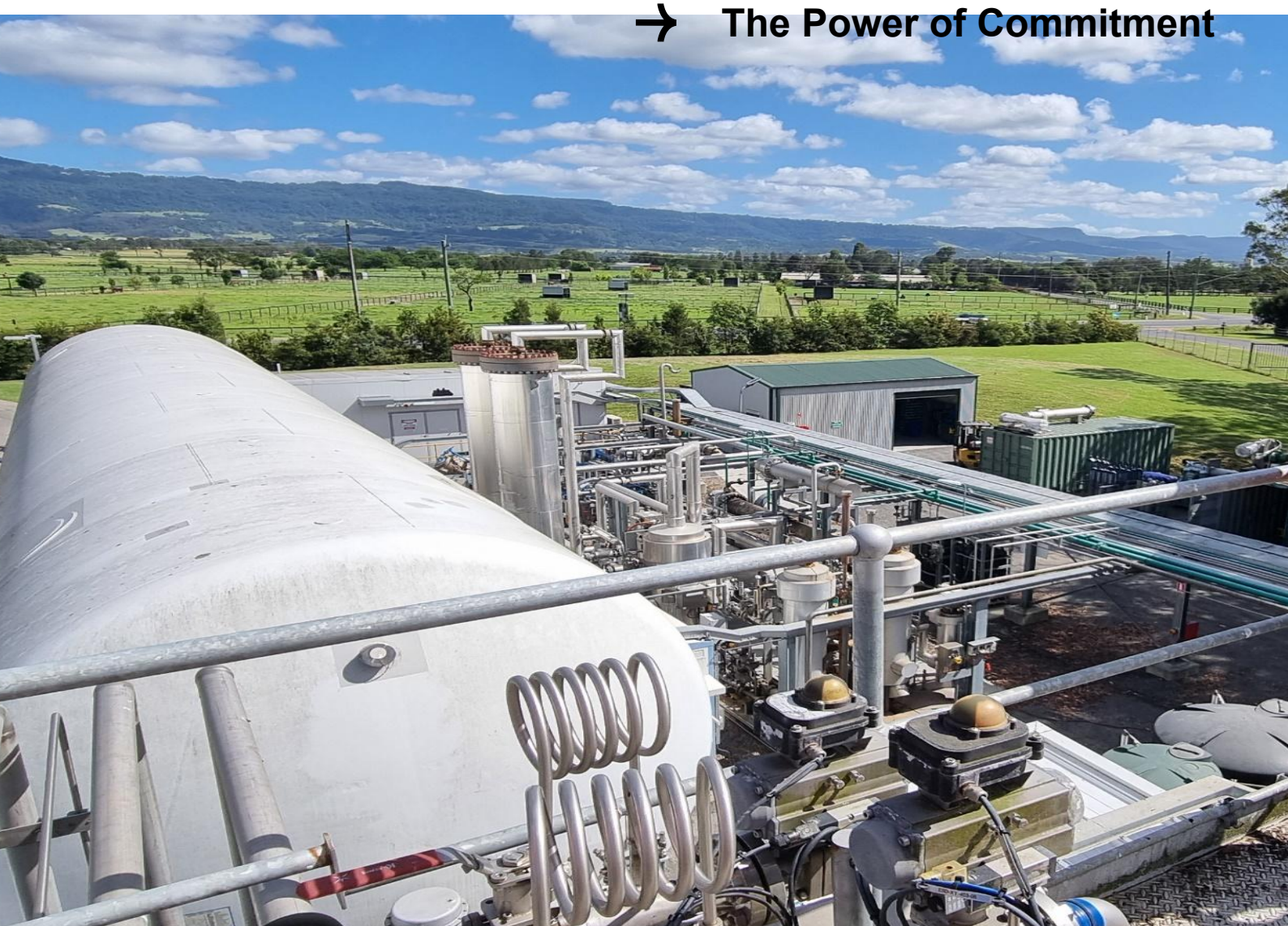
Supagas Modification 30

Air Quality Monitoring Plan

Supagas

24 April 2026

→ The Power of Commitment



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1. Introduction

GHD Pty Ltd (GHD) has been engaged by Supagas to prepare an Air Quality Monitoring Program (AQMP) for the operation of the Supagas Carbon Dioxide (CO_2) Plant located at 220 Bolong Road, Bomaderry, NSW. The plant is situated adjacent to the former Dairy Farmers factory, which now forms part of the Manildra Group of companies (Shoalhaven Starches).

This document has been specifically prepared to satisfy the requirements of Development Consent 06_0228 Condition 10 for Modification 30 (MOD 30), approved by the NSW Department of Planning, Housing and Infrastructure (DPHI).

Condition 10 of the consent states:

10. The Applicant shall prepare an Air Quality Monitoring Program for the development to the satisfaction of the Secretary. This program must:

- *a) be prepared in consultation with EPA;*
- *b) be submitted to the Secretary for approval within 3 months of this consent; and*
- *c) include a program to monitor the ongoing performance of the development.*

Air quality monitoring – MOD30

10C. The Applicant must update the Air Quality Monitoring Program required by Condition 10, to the satisfaction of the Planning Secretary, to include the monitoring of air emissions from the Supagas CO2 Plant, including ammonia.

Historically, Supagas has operated under the overarching air quality management protocols of the wider Manildra site. The approval of MOD 30 introduced a specific condition to explicitly update the air quality monitoring program to cover air emissions from the Supagas CO_2 plant.

This AQMP update addresses the specific requirement mandated by DPHI under Condition 10C, as outlined in Table 1 below.

Table 1 Conditions of consent

Consent requirement	Section in plan
Air quality monitoring – MOD30	
10C. The Applicant must update the Air Quality Monitoring Program required by Condition 10, to the satisfaction of the Planning Secretary, to include the monitoring of air emissions from the Supagas CO_2 Plant, including ammonia.	Entire document

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Project description

Supagas owns and operates a Carbon Dioxide (CO_2) Plant at Bomaderry, NSW, adjacent to the former Dairy Farmers factory that now belongs to the Manildra Group of companies and which Shoalhaven Starches forms a part of. The site is located at 220 Bolong Road, Bomaderry.

This plant takes CO_2 from the adjacent Shoalhaven Starches operations and processes this gas to food-grade quality for the food and beverage market. The CO_2 Plant was approved in two stages: initially producing 50 tonnes per day (TPD), which was subsequently increased to 90 TPD.

