12 July 2024
Air Flow Meter	Calibrator 3 Standard flow	19031011003	Sensodyne	12 July 2024
Temperature meter	GT 11	00000057	Qtechom	27 February 2024
Pressure meter	CPG2400	410006KD/651082	IPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensodyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibration By :

Mr. Noppasorn Luangrat

Service Calibration Engineer

Approved By :

Mr. Pasi Matharom

Calibration Engineer Supervisor

Issue Date : 13 February 2024

This result related only to the item calibrated. This certificate shall not be reproduced except in full without written approval of the Innovate Instrument Co., Ltd.

FM-705-AFM-01 Rev 01 Issue Date 25/01/24

Certificate No : 24-AFM-032  
Request No : Req-2024-0240

#### Result of Calibration : Without Adjustments

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
23.86	101.89	9.5	100.13	5.1	2.8
23.90	101.71	9.01	513.93	12.9	7.2
24.16	102.02	10.06	1019.3	14	14
24.00	101.31	19.97	2023.0	26	29
24.10	101.57	29.99	3015.6	37	43
24.00	102.00	39.94	3914.8	48	59
24.00	102.65	47.19	4740.5	52	72

Note: STD: Standard; U.C.: Unit Conversion; calibration; U.C. Reference: Calibration; Atmospheric pressure and room temperature condition; Flow Rate was corrected for non standard operating condition by using equation.

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

Abbrev.: Q = Flow Rate; P = Absolute Pressure; T = Absolute Temperature  
Alga = Moisture Content;  $\alpha$  = Standard Deviation

- Holocene remnant forest

End of Certificate

11. *Journal of Management Education* 36(10):1039-1050, 2012. doi:10.1177/0013164412461132. Copyright © 2012 Sage Publications. All rights reserved. This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.

REVIEW BY: Aitchawan S  
 APPROVED BY: Tanyatong M  
 DATE: 12 Jan 2023

  
 ARCHEMICA

## Certificate of Calibration

### ICS-2100: Anion (ID#659)


This certificate is to verify that instrument below are calibrated  
by Archemica Lab Co., Ltd.

ICS-2100 S/N: 15010977

AS-HV S/N: 5450A36659

For

## ALS Laboratory Group (Thailand) Co., Ltd.

  
ALS Laboratory Group (Thailand) Co., Ltd.

Operator Signature: Mr. Nudnanai Laekhwon  
 (Mr. Nudnanai Laekhwon)  
 Application Chemist

Date: Jan 12, 2024



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES: EQUIPMENT CALIBRATION AND TESTING SERVICES  
831/4 PATTANASEM ROAD 508 TH SUKHUMVIT SUKHUMVIT 80, BANGKOK 10250  
TEL: 0-2717-3600-2 FAX: 0-2716-9384



### Certificate of Calibration

Certificate No. 23PH493  
Page: 1 of 2

Equipment :	Lux Meter
Manufacturer:	PEAKMETER
Model :	PM6612L
Serial No. :	H12A420118
ID No.:	BK6- FS1146

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services & Equipment Calibration and Testing Services.

Condition As-Received: Used Item  
Received Date: 13 September 2023  
Calibration Date: 14 September 2023

Submitted by: A/S Laboratory Group (Thailand) Co., Ltd.

Reference: 2309-9439WSC  
Ambient Temperature:  $23 \pm 2$  °C  
Relative Humidity:  $50 \pm 15$  %

104 Phatthanakan 40 Phatthanakan Rd.  
Kruaeng Phatthanakan, Khet Suan Luang  
Bangkok 10250 Thailand

**Procedures used:** Calibration were conducted using in-house calibration procedure QP-PH01 by measuring against luminous-intensity standard (lm) (source based method) According to the inverse square law measurement method.

