Site Visit Report

The site visit process is a sample on a particular day of an installation's compliance with some of its licence conditions. Where non-compliance against a particular condition has not been reported, this should not be construed to mean that there is full compliance with that condition of the licence.

Instructions and actions arising from the visit shall be addressed, or where applicable noted, by the licensee in order to ensure compliance, to improve the environmental performance of the installation and to provide clarification on certain issues.

The licensee shall take the actions specified to close out the non-compliances and observations raised in this Site Visit Report.

The licensee may also be requested to provide a response to the Environmental Protection Agency (hereafter referred to as the Agency) in relation to the site visit report findings.

Licensee

Name of Installation	Timoleague Agri Gen Limited
Licensee	Timoleague Agri Gen Limited
Licence Register No.	P0986-01
CRO Number	511659
Site Address	Barryshall, Timoleague, Bandon, Cork
Site Visit Reference No.	SV30893

Report Detail

Issue Date	08/01/2026
Prepared By	Aimee Carroll

Site Visit Detail

Date Of Inspection	12/12/2025		
Time In	09:00	**Time Out**	17:00
EPA Inspector(s)			
Additional Visitors	Element		
Licensee Personnel and Role	N/A		

Summary

This site visit was conducted as part of the Agency's routine air emissions monitoring programme. The monitoring report is attached.

An observation was raised in relation to an elevated Volumetric Flow Rate measurement at Emission Point Ref. No. A1 Gas Engine.

The licensee is required to submit a response to the observation raised in this site visit report within 31 days of the date of issue of this report (using the 'Make a Response' link on the Site Visits page in EDEN), as outlined in the Follow-up Actions section of this report.

Site Areas Inspected

See report.

Documents Inspected

See report.

1. Site Specific Issues

		Answer	Condition Number	Non Compliance	Observation
1.1	Elevated VFR measurement at Emission Ref. No. A1 Gas Engine	Checked	5.1	No	Yes

Comment / Action Required

Monitoring carried out at the following Air Emissions Monitoring Point Reference number recorded the following:

- A1 Gas Engine: A Volumteric Flow Rate (VFR) measurement of 4304 m³/hr, with a measurement uncertainty of 270 m³/hr, versus an ELV of 4200 m³/hr.

Action Required:

Submit an investigation report in relation to the above elevated results within 31 days of the date of issue of this report to the Agency via a licensee return on EDEN.

EPA AIR EMISSIONS COMPLIANCE MONITORING EMISSIONS REPORT

(Prepared on behalf of the EPA by Element Ireland - EPA Contract No. OEE25AEMP)

Element Ireland, Unit D8 North City Business Park, North Road, Finglas, Dublin 11
Your Element Ireland Contact: James Magann (+353 (0)877 566 106)
E: james.magann@element.com

Stack Emissions Testing Report Commissioned by
EPA Office of Environmental Enforcement

Installation Name & Address
Timoleague Agri Gen Ltd
Barryshall
Bandon
Cork

Industrial Emissions Licence: P0986-01

Stack Reference
A1 Gas Engine

Dates of the Monitoring Campaign
12th November 2025

Job Reference Number
P0986-01CAR25-01

Report Written by
Radek Chromik Team Leader MCERTS Level 2 MM23 1801 TE1 TE2 TE3 TE4

Report Checked by	Report Approved by
Donal O Faogain Technical Report Writer MCERTS Level 2 MM 13 1259 TE1 TE2 TE3 TE4	Darragh Long Reporting Manager MCERTS Level 2 MM 18 1494 TE1 TE2 TE3 TE4

Report Date
12th December 2025

Version
Version 1

Signature of Report Checker	Signature of Report Approver
	

CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element Ireland's ISO 17025 accreditation.

The testing performed fully meets the technical requirements in Irish EPA Guidance Note, AG2.

Executive Summary

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MONITORING OBJECTIVES

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine
12th November 2025

Overall Aim of the Monitoring Campaign

Element Ireland were commissioned by the EPA Office of Environmental Enforcement to carry out stack emissions testing at Timoleague Agri Gen Ltd on the A1 Gas Engine at Ireland.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Licence.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide, Non-Methane VOCs , Total VOCs (as Carbon), Oxides of Nitrogen (as NO_2), Carbon Monoxide

Executive Summary

(Page 2 of 7)

MONITORING RESULTS

Timoleague Agri Gen Ltd, Ireland

A1 Gas Engine

12th November 2025

where MU = Measurement Uncertainty associated with the Result

		Concentration				Mass Emission			
Parameter	**Units**	**Result**		**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	0.22		0.36	50	g/hr	0.94	1.6	-
Sulphur Dioxide [1]	mg/m³	0.85		0.06	60	g/hr	3.7	0.34	-
Non-Methane VOCs [1]	mg/m³	0.14		0.02	75	g/hr	0.59	0.11	-
Total VOCs (as Carbon) [1]	mg/m³	542		23.6	1000	g/hr	2331	178	-
Oxides of Nitrogen (as NO_2) [1]	mg/m³	113		4.8	190	g/hr	486	36.8	-
Carbon Monoxide [1]	mg/m³	358		15.1	1500	g/hr	1542	116	-
Carbon Dioxide	% v/v	**Dry**	9.6	0.33					
Oxygen	% v/v	**Dry**	9.1	0.29					
Water Vapour	% v/v		9.2	0.48					
Stack Gas Temperature	°C		208						
Stack Gas Velocity	m/s		21.6	0.94					
Volumetric Flow Rate (ACTUAL)	m³/hr		4294	269	**Limit**				
Volumetric Flow Rate (REF) [1]	m³/hr		4304	270	4200				

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM THE PRELIMINARY VELOCITY TRAVERSE.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, dry gas, 15% oxygen.

MONITORING DATE(S) & TIMES

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine
12th November 2025

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	0.22	g/hr	0.94	12/11/2025	10:10 - 10:40	30
Sulphur Dioxide	R1	mg/m³	0.85	g/hr	3.7	12/11/2025	10:10 - 10:40	30
Non-Methane VOCs	R1	mg/m³	0.14	g/hr	0.59	12/11/2025	10:10 - 10:40	30
Total VOCs (as Carbon)	R1	mg/m³	542	g/hr	2331	12/11/2025	10:10 - 10:40	30
Oxides of Nitrogen (as NO_2)	R1	mg/m³	113	g/hr	486	12/11/2025	10:10 - 10:40	30
Carbon Monoxide	R1	mg/m³	358	g/hr	1542	12/11/2025	10:10 - 10:40	30
Carbon Dioxide	R1	% v/v	9.6			12/11/2025	10:10 - 10:40	30
Oxygen	R1	% v/v	9.1			12/11/2025	10:10 - 10:40	30
Water Vapour	R1	% v/v	8.5			12/11/2025	09:30 - 10:00	30
Velocity Traverse	R1					12/11/2025	09:50 - 09:53	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine
12th November 2025

Standard Operating Conditions

Parameter	Value
Process Status	On - Gas Engine
Capacity (of 100%) and Tonnes / Hour	500KW
Continuous or Batch Process	Continuous
Feedstock (if applicable)	Gas
Abatement System	Biofilter
Abatement System Running Status	On
Fuel	N/A
Plume Appearance	None

