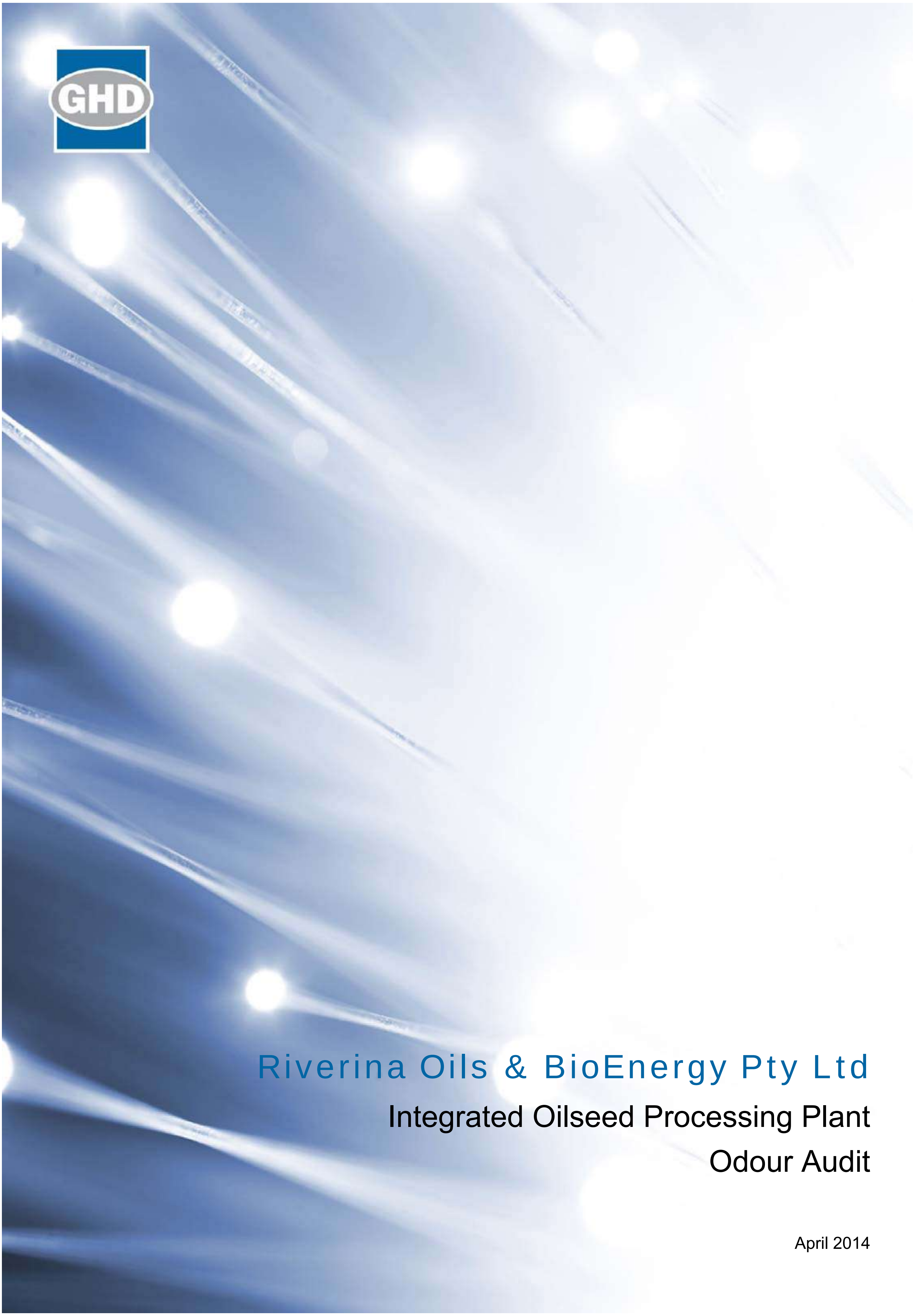

Riverina Oils & BioEnergy Pty Ltd

Integrated Oilseed Processing Plant
Odour Audit

April 2014

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Executive summary

GHD has undertaken an odour audit of the Riverina Oils and BioEnergy (ROBE) integrated oilseed processing plant. This audit was undertaken in order to meet the requirements of the Department of Planning (DoP) Conditions of Approval (CoA) and the Environment Protection Authority (EPA) Environment Protection Licence (EPL) conditions which apply to the site and its activities.

GHD utilised and reviewed a variety of information sources as part of the odour auditing process. The audit included a review of the Air Quality Assessment (Heggies, 2010) undertaken for the project as part of the 2010 Environmental Assessment. As part of this review GHD undertook odour dispersion modelling based on site specific data collected by ROBE as part of its source emissions monitoring program.

Key conclusions associated with each information source reviewed are summarised below.

Sensitive receptors

The audit reviewed the location of the ROBE site and odour emissions in relation to 9 identified sensitive receptors (residences). At present the closest sensitive receptor is 1 km from the ROBE site.

Prevailing wind and atmospheric stability

The prevailing winds at the site (based on ROBE site meteorological data) are from the south west and north east, although seasonal variation exists. The nearest sensitive receptors are located to the north west and south east, often outside the direction of the prevailing winds.

Odour sources

The 2010 Environmental Assessment indicated that the main sources of odour on the ROBE site would be point source discharges from the SPP and SEP plants. Diffuse (fugitive) emissions were considered to be minimal. The audit undertaken by GHD has identified that there are three potential sources of emissions (SPP, SEP and refinery).

The ROBE site incorporates a range of engineering and operational measures to minimise the generation of point source and diffuse odours. These measures include combined venting of internal processes and equipment, covered conveyors, enclosed buildings and wet scrubber technology. Diffuse emissions are considered to be minor when the plant is operating under normal circumstances.

Olfactory assessment has shown that odour may be generated on adjoining land. Sources of off-site odour may be agricultural activity and/or disused lagoons associated with a former wool combing operation.

Odour complaints

With the exception of a telephone complaint received from the EPA on 18 November 2013, (associated with wastewater pond odour rather than overall site odour), no odour complaints have been received by ROBE. Complaints are seen as a practical measure for odour performance, which should be taken into consideration when evaluating odour issues. However, it is noted that the perception of offensive odour at a sensitive receptor may not automatically translate into a complaint.

CEMS

ROBE operates a CEMS which measures TRS concentrations at both the SPP and SEP.

Data from the CEMS system is limited and does not provide a long term trend. There appear to be reductions in TRS (as H2S) concentrations following detailed investigation and scrubber optimisation processes undertaken in January 2014. Ongoing and consistent monitoring and collection of data is required in order to assess scrubber and site air emissions performance over the longer term.

Source Emissions Monitoring

ROBE has implemented a source emissions monitoring program. The results of the program indicate that:

- Hydrogen sulphide concentrations in emissions from the SPP, SEP and refinery comply with the EPL and *Protection of the Environment Operations (Clean Air) Regulation 2010* performance standard for hydrogen sulphide (5 mg/m3); and
- There are a variety of compounds (other than hydrogen sulphide) in stack emissions which have the potential to generate odour.

Olfactometry Monitoring

The results from olfactometry monitoring indicate that:

- Odour emission rates (24.6 x 10^6 OUm3/min) are significantly greater than those calculated based on GC-MS data obtained from the source emissions monitoring program (0.044 x 106 OUm^3/min);
- The plant OER based on olfactometry is ~ 5 fold that calculated as part of the 2010 Environmental Assessment; and
- Odour may be generated from adjoining land, in significant enough quantities to be detected in ground level measurements at the site boundary.

Odour dispersion modelling

Dispersion modelling was undertaken in order to assess the potential impact of site odour emissions on the identified nearest receptors, and to allow a comparison to be made against the predictions in the 2010 Environmental Assessment. Modelling was undertaken using both olfactometry and source emissions monitoring data. When the predicted peak 99 percentile odour levels are determined the results using olfactometry data indicate that the nearly all of nearest receptors would experience 99th percentile odour levels greater than the project odour criterion of 5 OU.

Modelling using GC-MS data indicates that the site would comply with the 99th percentile odour criterion of 5 OU, although it should be noted that the odour emission rates (~ 0.05 OU) are well below what would be considered typical of an oilseed processing facility, and are not consistent with downwind odour observations.

The peak odour levels based on olfactometry are consistent with the ambient measured odour levels and are of the right order of magnitude for this type of plant. Neither set of results (i.e. measured from olfactometer and calculated from GC-MS) correlate well with the 2010 Environmental Assessment.

Recommendations

Given that the main sources of odour on the site are the SPP and SEP, a series of recommendations associated with the ongoing monitoring, operation and review of the wet scrubbers associated with these plants have been provided.

An inconsistency in analytical results (significant difference between olfactometry and GC-MS results) was noted but cannot be explained. ROBE may wish to investigate this further.

Investigation of potential modifications to the refinery is considered to be a lower priority due to its relatively small contribution to site odour emissions.

Glossary of Terms

Abbreviations	Definition
ASL	Above Sea Level
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
BPIP	Building Profile Input Program
CEMS	Continuous Emissions Monitoring System
CoA	Conditions of Approval
DEC	NSW Department of Environment and Conservation
DoP	NSW Department of Planning
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
ETC	Emission Testing Consultants Pty Ltd
GC-MS	Gas Chromatography - Mass Spectrometry
GHD	GHD Pty Ltd
H_2S	Hydrogen sulphide
m^3	Cubic metre
OEH	NSW Office of Environment & Heritage
OER	Odour emission rate
PLC	Programmable Logic Controller
POEOA	Protection of the Environment Operations Act
RCA	Root Cause Analysis
ROBE	Riverina Oils and Bio Energy Pty Ltd
SEP	Solvent Extraction Plant
SPP	Seed Preparation Plant
TRS	Total Reduced Sulphur
VOC	Volatile Organic Compound

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1. Introduction

1.1 Purpose

This odour audit has been undertaken by GHD in order to assess compliance of the integrated oilseed processing plant owned by Riverina Oils and BioEnergy Pty Ltd (ROBE) with s129 of the NSW *Protection of Environment Operations Act 1997*.

The plant is located at the intersection of Trahairs and Byrnes Road in the Bomen Industrial Estate, approximately 8 km northeast of Wagga Wagga in NSW. The plant is considered to be fully operational following a period of progressive increases in production levels during 2013 and early 2014.

The Department of Planning (DoP) and the Environment Protection Authority (EPA) have issued Conditions of Approval (CoA) (07-0146) and an Environment Protection Licence (EPL) (#13097) which apply to the site and its activities. Condition L6.2 of the EPL, and Conditions 32 and 32a of the CoA's require that an odour audit of the operational facility be undertaken. This document addresses the odour audit requirements of both the EPL and CoA.

In essence the audit serves as a check on the performance of the facility with respect to the potential for off-site odour impact.

In addition to presenting information on odour emissions, this document presents relevant contextual information including a description of the ROBE site and surrounding areas, sensitive receptors, oilseed processing plant design and manufacturing processes, and prevailing meteorological conditions.

1.2 Scope

The scope of work for the odour audit has included the following activities:

- Compilation and review of relevant site information including drawings, reports, data, operational manuals and meteorological data;
- Site description and identification of sensitive receptors;
- Description and review of operational activities, identification and confirmation of relevant odour sources;
- Compilation and validation of the meteorological data from the on-site anemometer to AUSPLUME format;
- Development of an Odour Emission Rate (OER) inventory based on onsite odour measurements;
- Use of AUSPLUME v6 to predict the 99 percentile odour impact at the site boundary and at nearby sensitive receptors (residences), and to confirm whether the EPA odour design criterion is met;
- Sensitivity checks on the inputs used by Heggies (2010) in the project Environmental Assessment (Lennon Salvestro, 2010) to determine the relative effect of the synthesised meteorology and of the OER estimates on the model predictions;
- Compilation and discussion of results; and
- Development of recommendations for the investigation and improvement in air emissions management and odour performance.

The assessment has been conducted in accordance with the *Approved Methods and Guidance for Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005).

The audit has utilised and relied upon information from a variety of sources including:

- ROBE (2014) Odour Management Plan, GHD, January 2014
- Heggies Pty Ltd (2010) Riverina Oils and BioEnergy, Integrated Oilseed Processing Plant, Odour Impact Assessment, March 2010
- Lennon Salvestro Planning (2010) Riverina Oils and BioEnergy, Integrated Oilseed Processing Plant, Environmental Assessment, August 2010
- Quarterly air emissions test results from testing required by the EPL, undertaken by Emission Testing Consultants Pty Ltd (ETC);
- Additional emissions testing undertaken by ETC at the request of ROBE; and
- Plant design, production, operational and procedural information, including the external complaints register provided by ROBE.

1.3 Assumptions and Limitations

This document has been compiled based on information obtained from a number of sources (as listed in 1.2). ROBE has provided information in relation to plant design, construction and operation, management processes and procedures. GHD has not independently verified all aspects of the plant engineering, operational or management procedures associated with the ROBE site.

Air emissions testing of the ROBE site and subsequent laboratory analysis and olfactometry testing has been performed independently by ETC and/or by NATA certified commercial laboratories. Whilst GHD has reviewed results of these analyses and relevant operational data, it has not audited sample collection, laboratory analysis or reporting procedures.

Site based meteorological information has been obtained from the automatic weather station (AWS) operated and maintained by ROBE. The weather station location and equipment has been previously approved by the EPA in accordance with condition M4.1 of the EPL.

2. Regulatory Framework

2.1 Protection of Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the main piece of environmental legislation in NSW which is relevant to the operation of the ROBE site. It covers aspects including water, land, air and noise pollution and waste management.

ROBE operates a scheduled premise, which is licenced under the POEO Act.

The POEO Act (Sections 124-126), requires that businesses maintain and operate equipment and handle materials in a proper and efficient manner in order to prevent air pollution at all times.

Under Section 129 of the POEO Act, businesses licensed by the EPA must not cause or permit the emission of any offensive odour from the premises.

2.2 Environmental Planning and Assessment Act 1979

Planning and development within NSW is carried out under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000*. The ROBE project was assessed as a 'major project' under Part 3A of the Act, with the Minister for Planning being the approval authority.

ROBE was granted approval to construct and operate the oilseed processing facility in 2011 following an assessment of the project against the requirements of the Act, and against other relevant planning and environmental legislation.

The approval to construct and operate the plant was issued with a series of conditions (Conditions of Approval (07-0146)).

2.3 EPL Conditions and Project Conditions of Approval

The ROBE site must be managed to achieve compliance with the site EPL #13097 (administered by the NSW EPA) and the Project CoA (07-0146) (administered by the NSW Department of Planning). Relevant conditions from each document (*that specifically relate to this odour audit*) are provided in the following sections.

2.3.1 Environment Protection Authority - EPL Condition L5

Potentially Offensive Odour

Condition L5.1 requires that:

The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

Condition L5.2 advises that:

No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.

The above conditions require ROBE to avoid the emission of potentially offensive odour beyond the site boundary and indicate that there are no conditions under which the emission of potentially offensive odour is permitted.