Condition of this result of calibration

<sup>†</sup> Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Photometry & Encoder	LMQ-de 9.6 m	120RC003	DL-0064-22	20 Jul 2025
	LMQ-de 9.6 m	5-1472	TP-1036-22	11 Dec 2023

3 This result of calibration was made on request at the point specified by customer  
3 Test Equipment: Programmable Voltage/Current Source / Model: CLR3A EN: 092/0294  
4 Test Equipment: Humidity Meter / Model: 51002 EN: 030109  
5 The certificate is valid only to the item calibrated on date and place of calibration  
6 The Certification is traceable to the International System of Unit maintained through-  
national Institute of Metrology (Thailand) NIM  
national Institute of Metrology (Thailand) NIM OIML Accredited No. Calibration 0144

Calibrated by : Faivat Nicas  
Issue Date : 15 September 2023

Approved Signatory : \_\_\_\_\_  
 1. Phalisco Pratsatpal  
 2. Chatchawan Khunpiluek  
 3. Nuntawat Khanchai

# 0324399

Cert. No.: 23PH493  
Page.: 2 of 2

Result of calibration:- ( ) Without adjustment ( \* ) After adjustment

Function : Illuminance Measurement	Range : Autorange
------------------------------------	-------------------

Standard Value	Before Adjust UUC* Reading (1x)	After Adjust UUC* Reading (1x)	Error (1x)	Uncertainty (± 1σ)
0	0.00	0.00	0.00	0.00
15		14.71	0.29	0.20
100		99.6	-1.0	1.3
500		499	-2	6.5
1000	885	1690	0	13
2000		2000	0	26
3000	-	3000	0	39
4000	-	4000	0	52
5000	5420	5000	0	65

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %.

Before adjustment light source factor setting mode :  $L_1 = 0.980$

After adjustment light source factor setting mode :  $L_0 = 1.116$

UUC\* = Unit Under Calibration.

• 0100

u 1180C49





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534-4 PATTANAKARN ROAD SOI 18, SIANLIANG, SIANGKANG, BANGKOK, 10259  
TEL: 0-2717-0609-24 FAX: 0-2716-0484



## Certificate of Calibration

Certificate No.: 23PH494  
Page: 1 of 2

Equipment: Lux Meter  
Manufacturer: PEAKMETER  
Model: PM612L  
Serial No.: H12A-K20117  
ID No.: BKK\_FS1145  
Condition As-Received: Used Item  
Received Date: 13 September 2023  
Calibration Date: 14 September 2023  
Reference: 2303-0430WISC  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %

This certificate may not be reproduced other than in full,  
except with the prior written approval of the head of  
Corporate Services & Equipment Calibration and Testing Services.

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,  
Khwang Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Procedure used: Calibration were conducted using in-house calibration procedure CP-PH01 by measuring against  
luminous-intensity standard lamp (source-based method) According to the inverse square law measurement  
method.

### Condition of this result of calibration

1 Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Exp. Date
1) Photometry & Encoder	LMguide 9.6 m	120RC003	DL-0064-22	20 Jul 2025
2) High-accuracy Irradiance Standard	OL-FEL-U	P-1472	TP-1039-22	11 Dec 2023

2 This result of calibration was made on request at the point specified by customer

3 Test Equipment: Programmable Voltage/Current Source ( Model: OL83A, S/N: 09220254 )

4 Test Equipment: Illuminance Meter ( Model: 51002, S/N: 080129 )

5 The certificate is valid only to the item calibrated on date and place of calibration.

6 This Certificate is traceable to the International System of Units maintained through:-

-National Institute of Metrology Thailand (NIMT)

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Nivatt Nitis  
Issue Date: 15 September 2023

Approved Signatory:  
[Signature]  
1) Pholinee Prapthapal  
[Signature]  
2) Chatchawan Khunpluek  
[Signature]  
3) Nantawat Khanchai