MONITORING & ANALYTICAL METHODS

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine
12th November 2025

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EDU	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.18 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EDU	MD 101	IC	MCERTS	EET	MCERTS	0.016 mg/m³
Non-Methane VOCs	CEN/TS 13649	MD 016	MCERTS	EDU	In House	GC/MS	None	MAR	None	0.083 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EDU	MD 005	Gravimetric	MCERTS	EDU	MCERTS	0.10 % v/v
Total VOCs (as Carbon)	EN 12619:2013	MD 020	MCERTS	EDU	Flame Ionisation Detection by Sick 3006				MCERTS	0.32 mg/m³
Oxides of Nitrogen (as NO_2)	EN 14792	MD 039	MCERTS	EDU	Chemiluminescence by Horiba PG-350EU				MCERTS	0.41 mg/m³
Carbon Monoxide	EN 15058	MD 039	MCERTS	EDU	NDIR by Horiba PG-350EU				MCERTS	0.39 mg/m³
Carbon Dioxide	CEN/TS 17405	MD 039	MCERTS	EDU	NDIR by Horiba PG-350EU				MCERTS	0.1 %
Oxygen	EN 14789	MD 039	MCERTS	EDU	Dry Paramagnetic Cell by Horiba PG-350EU				MCERTS	0.1 %
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EDU	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Dublin Lab - EDU)	ISO 17025 Accreditation Number: INAB 393T
Marchwood Scientific Services Ltd (MAR)	ISO 17025 Accreditation Number: UKAS 1668
Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
All	All	There are no deviations associated with the sampling employed.

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.27
Width	m	-
Area	m²	0.06
Port Depth	cm	17
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	5" Flange

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Permanent
Inside / Outside	Outside

Platform Details

Irish EPA Technical Guidance Note AG1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in Irish EPA Guidance Note AG1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

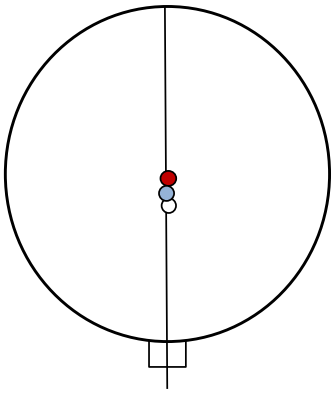
Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	238.0	> 5 Pa	Yes
Mean Velocity	m/s	21.63	-	-
Lowest Gas Velocity	m/s	21.63	-	-
Highest Gas Velocity	m/s	21.63	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	3.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

PLANT PHOTOS

Photo 1

Photo 2

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- ● = combustion gases sample point
- ● = non-isokinetic sample point

APPENDIX CONTENTS

APPENDIX 1

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Radek Chromik	MCERTS Level 2	MM23 1801	TE1 TE2 TE3 TE4
Technician	Anthony Kelly	MCERTS Level 1	MM23 1847	TE1

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.1000
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.10008
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.10006
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	CAT 5.53
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21S.73
S-Pitot (2)	CAT 21P.200
L-Pitot	-
Site Balance	CAT 17.10
500g / 1Kg Check Weights	CAT 17.10
Last Impinger Arm	-
Callipers	CAT 23.11
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-350EU	CAT 39.20
SELECT Horiba Model (2)	-
SELECT Servomex Model	-
SELECT NOX Analyser/Convertor	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	CAT 4.0027
SELECT FTIR	-
Gasmet Sampling System	-
Sick 3006	CAT 8.16
M&C PSS	CAT 12.114
Mass Flow Controller (1)	CAT 6.45
Mass Flow Controller (2)	CAT 6.85
Mass View (1)	CAT 25.11
Mass View (2)	CAT 25.12
Hioki 5043 (V)	CAT 11.114
SELECT Logger 2	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.268
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.268
Stopwatch	CAT 15.52
Barometer	CAT 13.50
Stack Thermocouple (1)	CAT 4.00093
Stack Thermocouple (2)	CAT 4.0162
Stack Thermocouple (3)	-
1m Heated Line (1)	CAT 20.205
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	CAT 20.1020
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	CAT 20.1020
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.66

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Non-Methane VOCs	CEN/TS 13649	MD 016
Water Vapour	EN 14790	MD 005
Total VOCs (as Carbon)	EN 12619:2013	MD 020
Oxides of Nitrogen (as NO_2)	EN 14792	MD 039
Carbon Monoxide	EN 15058	MD 039
Carbon Dioxide	CEN/TS 17405	MD 039
Oxygen	EN 14789	MD 039
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.27
Stack Width, W	m	-
Stack Area, A	m^2	0.06
Average Stack Gas Temperature, T_a	°C	208.4
Average Stack Gas Pressure	Pa	238.0
Average Stack Static Pressure, P_{static}	kPa	-0.177
Average Barometric Pressure, P_b	kPa	99.8
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2	-	9.60	8.71	0.0960	44.01	1.9635	0.18848
O_2	-	9.12	8.28	0.0912	32.00	1.4277	0.13024
N_2	-	81.28	73.79	0.8128	28.01	1.2498	1.01585
Moisture (H_2O)	-	-	9.22	0.0922	18.02	0.8037	0.07409

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.335
Wet Density (STP), P_{STW}	kg/m³	1.286
Dry Density (Actual), P_{Actual}	kg/m³	0.744
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	0.717

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	208.4	0.0
Total Pressure	kPa	99.6	101.3
Moisture	%	9.22	0.00
Oxygen (Dry)	%	9.1	15.0

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	4294
Gas Volumetric Flowrate (STP, Wet)	m³/hr	2395
Gas Volumetric Flowrate (STP, Dry)	m³/hr	2174
Gas Volumetric Flowrate REF [1]	m³/hr	4304

APPENDIX 2

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	12/11/2025
Time of Survey	-	09:50 - 09:53
Atmospheric Pressure	kPa	99.8
Average Stack Static Pressure	Pa	-177
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	2
Number of Lines Used	-	1

		Sampling Line A					Sampling Line B				
Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °	ΔP	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*-177.0*									
Mean		**238.0**	**208.4**	**0.717**	**21.63**						
1	0.13	238.0	208.4	0.717	21.63	3.0					

APPENDIX 2

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	5.001	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	5.898	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	18.026	
- Overall corrections to dynamic measurements	u(Cf)	24.008	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00006	-
- $\varphi O_2,w$	-	8.282	
- $\varphi CO_2,w$	-	8.714	
- Oxygen, dry	u(ϕO_2,d)	0.279	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.294	
- Water Vapour	u(ϕH_2O)	0.470	
- Oxygen, wet	u(ϕO_2,w)	0.257	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.271	
Standard uncertainty associated with the stack temperature	u(Tc)	2.456	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.763	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	5.001	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00419	-
Standard uncertainty associated with the local velocities	u(vi)	0.479	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.479	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.938	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	4.34	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	269.2	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00102	
- $u^2(qV,w)$	-	18860	
- u(qV,w)	-	137.3	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	6.27	%

APPENDIX 2

WATER VAPOUR: RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland

A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	% v/v	8.5		8.5
Uncertainty	±% v/v	0.44		0.44