2.3.2 Environment Protection Authority - EPL Condition L6.2

Condition L6.2 requires that:

A comprehensive odour audit of the fully operational facility to confirm compliance to s129 of the POEO Act is to be completed following commissioning. The scope and timing of the audit is to be acceptable to the NSW EPA. The proponent must submit to the EPA a description of additional mitigation measures that will be implemented if offensive odour impacts occur.

2.3.3 Department of Planning - CoA Condition 32

Condition 32 requires that:

The Proponent shall undertake an odour audit of the facility during operation, to demonstrate compliance with Section 129 of the Protection of Environment Operations Act 1997, to the satisfaction of the OEH.

2.3.4 Department of Planning - CoA Condition 32a

Condition 32a requires that:

In the event that the odour audit referred to in Condition 32 above identifies an exceedance, the Proponent shall outline the measures to remediate the issue and prevent future incidents occurring. These measures shall be determined in consultation with OEH, and the measures to be implemented and the timing of their implementation shall to be to the satisfaction of the Director-General.

2.4 Other relevant EPL and CoA conditions

In addition to this odour audit, the EPL and CoA also require a post commissioning validation report (EPL Condition L6.1) and a report on the ROBE site source emissions monitoring program (EPL Condition L6.3 and CoA 38, 39 and 39a). This audit report will also be used to inform and support these reports. Because of this, the scope of work has included a review and comparison of the air dispersion modelling results obtained from the current (2104) audit with those presented in the 2010 Environmental Assessment (Heggies, 2010).

3. Site Description

3.1 Location

The ROBE oilseed processing plant site (Lot 2, DP 590756) is located at the intersection of Trahairs and Byrnes Road (177 Trahairs Road) in the Bomen Industrial Estate, approximately 8 km northeast of Wagga Wagga (refer Figure 1). The plant site is approximately 16.5 ha in size.

The site occurs within the Wagga Wagga Local Government Area where it is zoned General Industrial (IN1) under the *Wagga Wagga Local Environment Plan* 2010.

3.2 Topography and drainage

The topography in the vicinity of the plant site is generally flat with an elevation of approximately 245 m ASL (Lennon Salvestro, 2010). The site is located on a broad undulating ridge running generally from the south west to the north east.

The site is part of the Wagga Wagga catchment area. Site surface drainage flows in a south-easterly direction. A number of minor watercourses and drainage lines in the vicinity of East Bomen ultimately combine to discharge to the Murrumbidgee River, approximately 6 km away at its closest point.

The site itself consists of sealed and gravelled areas associated with roadways and buildings, as well as significant areas of unsealed, gravelled or grassed areas. Some of these areas are being progressively landscaped or are used for the storage of spare parts and other materials.

3.3 Existing environment and sensitive receptors

The area surrounding the project site currently contains a mixture of both rural and industrial land uses. The closest rural residential receptors are located intermittently to the northwest, west and south east of the site, primarily adjacent to the Olympic Highway or Bomen Road East.

The nearest residential receptors to the site are presented in Table 1 and Figure 2.

A number of other isolated rural residences occur within the wider vicinity of the site, for example adjacent to Mary Gilmour Road (approximately 2.4 km to the north) or Shepherds Siding Road and Pattersons Road (two residences approximately 3.2 km to the east of the site).

It is understood that the Wagga Wagga City Council is currently assessing an application for a residence south of Trahairs Road (West).

Table 1 Sensitive Residential Receptor Details

Receptor	Easting	Northing	Distance to site boundary (km)
R1	537248	6121739	1.5
R2	537625	6121799	1.9
R3	538090	6121848	1.0
R4	537968	6122862	1.5
R5	537760	6123116	1.75
R6	538140	6123263	1.5
R7	538268	6123807	1.9
R8	540329	6119814	1.9
R9	540594	6119575	2.25

Figure 1 Site Location

Figure 2 Nearest residential receptors

A number of industrial and commercial facilities (some operating, some closed) also occur in the vicinity (to the south) of the ROBE facility (refer Figure 3). Facilities within 1.5 km of the ROBE site include:

- a (closed) wool combing plant and associated wastewater treatment and storage ponds
- Buckman Laboratories – administration offices and storage of bulk chemical products
- Metroll – metal building products
- Australian Wool Handlers – wool store
- AusFarm Nutritional Products – livestock feed supplement manufacturer and supplier
- Renewed Metal Technologies (RMT) – battery recycling plant

Figure 3 View south from ROBE site to adjoining industrial area

3.4 Off-site / background odour sources

The ROBE plant site is located on the north eastern boundary of the Bomen industrial estate, which contains a number of different manufacturing and industrial facilities, as well as agricultural land. A variety of agricultural activities involving livestock and cropping are undertaken on the adjoining land. In addition, there are a series of unused effluent lagoons associated with the former wool combing plant. There is potential for a variety of odours to be generated as a result of the current and previous activities undertaken on the adjoining land.

Figure 4 View east of ROBE site showing agricultural land and disused effluent ponds from the wool combing plant

3.5 Local wind conditions

The local wind climate largely determines the pattern of off-site odour impact. The characterisation of local wind patterns requires accurate site-representative hourly recordings of wind direction and speed over a period of at least a year.

Wind rose distributions for the ROBE facility have been compiled based on data obtained from the automatic weather station (AWS) located on the ROBE site which has been operation since March 2011. This data has been used to create a 12 month data file for the period 01 October 2012 to 30 September 2013. This 12 month period was chosen as the rainfall average was closest to the long term average. The anemometer wind speed sensor is a wind vane and rotating cup type. A comparison of site data against the meteorological conditions modelled in the project Environment Assessment (Heggies, 2010) is presented in section 8.6.3.

The effect of wind on dispersion patterns can be examined using the general wind climate and atmospheric stability class distributions. The general wind climate at a site is most readily displayed by means of wind rose plots, giving the incidence of winds from different directions for various wind speed ranges.

The features of particular interest in this assessment are: (i) the prevailing wind directions and (ii) the relative incidence of more stable light wind conditions.

3.5.1 Prevailing Wind pattern

Annual variation in wind pattern

The average wind rose for the entire data period is shown in Figure 5 and indicates that predominant annual average wind directions are from the west-southwest comprising of 9.6 per cent of incident winds, with a comparable extent from the south-west (9.5 per cent) and to lesser extents from the north, northeast and east-southeast (8.8 per cent, 9.1 per cent and 9.4 per cent respectively). The annual average wind speed measured was 2.0 m/s. The observed wind speed distribution indicates that the largest proportion of high wind speeds (> 6 m/s) are from the southwest and the largest proportion of light winds (< 2 m/s) are from the east-southeast.

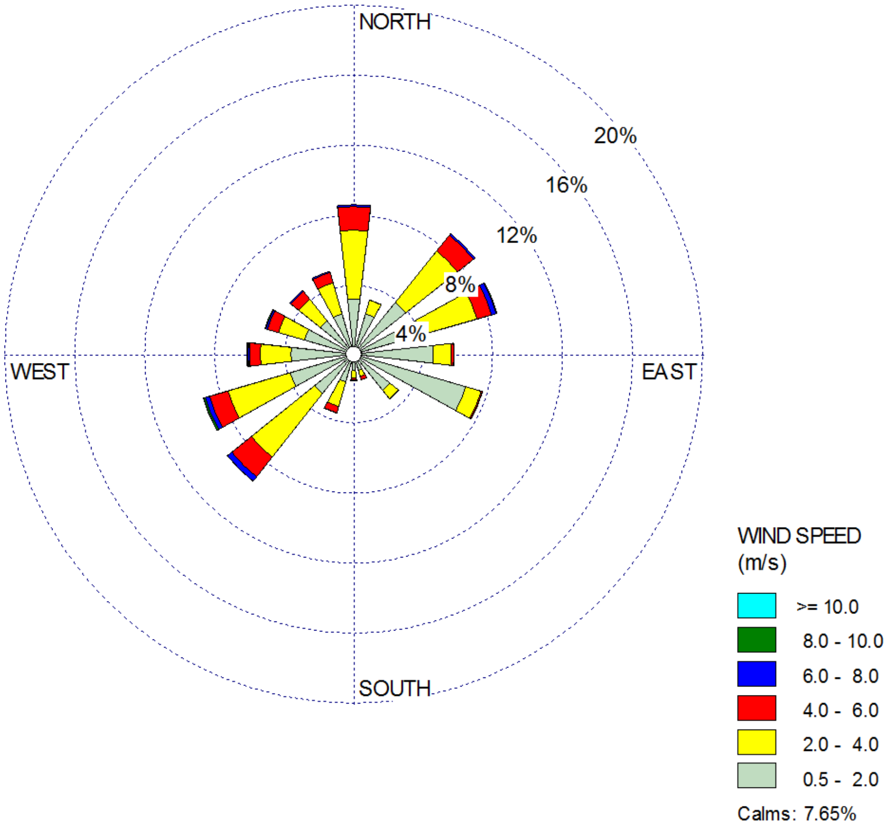


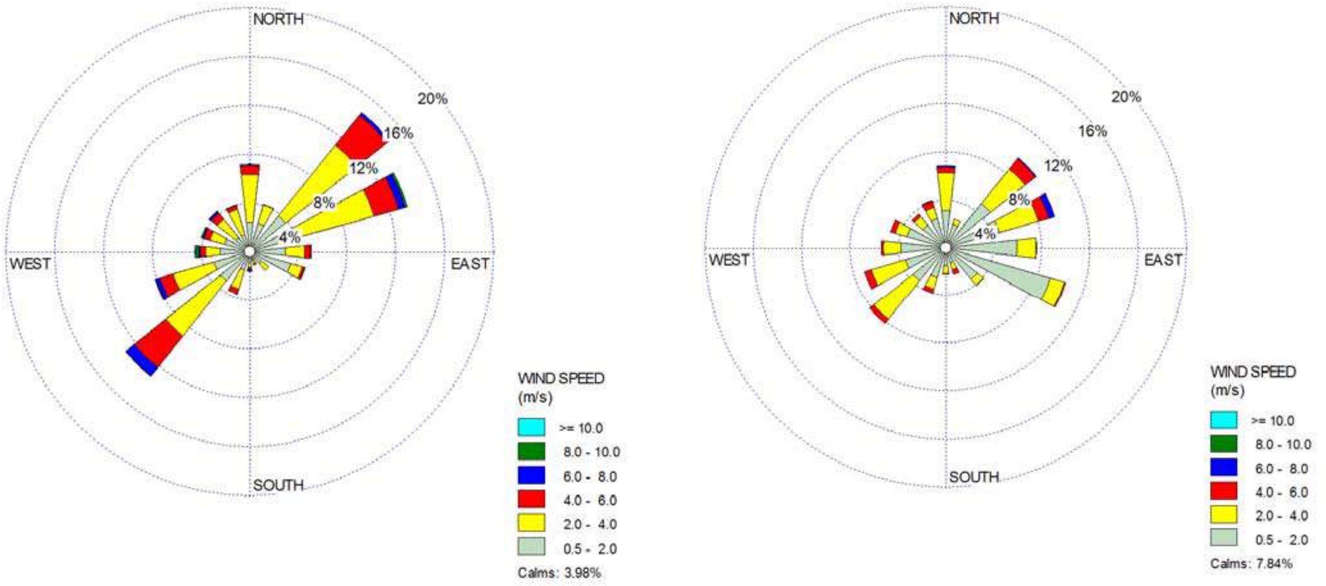
Figure 5 ROBE AWS annual wind rose distribution

Seasonal variation in wind pattern

The seasonal wind roses presented in Figure 6 indicate that:

- During winter, northerly winds are the most dominant due to pre-frontal northerlies followed by synoptic westerlies and cool air drainage flows from the east-southeast;
- During summer north-easterly winds are the most dominant followed by the southwest due to the synoptic sub-tropical ridge migrating to the south of this location during the warmest months of the year;
- Spring and autumn are transitional periods. During these months both summer and winter patterns are observed;
- The seasonal incidence of high winds (>6 m/s) is greatest in summer, and lowest in autumn;
- The incidence of light (<2 m/s) winds is greatest in autumn, followed by winter and least in summer;
- As with the annual wind rose, there is a lack of southerly winds in all seasons, and
- The direction and high proportion of light winds in autumn is predominantly from the east-southeast and east. These drainage flows are likely to be associated with high stability, and can be expected to define the directions of poorest dispersion.

Summer (average speed = 2.56 m/s) **Autumn** (average speed = 1.76 m/s)



Winter (average speed = 1.84 m/s) **Spring** (average speed = 2.00 m/s)

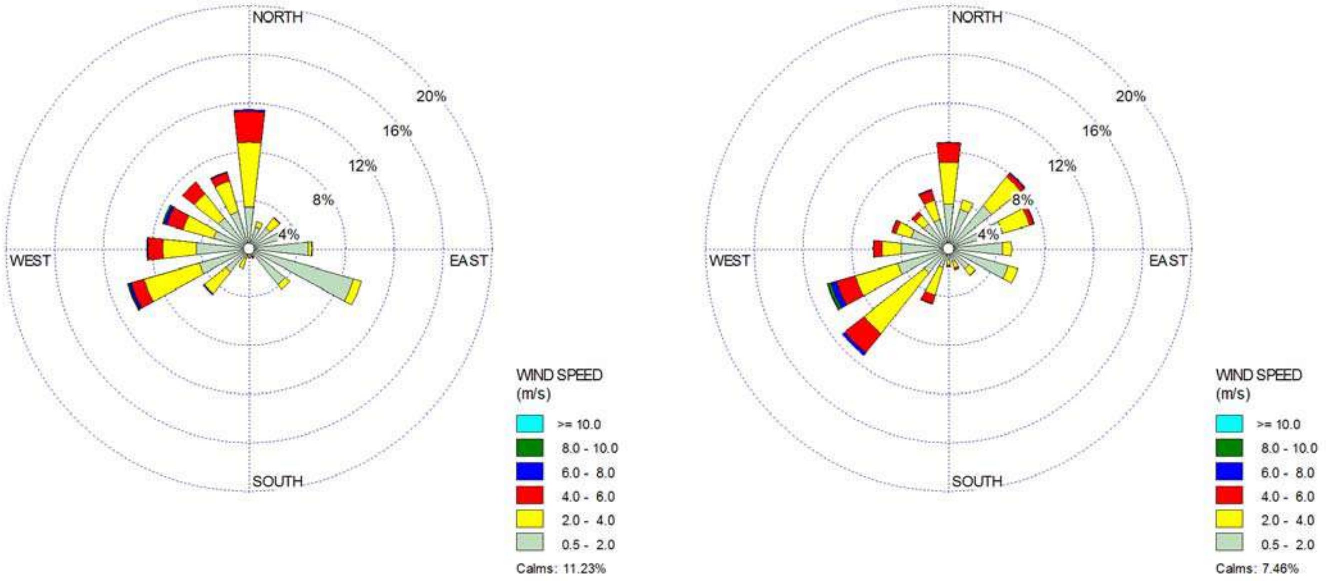


Figure 6 ROBE AWS seasonal wind rose distribution

3.5.2 Pattern of Atmospheric Stability

In the Pasquill/Gifford atmospheric stability scheme, stability is classified into six classes A through F. A, B and C stability classes represent strongly, moderately and slightly unstable atmospheres respectively. Under unstable conditions dispersion of emissions from near-ground sources is good due to convectively vertical turbulent mixing.