0324400



Cert. No.: 23PH494  
Page: 2 of 2

Result of calibration: ( ) Without adjustment ( \* ) After adjustment

Function: Illuminance Measurement Range: Autorange

Standard Value	Before Adjust UUC* Reading	After Adjust UUC* Reading	Error	Uncertainty
( lx )	( lx )	( lx )	( lx )	( ± lx )
0	0.00	0.00	0.00	0.060
15	-	14.89	-0.11	0.20
100	-	99.5	-0.5	1.3
500	-	500	0	6.5
1000	911	1000	0	13
2000	-	2000	0	26
3000	-	3010	10	39
4000	-	4020	20	52
5000	4550	5020	20	65

The reported uncertainty of measurement was based on a standard uncertainty multiplied by  
a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %

Before adjustment light source factor setting mode: L0 = 1.033

After adjustment light source factor setting mode: L0 = 1.142

UUC\* = Unit Under Calibration.

-000-

01180048

ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียน

ห้องปฏิบัติการวิเคราะห์







๓๕) นายประเสริฐ สุระชัย  
๓๖) นายบุญกุล จันทร์เปี่ยม  
๓๗) นายพิรพงษ์ ทองคุณปริศา  
๓๘) นายณพทศ ทองบุษ  
๓๙) นายอัฐวัฒน์ ม่วงแพร่  
๔๐) นายเจตตราวุฒิ ปัตตะมะ  
๔๑) นายภักดิ์ธนะ สววรรณ  
๔๒) นายพิชัย บุญวงศ์  
๔๓) นายภาณุพงศ์ โยมาวงศ์  
๔๔) นายสามารถ คูณปลี  
๔๕) นายสิริชัย โกศวิธาน  
๔๖) นายณัฐวุฒิ ศรีประเสริฐ  
๔๗) นายชรัสชัย นาคพนม  
๔๘) นายพรชัย ชัยทิพย์  
๔๙) นายสิทธิโชค พาสิตา  
๕๐) นายอนันต อินสุตา  
๕๑) นางสาววรรณิศา ชาติวันชัย  
๕๒) นางสาวพิมพ์ธรรมา มีมากุล  
๕๓) นางสาวพรพรรณ สิงห์สมบูรณ์  
๕๔) นางสาวชญานิษฐ์ พรหมจันทร์  
๕๕) นายศิริ วิริราช  
๕๖) นายจักริน หมั่นวิชา  
๕๗) นายฉัตรชัย สุขเปือย  
๕๘) นายสมรพันธ์ สันทองคำ  
๕๙) นายศุภพล สมบอ  
๖๐) นายศักดิ์ชัย อุบลศรี  
๖๑) นายธนกร นามะกุล  
๖๒) นายอติพงศ์ บัวแดง  
๖๓) นายณิชาธิ์ อุบลรัตน์  
๖๔) นายณัฐพล คุณสุทธิ  
๖๕) นายปิ่นพรวิมล สาริน  
๖๖) นายปิยะนัย พงษ์ศรี  
๖๗) นายพงศ์ศิริ โสมเขียว  
๖๘) นายพิพัฒน์ คำคำ  
๖๙) นายกาญจน์ มานิตย์  
๗๐) นายมงคล ผลาพิชัย  
๗๑) นายสิริรัตน์ ทองอิน  
๗๒) นายอนันต วิชาสมบัติ  
๗๓) นายศักดิ์กัศ วัฒนา

ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๓

๓๕๓) นายอนันตชัย...

๓๕๓) นายอนันตชัย...