Under Modification 30 (MOD 30), Supagas has been approved to undertake alterations and additions to this existing carbon dioxide plant. This additional plant infrastructure will allow for the extraction and processing of an additional 75 TPD of carbon dioxide, bringing the total site capacity up to 165 TPD.

Emitted pollutants which may have an impact on human health include CO_2, ammonia and odour, as identified in the *Revised Preliminary Hazard Analysis, Alterations and Additions to an Existing Carbon Dioxide Plant, Supagas (Shoalhaven Starches Site, Bomaderry, NSW)* (Pinnacle Risk Management, 2025) (the PHA). The PHA presents a detailed risk assessment including risk from emissions of CO_2 and ammonia, and all risks associated with the modified Supagas CO_2 Plant were concluded to be acceptable.

A key component of the CO_2 liquefaction and purification process is the plant's refrigeration system. The MOD 30 alterations include the installation of a new Stage 2 refrigeration unit alongside the existing Stage 1 infrastructure. The new Stage 2 unit will have the exact same capacity as the existing Stage 1 unit and will operate in an identical manner.

These refrigeration units utilise ammonia, which is entirely enclosed within a standard, fully sealed system. Under normal, continuous operations, there is no physical venting of ammonia to the atmosphere.

As a result of this sealed design, the primary focus of this AQMP is limited strictly to maintenance. Maintenance activities that involve opening the sealed ammonia system are infrequent and generally limited to tasks such as oil pump or oil filter changes. These activities are expected to occur approximately once every six months.

It is only during these maintenance events that minor, localised ammonia emissions and slight associated odours may be generated. Consequently, this monitoring program is designed to address these infrequent maintenance scenarios, rather than continuous daily operation.

3. Legislative and policy context

The relevant legislation and guidance for the AQMP of the project are:

– *NSW Protection of the Environment Operations Act 1997 (POEO Act)* – The POEO Act provides the statutory framework for managing pollution in NSW, including the procedures for issuing licences for environmental protection on aspects such as waste, air, water, and noise pollution control. The POEO Act requires that no occupier of any premises causes air pollution (including odour) through a failure to maintain or operate equipment or deal with materials in a proper and efficient manner. For point source emissions where no standard of concentration and/or rate has been set, and for non-point source emissions, the operator must also take all practicable means to minimise and prevent air pollution (sections 124, 125, 126 and 128 of the POEO Act). The POEO Act includes the concept of ‘offensive odour’ (section 129) and states it is an offence for scheduled activities to emit ‘offensive odour’, subject to limited defences.

– NSW Protection of the Environment Operations (Clean Air) Regulation 2022 (POEO Clean Air Regulation) – The POEO Clean Air Regulation provides regulatory measures to control emissions from motor vehicles, fuels, and industry.
– National Environment Protection Council (NEPC) National Environment Protection (Ambient Air Quality) Measure 2021 (the Air NEPM) – The National Environment Protection Council of Environmental Ministers, now the National Environment Protection Council (NEPC), set uniform national standards for ambient air quality. The document containing these standards is known as the Air NEPM, which also contains goals for the identified relevant pollutants inclusive of particulates and concentration limits, averaging periods, and number of allowed exceedances for each of the identified pollutants.
– *NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales 2022* (the Approved Methods) - The Approved Methods lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in NSW. It considers the above-mentioned legislation and guidance to provide pollutant assessment criteria.
– Environment Protection Licence (EPL) – Manildra is the holder of EPL number 883 issued by the NSW EPA. The EPL must not cause or permit the emission of offensive odour beyond the boundary of the premises.
– *Guide to Conducting Field Odour Surveys* (NSW EPA, 2022) – This guide provides the methodology for undertaking field odour surveys in NSW. It has been adopted to inform the boundary odour survey methodology described in Section 6 of this AQMP.

3.1 Assessment criteria

The application of each impact assessment criteria is variable for each pollutant based on the following factors:

– Averaging period – the period over which modelled concentrations are averaged
– Statistic – the statistic of the modelled concentrations. As an example for a 1-hour averaging period, the 'maximum statistic' would be the highest predicted value at any receptor for the entire modelling period. The 99.9th percentile statistic would be (approximately) the ninth highest hour in a one year modelling period.
– Impact location – the location at which the impacts are to be assessed. For some pollutants, impacts are assessable only at sensitive receptor locations, while some impacts are assessable at and beyond the boundary of the site. The criteria apply at ground level where receptors are likely to be exposed.
– Impact type – the type of impact assessed. For some pollutants, the impacts are assessable only for the project's contribution to pollutant concentrations at the relevant impact location (referred to as 'incremental impacts'). For other pollutants, the cumulative impact (which includes both the incremental concentration as well as the background concentration) is assessed.

The sampling results will be evaluated against the relevant NSW EPA criteria outlined in the Approved Methods (2022). As ammonia is both a principal toxic air pollutant and an individual odorous air pollutant, its impact assessment criteria satisfy both health and amenity requirements.

The adopted quantitative criterion for toxicity of ammonia is set at a maximum 1-hour average ground-level concentration of 0.33 mg/m^3.

In addition to quantitative sampling, boundary odour surveys will be used to assess compliance with Section 129 of the POEO Act 1997 to ensure **no offensive odours are detected beyond the site boundary**.

Given no individual odorous criterion is applied to ammonia in the Approved Methods, Table 2 provides a summary of appropriate impact assessment criteria in Approved Method for complex mixtures of odorous air pollutants for reference. Note any field odour surveys would focus on the presence of offensive odours at the site boundary using Guide to Conducting Field Odour Surveys (NSW EPA, 2022) and would not be directly comparable with impact assessment criteria in the table below.

No criterion is applied to carbon dioxide in the Approved Methods.

Table 2 *Impact assessment criteria for complex mixtures of odorous air pollutants (nose-response-time average, 99th percentile)*

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (⩾~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence ((⩾~2)	7.0

4. Operational emissions

The Supagas CO_2 plant has two distinct operating contexts relevant to air emissions: routine operation and planned maintenance. This section defines the expected emission activities under each context and identifies the practical scenarios that are relevant to monitoring.

4.1 Routine operating conditions

Under routine operation, the refrigeration system operates as a closed and sealed system. Ammonia is retained within the process loop and there is no planned venting to atmosphere during normal plant operation.

Operational history supports this expected behaviour. Supagas has advised that two fixed ammonia sensors are installed near the existing refrigeration compressors and neither has been triggered over six years of operation. This indicates that ammonia releases during normal operation are not expected to be a material pathway for off-site air quality impact.