General Sampling Information

Parameter	Value
Standard	EN 14790
Technical Procedure	MD 005

WATER VAPOUR: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	09:30 - 10:00
Sampling Dates	-	12/11/2025
Sampling Device	-	DGM
Duration	mins	30
DGM Start Volume	m^3	8.1050
DGM End Volume	m^3	8.4000
DGM Start Temperature	°C	14.0
DGM End Temperature	°C	15.0
Start ΔH	mmH_2O	14.0
End ΔH	mmH_2O	15.0
DGM Y_d	-	0.9820
Barometric Pressure	kPa	99.8
Volume Sampled (STP, Dry)	m^3	0.2713
Volume Sampled (STP, Wet)	m^3	0.2963
Sample Flow Rate	l/min	9.66
Liquid Trap Start Mass	g	3546.8
Liquid Trap End Mass	g	3563.5
Silica Trap Start Mass	g	1564.1
Silica Trap End Mass	g	1567.5
Total Mass Of Water Vapour	g	20.1
Calculated Water Vapour	% v/v	8.45

Where: DGM stands for Dry Gas Meter

APPENDIX 2

WATER VAPOUR: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	9.7
Pre-Sampling Leak Rate	l/min	0.08
Post-Sampling Leak Rate	l/min	0.08
Allowable Leak Rate	l/min	0.19
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

Measurement Uncertainty	Units	Run 1
Measurement Uncertainty (MU)	%	5.2
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel	Units	Run 1
Less than 50% Faded	%	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

APPENDIX 2

WATER VAPOUR: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value			Standard uncertainty			
Measured Quantities	**Symbol**	**Run 1**		**Symbol**	**Units**	**Run 1**	
Sampled Volume (Actual)	V_m	0.2950		uV_m	m³	0.0059	
Sampled Gas Temperature	T_m	287.5		uT_m	K	2.00	
Sampled Gas Pressure	ρ_m	99.8		$u\rho_m$	kPa	0.50	
Sampled Gas Humidity	H_m	0.00		uH_m	% v/v	1.00	
Repeatability of Weighing	R_w	20.10		uR_w	g	0.06	
Reading of Balance	R_b	20.10		uR_b	g	0.10	
Leak	L	0.83			%	-	

	Uncertainty as a Percentage			
Measured Quantities	**Units**	**Run 1**		**Requirement of Standard**
Sampled Volume (Actual)	%	2.00		≤2%
Sampled Gas Temperature	%	0.70		≤1%
Sampled Gas Pressure	%	0.50		≤1%
Sampled Gas Humidity	%	1.00		≤1%
Repeatability of Weighing	%	0.30		No Requirement
Reading of Balance	%	0.50		No Requirement
Leak	%	0.83		≤2%

	Uncertainty in Measurement Units				Sensitivity Coefficient	
Measured Quantities	**Symbol**	**Units**	**Run 1**		**Run 1**	
Sampled Volume (STP)	V_m	m³	0.2713		31.15	
Repeatability of Weighing	R_w	g	20.10		0.42	
Reading of Balance	R_b	g	20.10		0.42	
Leak	L	% v/v	0.04		1.00	

	Uncertainty in Result		
Measured Quantities	**Units**	**Run 1**	
Sampled Volume (STP)	% v/v	0.215	
Repeatability of Weighing	% v/v	0.025	
Reading of Balance	% v/v	0.042	
Leak	% v/v	0.040	

Parameter	**Units**	**Run 1**
Combined uncertainty	% v/v	0.22
Expanded uncertainty (95% confidence)	% v/v	0.44
Expanded uncertainty (95% confidence), estimated with Method Deviations	% v/v	0.44
Uncertainty if Water Droplets are present	% v/v	N/A
Reported Uncertainty	% v/v	0.44
Expanded uncertainty (95% confidence)	%	5.2
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	5.2
Uncertainty if Water Droplets are present	%	N/A
Reported Uncertainty	%	5.2

APPENDIX 2

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.22		0.22
Uncertainty	±mg/m³	0.36		0.36
Mass Emission	g/hr	0.94		0.94
Uncertainty	±g/hr	1.6		1.6

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	10.0		10.0
Uncertainty	±% v/v	0.51		0.51

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.18		0.18

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	748.6
Stack static pressure, P_{static}	mmH_2O	-18.0
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	747.2
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	48.6
Total mass collected in impingers (silica trap)	g	9.2
Total mass of liquid collected, V_{lc}	g	57.8
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0720
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	0.7057
Gas meter correction factor, Y_d	-	0.9820
Average dry gas meter temperature, T_m	°C	15.4
Average pressure drop across orifice, ΔH	mmH_2O	51.0
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	0.6493
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0998
B_{wo} as a percentage	% v/v	9.98
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	9.98
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	0.7213
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	8.28
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	9.12
% oxygen reference condition, $REF\%O_2$	% v/v	15.00
O_2 Reference Factor wet (O_{2REFw}) = (21 - $REF\%O_2$) / (21 - $ACT\%O_{2w}$)	-	0.47
O_2 Reference Factor dry (O_{2REFd}) = (21 - $REF\%O_2$) / (21 - $ACT\%O_{2d}$)	-	0.51
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	1.5290
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	1.2853
Molecular weight of dry gas stream, M_d		
CO_2	% v/v	9.60
O_2	% v/v	9.12
Total	% v/v	18.72
N_2	% v/v	81.28
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	29.90
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.71
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	24.92
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	4.99
Average stack gas temperature, T_s	°C	208.5
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s + 273})) / (\sqrt{(M_s)(P_s)})$	m/s	22.07
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.06
$Q_a = (60)(A_s)(V_s)$	m^3/min	73.0
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	40.7
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	36.6
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	86.3
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	72.5
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	6.01
Nozzle area, A_n	mm^2	28.34
Total sampling time, q	min	30
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	114.9

APPENDIX 2

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.2853
Filter I.D. Number	-	47-124354
Start Filter Mass	g	0.14784
End Filter Mass	g	0.14780
Total Mass on Filter	g	-0.00004
Probe Rinse I.D. Number	-	PR-47-124354
Start Probe Rinse Mass	g	2.91255
End Probe Rinse Mass	g	2.91287
Total Mass in Probe Rinse	g	0.00032
Total Mass Collected	mg	0.28
Calculated Concentration	mg/m^3	0.22
Balance Uncertainty / LOD	mg/m^3	0.18

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	12/11/2025
Average Volume Sampled (REF)	m^3	1.2853
Filter I.D. Number	-	47-124312
Start Filter Mass	g	0.14730
End Filter Mass	g	0.14725
Total Mass on Filter	g	-0.00005
Probe Rinse I.D. Number	-	PR-47-124312
Start Probe Rinse Mass	g	2.93662
End Probe Rinse Mass	g	2.93676
Total Mass in Probe Rinse	g	0.00014
Total Mass Collected	mg	0.09
Calculated Concentration	mg/m^3	0.07
Balance Uncertainty / LOD	mg/m^3	0.18

APPENDIX 2

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	23.1
Pre-Sampling Leak Rate	l/min	0.13
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.1
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	114.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.25
ELV [Daily ELV for IED]	mg/m³	50.00
Allowable Weighing Uncertainty	mg/m³	2.50
Weighing Uncertainty Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	209

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.14
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m³	5.0
Blank Acceptable	-	Yes

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	0.7057	uV_m	m^3	0.0141
Sampled Gas Temperature	T_m	288.4	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	99.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.56	uL	%	-
Mass of Particulate	m	0.28	um	mg	0.23
Uncollected Mass	UCM	0.09	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.50	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.56	≤2%
Mass of Particulate	%	0.36	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.6493	0.34
Leak	L	mg/m^3	0.001	1.00
Mass of Particulate	L_r	mg	0.280	0.78
Uncollected Mass	UCM	mg	0.05	0.78