The stability category D denotes neutral atmospheric conditions (strong winds in moderate temperatures or lighter winds on overcast to partly cloudy days).

Categories E and F denote slightly and moderately stable atmospheres when dispersion is poorest, as vertical mixing of air is suppressed. Stable atmospheric conditions occur in the absence of strong gradient winds, and mostly on nights with clear skies. They are often associated with ground-based radiation forced temperature inversions, sometimes with fog, mist or frost.

Neutral stability (D class) conditions occur most frequently and along with the prevailing wind direction can indicate the most common direction for potential impact. Under night-time E and F class conditions, emissions from ground based sources; result in a downwind plume that is detectable to a greater distance than during the day.

Annual Average Directional Pattern in Atmospheric Stability

Figure 7 shows the stability rose for the entire data period. Noting that a neutral atmosphere (D) is normally the dominant stability state of the atmosphere, D class conditions occur at 38.2% incidence while the A, B and C class contribute unstable atmospheres 32.1% of the time and the stable E and F conditions occur at a 29.7% incidence. Figure 7 indicates that the majority of stable winds are from the east northeast, west south-west and south-west.

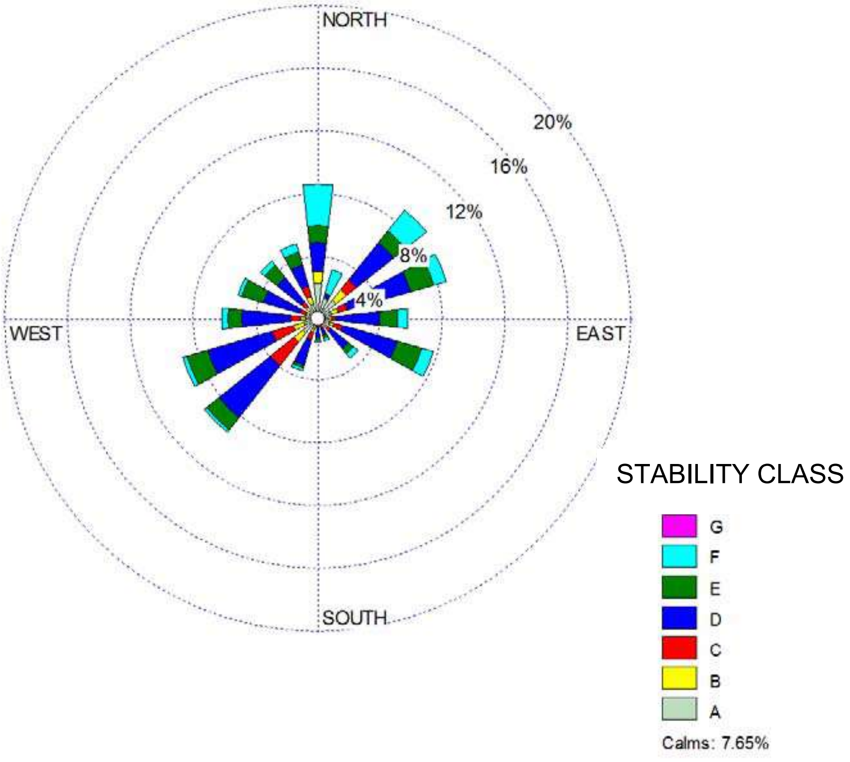


Figure 7 ROBE AWS Annual Stability Rose

Seasonal Variation in Atmospheric Stability

Figure 8 shows the following seasonal variation trends in atmospheric stability:

- In summer, the peak occurrence of stable winds is from the east northeast;
- In winter, stable winds predominate from the west southwest and west;
- In autumn, stable winds predominate from the northeast, east northeast and east-southeast; and
- In spring, stable winds predominate from the south west and west southwest.

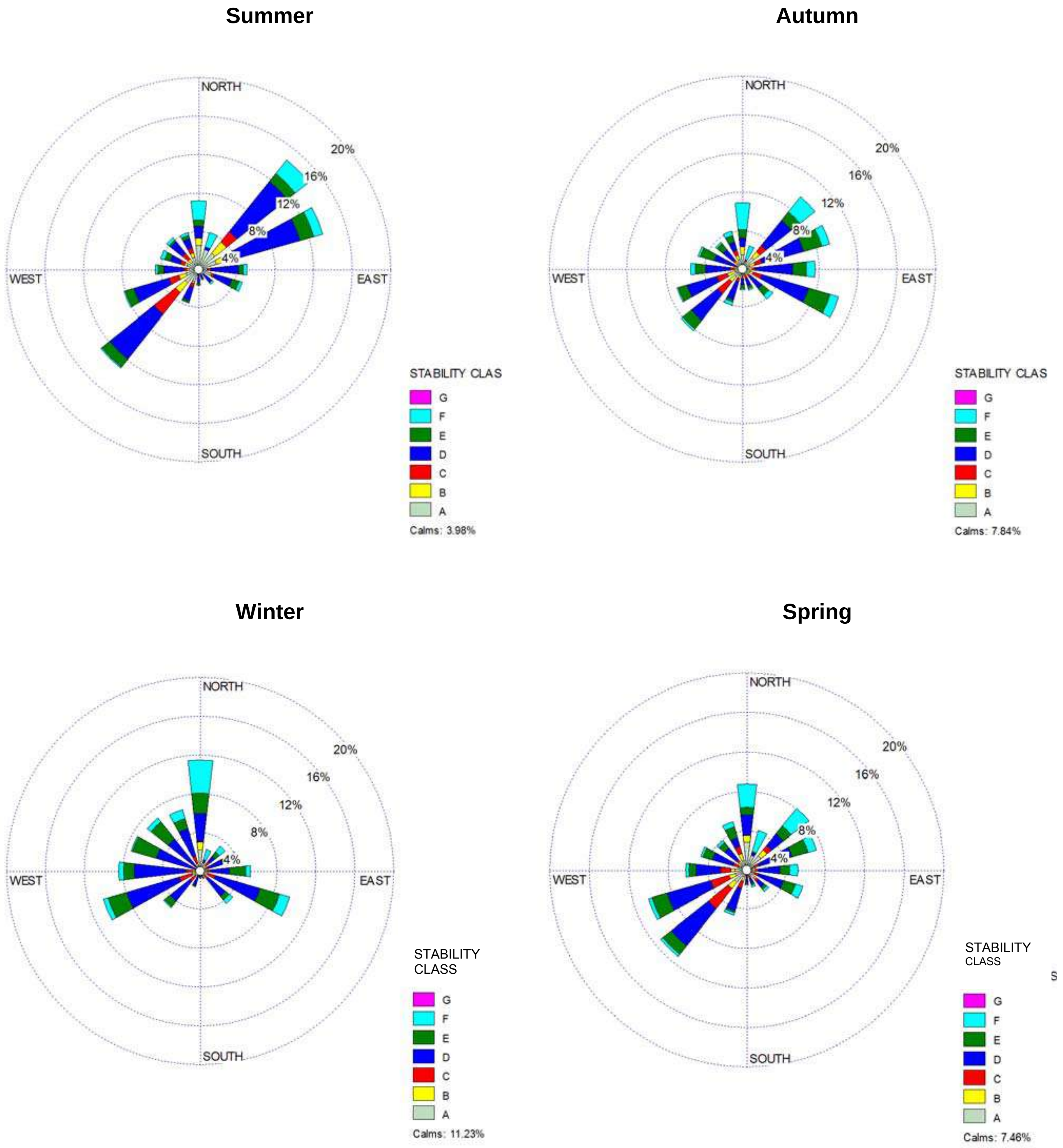


Figure 8 ROBE AWS Seasonal Stability Roses

When the wind pattern information presented in this section is compared against the location of sensitive residential receptors (Figure 2), it can be seen that the predominant wind directions (southwest and north easterly winds) at the site tend to be avoid (blow away from) the majority of sensitive receptors.

A comparison of atmospheric stability information against the meteorological conditions modelled in the project Environment Assessment (Heggies, 2010) is presented in section 8.6.3.

4. Plant Description

4.1 ROBE Integrated Oilseed Processing Plant

The plant currently processes canola seed but is also capable of processing sunflower, cotton seed and soybeans. Approximately 500 tonnes of seed are processed on a daily basis. The plant has an oilseed processing capacity of 165,000 tonnes per year. This equates to approximately 75,000 tonnes of vegetable oil per year.

Plant production levels (for both seed crushing and oil production) throughout 2013 and 2014 are presented in Figure 9. ROBE worked through a number of stages which culminated in the plant achieving and maintaining the design capacity in early 2014.

A layout of the ROBE plant site and key site features is presented in Figure 10 and Appendix A. The site is comprised of a number of key process components. These include:

- Oilseed receival and storage;
- Oilseed processing and crushing in the seed preparation plant (SPP);
- Meal handling, processing and oil recovery in the solvent extraction plant (SEP);
- Meal storage;
- Oil refining; and
- Storage of finished oil product in a tank farm prior to despatch.

A series of ancillary activities including the operation of a weighbridge, raw water and effluent treatment plants, steam production, firefighting service, laboratory and administration are also undertaken.

4.2 Hours of Operation

The manufacturing process utilised by ROBE is a continuous one which operates 24 hours per day, 7 days per week. Maintenance shuts are scheduled on a monthly basis. An annual maintenance shut is also undertaken.

The plant operates a shift roster based on 2 x 12 hour shifts (8 am to 8 pm). A general day time shift (8 am to 4 pm) is also utilised.

4.3 Process Overview

There are a number of stages to the production of edible vegetable oil, each yielding one or more products which are either sold or undergo further processing. A process flowchart demonstrating the steps in the operation of the plant is presented in Figure 11. An outline of the process supported by site photographs (Figure 12) is provided below:

- Oilseed is received and stored in a silo;
- Oilseed is fed from the storage silo to the oilseed crushing plant (SPP) via a conveyor, prior to preconditioning and crushing;
- Conditioned oilseed is mechanically crushed to expel the oil from the seed. This process results in the production of expelled oil and oilcake;
- Expelled oil is processed in the vegetable oil refinery and oilcake is transferred via conveyor to the solvent extraction plant (SEP); and,
- Oil expelled during the oilseed crushing process (SPP) or recovered as part of processing in the SEP is refined in the vegetable oil refinery.

Some by-products are produced, stored or further processed and sold onto the local market. These are described below:

- The oilcake produced from the crushing plant is conveyed to the SEP;
- The de-oiled meal from the SEP is blended with by-products from the crushing plant and refinery. The extracted oil from this process is pumped from the SEP to the vegetable oil refinery or to intermediate storage tanks located in the tank farm; and,
- The meal is then transported to the meal shed for storage, loaded onto trucks and distributed.

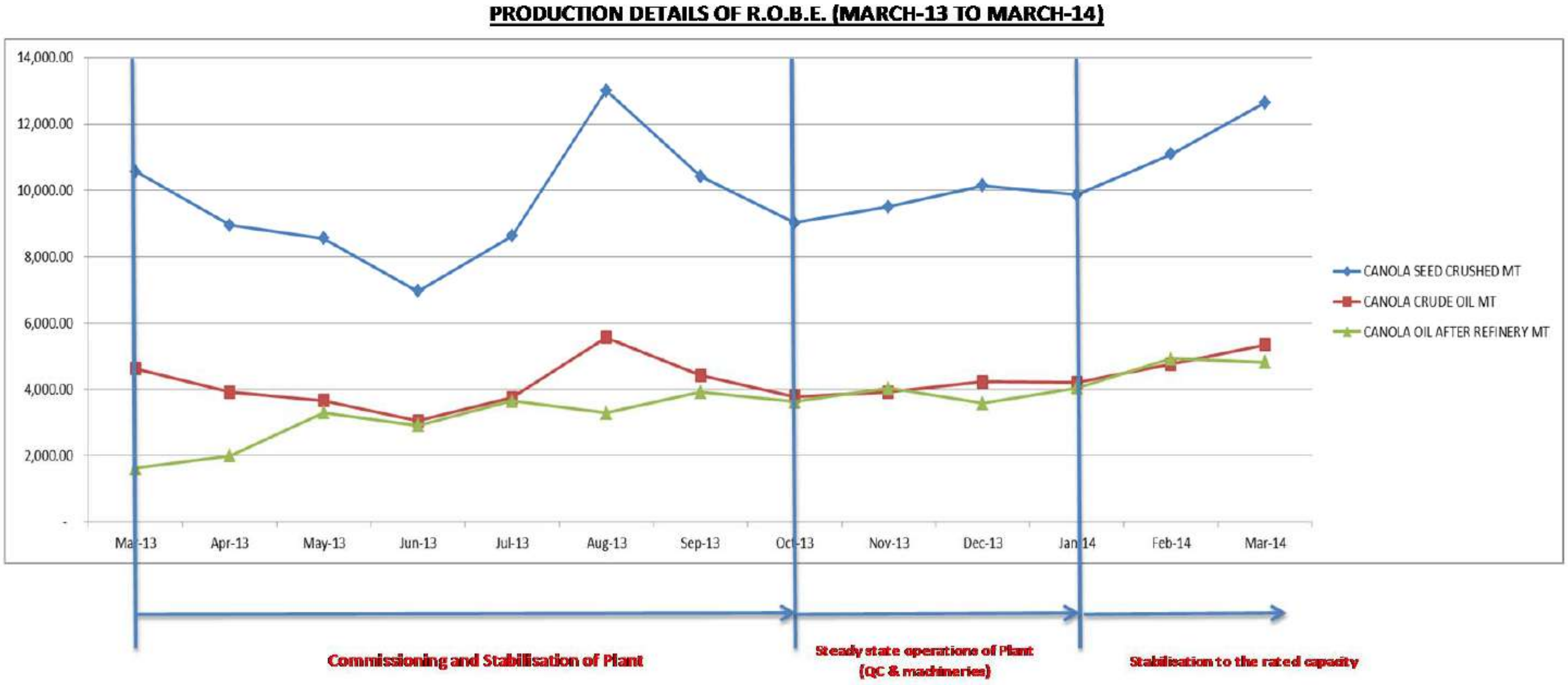


Figure 9 ROBE site production rates and phases 2013/2014 (Source: ROBE)