Consistent with this operating profile, routine operation is considered a low-emission condition for ammonia and associated odour. No other potentially odorous pollutants are understood to be emitted at the site.

The CO_2 Plant has capacity to process a total of 165 tonnes per day of CO_2 which would otherwise be vented to the atmosphere. As part of the processing operation, a residual emission of CO_2 of approximately 10.7 tonnes per day is expected. Risks associated with emission of CO_2 and subsequent monitoring requirements are described in Table 3.

Table 3 *Risks associated with emission of CO_2 and subsequent monitoring requirements*

Risk	Assessment
Human health	Potential human health risks associated with CO_2 emissions are primarily linked to enclosed or poorly ventilated environments, where CO_2 can accumulate and lead to oxygen displacement. In this case, CO_2 will be released via a 4-metre high stack into a naturally ventilated, open environment, where effective atmospheric dispersion is anticipated. There are no enclosed spaces or confined-space work activities associated with the emission point, and no credible scenarios have been identified that would result in the accumulation of CO_2 to concentrations of health concern. Consequently, the risk of elevated CO_2 exposure to workers is considered negligible, and routine on-site CO_2 monitoring for worker health and safety is not considered necessary under normal operating conditions. Existing workplace health and safety procedures are considered adequate to manage residual risk.
Ambient air quality	Operation of the CO_2 Plant will result in a net reduction in total CO_2 emissions, as the quantity of CO_2 processed and retained by the Plant substantially exceeds residual emissions. CO_2 is not listed as a criterion pollutant under the Approved Methods, and there are no ambient air quality standards or assessment criteria applicable to CO_2 for environmental compliance purposes. Therefore ambient air quality monitoring of CO_2 is not considered necessary during routine plant operations.

Risk	Assessment
Environment	The emitted CO_2 is biogenic in origin, arising from contemporary biological sources rather than fossil carbon. Biogenic CO_2 forms part of the natural short-term carbon cycle and does not represent a net increase in atmospheric carbon when considered in a lifecycle context. As such, there is no environmental requirement for routine monitoring of biogenic CO_2 emissions, provided emissions do not present a safety risk or result in off-site amenity impacts, neither of which are expected for this project.

Impacts to human health, ambient air quality and the environment from emission of CO_2 are considered negligible and monitoring of CO_2 is not considered necessary during routine operation conditions.

4.2 Maintenance operating condition

Potential ammonia release is associated with infrequent maintenance activities that involve opening parts of the sealed system. These activities are generally limited to tasks such as oil pump or oil filter changes and are expected to occur approximately once every six months.

During these activities, any emissions are expected to be minor in quantity, short in duration, and localised to the immediate maintenance area. Supagas has advised that slight odour may be detected locally during such works. This potential is therefore maintenance-specific rather than continuous across normal operations.

Where instrument tubing venting is required during maintenance, venting is managed through water absorption containers rather than direct atmospheric release. These containers are removed from site on completion of the works.

4.3 Practical emission scenario for monitoring

Based on how the plant operates, the AQMP focuses on a controlled maintenance event because this is the time when ammonia release is most likely to happen.

During normal operation, the refrigeration system is sealed and ammonia release potential is very low. During specific maintenance activities, such as oil pump or oil filter changes, small amounts of ammonia may be released for a short period. These events do not happen often and are expected only occasionally (about once every six months).

Accordingly, the ammonia emission of this plant is characterised by:

– negligible release potential during routine operation
– low-level, short-duration, and infrequent release potential during specific maintenance tasks.

This difference between normal operation and maintenance is the reason the AQMP monitoring approach focuses on maintenance events.

5. Management measures

This section outlines the practical management measures that apply to ammonia and odour during plant operation and maintenance. The measures focus on the only relevant emission period identified for this AQMP, which is infrequent maintenance work on the sealed refrigeration system.

Nearby sensitive receptors with potential to be affected were identified in the Modification to CO2 Plant (Supagas) Air Quality Assessment (GHD, 2025) as presented in Figure 1.

5.1 Prevention measures

The following prevention measures are used to minimise the chance of ammonia release:

- The refrigeration system is operated as a sealed system during normal operation.
- Fixed ammonia sensors are installed near the refrigeration compressors to provide ongoing leak detection.
- Maintenance is planned and carried out as scheduled activities, rather than reactive works where possible.
- Only required system access points are opened during maintenance, and only for the minimum time needed to complete the task.