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.006
Leak	mg/m^3	0.0007
Mass of Particulate	mg/m^3	0.1789
Uncollected Mass	mg/m^3	0.0419

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	0.51
Stack Gas O_2 Content	% v/v	9.12
MU for O_2 Correction	-	0.02
Overall MU For O_2 Measurement	%	4.21

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.18
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.36
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	0.36
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.36
Reported Uncertainty	mg/m^3	0.36
Expanded uncertainty (95% confidence), without Oxygen Correction	%	165.4
Expanded uncertainty (95% confidence), with Oxygen Correction	%	165.5
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	165.5
Reported Uncertainty	%	165.5
Reported Uncertainty as % of ELV	%	0.7

APPENDIX 2

SULPHUR DIOXIDE: RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.85		0.85
Uncertainty	±mg/m³	0.06		0.06
Mass Emission	g/hr	3.7		3.7
Uncertainty	±g/hr	0.34		0.34

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	10.0		10.0
Uncertainty	±% v/v	0.51		0.51

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.04		0.04

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	28/11/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

APPENDIX 2

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	748.6
Stack static pressure, P_{static}	mmH_2O	-18.0
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	747.2
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	48.6
Total mass collected in impingers (silica trap)	g	9.2
Total mass of liquid collected, V_{lc}	g	57.8
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0720
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	0.7057
Gas meter correction factor, Y_d	-	0.9820
Average dry gas meter temperature, T_m	°C	15.4
Average pressure drop across orifice, ΔH	mmH_2O	51.0
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	0.6493
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0998
B_{wo} as a percentage	% v/v	9.98
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	9.98
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	0.7213
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	8.28
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	9.12
% oxygen reference condition, $REF\%O_2$	% v/v	15.00
O_2 Reference Factor wet (O_{2REFw}) = (21 - $REF\%O_2$) / (21 - $ACT\%O_{2w}$)	-	0.47
O_2 Reference Factor dry (O_{2REFd}) = (21 - $REF\%O_2$) / (21 - $ACT\%O_{2d}$)	-	0.51
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	1.5290
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	1.2853
Molecular weight of dry gas stream, M_d		
CO_2	% v/v	9.60
O_2	% v/v	9.12
Total	% v/v	18.72
N_2	% v/v	81.28
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	29.90
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.71
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	24.92
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	4.99
Average stack gas temperature, T_s	°C	208.5
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s + 273})) / (\sqrt{(M_s)(P_s)})$	m/s	22.07
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.06
$Q_a = (60)(A_s)(V_s)$	m^3/min	73.0
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	40.7
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	36.6
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	86.3
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	72.5
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	6.01
Nozzle area, A_n	mm^2	28.34
Total sampling time, q	min	30
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	114.9

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.2853
Laboratory Result for Front Impingers	µg/ml	3.65
Laboratory Result for Back Impinger	µg/ml	0.33
Volume in Front Impingers	ml	288.5
Volume in Back Impinger	ml	124.4
Mass in Front Impingers	µg	1053.0
Mass in Back Impinger	µg	41.1
Total Mass Collected	µg	1094.1
Calculated Concentration	mg/m^3	0.85

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	12/11/2025
Average Volume Sampled (REF)	m^3	1.2853
Laboratory Result for Impingers	µg/ml	0.17
Volume in Impingers	ml	300.3
Total Mass Collected	µg	51.1
Calculated Concentration	mg/m^3	0.04

APPENDIX 2

SULPHUR DIOXIDE: QUALITY ASSURANCE

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Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	23.1
Pre-Sampling Leak Rate	l/min	0.13
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	96.2
Allowable Absorption Efficiency	%	N/A [2]
Absorption Efficiency Acceptable	-	Yes [2]

[2] The concentration is less than 30% of the ELV, therefore no assessment against an allowable efficiency is required.

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.1
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	114.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	209

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

APPENDIX 2

SULPHUR DIOXIDE: QUALITY ASSURANCE

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Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.14
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	6.0
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation	Run Number	
(x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	1	
There are no deviations associated with the sampling employed.	wx	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value			Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**		**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	0.7057		uV_m	m³	0.0141
Sampled Gas Temperature	T_m	288.4		uT_m	K	2.00
Sampled Gas Pressure	ρ_m	99.6		$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00		uH_m	% v/v	1.00
Leak	L	0.56		uL	%	-
Laboratory Result	L_r	0.90		uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.50	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.56	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m³	0.6493	1.31
Leak	L	mg/m³	0.003	1.00
Laboratory Result	L_r	mg/m³	0.008	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m³	0.022
Leak	mg/m³	0.0028
Laboratory Result	mg/m³	0.0077

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	0.51
Stack Gas O_2 Content	% v/v	9.12
MU for O_2 Correction	-	0.02
Overall MU For O_2 Measurement	%	4.21

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m³	0.02
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m³	0.05
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m³	0.06
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m³	0.06
Reported Uncertainty	mg/m³	0.06
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.3
Expanded uncertainty (95% confidence), with Oxygen Correction	%	6.8
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	6.8
Reported Uncertainty	%	6.8
Reported Uncertainty as % of ELV	%	0.1

APPENDIX 2

NON-METHANE VOCS : RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland

A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Non-Methane VOCs	mg/m³	0.14		0.14

General Sampling Information

Parameter	Value	
Standard	CEN/TS 13649	
Technical Procedure	MD 016	
Name of Analytical Laboratory	MAR	
Analytical Laboratory's Procedure	In House	
ISO 17025 Accredited Analysis?	See Executive Summary	
Date of Sample Analysis	28/11/2025	
Probe Material	Titanium	
Sample Tube Type	Coconut Shell Charcoal	
Dynamic Dilution Employed	No	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

APPENDIX 2

NON-METHANE VOCS : SAMPLING DETAILS

RUN 1

Parameter	Units	Value
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Sampling Device	-	MV
Duration	mins	30
N_2 to Stack Gas Dilution Ratio	: 1	0
Volume Sampled (REF)	m^3	0.0240

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	LOD (Front) µg	LOD (Back) µg	LOD (Total) µg	Concentration mg/m^3	Reported Concentration (Blank Reviewed) mg/m^3	Reported LOD mg/m^3	Adsorption Efficiency %
Non-Methane VOCs	2.3	< 1.0	3.3	1.0	1.0	2.0	0.137	0.137	0.083	100.0

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

Tube Lot Number and Unique ID:

Mass Emission (kg/h)
>0.00059 and <0.00059

APPENDIX 2

NON-METHANE VOCS : SAMPLING DETAILS

BLANK 1

Parameter	Units	Value
Sampling Dates	-	12/11/2025
Sampling Device	-	MV
Average Volume Sampled (REF)	m^3	0.0240

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	Concentration mg/m^3
Non-Methane VOCs	< 1.0	< 1.0	2.0	< 0.083

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

Tube Lot Number and Unique ID:

APPENDIX 2

NON-METHANE VOCS : QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	0.4
Pre-Sampling Leak Rate	l/min	0.00
Post-Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.02
Leak Test Acceptable	-	Yes

Adsorption Efficiency	Units	Run 1
Non-Methane VOCs	%	100.0
Allowable Adsorption Efficiency	%	95.0
Adsorption Efficiency Acceptable	-	Yes

Temperature at Sample Tubes	Units	Run 1
Temperature	°C	12
Allowable Temperature	°C	40
Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