Figure 10 Site Layout

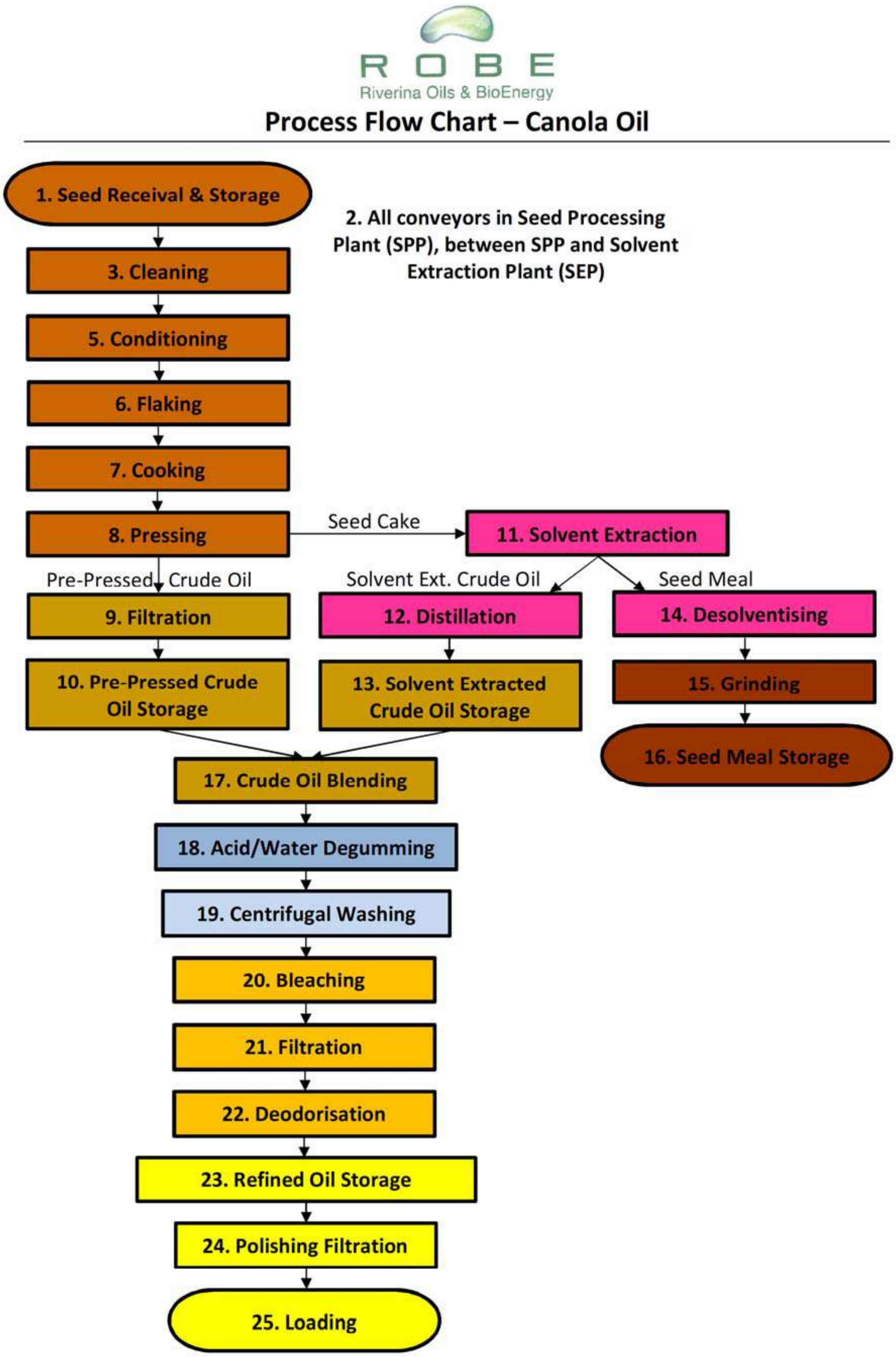


Figure 11 ROBE manufacturing activities – canola oil process flow chart

Seed delivery and storage

Seed preparation plant (SPP)

Solvent extraction plant (SEP)

Bulk de-oiled meal storage building

Oil refinery

Oil storage and despatch area

Figure 12 Main process areas and buildings

5. Potential Sources of Odour

A quantitative odour impact assessment (Heggies, 2010) was performed as part of the Environmental Assessment undertaken for the approval of the ROBE plant (Lennon Salvestro, 2010). The assessment assumed that the principal sources of odour were point source emissions associated with the SPP and SEP. This has largely been confirmed through site observations and monitoring following construction and operation of the plant. It should be noted that the Heggies (2010) report did not model any odour emissions associated with the oil refinery. A comparison of odour modelling inputs is presented in 8.6.3.

This section of the report describes the sources of odour on the site (both point and diffuse).

5.1 Point Sources of Odour

A summary of the air emission point sources (as at November 2009), their location, emission control equipment and venting arrangements is presented in Appendix A. There are three identified point sources of odour at the facility which are monitored in accordance with the EPL. A fourth point source is infrequently used and is not required to be monitored by the EPL.

5.1.1 Seed Preparation Plant (SPP)

The release of odoriferous compounds happens while crushing canola (Heggies, 2010) and during its subsequent processing. Canola seed is conveyed from the silo adjacent to the SPP, where it is cleaned, pre heated, flaked, cooked and pressed as part of the oil extraction process.

A series of vents, ducts and fans combine to extract air from within the SPP and discharge it through a wet scrubber prior to its release to atmosphere at approximately 25 metres above ground level (refer Figure 13). This discharge point is described as ‘EPA identification number 2’ on the EPL.

Figure 13 Seed Preparation Plant - Combined Vent

5.1.2 Solvent Extraction Plant (SEP)

Seedcake generated by the oilseed processing activities in the SPP is conveyed to the SEP where a solvent (hexane) is introduced in order to assist with the extraction of the remaining vegetable oil. A combined vent system collects air emissions from vessels and cyclones within the SEP and discharges them through a wet scrubber prior to their release to atmosphere at approximately 25 metres above ground level (refer Figure 14). This discharge point is described as ‘EPA identification number 3’ on the EPL.

Figure 14 Solvent Extraction Plant – combined vent and scrubber (at right)

5.1.3 Refinery – filter blowing vapour scrubber

Crude oils from the SPP and SEP processes are transferred to the refinery where they are neutralised, degummed, bleached, deodorised and refined in order to produce a finished oil product. A series of tanks containing water are used to scrub the vapours associated with the refining process. Emissions are combined and discharged through a single pipe approximately 25 metres above ground level. This discharge point (Figure 15) is identified as ‘EPA identification number 14’ on the EPL.

Figure 15 Refinery - filter blowing discharge point (left), steam boiler (right)

5.1.4 SEP Extractor Purge Fan

The extractor purge fan is located within the SEP building and is used to expel air and residual hexane during plant shutdowns which require hot work to be undertaken (refer Figure 16). It discharges through a vent approximately 14.5 metres above ground level. It is not a routinely operated discharge point and is not required to be monitored by the EPL.

Figure 16 SEP Extractor Purge Fan

5.2 Diffuse Sources of Odour

As described previously, the majority of oilseed processing activities which are likely to contribute to odour are point source emissions. These activities are undertaken within enclosed buildings which utilise air emissions controls prior to discharge. In addition to point sources of odour emission, there are also a number of potential diffuse or fugitive sources of emissions on the site. These are described in subsequent sections and are considered to make a minor contribution to site odour emissions under normal operating circumstances.

5.2.1 Unloading and storage of canola seed

The activities associated with the unloading and storage of oilseed (currently canola) are considered to be a very minor source of odour. Some odour may be generated during unloading of seed into an open pit and during subsequent conveyance into the silo. As may be seen from Figure 17, these activities are undertaken within enclosed or partially enclosed buildings.

Figure 17 Oilseed storage and unloading area

5.2.2 Meal cake conveyors

Meal cake conveyors transfer seedcake and meal between the:

- SPP and SEP plant (Figure 18); and the
- SEP and the de-oiled cake storage building (Figure 19).

These conveyors are enclosed but are not completely sealed. There is the potential for some minor air movement and diffuse emissions to be associated with the conveyance and processing of meal cake.

Figure 18 Covered meal cake conveyors SPP to SEP

Figure 19 Covered meal cake conveyor prior to storage building

5.2.3 Meal cake storage

Processed (de-oiled) meal cake (post SEP processing) is stored in a large, substantially enclosed and unvented building (refer Figure 20). The building can be closed via a large roller door.

Trucks are used to transport the meal cake off-site. They are loaded by conveyor within a partially enclosed building or by front end loader in the open air adjacent to the building.

There is potential for air movement and diffuse emissions to be associated with the storage and handling of meal cake prior to despatch from the site.

Figure 20 Meal cake storage building

5.2.4 Waste water treatment plant

The ROBE site utilises a number of waste water treatment processes to allow internal reuse and recycling of process water. A series of stages are operated including screening, mixing, clarification, aeration and ultimately membrane treatment. An evaporation pond associated with the plant is located in the south east corner of the site (refer Figure 10). The mechanical aeration of wastewater (Figure 21), the temporary storage of solids extracted from the wastewater, or temporary storage of water in the evaporation pond (Figure 22) may provide conditions suitable for the creation and release of diffuse odours. The treatment plant is located adjacent to the eastern boundary of the site.

Figure 21 Aeration tank in the wastewater treatment plant

Figure 22 Evaporation pond

5.2.5 Spent earth

Spent earth is generated as a by-product of the oil refining process. This material is temporarily stored in a bunker at the north eastern corner of the refinery building (Figure 23) and represents a minor source of diffuse odour.

Figure 23 Spent earth temporary storage

5.2.6 Tank farm

Crude and refined oils are stored in the tank farm prior to blending or despatch (Figure 24). The tanks are located in a bunded and sealed area. There is a minor localised ‘oily’ odour associated with this part of the plant.

Figure 24 Crude and refined oil storage / tank farm

5.2.7 Other minor emission sources

The transport and handling of seed and seed cake may from time to time result in spills to roadways or adjoining gravel or concrete areas. These spills may result in the emission of minor diffuse and localised odours. The site employs a fulltime cleaner and utilises a street sweeper in order to contain and remove any spilt material.

6. Results of Analysis and Odour Emission Rates

6.1 Sources of information

GHD has utilised a variety of information sources as part of the odour auditing process. These sources of information have included:

- Odour complaints received and documented in the ROBE complaints register;
- Continuous emissions monitoring system (CEMS) data from the SPP and SEP plants;
- Source emissions sampling and analysis of the SPP, SEP and refinery air emissions using gas chromatography - mass spectrometry (GC-MS) methods;
- Sampling and analysis of the SPP, SEP and refinery air emissions using olfactometry methods; and
- Sampling and analysis of ground level odour concentrations at the site boundary (both upwind and downwind).

Emissions Testing Consultants Pty Ltd (ETC) produced a series of sampling reports which provide relevant information in terms of sampling conditions, analyses undertaken and test results. These reports are presented in Appendix B.

An AUSPLUME modelling process was utilised by GHD using the odour data provided by the olfactometry and GC-MS analyses. Note that only the data from the most recent odour testing event (25 February 2014) was used for modelling purposes as they best represent normal site operations at design capacity.

Note that fugitive emissions were not modelled by GHD. They are considered to be minor.

6.2 Complaints

Odour complaints are a practical measure of odour performance in that they reflect the impact on sensitive receptors. It should however be noted that the perception of offensive odour at a sensitive receptor may not automatically translate into a complaint.

ROBE advises that no odour related external complaints from sensitive receptors have been received during the past 18 months.

The NSW EPA contacted ROBE by telephone on 18 November 2013 to advise of odour concerns associated with the site wastewater evaporation pond. These concerns were addressed through the removal of production residues which had accumulated in the pond during commissioning. This odour complaint is considered to be a temporary matter, unrelated to the broader process odour emissions.

6.3 CEMS data

ROBE has installed a continuous emissions monitoring system (CEMS) which analyses and records TRS (as H_2S) concentrations within the SPP and SEP emission stacks. The unit has experienced PLC issues with data capture and segregation between sampling locations. ROBE has worked on this issue throughout the second half of 2013. The CEMS unit is calibrated annually by the supplier Thomson Environmental Systems. It was calibrated on 24 April 2013 and is scheduled for recalibration in April 2014.

The CEMS system is linked to the ROBE plant control and as such is used for operational monitoring and control purposes. A series of alarm set points based on TRS concentration are utilised by the plant control system.

Data from the CEMS system is somewhat limited and does not provide a long term trend (refer Appendix C). It is however possible to identify changes in TRS concentration based on the performance of the wet scrubber systems located in the SPP and SEP. The detailed investigation and scrubber optimisation processes undertaken in January 2014 appear to have resulted in a reduction in TRS emissions at both plants.

Ongoing and consistent monitoring and collection of CEMS data is required in order to assess scrubber and site air emissions performance over the longer term.

6.4 Source Emissions Monitoring – odour related parameters

ROBE has undertaken a source emissions monitoring program in accordance with the requirements of the EPL and CoA's. The results of the review of this source emissions monitoring program are the subject of a separate report (refer GHD report number 74575, April 2014).

Table 2 presents a selection of the source emissions monitoring program results (odour relevant parameters). From this it may be seen that the ROBE site complies with the EPL and *Protection of the Environment Operations (Clean Air) Regulation 2010* relevant emissions performance standard for hydrogen sulphide emissions (5 mg/m^3).

In addition to hydrogen sulphide, volatile organic compounds (VOC's) may also contribute to site odour emissions. The type and impact of VOC emissions on site odour levels is discussed in section 6.5.

Table 2 Results of ROBE source air emissions monitoring – odour related parameters

EPA Identification Number	EPA Location Description	EPA Emissions Parameter & (EPL Conc'n limit (mg/m^3))	Quarter 1 (26/06/2013)	Quarter 2 (7/08/2013)	Quarter 3 (24/10/2013)	Quarter 4 (25/02/2013)	Compliant with Clean Air Reg Sch 4, Group 6 & EPL?
2	Combined Vent servicing SPP TAG704,705,2705,2713 and 2782C	Hydrogen sulphide (5)	< 3	<0.04	<0.04	< 4	Yes
3	Solvent Extraction Plant Scrubber Combined Vent TAG14A, 14B and 136	Hydrogen sulphide (5)	-	0.32	0.37	< 3	Yes
		VOCs (40)	29	32	16	17	Yes
14	Filter Blowing Vapour Scrubber TAG629 and 6325B/532B	VOCs (40)	-	370	63	360	No
		Hydrogen sulphide (5)	-	<0.04	<0.04	< 3	Yes

6.5 Measured Odour Emission Rates

As discussed in 6.4, ROBE has implemented a source emissions monitoring program. Quarterly samples were collected for analysis by ETC. The current source emissions monitoring program includes mandatory sampling and analysis prescribed by the EPL, and voluntary sampling and analysis (olfactometry and GC-MS) undertaken by ROBE in order to characterise and understand odour emissions on the site. The reports associated with the monitoring program are presented in Appendix B.

6.5.1 Emission rates - Olfactometry

The results from the most recent odour testing event (25 February 2014) were utilised for subsequent modelling purposes as they reflect the most appropriate site production levels (site production operating at design capacity (refer Figure 9)), and ROBE has indicated that the SPP and SEP wet scrubbers were considered to be operating at the preferred pH range, following a review and optimisation process which was undertaken. Table 3 presents the results of the olfactometry assessment.

From the table it can be seen that the largest site odour contribution is from the SEP, followed by the SPP and Refinery.