5.2 Mitigation measures

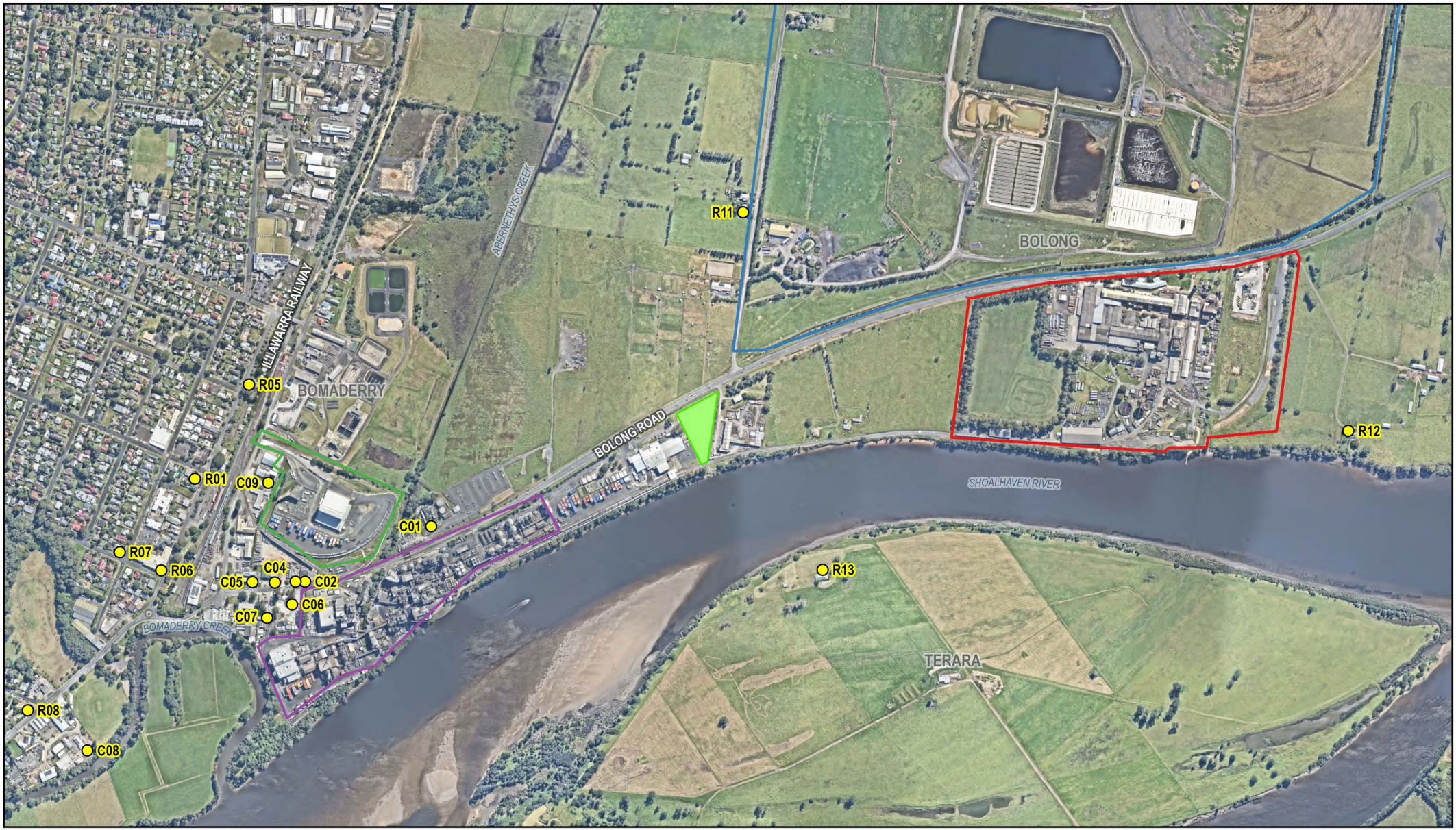
Where maintenance may involve minor ammonia release potential, the following mitigation measures are applied:

- Any required venting of instrument tubing is managed through water absorption containers, not direct venting to atmosphere.
- Maintenance activities such as oil pump or oil filter changes are carried out efficiently to reduce the duration of potential localised emissions.
- Work is undertaken in a controlled maintenance area with on-site personnel present to observe any local odour and respond promptly.
- Water absorption containers used during maintenance are removed from site after completion of the works.

5.3 Rectification measures

If unexpected ammonia release or off-site odour potential is identified during maintenance, the following rectification measures are recommended:

- Pause the relevant maintenance activity where safe to do so.
- Check the relevant equipment, fittings, and work method to identify the likely source.
- Confirm that any required venting continues to be managed through water absorption containers.
- Record the event and corrective actions in site maintenance records, including time, location, activity and close-out actions.
- Resume work only after the responsible supervisor confirms the issue has been addressed.



LEGEND

- Sensitive receptors
- CO2 Plant (Supagas)

Plant Areas

- APM boundary
- Environmental farm boundary
- Packing plant (proposed) boundary
- Shoalhaven Starches factory boundary

Paper Size ISO A4

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Allen Price Pty Ltd
Supagas Modification Noise Assessment
Air Quality Impact Assessment

Project No. **12656886**
Revision No. **B**
Date **20/05/2025**

Sensitive receptor locations

FIGURE 1

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Print date: 20 May 2025 - 14:45

Data source: DCS: Roads, Railways, Waterways, 2025 DFSI: NPWS: 2025 Nearmap WMS Server: – Imagery (Date extracted: 20/05/2025)
Created by: gpullan

6. Monitoring and evaluation

6.1 Monitoring overview

To address Condition 10C, monitoring will be undertaken during a one-off controlled maintenance event or actual scheduled maintenance event, being the period when ammonia release is most likely to occur.

Maintenance events will follow the same procedure, and emissions of ammonia during maintenance is not anticipated to vary significantly between events, therefore monitoring and confirmation of compliance during a single event is considered sufficient to show compliance for all future similar maintenance events.

The monitoring program will be designed to assess ammonia concentrations at the emission source, in the downwind direction, and at the site boundary. In addition, a boundary odour survey will be undertaken during the monitoring event to assess whether any odour associated with maintenance activities extends beyond the site (refer Section 6.2.3).

6.2 Ammonia monitoring

6.2.1 Instrument-based monitoring

Where portable monitoring instrument is available, real-time monitoring will be undertaken using suitable calibrated instruments. Monitoring will include the following locations:

- **Source monitoring:** Monitoring will be conducted at and around the emission source to characterise source-level ammonia concentrations during maintenance.
- **Downwind step-back monitoring:** Monitoring will then be undertaken downwind of the source, based on the prevailing wind direction at the time of measurement. A step-back approach will be applied, with measurements taken progressively further away from the source. This will continue until measured concentrations fall below the adopted assessment criteria. This process will identify the approximate distance required for ammonia concentrations to drop to an acceptable level.
- **Site boundary monitoring:** Monitoring will also be conducted at the site boundary to assess potential off-site impacts.

Instrumentation should be capable to measure ammonia at or below the assessment criteria of **0.33 mg/m^3.**

6.2.2 Active sampling with laboratory analysis

If portable monitoring equipment is unavailable or does not provide sufficient resolution (i.e at or below **0.33 mg/m^3)** for ammonia measurement, active air sampling and laboratory analysis will be undertaken:

- one air sample collected at the source during maintenance to represent emission concentrations
- one air sample collected at a downwind location during maintenance to assess dispersion from the source
- one air sample collected at the site boundary during maintenance to assess potential impacts beyond the site

Monitoring ammonia includes the use of sorbent tubes and analysed in a NATA accredited laboratory.

6.2.3 Odour survey

During site attendance it is recommend that a boundary odour survey be undertaken as per to *Guide to Conducting Field Odour Surveys* (NSW EPA, 2022). This should include a 10 minute odour survey.

6.3 Complaint-based monitoring

If any valid air quality complaints are received, or offensive odour is noticed at the site boundary, air quality checks by the Environmental Coordinator are required immediately including air quality checks at residential receiver locations to verify the complaint details where applicable. A boundary survey shall be undertaken to investigate

and mitigate the responsible source(s) with consideration to *Guide to Conducting Field Odour Surveys* (NSW EPA, 2022).