APPENDIX 2

NON-METHANE VOCS : QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	0.4
Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.02
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1	Allowed
Allowable for Non-Methane VOCs	mg/m³	0.1	7.5

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1
There are no deviations associated with the sampling employed.	x

APPENDIX 2

NON-METHANE VOCS : MEASUREMENT UNCERTAINTY CALCULATIONS

	Value			Standard uncertainty			
Measured Quantities	**Symbol**	**Run 1**		**Symbol**	**Units**	**Run 1**	
Sampled Volume (STP)	V_m	0.0121		uV_m	m^3	0.0002	
Leak	L	0.00		uL	%	-	
Laboratory Result	L_r	9.00		uL_r	%	-	

	Uncertainty as a Percentage			
Measured Quantities	**Units**	**Run 1**		**Requirement of Standard**
Sampled Volume (STP)	%	2.00		≤2%
Leak	%	0.00		≤5%
Laboratory Result	%	9.00		No Requirement

	Uncertainty in Measurement Units				Sensitivity Coefficient	
Measured Quantities	**Symbol**	**Units**	**Run 1**		**Run 1**	
Sampled Volume (STP)	V_m	m^3	0.0121		11.32	
Leak	L	mg/m^3	0.000		1.00	
Laboratory Result	L_r	mg/m^3	0.012		1.00	

	Uncertainty in Result		
Measured Quantities	**Units**	**Run 1**	
Sampled Volume (STP)	mg/m^3	0.003	
Leak	mg/m^3	0.0000	
Laboratory Result	mg/m^3	0.0124	

	Oxygen Correction Part of MU Budget		
Measured Quantities	**Units**	**Run 1**	
O_2 Correction Factor	-	0.51	
Stack Gas O_2 Content	% v/v	9.12	
MU for O_2 Correction	-	0.02	
Overall MU For O_2 Measurement	%	4.21	

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.013
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.025
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	0.025
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.025
Reported Uncertainty	mg/m^3	0.025
Expanded uncertainty (95% confidence), without Oxygen Correction	%	18.1
Expanded uncertainty (95% confidence), with Oxygen Correction	%	18.1
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	18.1
Reported Uncertainty	%	18.1
Reported Uncertainty as % of ELV	%	N/A

NOTE: Uncertainties reported in mg/m ³ are based upon the summation of all Speciated VOCs Measured.

APPENDIX 2

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	542		542
Uncertainty	±mg/m³	23.6		23.6
Mass Emission	g/hr	2331		2331
Uncertainty	±g/hr	178		178

General Sampling Information

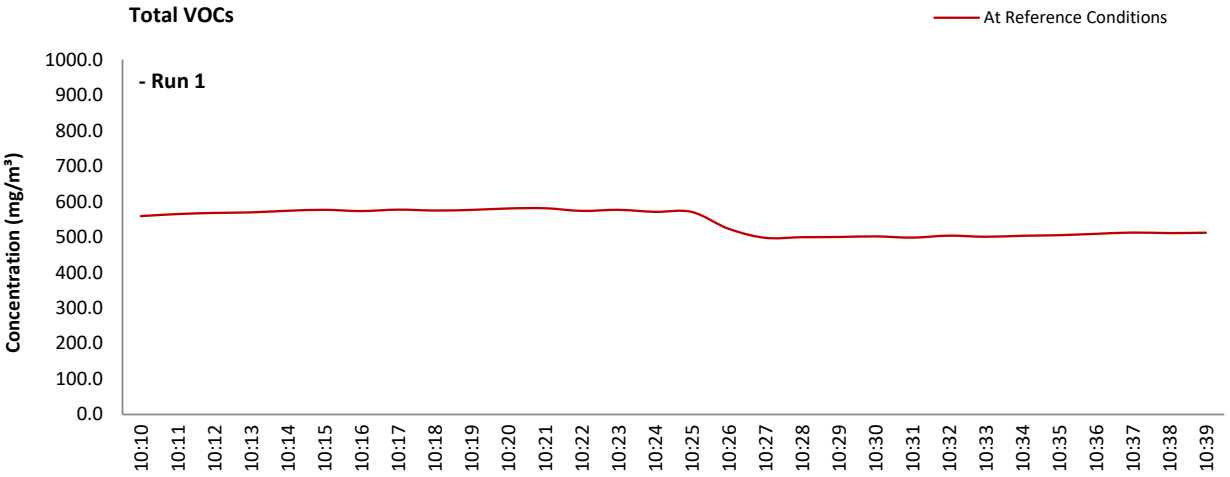
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	MD 020	
Probe Material	Titanium	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	1.0617	
Span Gas Expiry Date	INPUT	
Span Gas Start Pressure (bar)	INPUT	
Gas Cylinder Concentration (ppm)	802.69	
Span Gas Set Point (ppm)	802.69	
Span Gas Uncertainty (%)	2	
Zero Gas Type	Synthetic Air (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

TOTAL VOCs (as CARBON): DATA TREND

Graphical Trend of Data



TOTAL VOCs (as CARBON): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Instrument Range	ppm	1000
Span Gas Value	ppm	802.7

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	2.00
	Zero Down Sampling Line (Post)	ppm	-4.00
	Zero Drift	ppm	-6.00
	Zero Drift	%	-0.76
	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± ppm	40.13
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	790.00
	Span Down Sampling Line (Post)	ppm	755.00
	Span Drift	ppm	-35.00
	Span Drift	%	-4.43
	Drift Correction Applied	2-5%	Yes
	Allowable Span Drift	± ppm	40.13
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	13 - 14

Method Deviations

Nature of Deviation	Run Number	
(x = deviation applies to the associated run)	1	
There are no deviations associated with the sampling employed.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	1000.0		mg/m³ (REF)
Allowable MU	15.0		%
Measured concentration	1072.19		mg/m³ (STP, dry)
Range Used	1000.0		ppm
Range Used [A]	1606.1		mg/m³
Cal gas conc.	802.7		ppm
Conversion	1.61		ppm to mg/m³
MCERTS Range [B]	15.0		mg/m³
Lower of [A] or [B]	15.0		mg/m³
Cal gas conc.	1289.2		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	30		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.21		% of value
Zero drift	-0.76		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	1.60		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	1.40		% full scale/10K
Combined interference	0.45		% range
Dependence on voltage	0.50		% full scale/10V
Losses in the line (leak)	1.49		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.00		mg/m³
Lack of fit	0.02		mg/m³
Drift	-5.65		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.01		mg/m³
Ambient temperature dependence	0.20		mg/m³
Combined interference (from MCERTS Certificate)	0.04		mg/m³
Dependence on voltage	0.06		mg/m³
Losses in the line (leak)	9.25		mg/m³
Uncertainty of calibration gas	12.38		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	1072.19		mg/m³
Combined uncertainty			16.46		mg/m³
Expanded uncertainty	k =	1.96	32.26		mg/m³
Uncertainty corrected to std conds. (O_2)			16.30		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.01		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	3.23		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	15.0		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	4.36		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	3.55		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	15.3		% at ELV
Result of Compliance with Uncertainty Requirement	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 15% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

APPENDIX 2

OXIDES OF NITROGEN (as NO_2): RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	113		113
Uncertainty	±mg/m³	4.8		4.8
Mass Emission	g/hr	486		486
Uncertainty	±g/hr	36.8		36.8