Table 3 Results of olfactometry analysis

Sampling Location	Odour concentration (OU)	Volumetric flow rate (m3/s)	Odour mass rate (OUV/min)
DP2 (SPP)	18,000	2.6	2,800,000
DP3 (SEP)	91,000	3.8	21,000,000
DP14 (Refinery)	110,000	0.1	<800,000

6.5.2 Emission rates - GC-MS

Stack emissions were also sampled in flexfoil bags and speciated for reduced sulphides and VOCs using GC-MS techniques. Sampling was undertaken utilising the NSW EPA approved methods. The results for reduced sulphides (sampled 25 February 2014) and a number of other compounds are presented in Table 4. The table also presents calculations undertaken to determine stack odour emission rates based on the “chemical” odour unit contributions of the individual identified species.

From the table it can be seen that the largest site odour contribution is from the SEP, followed by the refinery and then the SPP.

The odour emissions calculated and presented in Table 4 are significantly lower than that those presented in Table 3.

Table 4 Results of GC-MS analysis

Sampling Location	Other Analytes	Concentration (ppm)	Odour threshold (ppm)	Calc'd odour (OU)	Odour concentration (OU)	Odour mass rate (ouv/min)
DP2 (SPP)	Dimethyl Sulphide	0.300	0.500	0.6		
	H2S (flexfoil bag)	< 0.1	0.005			
	Methyl Mercaptan	0.100	0.021	4.8		
	Carbonyl Sulphide	< 0.1	0.050			
	Ethyl Mercaptan	< 0.1	0.003			
	n-Propyl Mercaptan	< 0.1	0.003			
	Thiophene	< 0.1	0.001			
	n-Butyl Mercaptan	< 0.1	0.001			
	Tetrahydrothiophene	< 0.1	0.001			
	H2S (impingers) (1 hour)	*< 3*	*0.005*			
	Total			**5.36**	**13.9**	**837**
DP3 (SEP)	Dimethyl Sulphide	< 0.1	0.5000			
	H2S (flexfoil bag)	0.80	0.0050	160		
	Methyl Mercaptan	0.20	0.0210	9.5		
	Carbonyl Sulphide	0.30	0.0500	6.0		
	Ethyl Mercaptan	< 0.1	0.0028			
	n-Propyl Mercaptan	< 0.1	0.0031			
	Thiophene	< 0.1	0.0006			
	n-Butyl Mercaptan	< 0.1	0.0014			
	Tetrahydrothiophene	< 0.1	0.0006			
	H2S (impingers) (1 hour)	*< 2*	*0.0050*			
	Total			**175.5**	**667**	**40,019**
DP14 (Refinery)	Dimethyl Sulphide	0.5	0.0010	504.7		
	H2S (flexfoil bag)	< 0.1	0.0050			
	Methyl Mercaptan	0.2	0.0210	10.4		
	Carbonyl Sulphide	< 0.1	0.0500			

Sampling Location	Other Analytes	Concentration (ppm)	Odour threshold (ppm)	Calc'd odour (OU)	Odour concentration (OU)	Odour mass rate (ouv/min)
	Ethyl Mercaptan	< 0.1	0.0028			
	n-Propyl Mercaptan	< 0.1	0.0031			
	Thiophene	< 0.1	0.0006			
	n-Butyl Mercaptan	< 0.1	0.0014			
	Tetrahydrothiophene	< 0.1	0.0006			
	H2S (impingers) *(1 hour)*	*< 2.0*	*0.005*			
	Total			**515**	**51.5**	**3091**

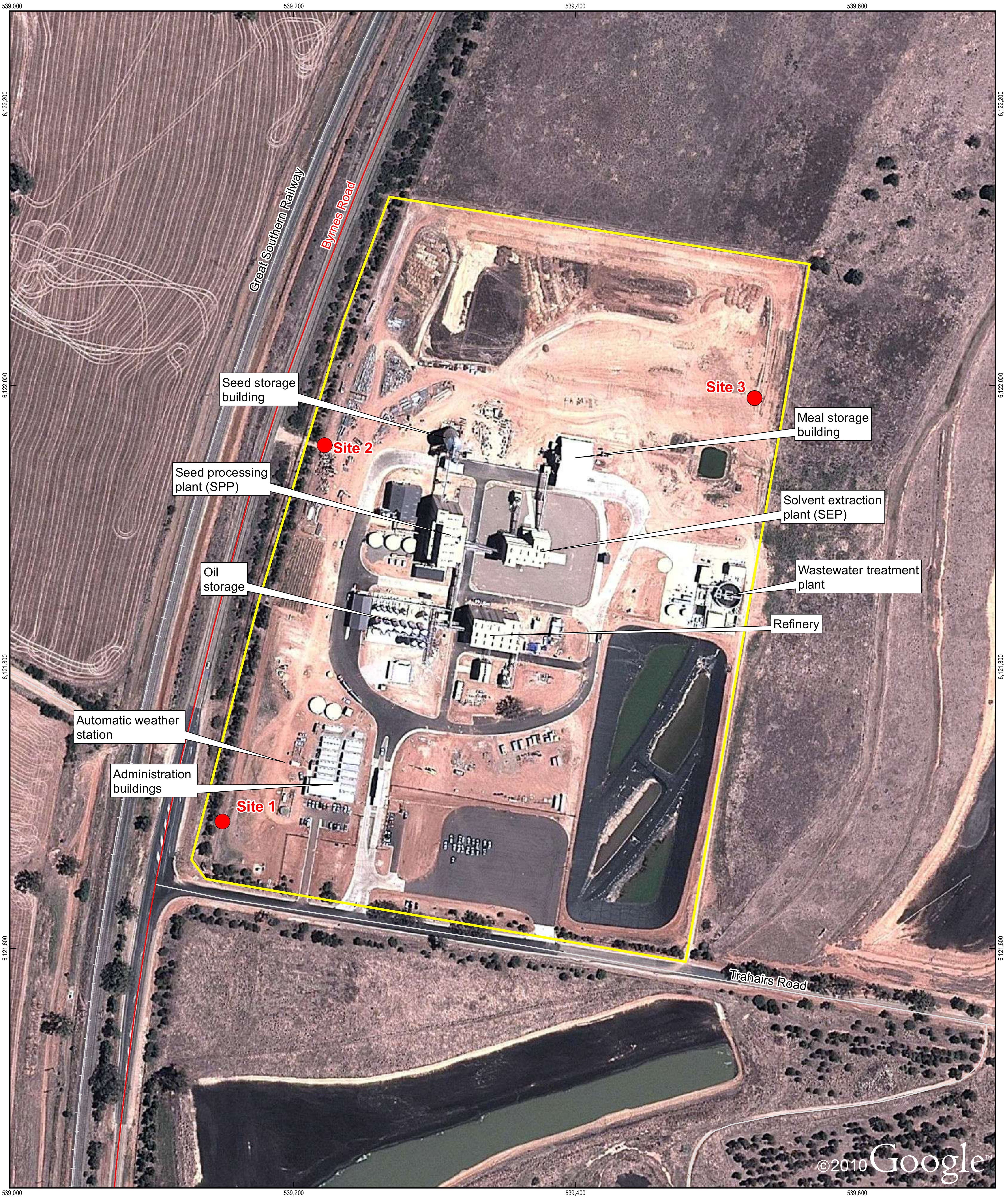
6.5.3 Boundary Odours

Monitoring using olfactometry techniques of ambient air on the plant boundaries was also undertaken by ETC on the 25 February 2014 under normal plant operating conditions. The location of monitoring points (upwind and downwind) is shown in Figure 25. The results are presented in Table 5. From the table it can be seen that the highest concentration (101 OU) was measured along the southwest boundary.

ETC has advised that the high upwind result of 86 OU was due to another odour source not sourced to the ROBE site. A possible source may have been the adjoining land containing grazing livestock and disused lagoons (refer Figure 4). If the upwind odour is subtracted from the highest downwind result, the odour measured on the boundary would be 15 OU which would represent the signal from the plant only.

Table 5 Boundary Odours

Sampling Location	OU	Time	GPS Co-ordinates	
Site 1 Downwind (Southwest Boundary)	101	0834-0843	35°2'47"S	147°25'45" E
Site 2 Downwind (Northwest Boundary)	37	0847-0956	35°2'42"S	147°25'48" E
Site 3 Upwind (East Boundary)	86	0901-0910	35°2'39"S	147°25'49" E



LEGEND

● Odour monitoring point - sampling event 25/02/2014

Arterial road

Road

Railway line

ROBE property boundary

Paper Size A3

0 25 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Riverina Oils & BioEnergy
Odour management plan and assessment

Job Number	23-1493102
Revision	0
Date	27 Mar 2014

Boundary odour monitoring points

Figure 25

G:\23\14931\GIS\Maps\231493102_ROBE_Fig2_BoundaryOdourMonitoringPoints_SamplingEvent2.mxd

Suite 3, Level 1, 161-169 Baylis Street Wagga Wagga NSW 2650 Australia **T** 61 2 6923 7400 **F** 61 2 6971 9565 **E** wgamail@ghd.com **W** www.ghd.com

Data source: NSW Government: Roads, railways, lot boundary - 2012; Google: Google Earth aerial imagery - extracted November 2013. Created by:rtrobinson

7. Odour characterisation and criteria

7.1 Characterisation and measurement

The odour level (or concentration) of an odour sample is measured using a Dynamic Olfactometer, using the ‘forced choice’ procedure in which two ports (one issuing odour free air, and one presenting the diluted odour sample) are to be smelt by a human panel. Each panellist is forced to select a port (left or right) presenting the diluted odorant. If neither port is perceived to be odorous, a choice must still be made but with the annotation ‘guess’. When the dilution ratio reduces, a panellist may consider that one of the ports is odorous, but is not certain, in which case the annotation is ‘maybe’. Finally, at a lower dilution ratio, the panellist is sure which port is odorous and the annotation is ‘certain’.

The odour concentration of the sample is then defined as the dilution ratio required to bring the odour to a level at which 50% of the panellists (six are normally used) can correctly detect the odour with certainty. The unit used is an ‘odour unit’ or OU – as a ratio it is dimensionless.

An Australian Standard (AS/NZS 4323.3.2001) for olfactometry has been developed which is consistent with European CEN Standard. Both standards have adopted the certainty threshold as the odour standard and have referenced 1 OU to a concentration of butanol of 40 ppb. AS/NZS 4323.3 requires panellists to be tested against n-butanol as a reference odorant and to return a threshold of between 20 and 80 ppb. The odour levels referred to in this report are the certainty odour levels.

7.2 Odour criterion

DEC has defined an odour criterion and the Odour Guideline (*Approved Methods and Guidance for Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005)) specifies how it should be applied in dispersion modelling to assess the likelihood of nuisance impact arising from the emission of odour.

Odour impact is a subjective experience and has been found to depend on many factors, the most important of which are:

- The **F**requency of the exposure;
- The **I**ntensity of the odour;
- The **D**uration of the odour episodes;
- The **O**ffensiveness of the odour; and
- The **L**ocation of the source

These factors are often referred to as the FIDOL factors.

DEC has defined the odour criterion to take account of two of these factors (**F** is set at 99%ile, **I** is set at from 2 to 7 OU). The choice of criterion odour level has also been made to be dependent on the population of the affected area, and to some extent it could be said that population is a surrogate for location – so that the **L** factor has also been considered. The relationship between the criterion odour level **C** to affected population **P** is given below:

$$\mathbf{C = \left[\log P - 4.5\right] \div -0.6} \qquad \textbf{equation 1}$$

Table 6 lists the values of C for various values of affected populations as obtained using equation 1.

Table 6 Odour criterion for the assessment of odour

Population of affected community	Odour performance criteria (nose response odour certainty units at 99th percentile)
Single Residence (≤ ~2)	7
~ 10	6
~ 30	5
~ 125	4
~ 150	3
Urban (~2,000)	2

The criterion assumes that 7 OU at the 99th percentile would be acceptable to the average person, but as the number of exposed people increases there is a chance that sensitive individuals would be encountered. The criterion of 2 OU at the 99th percentile is considered to be acceptable for the whole population.

The criterion has also been specified at an averaging time of nominally 1 second. The choice of the short averaging time is recognition by DEC that the human nose has a response time of less than 1 second, so that modelling of odour impact should allow for the short-term concentration fluctuations in an odour plume due to turbulence.

As the AUSPLUME dispersion model (utilised in this assessment) only predicts concentrations over an averaging period of one hour, a ratio between the 1 second peak concentration and 60 minute average concentration has been applied - known as the peak to mean ratio (PM60). PM60 is a function of source type, stability category and range (ie near or far-field), and values are tabulated in the modelling Guideline[1].

7.3 Project odour criterion

The project site is surrounded primarily by rural receptors over 1 km away. The odour criterion defined as 5 odour units (5OU) (representing ~30 residents) was utilised in the project Environmental Assessment (Heggies, 2010) report, and has been accepted in this audit report as the project criterion against which modelling would be undertaken.

---

[1] Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005).

8. Odour Dispersion Modelling

8.1 The model

The GHD odour dispersion modelling study for the ROBE site was carried out using AUSPLUME Version 6.0, a Gaussian, steady-state, plume dispersion model developed by the Victorian Environmental Protection Authority (EPA Victoria). Ausplume is the approved dispersion model recommended by the NSW DECC in their document - *Approved Methods and Guidance For the Modelling and Assessment of Air Pollutants in New South Wales (2005)*.

The Ausplume V6.0 atmospheric dispersion model is used to project downwind ground level concentrations of air contaminants by taking into consideration various factors including:

- Odour emissions data - odour emission rate and source dimensions;
- Site specific meteorology; and
- Building wake effects.

For this study, the air contaminant was odour and ground level concentrations in odour units (ou) have been projected.

8.2 Model configuration

The following settings were used in the simulations – further detail is given in the AUSPLUME text file outputs in Appendix D.

- Model: AUSPLUME 6.0;
- The receptor grid was 4.5 km x 4.5 km, with a 50 m grid resolution;
- Source odour emission rates were modelled as constant– see Section 6.4;
- Meteorology was taken from the onsite AWS anemometer at ROBE, period 01 October 2012 to 30 September 2013;
- Stacks were each modelled as a stack source;
- A roughness height of 0.1 m was used to characterise the rural environment;
- Irwin's 'Rural' wind profile exponents were used; and
- Horizontal dispersion was parameterised according to equations of the Pasquill-Gifford curves.

8.3 Peak to mean calculation

The *Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales* states that peak to mean values are applied to the emissions from the sources in order to estimate the peak concentration. Peak to mean values are required as the evaluation of odour impacts requires the estimation of short or peak concentrations on the time scale of less than one second. As previously noted, dispersion model predictions are however, typically valid for averaging periods of 1 hour and longer. Thus, in order to predict peak concentrations a ratio between extreme short term concentration and longer-term averages were used as defined in the *Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales* (refer Table 6.1). The peak-to-mean ratio in the near-field for a wake-affected stack/roof vent source for Pasquill-Gifford atmospheric stability classes A-F is 2.3 were applied to the site.

8.4 BPIP

The layout of the ROBE site in particular built forms have been included in AUSPLUME in order to account for wake affects from the buildings on the stack sources. The Building Profile Input Program (BPIP) was run using the PRIME algorithm.

8.5 Source Parameters

The following Table 7 provides the source parameters used in the modelling for the three stack emission points.