๓๕๔) นายอนันตชัย วิสม  
๓๕๕) นายวรวิทย์ ตีนิ  
๓๕๖) นายแสงธรรม นนทะสิทธิ์  
๓๕๗) นายสุพจน์ รัตน  
๓๕๘) นายชัยวุฒิ ไชยชนะ  
๓๕๙) นายศิริศร ศรีธรรมมา  
๓๖๐) นายณนทกร เมธอภัย  
๓๖๑) นายคำชัย สุทธิ  
๓๖๒) นางสาวณัฐกรีน บุญตะนัย  
๓๖๓) นางสาวพัชรินทร์ แสนสร้อย  
๓๖๔) นายไพโรจน์ เปี่ยมพิมาย  
๓๖๕) นางสาวศุภมาศ ทองมาก  
๓๖๖) นางสาวกสิตา จิตร์สว่าง  
๓๖๗) นางสาวจันทรา เลิกอยู่  
๓๖๘) นางสาวกัญญาพร คำมี  
๓๖๙) นางสาวกมลรัตน์ ภาณุ  
๓๗๐) นางสาวไพโรจน์ ศรี  
๓๗๑) นางสาววิภาดา ฟู  
๓๗๒) นางสาววิภาดา ฟู  
๓๗๓) นางสาววิภาดา ฟู  
๓๗๔) นางสาววิภาดา ฟู  
๓๗๕) นางสาววิภาดา ฟู  
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๓๗๙) นางสาววิภาดา ฟู  
๓๘๐) นางสาววิภาดา ฟู  
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๓๙๘) นางสาววิภาดา ฟู  
๓๙๙) นางสาววิภาดา ฟู  
๔๐๐) นางสาววิภาดา ฟู

ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๓

๓๕๓) นางสาวอุบล...

๓๕๓) นางสาวอุบล...

๓๕๓) นางสาวอุบล เด็กศิริ  
๓๕๔) นางสาวมโนรัตน์ ทองบุตร  
๓๕๕) นายภาณุวัฒน์ เทนไทย  
๓๕๖) นางสาวสุภาวดี เมธอภัย  
๓๕๗) นางสาวพรทิศา สดาศานนท์  
๓๕๘) นายอภิรักษ์ วัชรนา  
๓๕๙) นายไพโรจน์ วัชรนา  
๓๖๐) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๑) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๒) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๓) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๔) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๕) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๖) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๗) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๘) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๖๙) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๐) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๑) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๒) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๓) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๔) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๕) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๖) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๗) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๘) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๗๙) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๐) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๑) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๒) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๓) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๔) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๕) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๖) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๗) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๘) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๘๙) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๐) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๑) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๒) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๓) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๔) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๕) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๖) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๗) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๘) นายจิรเมธ ประเสริฐศิริพงษ์  
๓๙๙) นายจิรเมธ ประเสริฐศิริพงษ์  
๔๐๐) นายจิรเมธ ประเสริฐศิริพงษ์

ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๓๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๔๘  
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ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๓  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๔  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๕๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๓  
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ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๕  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๖  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๗  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๘  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๖๙  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๐  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๑  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๒  
ทะเบียนเลขที่ ๖-๒๐๕-๖-๐๐๗๓

๓๕๓) นายอนันตชัย...

๓๕๓) นายอนันตชัย...

สิ่งส่งมอบด้วย ๓

เอกสารแนบท้ายหนังสือรับข้ออาชญาขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสาร  
บริษัท เอแอลเอส แอสโซซิเอตส์ จำกัด (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๕  
ที่ ยก ๐๓๐๐(๑) / ๑๖ ๑๖ ๑๖ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

๓. ขอบข่ายการทดสอบที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๕๓ รายการ  
ไว้เสีย จำนวน 60 รายการ

ลำดับที่	สารเคมี	วิธีการวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
6	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
7	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
8	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
9	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
10	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>(4)</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>(4)</sup>
12	Carbaryl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
13	Carbofuran	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method <sup>(4)</sup> 2) Closed Reflux, Titrimetric Method <sup>(4)</sup>
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
17	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method <sup>(4)</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
20	Cyanide	Distillation, Colorimetric Method <sup>(4)</sup>
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
33	Formaldehyde	Distillation, Colorimetric Method <sup>(4)</sup>
34	Free Chlorine	1) DPD Ferrous Titrimetric Method <sup>(4)</sup> 2) DPD Colorimetric Method <sup>(4)</sup>
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
36	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
37	Hexavalent Chromium	Colorimetric Method <sup>(4)</sup>
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
39	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