6.4 Evaluation of results

Results from the one-off maintenance monitoring event will be evaluated using both ammonia concentration data and boundary odour observations. Measured ammonia concentrations will be compared with the adopted assessment criteria including source, downwind sample and site boundary results, to confirm that concentrations reduce with distance and do not indicate unacceptable off-site impacts. Boundary odour survey findings will also be reviewed to determine whether any offensive odour occurred beyond the premises.

The monitoring event will be considered satisfactory where ammonia concentrations comply with the adopted criteria and no offensive odour is identified at the site boundary. If non-compliance or unexpected impacts are identified, further investigation and additional monitoring will be required. This would include ongoing monitoring of ammonia with alarms at trigger levels selected to allow for the emission source to be mitigated prior to exceedance of the criterion, as well as an alarm at the criterion level for workers to move to safety away from the emission source.

6.5 Reporting

A monitoring report will be prepared following completion of the one-off maintenance monitoring event. The report will document the maintenance activities undertaken, monitoring locations and methods, meteorological conditions, ammonia monitoring results, boundary odour survey observations, and an assessment against the adopted criteria. The report will be submitted to DPHI and provided to the EPA to demonstrate compliance with Condition 10C.

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SHOALHAVEN STARCHES
ENVIRONMENTAL PROCEDURE

TITLE:	AIR QUALITY MONITORING PLAN
PURPOSE:	This document details the company's air emission monitoring procedures to ensure compliance with Environment Protection Licence (EPL) No.883 conditions and relevant Development Consents.
SCOPE:	This procedure applies to the air emission points and odour generating activities as defined in the EPL and activities associated with Development Consent 06_0228. The Compliance Manager is responsible for ensuring compliance with the company's air quality monitoring requirements.
SPECIFICATION:	To meet EPL Guidelines and Department of Planning Consent conditions.
ACTION ON NON-CONFORMANCE	Advise Compliance Manager and document through Quality Corrective & Preventative Action procedure (QMS-P-0130).
FREQUENCY:	Annual, Six-monthly & Quarterly for EPL testing and as specified in this procedure for Development Consent monitoring
REFERENCES:	Shoalhaven Starches Environment Protection Licence 883. Development Consent 06_0228. *NSW EPA Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (2022).* *Protection of the Environment Operations (Clean Air) Regulation 2022.* GHD Report on Ethanol Upgrade Air Quality Assessment, July 2008, Revision 0. Odour Management Plan EN-P-247

Document Control

Revision No	Date	Prepared by	Authorised by	Comments
1.0A		Shoalhaven Starches	J. Studdert	
1.0B		Shoalhaven Starches	J. Studdert	Updated to include ethanol upgrade development consent requirements
1.0C	04-04-13	Shoalhaven Starches	J. Studdert	Changes to Environment Protection Licence & development consent monitoring requirements
1.0D	12-12-13	Shoalhaven Starches	J. Studdert	Update as per EPL changes 8-Nov-13
1.0E	23-10-14	Shoalhaven Starches	J. Studdert	Inclusion of Boiler 2 testing as per EPA licence variation
1.0F	07-08-15	Shoalhaven Starches	J. Studdert	
1.0G	16-06-17	Shoalhaven Starches	J. Studdert	Inclusion of DDG pellet stack & Starch Dryer No.5
1.0H	16-11-18	Shoalhaven Starches	J. Studdert	Updates as per EPA licence changes
1.0I	08-03-22	Shoalhaven Starches	J. Studdert	Update as per EPA licence Revision 1-Nov-22 review, No changes made
1.0J	29-01-24	Shoalhaven Starches	J. Studdert	Yearly review
1.0K	07-01-25	Shoalhaven Starches	J. Studdert	Cogeneration Plant testing requirements add
1.0L	10-10-25	Shoalhaven Starches	J. Studdert	Biofilter C added
1.0M	30-04-26	Shoalhaven Starches	J. Studdert	Update to include latest development applications up to and including MOD 30 & EPL 883 changes.

PROCEDURE:

1. Quarterly Environment Protection Licence (EPL) Testing

At the commencement of each EPL year, obtain a quote or quotes (if required) to complete the boiler emission testing and odour testing as per Environment Protection Licence (EPL) Condition M2.1.

During the quoting process Shoalhaven Starches is to advise the company of the following requirements:

- All testing must be undertaken by NATA accredited testing and analysis company (including analytical laboratories)
- All testing must be carried out in accordance with approved method and EPL monitoring requirements
- Production data is to be obtained from relevant production managers during testing period.
- The Compliance Manager (or nominated delegate) must be informed immediately of any non-conformances with EPL limits.
- The final report is due within 4 weeks of the last day of testing.
- Reports are to be submitted to the Compliance Manager

2. Boiler 5 & 6 (Point 35) Testing

The quarterly testing for the Boilers is per calendar quarterly based on the EPL anniversary date of 30 April each year.

EPL Quarters are:

- 1 May to 31 July
- 1 August to 31 October
- 1 November to 31 January
- 1 February to 30 April

The following table (Table 1) summarises the parameters to be tested for the boilers and associated EPL concentration emission limits (where applicable). These parameters must be tested and reported each quarter.

Table 1 –5 & 6 Monitoring Requirements

Parameter	EPA NSW Approved Method	EPL 100 percentile concentration limit
Flow, temperature, velocity, pressure of stack gases	TM-2	--
Dry Gas Density/Molecular Weight of stack gases	TM-23	--
Moisture	TM-22	--
Nitrogen dioxide (converted to NO_x)	TM-11	500 mg/m^3
Oxygen	TM-25	>5 %
Sulphur Dioxide	TM-4	600 mg/m^3
Total Solid Particles	TM-15	30 mg/m^3
Fine particulates	OM-5	--
Opacity	CEM-1	20 %
Odour (Point 35 only)	OM-7	--
VOCs as n-propane equivalent	TM-34	40 mg/m^3
Cadmium	TM-12, TM-13 & TM-14	0.2 mg/m^3
Mercury	TM-12, TM-13 & TM-14	0.2 mg/m^3
Type 1 and Type 2 substances in aggregate	TM-12, TM-13 & TM-14	1 mg/m^3

Key:
mg/m^3 = milligrams per cubic metre
OM = Other Method
TM = Method

Note: Sulphur Dioxide frequency is yearly in the EPL, however Shoalhaven Starches has made a decision to undertake quarterly testing. Opacity monitoring is continuous.

The Boiler Emission Survey Report must meet the analytical reporting requirements as set out in Section 4 of the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* and also include comparison with EPL emission concentration limits.