Table 7 Source Parameters

Point	Velocity (m/s)	Temperature (°C)	Diameter (m)	Flow rate (m^3/s)	Height (m)	Co-ords
SPP	3.6	41	1.1	2.6	30	539319 6121890
SEP	5.2	45	1.1	3.8	23.5	539378 6121881
Refinery	2.0	43	0.31	0.1	28	539361 6121826

8.6 Modelling Results

AUSPLUME modelling was undertaken to establish the predicted odour levels at the three boundary odour points for the wind conditions at the time of sampling and using the stack OERs and for a 12 month period (01 October 2012 to 30 September 2013) to produce the 99th percentile predicted odour concentration.

Two separate scenarios have been modelled:

(i) using emissions from the olfactometry results and

(ii) using emissions based on the GC-MS analysis of flexfoil samples.

Note that only the most recent set of odour measurements taken on 25th of February 2014 were used in the modelling.

8.6.1 AUSPLUME Boundary Modelling

The AUSPLUME model was run for 1 hour under the meteorological conditions occurring at the time of measurement on the 25th of February 2014. Data was obtained from the onsite anemometer at ROBE. Table 8 shows that the measured wind speed was a north-easterly at 1.2 m/s. The stability class was an unstable ‘A’.

Table 8 Meteorology conditions on 25 February 2014

Time	Temperature (°C)	Wind speed (m/s)	Wind direction (Degrees)	Stability Class	Mixing Height (m)
8.30 - 9.10 am	21	1.2	49	A	1482

The results in Table 9 indicate that the modelled olfactometry results match up well with the analysis. Given 101 OU was measured at Site 1, when background (i.e. upwind 86 OU) is taken into account (i.e. subtracted from downwind value) a signal of 15 OU from the ROBE sources is determined. This value matches with the predicted 15 OU modelled using the olfactometry results.

The results from the GC-MS analysis of flexfoil samples are very low and do not correlate well with the samples taken at the boundary.

Table 9 Boundary results – Predicted Odour Levels, OU

Method	Site 1	Site 2	Site 3
Olfactometry	15	0.003	0
GC-MS	0.03	0	0

8.6.2 Off-Site Peak Odour Impact

The predicted 99th percentile odour concentrations for a 12 month meteorological file are presented in Figure 26 and Figure 27. It can be seen that the olfactometer results show odour levels of 10 OU over 2 km from the site with the closest receptor R3 (west of the site) predicted to have an odour level of ~23 OU. The 5 OU criterion is therefore not met at the nearest receptors.

The results based on the GC-MS analysis of flexfoil samples are very low in comparison with a maximum predicted value of 0.08 OU.

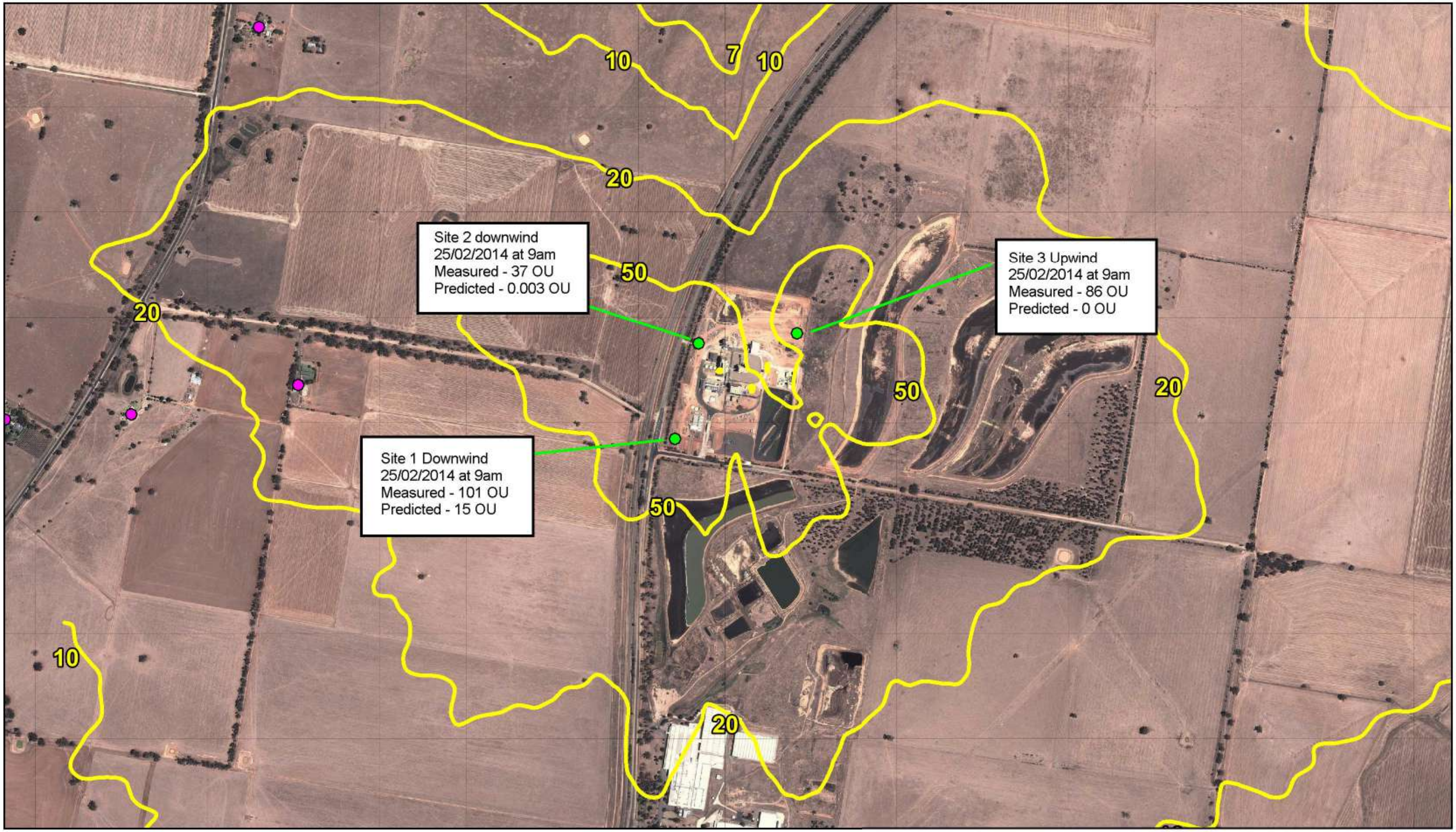
Predicted Odour Exposure at Nearby Residences

Table 10 presents the predicted 99th percentile odour levels at each receptor using both olfactometry and GC-MS data (refer to Figure 2 for receptor locations). If olfactometry data is used only one receptor (R7) is compliant with the 5 OU criterion, while all other identified receptors were predicted to have a concentration greater than 5 OU ranging from ~6 to 23 OU. The results from the GC-MS based analysis indicate that all receptors are predicted to have a concentration below 0.02 OU.

There have been no odour complaints received by ROBE from sensitive receptors (residences) in the vicinity of the plant. However, to the extent that existing residents are within the zone of potential odour impact, it is possible that they are accustomed to the occasional odour exposure. For these residents, any odour may have become part of the background palette of ambient odour. This situation might not be replicated with new receptors in the area. New residents may find odour from the site unusual and objectionable and this may potentially result in a source of complaints.

Table 10 Predicted peak (99th percentile) odour impact at nearest receptors

Residence ID	Easting (m)	Northing (m)	Odour Impact (OU) – olfactometry data	Odour Impact (OU) – GC-MS data
1	537248	6121739	12.8	0.01
2	537625	6121799	16.3	0.01
3	538090	6121848	23.6	0.02
4	537968	6122862	15.4	0.01
5	537760	6123116	12.2	<0.01
6	538140	6123263	8.5	<0.01
7	538268	6123807	3.3	<0.01
8	540329	6119814	6.8	<0.01
9	540594	6119575	6.3	<0.01



Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

LEGEND

▭	Odour Units (Ground Level)
●	Sensitive Receptors

GHD
CLIENTS PEOPLE PERFORMANCE

Riverina Oils & BioEnergy Pty Ltd
Air Quality Assessment
Predicted 99th percentile Odour Concentration (OU)
Emission rates based on olfactometry

Job Number	23/14931
Revision	A
Date	17/03/2014

Figure 26

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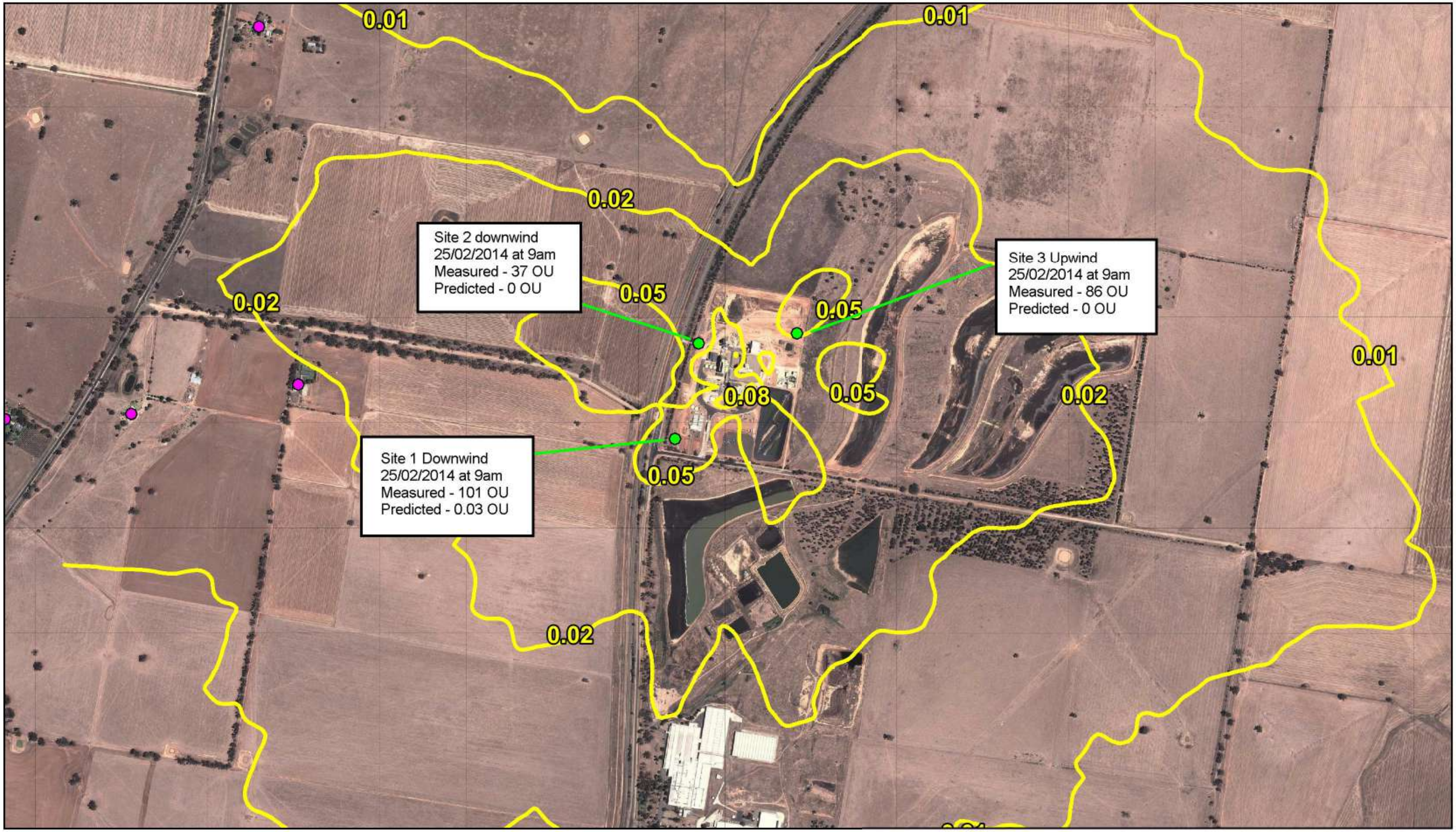
Google Earth Imagery 2014. Created by: M.A



Site 2 downwind
25/02/2014 at 9am
Measured - 37 OU
Predicted - 0 OU

Site 3 Upwind
25/02/2014 at 9am
Measured - 86 OU
Predicted - 0 OU

Site 1 Downwind
25/02/2014 at 9am
Measured - 101 OU
Predicted - 0.03 OU

0 150 300 450
metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N
W E
S

LEGEND

▭	Odour Units (Ground Level)
●	Sensitive Receptors

GHD
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Riverina Oils & BioEnergy Pty Ltd
Air Quality Assessment

Job Number | 23/14931
Revision | A
Date | 17/03/2014

Predicted 99th percentile Odour Concentration (OU)
Emission rates based on GC/MS
analysis of flexfoil samples

Figure 27

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8/180 Lonsdale St Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au W www.ghd.com.au

Google Earth Imagery 2014. Created by: M.A

8.6.3 Comparison of Heggies (2010) and GHD (2014) Assessments

Dispersion modelling of the plant odour emissions was conducted prior to the ROBE plant's construction (Heggies, 2010). This modelling relied on; (i) synthesised meteorological data, and (ii) calculated source odour emission rates (OERs) based on a sulphur mass balance and an assumed conversion of 100% of sulphur to H_2S.

GHD has undertaken a review of the modelling undertaken for the Air Quality Assessment (Heggies, 2010) presented in the 2010 Environmental Assessment (Lennon Salvestro, 2010).

A comparison of modelling inputs and assumptions is presented in Table 11.

The significant differences between Heggies (2010) and GHD's (2014) assessments were:

- Meteorology;
- Emission sources; and
- Emission rates

Meteorology

Heggies used TAPM to generate a complete 2003 data set incorporating BoM data from Wagga Wagga as the on-site anemometer had not been installed at that time. In contrast, GHD used a 12 month data set from the ROBE AWS anemometer located on the site. The main differences in annual wind roses are shown in Table 11. From this it may be seen that there is a higher incidence of south-westerly, northerly and east-south-easterly winds from the on-site data compared to that predicted by TAPM, with also a predicted lower incidence from the northwest quadrant and northeast. The proportion of light wind speeds also is greater in the onsite data in comparison to the predicted TAPM data.

The stability classes presented below show that the TAPM predicted dataset had a predicted higher incidence of stable conditions compared with the onsite data, while the onsite data had a much larger proportion of unstable A class than was predicted by TAPM.

The consequences of the differences in meteorology are not considered to be significant in terms of dispersion modelling or the impact on receptors. Odour emission rates are expected to play a more significant role in determining off site impacts.

Emission sources

Heggies (2010) did not model the refinery emissions source. Modelling was only undertaken for the SEP and SPP.

The refinery represents a source of odour not identified or accounted for in the 2010 Environmental Assessment. Its contribution to overall site odour (site OER), based on the February 2014 monitoring is estimated to be around 3% of site OER.