40 Manganese...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
42	Methiocarb	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
44	Methomyl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
45	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method <sup>(4)</sup> 2) Soxhlet Extraction Method <sup>(4)</sup>
47	Oxamyl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
48	Propoxur	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
49	pH	Electrometric Method <sup>(4)</sup>
50	Phenols	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup>
51	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
52	Sulfide	Iodometric Method <sup>(4)</sup>
53	Temperature	Laboratory and Field Methods <sup>(4)</sup>
54	Total Dissolved Solids	Dried at 180 °C <sup>(4)</sup>
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method <sup>(4)</sup>
56	Total Phosphorous	Digestion, Colorimetric Method <sup>(4)</sup>
57	Total Suspended Solids	Dried from 103-105 °C <sup>(4)</sup>
58	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
59	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation <sup>(4)</sup>
60	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

น้ำดื่ม...

น้ำดื่ม จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation <sup>(4)</sup>
35	Chromium (VI)	Colorimetric Method <sup>(4)</sup>

36 Chrysene...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
37	Cyanide	Distillation, Colorimetric Method <sup>(4)</sup>
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

56 1,3-Dichloropropene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
63	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

76 γ-HCH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
83	Mercury	1) Digestion, Cold Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
84	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
86	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
87	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
90	Methyl tert-butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

94 N-Nitrosodiphenylamine...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup> 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
103	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>8</sub> -C <sub>6</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)(2)(3)</sup>

110 TPH (C<sub>8</sub>-C<sub>16</sub>)...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C <sub>10</sub> -C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,22)</sup>
111	TPH (C <sub>16</sub> -C <sub>33</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,22)</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(4)</sup>
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
126	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(4)</sup>

อากาศเสีย...

อากาศเสีย (ไม่ถ่วงน้ำหนัก) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
2	Arsenic	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
3	Beryllium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
4	Cadmium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
5	Carbon Monoxide	2) Sampling Bag Non-Dispersive Infrared Method <sup>(5)</sup> 1) Instrumental Analyzer Method <sup>(5)</sup>
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method <sup>(2)</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>(5)</sup>
7	Chromium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
8	Cobalt	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
9	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
10	Cresol	Adsorption Sampling, Gas Chromatographic Method <sup>(5)</sup>
11	Dioxins	Isokinetic Sampling <sup>(5)</sup>
12	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method <sup>(5)</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>(5)</sup>
13	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method <sup>(5)</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>(5)</sup>
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>(5)</sup>

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(5)</sup>
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
19	Opacity	Ringelmann's Method <sup>(2)</sup>
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>(5)</sup> 2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method <sup>(5)</sup> 3) Instrumental Analyzer Method <sup>(5)</sup>
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>(5)</sup> 2) Instrumental Analyzer Method <sup>(5)</sup>
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>(5)</sup>
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method <sup>(5)</sup> 2) Paired Train, Isokinetic Sampling, Gravimetric Method <sup>(5)</sup>

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(5)</sup>
28	Xylene	Adsorption Sampling, Gas Chromatographic Method <sup>(5)</sup>

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,28)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,28)</sup>
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

5 Beryllium...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.14,19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.17,19)</sup> 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.14,19)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.17,19)</sup>

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>(1.6.19)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(8.19)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
14	DOD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
16	DOT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup>

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>

22 Mercury...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1.6.20)</sup> 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(1.6.30)</sup> 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(30)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(21)</sup>
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(11.24)</sup>

- 2-Chlorobiphenyl...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	- 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup> Electrometric Method <sup>(23,24)</sup>
29	pH	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup>
30	Selenium	2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

31 Silver...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

Signal

ดิน...

## ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13)</sup>
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>

11 Benzo(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
12	Benzo(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
15	Benzo(g,h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup>
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13,23)</sup>
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>

Signal

23 Cadmium...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,25)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,16,19)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,17,19)</sup>
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>(8,19)</sup>

36 Chrysene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(12,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(27,28,29)</sup>
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>

49 1,2-Dichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

63 Di-n-Octyl Phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13)</sup>

73 n-Hexane...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	$\alpha$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
75	$\beta$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
76	$\gamma$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(7,18)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(7,18)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry <sup>(21)</sup> 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(30)</sup>

84 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(7,18)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

96 Polychlorinated biphenyls (PCBs)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3',3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
97	Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
98	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,18)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(7,18)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
108	TPH (C <sub>9</sub> -C <sub>6</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
109	TPH (C <sub>9</sub> -C <sub>16</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
110	TPH (C <sub>18</sub> -C <sub>35</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>

115 2,4,5-Trichlorophenol...



อนึ่ง หนังสือฉบับนี้



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อนึ่ง หนังสือฉบับนี้จะมีผลต่ออายุหรือหนังสือต่ออายุวีซ่าขึ้นทะเบียนต้องปฏิบัติตามวิธีกระทรวงเอกชน  
ในวันที่ ๒ กันยายน ๒๕๖๔

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายพรชัย คีตันกรวย)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน  
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนต้องปฏิบัติตาม  
โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๓๐๓๕  
โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๓๑๕๔  
ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dlw.mail.go.th



"อุตสาหกรรมไทยไกล ประเด็นภัยร้ายกว่าน้ำ ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๒๖/๑๓๖๕๔



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๕ ก.ย. ๒๕๖๔

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน  
เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด  
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน  
ลงวันที่ ๑๔ กรกฎาคม ๒๕๖๒

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน  
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๓ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ  
หนังสือรับขึ้นทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๖๗ สถานที่ตั้ง เลขที่ ๓๑๔/๓ หมู่ที่ ๘  
ถนนกาญจนาภิเษก ตำบลบ้านพุ อำเภอหาดใหญ่ จังหวัดสงขลา ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)  
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลต้องปฏิบัติตามวิธีการวิเคราะห์	ทะเบียนเลขที่ ๖-๒๖๗-ก-๐๐๐๑
นางสาวกนิษฐา เชนประสาพร	
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์	
๑) นางสาวอินทิรา คงประยูร	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๑
๒) นางสาวอมรรัตน์ เพชรประดับ	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๒
๓) นายทักษิณ อินโดรม	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๓
๔) นางสาวอนันดา บุญเพชร	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๔
๕) นางสาวสุทธิรักษ์ วิทยรัตน์	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๕
๖) นางสาวนริสา นฤมิตร	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๖
๗) นายวุฒิชัย หวญเจริญ	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๗
๘) นายอภิสิทธิ์ รัชย์	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๘
๙) นายอภิวัฒน์ สันตะ	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๐๙
๑๐) นายศิริชัย เกษมเกิด	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๐
๑๑) นายสมศักดิ์ จันทร์คง	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๑
๑๒) นางสาวพิชญา คุกรานนท์	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๒
๑๓) นายปัญญา เกียรติพิริยรักษ์	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๓
๑๔) นางสาวศินิภา รอดทองอ่อน	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๔
๑๕) นางสาวจุฑิมา สุขสวัสดิ์	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๕
๑๖) นางสาวจันทิมา คงทน	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๖
๑๗) นางสาวกุลวดี เรืองประพันธ์	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๗
๑๘) นางสาวอติยา เมืองแก้ว	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๘
๑๙) นางสาววันนา ชื่นย่อง	ทะเบียนเลขที่ ๖-๒๖๗-จ-๐๐๑๙

ค. ขอลายสารมลพิษที่ได้รับขึ้นทะเบียนไว้วิเคราะห์ในน้ำเสียและอากาศเสีย ตามสิ่งที่ส่งมาด้วย  
หนังสือฉบับนี้