General Sampling Information

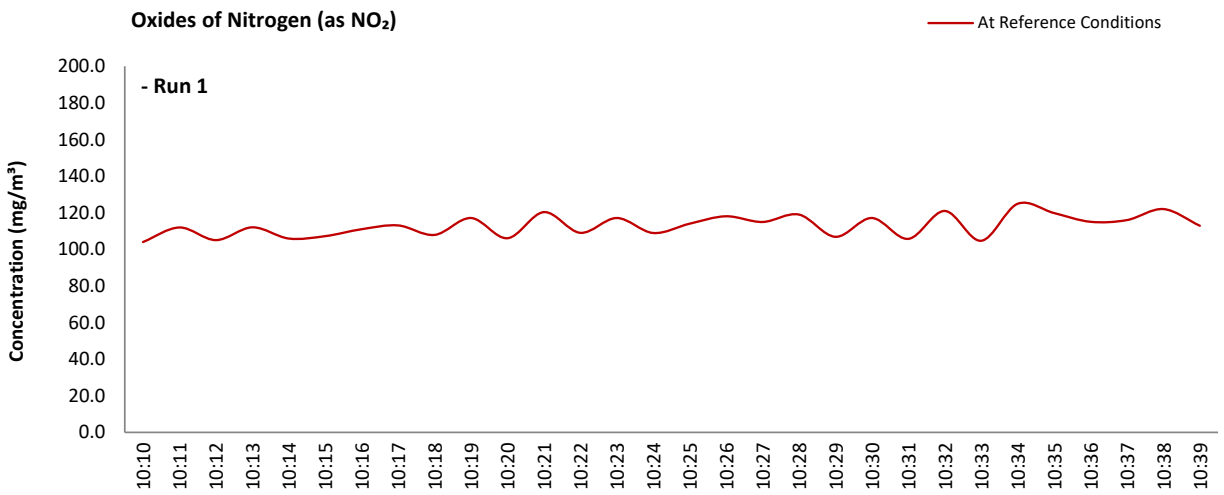
Parameter	Value	
Standard	EN 14792	
Technical Procedure	MD 039	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Date & Result of Last Converter Check	02/05/2025 - 98.9%	
Span Gas Type	Nitrogen Monoxide	
Span Gas Reference Number	12.0640	
Span Gas Expiry Date	06/04/2026	
Span Gas Start Pressure (bar)	80	
Gas Cylinder Concentration (ppm)	2018.6	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A2	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

OXIDES OF NITROGEN (as NO_2): DATA TREND

Graphical Trend of Data



APPENDIX 2

OXIDES OF NITROGEN (as NO_2): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Instrument Range	ppm	250
Span Gas Value	ppm	92.6

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.6
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	ppm	0.00
CAL 1	Zero at Analyser (Post)	ppm	0.60
CAL 1	Zero Drift	ppm	0.60
CAL 1	Zero Drift	%	0.65
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± %	5.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	ppm	92.58
CAL 1	Span at Analyser (Post)	ppm	92.50
CAL 1	Span Drift	ppm	-0.08
CAL 1	Zero Adj. Span Drift	%	0.73
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± %	5.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	13 - 14

Method Deviations

Nature of Deviation	Run Number
(x = deviation applies to the associated run)	1

OXIDES OF NITROGEN (as NO_2): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	190.0		mg/m³ (REF)
Allowable MU	10.0		%
Measured concentration	223.61		mg/m³ (STP, dry)
Ratio NO / NO_2	5		%
Range Used	250.0		ppm
Range Used [A]	513.1		mg/m³
Cal gas conc.	92.6		ppm
Conversion	2.05		ppm to mg/m³
MCERTS Range [B]	102.5		mg/m³
Lower of [A] or [B]	102.5		mg/m³
Cal gas conc.	190.0		mg/m³

Performance characteristics	RUN 1		Units
Response time	33		seconds
Number of readings in measurement	30		-
Repeatability at zero	0.10		% full scale
Repeatability at span level	0.15		% full scale
Deviation from linearity	0.29		% of value
Zero drift	0.65		% full scale
Span drift	-0.73		% full scale
Volume or pressure flow dependence	-0.30		% of full scale
Atmospheric pressure dependence	0.10		% of value/kPa
Ambient temperature dependence	0.06		% full scale/10K
Combined interference	0.73		% range
Dependence on voltage	0.26		% full scale/10V
Converter efficiency	98.9		%
Losses in the line (leak)	0.19		% of value
Uncertainty of calibration gas blending	1.40		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.03		mg/m³
Lack of fit	0.17		mg/m³
Drift	-0.24		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.03		mg/m³
Ambient temperature dependence	0.01		mg/m³
Combined interference (from MCERTS Certificate)	0.43		mg/m³
Dependence on voltage	0.03		mg/m³
Converter efficiency	0.07		mg/m³
Losses in the line (leak)	0.25		mg/m³
Uncertainty of calibration gas blending	1.81		mg/m³
Uncertainty of calibration gas	2.58		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	223.61		mg/m³
Combined uncertainty			3.21		mg/m³
Expanded uncertainty	k =	1.96	6.28		mg/m³
Uncertainty corrected to std conds. (O_2)			3.17		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	2.81		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	3.31		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	10.0		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	4.23		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	3.57		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	10.5		% at ELV
Result of Compliance with Uncertainty Requirement	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be <10% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 10% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

APPENDIX 2

CARBON MONOXIDE: RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	358		358
Uncertainty	±mg/m³	15.1		15.1
Mass Emission	g/hr	1542		1542
Uncertainty	±g/hr	116		116

General Sampling Information

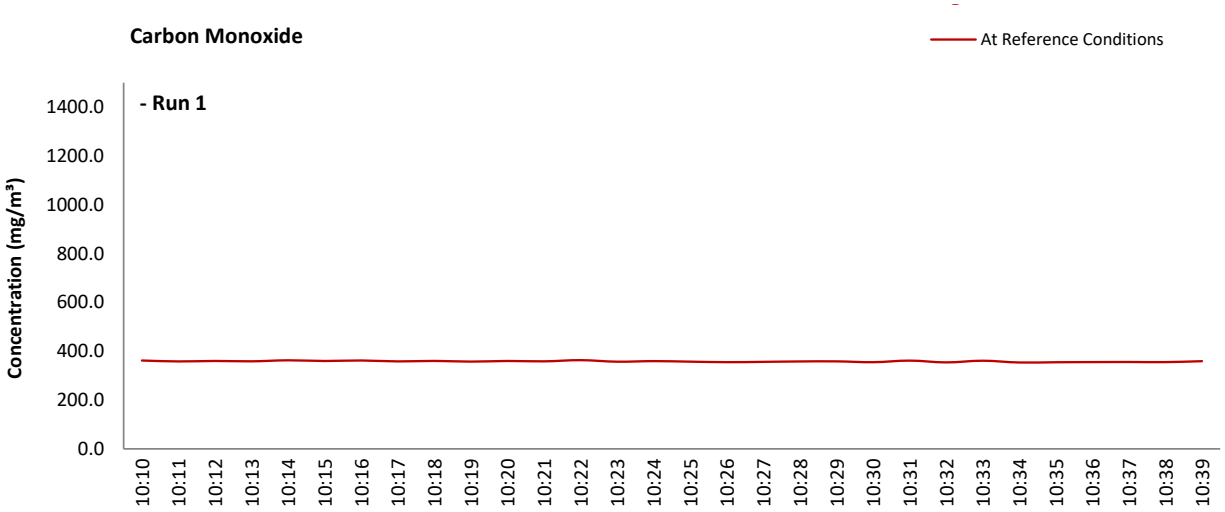
Parameter	Value	
Standard	EN 15058	
Technical Procedure	MD 039	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Carbon Monoxide	
Span Gas Reference Number	12.0640	
Span Gas Expiry Date	06/04/2026	
Span Gas Start Pressure (bar)	80	
Gas Cylinder Concentration (ppm)	4065.2	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A2	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 15% oxygen.