Emission Rates

Heggies (2010) calculated source odour emission rates (OERs) based on a sulphur mass balance and an assumed conversion of 100% of sulphur to H_2S. The difference in odour emission rates calculated by that method from the measured odour emissions is substantial with a plant OER of 4.8×10^6 OUv/min compared to the measured plant OER of 24.6×10^6 OUv/min. In summary, the calculated plant OER in the 2010 Air Quality Assessment is 20% of that measured via olfactometry.

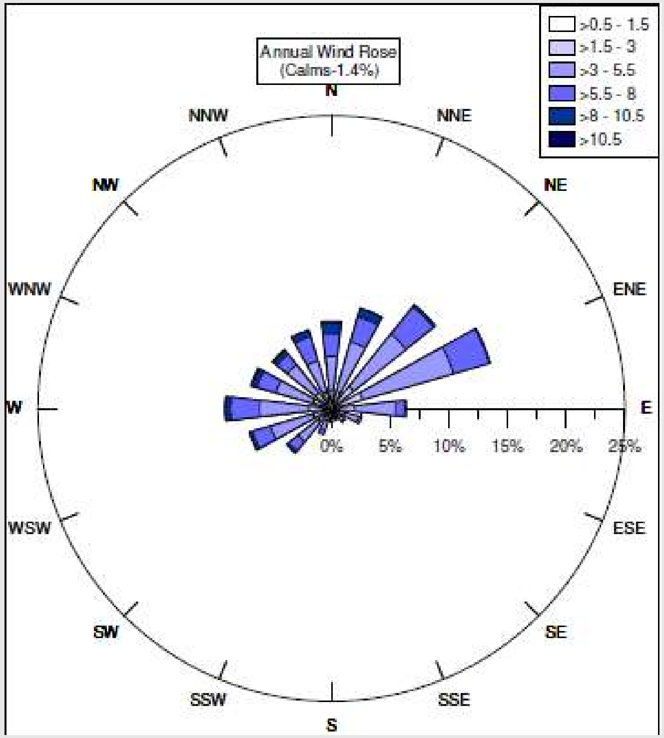
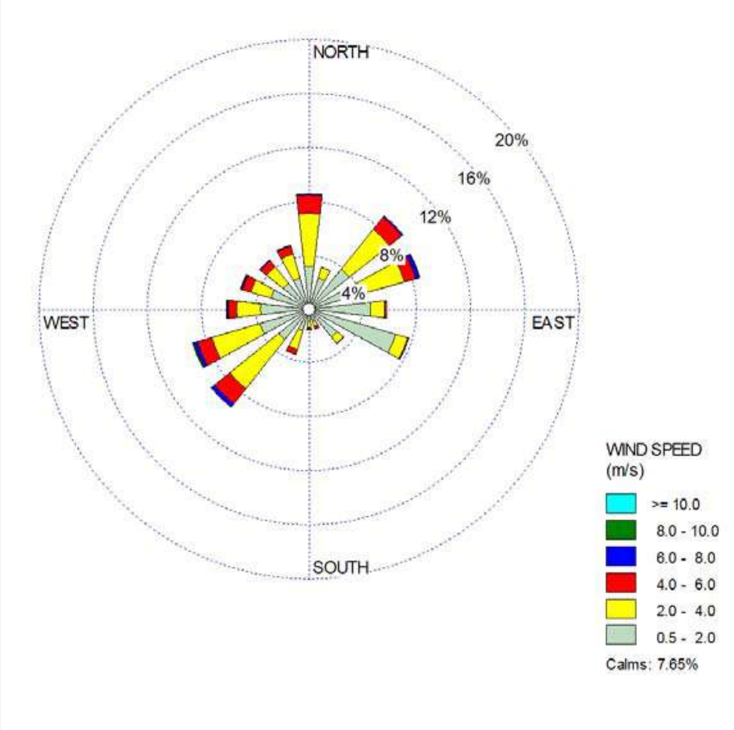
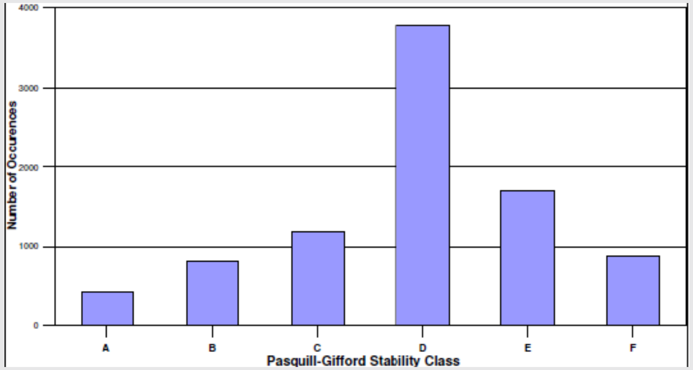
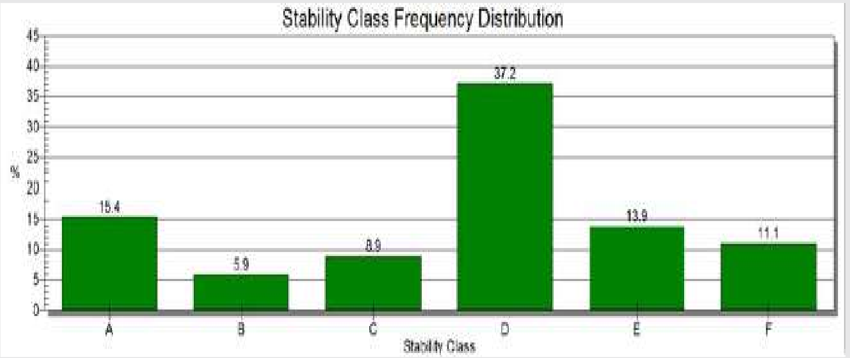
Summary

Neither set of results (i.e. measured from olfactometer and calculated from GC-MS) correlate well with the modelling undertaken for the 2010 Environmental Assessment.

For example, predicted peak odour levels at the closest receptor to the west R3 were 23 OU and 0.02 OU respectively. In comparison the Heggies (2010) modelling predicted a concentration of 0.1 OU at the same receptor.

Table 11 Air Quality Impact Assessment – Sensitivity analysis of modelling and comparison of results

Modelling Parameter	Heggies (2010)	GHD (2014)
Operation times	24 hrs/day, 7 days/week	24 hrs/day, 7 days/week
Production rate	165,000 tonnes oilseed / year	165,000 tonnes oilseed/year
Meteorology	TAPM 2003	On site met data October 2012 – October 2013
Odour Sources modelled	Seed preparation plant Solvent extraction plant	Seed preparation plant Solvent extraction plant Refinery
Sulphur mass balance	100% of sulphur assumed to be converted to H_2S	No mass balance or conversion % utilised – direct measurement used. GC-MS analysis has identified a range of sulphur based compounds
Scrubber H_2S Removal Efficiency	99.7%	Scrubbers operational but removal efficiency not quantified
Dispersion model	AUSPLUME v6	AUSPLUME v6

Modelling Parameter	Heggies (2010)	GHD (2014)
Meteorology **Annual Wind Rose**		
Meteorology **Annual Stability**		

Modelling Parameter	Heggies (2010)	GHD (2014)
Emission Points		
SPP	5,6,7,8,9	5,6,7,8,9
SEP	12,13,14	12,13,14
Refinery	N/A	18
Fugitive Emissions	Not modelled, considered to be minor	Not modelled, considered to be minor
Source Characteristics		
SPP		
Velocity m/s	10.5	3.6
temperature °C	75	41
diameter m	1	1.1
height of stack m	29	30
stack co-ords	539307 6121894	539319 6121890
SEP		
Velocity m/s	9	5.2
temperature °C	65	45
diameter m	1.1	1.1
height of stack m	29	23.5
stack co-ords	539364 6121887	539378 6121881

Modelling Parameter	Heggies (2010)	GHD (2014)
Refinery	N/A	
Velocity m/s		2
temperature °C		43
diameter m		0.31
height of stack m		28
stack co-ords		539361 6121826
Building heights (m)		
SPP	Unknown	29
SEP	Unknown	22.5
Refinery	Unknown	27
Oil storage	Unknown	15
SP shed	Unknown	15
Meal storage	Unknown	6
Emission Rates (odour mass rate)		Based on olfactometry from sampling undertaken 25/2/2014
SPP	177,720 OUv/min (3.7% of total)	2,800,000 Ouv/min (11.4% of total)
SEP	4,655,880 OUv/min (96.3% of total)	21,000,000 Ouv/min (85.4% of total)
Refinery	NIL	800,000 ouv/min (3.3% of total)
Fugitive Emissions	Not modelled	Not modelled

Modelling Parameter	Heggies (2010)	GHD (2014)
Plant OER	4.8 x 10^6 OUv/min	Based on olfactometry from sampling undertaken 25/2/2014 24.6 x 10^6 OUv/min
% Measured Plant OER	20	100

9. Conclusions

GHD has utilised and reviewed a variety of information sources as part of the odour auditing process. The key conclusions associated with each information source are presented in the following sections.

9.1 Site considerations

9.1.1 Sensitive receptors

The audit reviewed the location of the ROBE site and odour emissions in relation to 9 identified sensitive receptors (residences). At present the closest sensitive receptor is 1 km from the site, which provides a reasonable buffer distance. Dispersion modelling results are discussed in 9.7.

9.1.2 Prevailing wind and atmospheric stability

The prevailing winds at the site (based on ROBE site meteorological data) are from the south west and north east, although seasonal variation exists. The nearest sensitive receptors are located to the north west and south east, often outside the direction of the prevailing winds.

Air conditions at the site show a high degree of stability, with unstable conditions (which contribute to mixing and dispersion of air emissions) occurring approximately one third of the time.

9.2 Plant considerations

9.2.1 Odour sources

The 2010 Environmental Assessment indicated that the main sources of odour on the ROBE site would be point source discharges from the SPP and SEP plants. Diffuse (fugitive) emissions were considered to be minimal.

The audit undertaken by GHD has identified that there are three potential sources of emissions (SPP, SEP and refinery). The ROBE site incorporates a range of engineering and operational measures to minimise the generation of point source and diffuse odours. These measures include combined venting of internal processes and equipment, covered conveyors, enclosed buildings and wet scrubber technology.

Diffuse emissions are considered to be minor when the plant is operating under normal circumstances. The issues experienced in late 2013 with odour from the site wastewater pond highlight the need for operational activities to be mindful of the potential to generate odour.

Olfactory assessment has shown that odour may be generated on adjoining land. Sources of off-site odour may be agricultural activity and/or disused lagoons associated with a former wool combing operation.

9.3 Odour complaints

ROBE maintains an environmental incident register which is used to document incidents including external complaints. With the exception of a telephone complaint received from the EPA on 18 November 2013, (associated with wastewater pond odour rather than overall site odour), no odour complaints have been received by ROBE. Complaints are seen as a practical measure for odour performance, which should be taken into consideration when evaluating odour issues. However, it is noted that the perception of offensive odour at a sensitive receptor may not automatically translate into a complaint.

9.4 CEMS

ROBE operates a CEMS which measures TRS concentrations at both the SPP and SEP.

Data from the CEMS system is limited and does not provide a long term trend. There appear to be reductions in TRS (as H_2S) concentrations following detailed investigation and scrubber optimisation processes undertaken in January 2014. Ongoing and consistent monitoring and collection of data is required in order to assess scrubber and site air emissions performance over the longer term.

9.5 Source Emissions Monitoring

ROBE has implemented a source emissions monitoring program. The results of the program indicate that:

- Hydrogen sulphide concentrations in emissions from the SPP, SEP and refinery comply with the EPL and *Protection of the Environment Operations (Clean Air) Regulation 2010* performance standard for hydrogen sulphide (5 mg/m^3); and
- There are a variety of compounds (other than hydrogen sulphide) in stack emissions which have the potential to generate odour.

9.6 Olfactometry Monitoring

The results from olfactometry monitoring indicate that:

- Odour emission rates (24.6 x 10^6 OUm^3/min) are significantly greater than those calculated based on GC-MS data obtained from the source emissions monitoring program (0.044 x 10^6 OUm^3/min);
- The plant OER based on olfactometry is ~ 5 fold that calculated as part of the 2010 Environmental Assessment. This difference is not unexpected given the assumptions made in the 2010 mass balance calculations; and
- Odour may be generated from adjoining land, in significant enough quantities to be detected in ground level measurements at the site boundary.

9.7 Odour dispersion modelling

Dispersion modelling was undertaken in order to assess the potential impact of site odour emissions on the identified nearest receptors, and to allow a comparison to be made against the predictions in the 2010 Environmental Assessment. Modelling was undertaken using both olfactometry and source emissions monitoring data. When the predicted peak 99 percentile odour levels are determined (Figure 26 and Figure 27), the results using olfactometry data indicate that the nearly all of nearest receptors would experience 99th percentile odour levels greater than the project odour criterion of 5 OU.

Modelling using GC-MS data indicates that the site would comply with the 99th percentile odour criterion of 5 OU, although it should be noted that the odour emission rates (~ 0.05 OU) are well below what would be considered typical of an oilseed processing facility, and are not consistent with downwind odour observations.

The peak odour levels based on olfactometry are consistent with the ambient measured odour levels and are of the right order of magnitude for this type of plant. Neither set of results (i.e. measured from olfactometer and calculated from GC-MS) correlate well with the 2010 Environmental Assessment.

10. Discussion and Recommendations

10.1 Key Issues

The analysis undertaken raises a number of issues, specifically:

- What is/are the reason(s) for the failure of the GC-MS speciation to deliver OERs that are similar to the olfactometry results? GHD and ETC have reviewed data and discussed analyses with laboratories. At this stage there is no obvious explanation for the difference in sampling results; and
- What options are available in relation to additional mitigation measures at SPP and SEP in order to comply with the EPA odour criterion?

The ROBE Odour Management Plan identifies site roles and responsibilities in relation to odour management, together with a range of operational, management and maintenance procedures and contingency measures. Further investigation of the primary source of site odour control (wet scrubbers) is however recommended. A series of recommendations are provided in Table 12.

Table 12 Issues and Recommendations

Issue	Relevant details	Recommendation
H_2S removal efficiency is less than design	Heggies (2010) report assumes 99.7% removal efficiency of H_2S. CEMS data shows low TRS emissions. This is supported by quarterly sampling results (TM5)	Scrubber H_2S (or other compound) removal efficiency cannot be directly assessed at present. It is recommended that ROBE install sampling ports in the inlet pipe prior to entry into the wet scrubbers so that removal efficiencies in the SPP and SEP can be assessed.
	ROBE advise that caustic dosing trials in the scrubbers determined that a pH of 10.5 (pH range 9 to 11) was optimal for H_2S control (based on CEMS data). A pH control system based on dosing to achieve upper and lower pH limits has been implemented. BETE (scrubber supplier) specification recommends continuous caustic dosing and a pH >14 at the top of the scrubber column to maximise H_2S control.	Recommend ROBE undertake additional investigations to confirm optimal scrubber pH and control mechanisms (eg. pH set points) for caustic dosing. Ensure CEMS data can be acquired and manipulated easily so that the CEMS can be used as an efficient investigative and monitoring tool.
	BETE document advises that liquid flow to the distributor within the scrubber column should be 80 m^3/hr	ROBE has confirmed circulation pump flow capacity is 80 m3/hr. Actual flow may vary. Recommend ROBE review and monitor flow as part of scrubber operation.