"อุตสาหกรรมไทยไกล ประเด็นภัยร้ายกว่าน้ำ ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"




- ๒ -

หนังสือฉบับนี้จะมีผลต่ออายุในวันที่ ๑๖ สิงหาคม ๒๕๖๔ หากประสงค์จะต่ออายุหนังสือรับขึ้น  
ทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุหรือเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม  
ภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอ  
ผ่านระบบอิเล็กทรอนิกส์ได้ทั้งน้ำเสียและอากาศเสียโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายพรชัย คีตันกรวย)  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้  
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้  
โทร. ๐ ๗๔๓๒ ๕๐๒๔, ๐ ๗๔๔๔ ๐๖๓๔ ต่อ ๕๒๐๓  
ไปรษณีย์อิเล็กทรอนิกส์ sirw@dlw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนต้องปฏิบัติตามวิธีการวิเคราะห์เอกชน  
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๖๗  
ที่ อก ๐๓๒๖/๑๓๖๕๔ ลงวันที่ ๒๕ ก.ย. ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับการขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๗ รายการ  
น้ำเสีย จำนวน 25 รายการ

ลำดับที่	สารมลพิษ	วิธีการวิเคราะห์
1	Arsenic	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
2	Barium	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
3	Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method <sup>[1]</sup> 5-Day BOD Test, Membrane Electrode Method <sup>[1]</sup>
4	Cadmium	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
5	Chemical Oxygen Demand	Closed Reflux, Colorimetric Method <sup>[1]</sup> Closed Reflux, Titrimetric Method <sup>[1]</sup>
6	Chromium	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
7	Color	ADM Weighted-Ordinate Spectrophotometric Method <sup>[1]</sup>
8	Copper	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
9	Formaldehyde	Distillation, Colorimetric Method <sup>[2]</sup>
10	Free Chlorine	DPD Ferrous Titrimetric Method <sup>[1]</sup>
11	Hexavalent Chromium	Filtration, Colorimetric Method <sup>[1]</sup>
12	Lead	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
13	Manganese	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
14	Mercury	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
15	Nickel	Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1]</sup>
16	Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method <sup>[1]</sup>

ผู้ตรวจราชการ  
(นางสาวบุษยา รัตนสุภา)  
นักวิทยาศาสตร์ชำนาญการ

17 pH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	pH	Electrometric Method <sup>[1]</sup>
18	Phenol	Distillation, Direct Photometric Method <sup>[1]</sup>
19	Selenium	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[1]</sup>
20	Sulfide	ZnS Precipitation, Iodometric Method <sup>[1]</sup>
21	Temperature	Laboratory and Field Methods <sup>[1]</sup>
22	Total Dissolved Solids	Dried at 180 °C <sup>[1]</sup>
23	Total Suspended Solids	Dried at 103-105 °C <sup>[1]</sup>
24	Trivalent Chromium	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[1]</sup>
25	Zinc	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[1]</sup>

#### ตารางเพิ่ม จำนวน 12 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[3]</sup>
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[3]</sup>
3	Carbon Monoxide	Sampling Bag Non-Dispersive Infrared Method <sup>[3]</sup>
4	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[3]</sup>
5	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory <sup>[3]</sup>
6	Hydrogen Sulfide	Absorption, Iodometric Method <sup>[3]</sup>
7	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[3]</sup>
8	Opacity	Ringelmann's Method <sup>[1]</sup>
9	Oxides of Nitrogen	Absorption Sampling, Phenoldisulfonic acid Method <sup>[3]</sup>
10	Sulfur Dioxide	Absorption Sampling, Barium-Thorin Titrimetric Method <sup>[3]</sup>
11	Sulfuric acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[3]</sup>
12	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>[3]</sup>

ปณช รัตนสุภา  
 (นางสาวปณช รัตนสุภา)  
 นักวิทยาศาสตร์ชำนาญการ

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