CARBON MONOXIDE: DATA TREND

Graphical Trend of Data



APPENDIX 2

CARBON MONOXIDE: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Instrument Range	ppm	2000
Span Gas Value	ppm	1200.8

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.6
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	ppm	0.00
CAL 1	Zero at Analyser (Post)	ppm	0.00
CAL 1	Zero Drift	ppm	0.00
CAL 1	Zero Drift	%	0.00
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± %	5.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	ppm	1200.70
CAL 1	Span at Analyser (Post)	ppm	1173.00
CAL 1	Span Drift	ppm	-27.70
CAL 1	Zero Adj. Span Drift	%	2.31
CAL 1	Drift Correction Applied	2-5%	Yes
	Allowable Span Drift	± %	5.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	13 - 14

Method Deviations

Nature of Deviation	Run Number	
(x = deviation applies to the associated run)	1	

APPENDIX 2

CARBON MONOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	1500.0		mg/m³ (REF)
Allowable MU	6.0		%
Measured concentration	709.46		mg/m³ (STP, dry)
Range Used	2000.0		ppm
Range Used [A]	2498.4		mg/m³
Cal gas conc.	1200.8		ppm
Conversion	1.25		ppm to mg/m³
MCERTS Range [B]	75.0		mg/m³
Lower of [A] or [B]	75.0		mg/m³
Cal gas conc.	1500.0		mg/m³

Performance characteristics	RUN 1		Units
Response time	33		seconds
Number of readings in measurement	30		-
Repeatability at zero	0.20		% full scale
Repeatability at span level	0.21		% full scale
Deviation from linearity	0.27		% of value
Zero drift	0.00		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	0.10		% of full scale
Atmospheric pressure dependence	0.22		% of value/kPa
Ambient temperature dependence	0.20		% full scale/10K
Combined interference	-0.48		% range
Dependence on voltage	0.15		% full scale/10V
Losses in the line (leak)	0.22		% of value
Uncertainty of calibration gas blending	1.40		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.04		mg/m³
Lack of fit	0.12		mg/m³
Drift	0.00		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.05		mg/m³
Ambient temperature dependence	0.03		mg/m³
Combined interference (from MCERTS Certificate)	-0.21		mg/m³
Dependence on voltage	0.02		mg/m³
Losses in the line (leak)	0.92		mg/m³
Uncertainty of calibration gas blending	5.73		mg/m³
Uncertainty of calibration gas	8.19		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	709.46		mg/m³
Combined uncertainty			10.05		mg/m³
Expanded uncertainty	k =	1.96	19.69		mg/m³
Uncertainty corrected to std conds. (O_2)			9.95		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	2.78		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	1.31		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	6.0		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	4.20		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	3.23		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	6.8		% at ELV
Result of Compliance with Uncertainty Requirement	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be <6% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 6% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

APPENDIX 2

CARBON DIOXIDE: RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

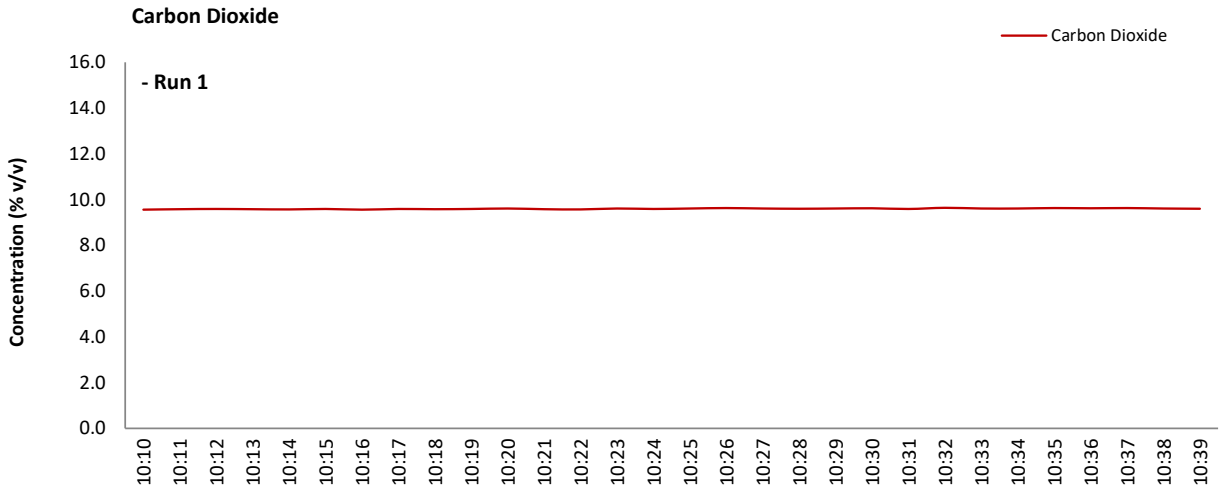
Parameter	Units	Run 1		Mean
Concentration	% v/v	9.6		9.6
Uncertainty	±% v/v	0.33		0.33

General Sampling Information

Parameter	Value	
Standard	CEN/TS 17405	
Technical Procedure	MD 039	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Carbon Dioxide	
Span Gas Reference Number	6.0110	
Span Gas Expiry Date	24/06/2029	
Span Gas Start Pressure (bar)	80	
Gas Cylinder Concentration (% v/v)	16.15	
Span Gas Uncertainty (%)	2.00	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A2	

CARBON DIOXIDE: DATA TREND

Graphical Trend of Data



APPENDIX 2

CARBON DIOXIDE: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Instrument Range	% v/v	20
Span Gas Value	% v/v	16.2

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.6
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	% v/v	0.00
CAL 1	Zero Down Sampling Line (Post)	% v/v	0.03
CAL 1	Zero Drift	% v/v	0.03
CAL 1	Zero Drift	%	0.19
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± %	5.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	% v/v	16.10
CAL 1	Span Down Sampling Line (Post)	% v/v	16.37
CAL 1	Span Drift	% v/v	0.27
CAL 1	Zero Adj. Span Drift	%	1.18
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± %	5.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	13 - 14

Method Deviations

Nature of Deviation	Run Number	
(x = deviation applies to the associated run)	1	

APPENDIX 2

CARBON DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	N/A		%vol
Allowable MU	25.0		%
Measured concentration	9.60		%vol
Range Used	20.0		%vol
Cal gas conc.	16.2		%vol

Performance characteristics	RUN 1		Units
Response time	31		seconds
Number of readings in measurement	30		-
Repeatability at zero	0.10		% full scale
Repeatability at span level	0.10		% full scale
Deviation from linearity	0.77		% of value
Zero drift	0.19		% full scale
Span drift	1.18		% full scale
Volume or pressure flow dependence	0.10		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	0.20		% full scale/10K
Combined interference	0.00		% range
Dependence on voltage	0.12		% full scale/10V
Losses in the line (leak)	0.31		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		%vol
Standard deviation of repeatability at span level	0.02		%vol
Lack of fit	0.09		%vol
Drift	0.08		%vol
Volume or pressure flow dependence	0.00		%vol
Atmospheric pressure dependence	0.02		%vol
Ambient temperature dependence	0.03		%vol
Combined interference (from MCERTS Certificate)	0.00		%vol
Dependence on voltage	0.01		%vol
Losses in the line (leak)	0.02		%vol
Uncertainty of calibration gas	0.11		%vol