Boiler pollution monitoring results are published on the Manildra Group website as per POEO Act requirements.

2

2. Cogeneration Discharge Stack Testing (Point 48 & 49)

The six-monthly testing for the Cogeneration Plant is per calendar quarterly based on the EPL anniversary date of 30 April each year.

EPL Quarters are:

- 1 May to 31 July
- 1 August to 31 October
- 1 November to 31 January
- 1 February to 30 April

The following table (Table 2) summarises the parameters to be tested for the discharge stack and associated EPL concentration emission limits (where applicable). These parameters must be tested and reported each six-monthly period

Table 2 – Cogeneration Plant Monitoring Requirements

Parameter	EPA NSW Approved Method	EPL 100 percentile concentration limit
Flow, temperature, velocity, pressure of stack gases	TM-2	--
Dry Gas Density/Molecular Weight of stack gases	TM-23	--
Moisture	TM-22	--
Nitrogen dioxide (converted to NO_x)	TM-11	40 mg/m^3
Oxygen	TM-25	--
VOCs as n-propane equivalent	TM-34	20 mg/m^3
Volumetric Flowrate	TM-2	--

Key:
mg/m^3 = milligrams per cubic metre
TM = Method

3. EPL Quarterly Odour Testing

Quarterly odour testing is based on the seasons; hence testing is conducted during summer, autumn, winter and spring. (This occurs to enable consistency in quarterly odour testing which was initially carried out during the four seasons for the previous site approval PRP1).

At the beginning of each quarter, the approved testing company will advise the Compliance Manager of the proposed testing dates. All results are to be presented in the Quarterly Odour Emission Survey report.

Table 3 summarises the odour monitoring locations as per the EPL.

Table 3 –EPL Odour Monitoring Locations

EPA Identification No.	Description of Location
8	No. 1 Gluten Dryer
9	No. 2 Gluten Dryer / Starch Dryer
10	No. 3 Gluten Dryer
11	No. 4 Gluten Dryer
12	No. 1 Starch Dryer
13	No. 3 Starch Dryer
14	No. 4 Starch Dryer
16	Carbon Dioxide Scrubber (outlet)
19	Effluent Storage Dam 1
20	Effluent Storage Dam 2
21	Effluent Storage Dam 3
23	Effluent Storage Dam 5
24	Effluent Storage Dam 6
25	Sulphur Oxidation Pond
35	Boiler 5&6 Combined Stack
39	Inlet pipe to Biofilter's A & B
40	Outlet of Biofilter A
41	Outlet of Biofilter B
44	Fermenter
46	DDG Pellet Plant Stack
47	Starch Dryer No.5
50	Outlet of Biofilter C

Tables 4, 5 and 6 summarise the parameters to be tested for the Point and Diffuse sources as per the EPL requirements.

Table 4 Sampling and Analysis of Point Sources (EPL Points 8, 9, 10, 11, 12, 13, 14, 16, 47)

Pollutant	Units	Frequency	EPA Approved Method
Dry Gas Density	kg/m^3	Quarterly	TM-23
Moisture Content	%	Quarterly	TM-22
Molecular Weight of stack gases	g/g-mole	Quarterly	TM-23
Oxygen (O2)	%	Quarterly	TM-25
Temperature	degrees Celsius	Quarterly	TM-2
Velocity	m/s	Quarterly	TM-2
Volumetric Flow Rate	m^3/s	Quarterly	TM-2
Odour	ou	Quarterly	OM-7

Key:

%	=	percent
g/g mole	=	grams per gram mole
K	=	Kelvins
kg/m^3	=	Kilograms per cubic metre
m/s	=	metres per second
m^3/s	=	cubic metres per second
ou	=	odour units

Table 5 Annual Sampling and Analysis of Diffuse Sources (Points 19, 20, 21, 23, 24, 25)

Pollutant	Units	Frequency	EPA Approved Method
Odour	ou	Yearly	OM-7

Key:

OM = Other Method
ou = odour units

Table 6 Quarterly Sampling and Analysis of Diffuse and Point Sources (Points 35, 39, 40, 41, 42, 44, 46)

Pollutant	Units	Frequency	EPA Approved Method
Odour	ou	Quarterly	OM-7

3.1 EPL Odour Dispersion Modelling

Odour dispersion modelling from the odour monitoring results for the reporting period (as required by condition M2.1) is to be included in the annual system performance report submitted to the EPA (refer to EPL condition R4).

N.B. The same odour dispersion model developed by GHD for the annual odour audit approved under development consent 06_0228 must be used.

4. Development Consent 06_0228 Monitoring Requirements

4.1 Biofilter System

Tables 6 summarises the sources from the factory which are ducted to the biofilter as they are ***mandatory*** as outlined in the Development Consent 06_0228 Ethanol Upgrade Project. Refer to the Odour Management Plan EN-P-247 for further details on the operation of the biofilter.

Table 7 – Mandatory – Sources to be Ducted to Biofilter

Plant	Section	Unit	Identification No.	Odour Emission Rate Before Biofilter Control (ou m^3/s)	Predicted Odour Emission Rate After Biofilter (ou m^3/s)
DDG (liquids)	Liquids Line	Feed dump tank	DDG 20	8,900	1,335
	Liquids Line	Condensate Tank	DDG 23	25,711	3,857
	Liquids Line	Vent Condenser	DDG 24	3,500	525
	Liquids Line	Finish Feed Tank	DDG 26	18,333	2,750
	Liquids Line	Finisher pump tank	DDG 28	1,433	215
	Liquids Line	Dryer Feed Tank	DDG 30	1,433	215
	Liquids Line	Feed Holding Tank (syrup)	DDG 31	1,317	198
	Liquids Line	CIP Tank	DDG 32	417	63

DDG (Solids)	Solids Line	Feed from blowers to DDG Shed Baghouse	DDG 18	867	130
	Solids Line	DDG Shed Load-out chute dust extraction	DDG 35	Not tested	Not tested

Key:
ou m^3/s = odour units cubic metres per second

Table 8 summarises the "*additional*" sources from the factory that may be ducted to the biofilter as outlined in the Development Consent of the Ethanol Upgrade. The "*additional"* sources are combination of Stages 2 and 3 from the GHD 2008 report.

As stated in a letter from the Department of Planning dated 21 July 2009, "*I concur that the additional odour control works may not necessarily be implemented all at the same time, or concurrently; however the Director-General will direct Shoalhaven Starches on the implementation specific controls listed as additional. This may be concurrently, or it may be one or two items from the list. The Director-General will determine which controls will be implemented and by when*.