			RUN 1		Units
Measurement uncertainty		**Result**	9.60		%vol
Combined uncertainty			0.17		%vol
Expanded uncertainty	k =	1.96	0.33		%vol

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.47		% of Value

APPENDIX 2

OXYGEN: RESULTS SUMMARY

Timoleague Agri Gen Ltd, Ireland
A1 Gas Engine

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	% v/v	9.1		9.1
Uncertainty	±% v/v	0.29		0.29

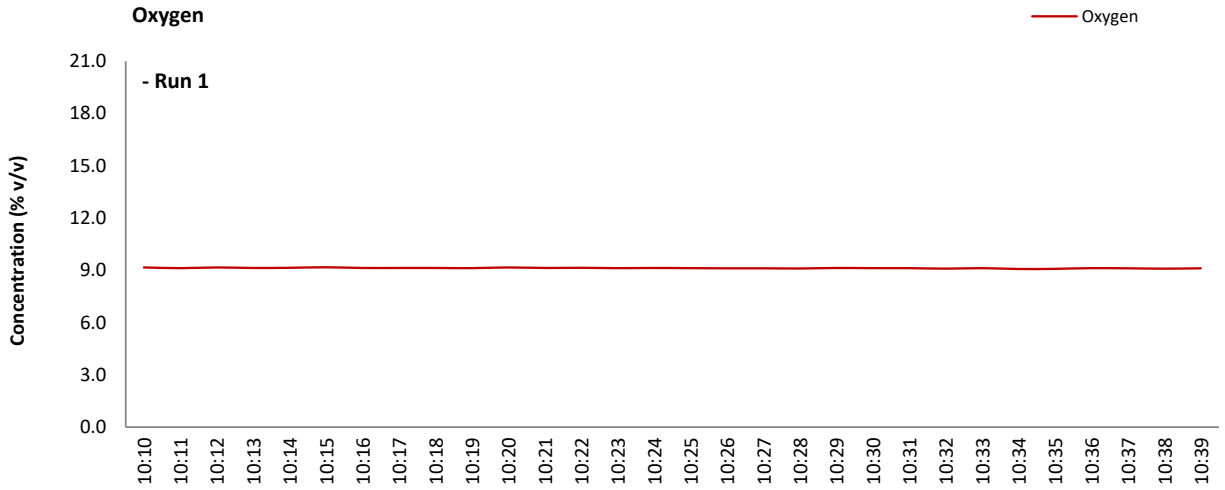
General Sampling Information

Parameter	Value	
Standard	EN 14789	
Technical Procedure	MD 039	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Synthetic Air (5 Grade)	
Span Gas Reference Number	11.0697	
Span Gas Expiry Date	03/04/2030	
Span Gas Start Pressure (bar)	40	
Gas Cylinder Concentration (% v/v)	21.63	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A2	

APPENDIX 2

OXYGEN: DATA TREND

Graphical Trend of Data



APPENDIX 2

OXYGEN: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	10:10 - 10:40
Sampling Dates	-	12/11/2025
Instrument Range	% v/v	25.0
Span Gas Value	% v/v	10.0

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	2.6
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	% v/v	0.00
CAL 1	Zero at Analyser (Post)	% v/v	-0.08
CAL 1	Zero Drift	% v/v	-0.08
CAL 1	Zero Drift	%	0.80
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± %	5.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	% v/v	9.97
CAL 1	Span at Analyser (Post)	% v/v	9.89
CAL 1	Span Drift	% v/v	-0.08
CAL 1	Zero Adj. Span Drift	%	0.00
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± %	5.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	13 - 14

Method Deviations

Nature of Deviation	Run Number
(x = deviation applies to the associated run)	1

APPENDIX 2

OXYGEN: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	N/A		%vol
Allowable MU	6.0		%
Measured concentration	9.12		%vol
Range Used	25.0		%vol
Cal gas conc.	21.6		%vol

Performance characteristics	RUN 1		Units
Response time	40		seconds
Number of readings in measurement	30		-
Repeatability at zero	0.01		% full scale
Repeatability at span level	0.01		% full scale
Deviation from linearity	0.02		% of value
Zero drift	-0.80		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	-0.01		% of full scale
Atmospheric pressure dependence	0.19		% of value/kPa
Ambient temperature dependence	0.09		% full scale/10K
Combined interference	0.00		% range
Dependence on voltage	0.01		% full scale/10V
Losses in the line (leak)	0.20		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		%vol
Standard deviation of repeatability at span level	0.00		%vol
Lack of fit	0.00		%vol
Drift	-0.10		%vol
Volume or pressure flow dependence	0.00		%vol
Atmospheric pressure dependence	0.01		%vol
Ambient temperature dependence	0.01		%vol
Combined interference (from MCERTS Certificate)	0.00		%vol
Dependence on voltage	0.00		%vol
Losses in the line (leak)	0.01		%vol
Uncertainty of calibration gas	0.11		%vol

			RUN 1		Units
Measurement uncertainty		**Result**	9.12		%vol
Combined uncertainty			0.15		%vol
Expanded uncertainty	k =	1.96	0.29		%vol

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.16		% of Value
Result of Compliance with Uncertainty Requirement	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be 0.3% vol absolute or 6% relative whichever is the lower, on a dry gas basis. Source, EN 14789.

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

FOLLOW-UP ACTIONS

The licensee is required to complete the actions outlined in this site visit report within the specified timeframes. Where required, the licensee shall also respond to actions specified in Compliance Investigations and/or submit a response to this site visit report via the EDEN system. The licensee shall maintain a documentary evidence, for review by the Agency, that the prescribed actions were completed within the required timeframe.

(i) Compliance Investigations

The Agency may generate a Compliance Investigation through the EDEN system and issue instructions and actions to the licensee. The licensee will receive notification when an instruction or action is issued and the licensee must respond to the actions within the Compliance Investigation within the specified timeframe.

(ii) Response to Site Visit Report

Where the licensee is requested to (or wishes to) respond to the Agency in relation to this site visit report, the licensee may select the 'Make a Response' link on the Site Visits page in EDEN where a .pdf document containing the response can be attached and submitted. The response should include details of the actions taken by the licensee to address the issues raised in this site visit report and the target completion dates. This Licensee Public Response provides the licensee with an opportunity to inform both the Agency and the public about the implementing of actions set out in the Agency site visit report. The response must be submitted **within 21 calendar days** of the issue date of this site visit report.

(iii) Publication of Reports

This site visit report will be published on the EPA's website, www.epa.ie, 30 calendar days after the site visit report issue date.

Any licensee response to this site visit report will be published on the EPA's website simultaneously (i.e. 30 calendar days after the site visit report issue date).

Please note that licensees are required to comply with the conditions of the licence at all times, and where non-compliance occurs, compliance must be restored within the shortest possible time. These actions will be verified during subsequent Agency visits. Please quote the above Inspection Reference Number in any correspondence in relation this Report.