Table 8 – Additional – Sources That May Be Ducted to Biofilter

Plant	**Section**	**Unit**	**Identification No.**	**Odour Emission Rate Before Biofilter Control (ou m^3/s)**	**Predicted Odour Emission Rate After Biofilter (ou m^3/s)**
New DDG Plant		DDG Tank Vents		36,000	5,400
	Dryer Building	Transfer Cyclones (6 units)		9,083	1,362
	Dryer Building	Dryers (6 units)		8,417	1,263
	Dryer Building	Decanters (10 units)		6,321	948
	Pellitiser Plant	Pellitiser Baghouses (2 units)		34,378	5,157
	Fugitives			722	108
Existing DDG	Liquids Line	Vent Condenser Drain	DDG 25	3,167	475
	Liquids Line	Decanter Feed Tank	DDG 1	108	33
	Solids Line	Decanters 3 & 4	DDG 5	1,700	255
	Solids Line	Decanters 1 & 2	DDG 2	260	39
Ethanol (new)	Fermentation	Propagation Tank	2	14,167	2,125
Ethanol (existing)	Fermentation	Yeast Propagators – Tanks 4 & 5	E15	28,333	4,250
		Yeast Propagators Tanks 1, 2 & 3	E14	5,500	825
Glucose	Brewers	Enzyme tanks (7)	B7	2,042	613

Starch	Factory Collection	Farm Tank	F18	3,834	1,150
DDG	Liquids Line	Light Phase Tank	DDG 19	450	68
Distillery		Molecular Sieve – Vacuum Drum	D2	1,350	203
Ethanol		Jet Cooker 2 & 4	E7	1,133	170
		Jet Cooker 1 – Retention Tank	E13	1,067	160
Glucose		Drum Vacuum Receiver	C4	3,500	525
		Ion Exchange Effluent Tank	C18	250	38
		Cooker A & B Flash Tanks	B3	950	143

Key:
ou m^3/s = odour units cubic metres per second

4.2 Biofilter Monitoring

Table 8 summarises the monitoring requirements for the biofilter's. Note that quarterly testing is to be carried out on:

- Inlet to the Biofilter (Point 39)
- Biofilter bed – 3 sections from each biofilter (Point 40,41 & 50)

Table 9 – Biofilter Monitoring Requirements

Parameter	Units of Measure	Frequency of Testing	Design Criteria	EPA Approved Method
Flow/ Velocity	Nm^3/hr	Quarterly		TM-2
Temperature	^oC	Quarterly	< 40	TM-2
Odour	ou	Quarterly	500	OM-8

Key:
^oC = temperature
m^3/hr = cubic metres per hour
ou = odour units

Odour Removal Efficiency Criteria: > 85%
(to be calculated by using inlet number and average of each biofilter bed)

Odour Emission Rates criteria:
Mandatory (odour controls) 11,939 ou m^3/s (peak 27,460 ou m^3/s)
Mandatory with ethanol upgrade 26,178 ou m^3/s (peak 60,208 ou m^3/s)

Additional	36, 916 ou m^3/s to 38, 221 ou m^3/s

Note: Odour emission rates relating to Additional odour controls will be required to be re-calculated if the Secretary requires additional controls to be installed. The OER will vary depending on the control installed.

If the OER criteria for the Biofilter is not achieved, then Shoalhaven Starches would have to investigate the non-compliance through Corrective Action procedure QMS-P-130. The corrective action would involve an audit of the activities associated with the time of the testing and including checks of the Biofilter media.

Once the source of the non-compliance is identified then Shoalhaven Starches would implement a plan to correct the problem and then re- the biofilter to ensure compliance.

4.3 Odour Verification Testing (MP 06_0228 , condition 6A,6C & 6D)

Additional odour testing verification as set out in Shoalhaven Starches Development Consent 06_0228 conditions of consent are shown below:

Condition 6A: The Independent Odour Audit is to include:

a) 3 monthly (quarterly) odour monitoring with samples taken from the carbon dioxide/ethanol recovery scrubber inlet/s and outlet/s; (identified as EPL Point 16).

b) quarterly odour monitoring with samples taken of single vent stack (direct to atmosphere) emissions from filling a fermenter tank; (identified as EPL Point 44)

Condition 6C: Quarterly odour monitoring from the DDG exhaust stack and report the results in the independent odour audit (identified as EPL Point 46).

Condition 6D: Odour monitoring on relocated Starch Dryer No.5 - MOD 7 (EPL Point 47) in accordance with requirements of the EPL and the report the results in the independent odour audit.

Condition 6E: If the results of odour monitoring show any odour impact greater than that predicted by the odour dispersion modelling in the EA and the modification proposals referred to in Condition 2 of Schedule 2, the Proponent shall investigate and implement further odour treatment options as directed by the Secretary or the EPA.

Condition 6F: The Applicant shall conduct odour validation monitoring on the gluten dryers 3 and 4, following implementation of the mitigation controls required by Condition 3D. Results of the odour validation monitoring shall be included in the independent odour audit required under Condition 5 of Schedule 3.

4.4 Yearly Compliance Testing for Odours – Mandatory

Each year Shoalhaven Starches must conduct an Independent Odour Audit (Schedule 3, condition 5 of the Development Consent 06_0228). This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary.

Table 10 summarises the yearly testing that may be required to determine compliance with predicted odour emissions for the *Mandatory* Odour Controls (Stage 1 in GHD's Ethanol Upgrade Air Quality Assessment report).

N.B. The number and location of odour samples may vary as required by the independent odour consultant.

Table 10 – Mandatory - Yearly Compliance Odour Testing

Location	Unit	Parameters to Monitor	Frequency	EPA Approved Method	Predicted Odour Emission Rate (ou m^3/sec)
Starch Plant (existing)	Gluten Dryers No. 1, 2, 3, 4	Flow, temperature	Quarterly	TM-2	--
		Oxygen	Quarterly	TM-25	--
		Moisture	Quarterly	TM-22	--
		Odour	Quarterly	OM-7	No. 1 - 9,886 (13,182)
					No. 2 - 4,133 (5,511)
					No. 3 - 14,625 (19,501)
					No. 4 – 9,998 (13,331)
Starch Plant	Starch Dryers No. 1, 3, 4 & 5	Flow, temperature	Quarterly	TM-2	--
	Spray Starch	Oxygen	Quarterly	TM-25	--
		Moisture	Quarterly	TM-22	--
		Odour	Quarterly	OM-7	No. 1 – 4,736 (6,315)
					No. 3 – 4,827 (6,436)
					No. 4 – 5,363 (7,151)
					No. 5 – 5,095 (6,794)
	Spray dryer				738 (983)
Ethanol Plant	Grain retention tank 2 (E2)	Flow, temperature	Yearly	TM-2	
(existing)	Feed to distillery (E22)	Oxygen	Yearly	TM-25	
	Farm Tank (F18)	Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	Grain – 3,250 (6,500)
					Feed – 83 (167)
					Farm tank – 3,834 (7,667)
	Vent stack while filling a Fermenter	Odour	Quarterly	OM-7	--
Glucose	Enzyme Tanks (7 of) (B7)	Flow, temperature	Yearly	TM-2	
		Oxygen	Yearly	TM-25	
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	2,042 (4,083)
Farm	WWTP				
	Ponds 1 - 6	Odour	Yearly	OM-8	3,600
	Bulk Volume Fermenter	Odour		OM-8	Negligible
	Membrane Bioreactor	Odour	Yearly	OM-8	500

Location	Unit	Parameters to Monitor	Frequency	EPA Approved Method	Predicted Odour Emission Rate (ou m^3/sec)
	Sulphur Oxidising (SO) basin	Odour	Yearly	OM-8	23,400
Flour Mill	4 x cyclones	Flow, temperature	Yearly	TM-2	
		Oxygen	Yearly	TM-25	
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	No. 1 – 1,654
					No. 2 – 617
					No. 3 – 1,477
					No. 4 – 551
DDG	Palmer Cooler Bypass Outlet	Flow, temperature		TM-2	Ducted to Boilers
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-8	
	DDG Odour Scrubber Outlet	As above		As above	Ducted to Boilers
	DDG Load Out Shed	As above	Yearly	As above	
	Boiler 5 & 6 Combined Stack Outlet	As above	Quarterly	As above	

Note: (xxx) numbers in the Predicted Odour Emission Rate (OER) column are the OER before control
Key:
ou m^3/s = odour units cubic metres per second
OM = Other Method
TM = Method

4.5 Compliance Testing for Odours – "Additional"

Table 11 summarises the yearly testing required to determine compliance with predicted odour emissions for Additional Odour Control if required.

Table 11 – Additional – Yearly Compliance Odour Testing

Location	Unit	Parameters to Monitor	Frequency	EPA Approved Method	Predicted Odour Emission Rate (ou m^3/sec)
Starch Plant	Gluten Dryer No. 5	Flow, temperature	Yearly	TM-2	
	Gluten grinder	Oxygen	Yearly	TM-25	
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	No. 5 – 9,661 (22,220)
					Grinder – 9,661 (22,220)

Note: (xxx) numbers in the Predicted Odour Emission Rate (OER) column are the OER before control

Key:

ou m^3/s = odour units cubic metres per second
OM = Other Method
TM = Method

5. National Pollutant Inventory (NPI)

If Shoalhaven Starches uses more than a specified amount of one or more NPI listed substances, or consumes more than a specified amount of fuel or electric power, Shoalhaven Starches will be required to estimate and report emissions of these substances.

Shoalhaven Starches does trigger thresholds and hence is required to report to the Environment Protection Authority (EPA) every year by 30 September, as described in the *Protection of the Environment Operations (General) Regulation 2022.*

The NPI Report measures the air emissions per point source on site. The Compliance Manager has responsibility for ensuring the NPI reporting requirements are met; supporting data and the NPI reports must be kept for a minimum of 4 years.

Table 11 summarises Shoalhaven Starches major air emission sources and the control measures implemented to mitigate air pollution.

Table 11 – Air Emissions Source Summary

Location	Emission Control Measures	Pollutants	OEH Approved Method	POEO (Clean Air) Regulation limit / EPL Limit
Boilers 1, 3, 4 & 7 - Natural Gas & Biogas & Cogeneration Plant	Low NOx Burner	Nitrogen Oxides (NO_x)	TM-11	350 mg/m^3
Boilers 2, 5 & 6 – Coal	Cyclone	TSP	TM-15 (AS4323.2)	30 mg/m^3
	Fabric Filter / Baghouse	Sulphur Dioxide	TM-4	600 mg/m^3
	Staged combustion, automatic tuning of air/gas ratios and continuous oxygen monitoring.	PM_{10}	OM-5	-
		Metals (Type I & II)	TM-12,13 & 14	1 mg/m^3
		VOC	TM-34	40 mg/m^3
	Continuous opacity Monitoring	Carbon Monoxide	TM-32	-
Gluten Dryers No. 1 – No. 9	Fabric Filter / Baghouse	TSP	TM-15 (AS4323.2)	50 mg/m^3
Starch Dryers No.1 – No.5	Wet Scrubber, Cyclones	TSP	TM-15 (AS4323.2)	50 mg/m^3
Spray Dryer	Fabric Filter / Baghouse	TSP	TM-15 (AS4323.2)	50 mg/m^3
Flour Mill	Fabric Filter / Baghouse	TSP	TM-15 (AS4323.2)	50 mg/m^3
Odour Sources – Refer to Appendix A & D of *Report on Ethanol Upgrade Air Quality Assessment*, GHD 2008	- Biofilter. - Improved DDG loadout. - Wastewater Treatment Plant & Biogas Recovery Plant. - Wet legs on tanks. - Foul process air sources piped to boilers for odour destruction.	Odour	OM-7	-

Key:

CO_2	=	Carbon Dioxide
VOC	=	Volatile Organic Compounds
mg/m^3	=	milligrams per cubic metre
POEO	=	Protection of the Environment (Clean Air) Regulation 2002
PM_{10}	=	Particulate matter less than 10 microns
TM	=	Method
TSP	=	Total Solid Particles

6. Supagas CO2 Plant Mod 30

In February 2026, MOD 30, Modifications to Supagas CO_2 Plant was approved and incorporated into this Air Quality Management Plan.

The *Modification to CO_2 Plant (Supagas) Air Quality Management Plan*, prepared by GHD, is included in **Appendix 1** of this monitoring plan.

PREPARED BY: G. DOSTAL AUTHORISED BY: J. STUDDERT

DATE: 30-04-2026 DATE: 30-04-2026

Appendix 1 - *Modification to CO_2 Plant (Supagas) Air Quality Assessment*, prepared by GHD