Issue	Relevant details	Recommendation
	Long term data trends captured over a variety of operational and production scenarios are required to confirm the adequacy of scrubber design and operations.	ROBE should ensure that relevant monitoring data sets are captured for an extended period of time and in a format that allows subsequent analyses to be undertaken. Recommend that ROBE undertake a process engineering review to assess the scrubber design and efficiency once appropriate long term data sets have been obtained.
Odour compounds other than H_2S are present in significant concentrations	Scrubber is designed to remove H_2S, SO_2 and acetaldehyde (BETE). Caustic dosing is recognised as an effective means of controlling H_2S release, however monitoring results suggest that a variety of other reduced sulphur compounds are present which may not be oxidised by caustic.	ROBE to investigate potential options to remove non H_2S compounds within the scrubbers. This may include dosing with other chemicals.
Refinery	Represents a source of odour not identified in the Heggies report. Contributes 3% to site OER based on Feb 2014 monitoring.	ROBE may wish to investigate the potential for the redirection of stack emissions from EPA Point 14 into the adjoining gas fired boiler (air intake or stack). This would require a detailed engineering and HAZOP assessment to confirm whether the modification was safe, appropriate and technically feasible. A low priority given small % contribution to site OER.
Inconsistent analytical results (significant difference between olfactometry and flexfoil bag (GC-MS) results)	Other odorous compounds present but not analysed in current suite of tests.	Review sampling and laboratory procedures. Consider duplicate sampling and analysis. Review analytical suite with laboratory to ensure that all significant odorous compounds are identified and quantified.

11. References

Heggies Pty Ltd (2010) *Riverina Oils and BioEnergy, Integrated Oilseed Processing Plant, Odour Impact Assessment*, March 2010

Lennon Salvestro Planning (2010) *Riverina Oils and BioEnergy, Integrated Oilseed Processing Plant, Environmental Assessment*, August 2010

NSW Department of Environment and Conservation (DEC) (2005), Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.

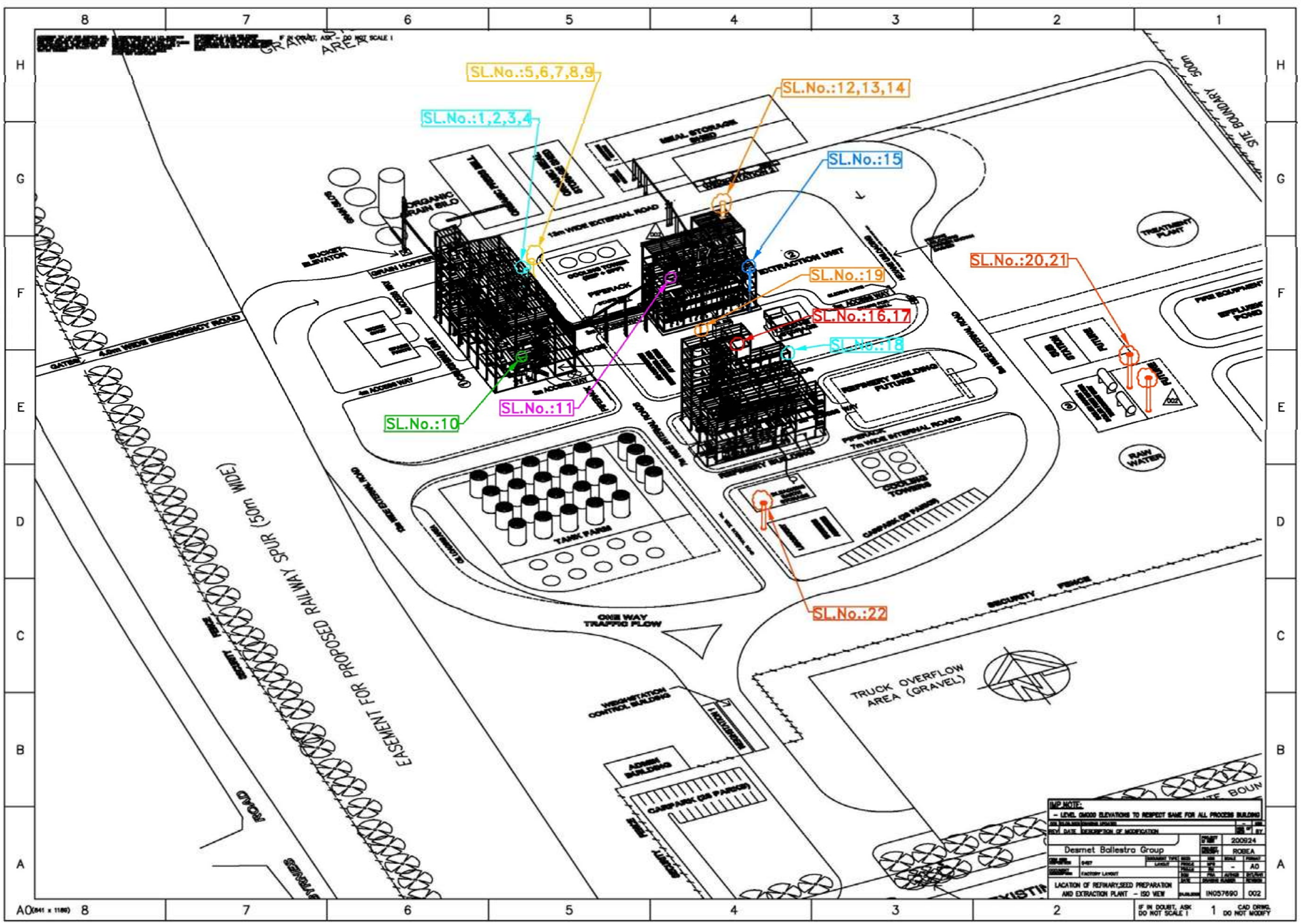
NSW Department of Environment and Conservation (DEC) (2006), Technical Framework: Assessment and management of odour from stationary sources in NSW.

Appendices

Appendix A – Plant Design & Vent Emission Points

ROBEA SEED CRUSHING PLANT & REFINERY : VENT EMISSION POINTS

EPA ID No	SL./ No	TAG	Emission Point Name	Emission Point Bldg	Height of Release Point	Side of Emission Point	Proposed Emission Control	Type of Emission	Quantity of Emission	Total	Notes
5	1	717	**DESTONER**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Dust filter/ cyclone in the device	Air + Fine dust	10200 CU M	31150	COMBINED VENT
	2	740	**SEED CLEANER**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Dust filter/ cyclone in the device	Air + Fine dust	6000 CU M		
	3	769	**HAMMER MILL**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Dust filter/ cyclone in the device	Air + Fine dust	9500 CU M		
	4	703	**CRACKING ROLL MILL**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Cyclone in the device	Air + Fine dust	5450 CU M		
2	5	704	**FLAKERS**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Cyclone in the device	Air + Moisture + fines	3000 CU M	27120	COMBINED VENT going to wet scrubbing system before release to atmosphere
	6	705	**PRE CONDITIONER**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Cyclone in the device	Air + Moisture + fines	3000 CU M		
	7	2705	**COOKER**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Cyclone in the device	Air + Moisture + fines	7500 CU M		
	8	2713	**CAKE COOLER**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Cyclone in the device	Air + Moisture + fines	13500 CU M		
	9	2782C	**FILTER BLOWING TANK**	**SPP**	Above 25.525mts	East side (Outside Bldg.)	Filter in the Device	Air + fines + traces of Oil	120 CU M		
8	10	2744	**OIL SCREENING TANK**	**SPP**	Above 7.500mts	South side (Inside Bldg.)	None	Air + Moisture	TRACES		
9	11	1B	**CAKE CONVEYOR**	**SEP**	Above 13.500mts	South side (Outside bldg.)	None	Air + Moisture	TRACES		Occassional vent during variation in process condition
3 + 11	12	14A	**CYCLONE FOR DT HEATER**	**SEP**	Above 25.525mts	North side (Outside bldg.)	Cyclone in the device	Air + Moisture + fines	20000 CU M	28000	COMBINED VENT going to wet scrubbing system before release to atmosphere
	13	14B	**CYCLONE FOR DT COOLER**	**SEP**	Above 25.525mts	North side (Outside bldg.)	Cyclone in the device	Air + Moisture + fines	8000 CU M		
	14	136	**RECUPERATION VENT FAN**	**SEP**	Above 25.525mts	North side (Outside bldg.)	Absorber in the device	Air + hex + traces of water	100 kgs/hr		
12	15	36P	**EXTRACTOR PURGE FAN**	**SEP**	Above 14.500mts	South side (Outside bldg.)	None	Air + hex + traces of water	4000 CU M		Occassional load which happens during shutdown for hot work only
13	16	609AC	**BAG DISCHARGE HOPPER**	**REF**	Above 18 mts	North side (Outside bldg)	Dust filter in the device	Air+ traces of activated carbon			
	17	609	**EARTH CONVEYING SYSTEM**	**REF**	Above 18 mts	North side (Outside bldg)	Dust filter in the devise	Air+ traces of bleaching earth			
14	18	629	**FILTER BLOWING VAPOR SCRUBBER**	**REF**	Above 19 mts	East side (Outside bldg)	Scrubbing the vapors by water	Steam + traces of oil	550 kgs/hr		During filter blowing every 2,5 hours
15	19	890HP	**HIGH PRESSURE STEAM BOILER**	**REF**	Above 29 mts	North side (Outside bldg)	None	Flue gases of natural gas combustion			
4	20	B1	**LOW PRESSURE STEAM BOILER**	**BOILER H**	Above 10 mts	East side (Outside bldg)	None	Flue gases of natural gas combustion			
10	21	B2	**LOW PRESSURE STEAM BOILER**	**BOILER H**	Above 10 mts	East side (Outside bldg)	None	Flue gases of natural gas combustion			
-	22	LAB	**LABORATORY FUMES CHAMBER**	**LAB**	Above 6 mts	West side (Outside bldg)	Scrubbing the vapors by water	Air + Moisture			

SL.No.:5,6,7,8,9
SL.No.:12,13,14
SL.No.:1,2,3,4
SL.No.:15
SL.No.:20,21
SL.No.:19
SL.No.:16,17
SL.No.:18
SL.No.:11
SL.No.:10
SL.No.:22
GRAIN AREA
IF IN DOUBT, ASK - DO NOT SCALE !
SITE BOUNDARY 500m
ORGANIC GRAIN SILO
BUCKET ELEVATOR
GRAIN HOPPER
MEAL STORAGE SHED
12m WIDE EXTERNAL ROAD
COOLING TOWER
PIPERACK
EXTRACTION UNIT
TREATMENT PLANT
FIRE EQUIPMENT
EFFLUENT POND
REFINERY BUILDING FUTURE
7m WIDE INTERNAL ROADS
REFINERY BUILDING
COOLING TOWERS
RAW WATER
4.0m WIDE EMERGENCY ROAD
GATES
4m ACCESS WAY
5m ACCESS WAY
TANK FARM
ONE WAY TRAFFIC FLOW
SECURITY FENCE
EASEMENT FOR PROPOSED RAILWAY SPUR (50m WIDE)
TRUCK OVERFLOW AREA (GRAVEL)
WEIGHSTATION CONTROL BUILDING
ADMIN BUILDING
CARPARK (35 PARKS)
ROAD
SITE BOUN
EXISTIN
IMP NOTE:
- LEVEL 0M000 ELEVATIONS TO RESPECT SAME FOR ALL PROCESS BUILDING
REV DATE DESCRIPTION OF MODIFICATION BY
Desmet Ballestra Group
200924
ROBEA
FACTORY LAYOUT
LAYOUT
A0
LACATION OF REFINARY,SEED PREPARATION AND EXTRACTION PLANT - ISO VIEW
IN057690
002
IF IN DOUBT, ASK DO NOT SCALE !
CAD DRWG. DO NOT MODIFY
A0(841 x 1189)
8 7 6 5 4 3 2 1
H G F E D C B A

Appendix B – Emission sampling reports

emissiontestingconsultants
Environmental Partners

VIC
Unit 2, 160 New Street,
Ringwood, VIC 3134

QLD
Unit 7, 10 Fortune Street,
Geebung QLD 4034

NSW
Unit 1, 19 Ralph Black Drive
Wollongong, NSW 2500

WA
Unit 3, 4 Monash Gate,
Jandakot, WA 6164

Freecall 1300 782 007
www.emission.com.au
ABN 74 474 273 172

Date: 22 July 2013

Report No: 130296r

Page: 1 of 13

Riverina Oils & BioEnergy Pty Ltd
177 Trahairs Rd, Bomen
Wagga Wagga NSW 2650

Emission Testing – June 2013
Quarterly Emission Sampling

Dear Mr Daniel Challis,

Tests were performed 26 June 2013 to determine emissions to air from four locations at the Bomen plant of Riverina Oils & Bio Energy Pty Ltd.

Yours faithfully
Emission Testing Consultants

David Corbett Ba/BCom
Client Manager

dc@emission.com.au

LICENCE COMPARISON

EPA No.	Location Description	Pollutant	Unit of measure	Licence limit	Detected values	Detected values (corrected to 3% O_2)
2	Combined Service Vent	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**< 2**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**< 3**	NA
3	Solvent Extraction Plant Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	**29**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	-	NA
13	Earth Conveying System	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**9.1**	NA
15	HP Steam Generator	Nitrogen Oxides (as NO2)	milligrams per cubic meter (mg/m^3)	350	65	**150**

All analytes highlighted in green are below the Licence Limit set by the NSW EPA as per licence 13097 (last amended on 27/07/2012). Results from EPA point 15 have also been corrected to 3% Oxygen as stipulated in Part 3, Schedule 5 of the *Protection of the Environment Operations (Clean Air) Regulation, (NSW)* 2010.

The Solvent Extraction Plant Scrubber was offline on the day of sampling thus results from this location are not representative of normal operating conditions. Reduced Sulphur Compounds (using TM-33) were measured at this location in order to provide data for comparison with the continuous online instrumentation installed at that location. Hydrogen Sulphide testing using TM-5 was not performed.

EXECUTIVE SUMMARY

Emission Testing Consultants (ETC) was engaged by Riverina Oils & BioEnergy Pty Ltd (ROBE) to investigate and perform emission monitoring pursuant to Environment Protection Licence (EPL) 13097. Monitoring was performed at four locations for the following parameters;

Discharge point	Selection of sampling positions	Flow rate	Velocity	Temperature	Moisture	**Particulate matter**	Dry gas Density	Molecular weight	**Carbon dioxide (CO2)**	**Oxygen (O2)**	**Nitrogen oxides (NOx) as NO2**	**Hydrogen sulphide (H2S)**	**Volatile organic compounds (VOC)**	**Total Reduced Sulphur Compounds**
2 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓
3 Solvent Extraction Plant Scrubber	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	✓
13 Earth Conveying System	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
15 High Pressure Steam Generator	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			

This formed the first round of quarterly monitoring for 2013 and included a review of the sampling provisions at all nominated locations within ROBE's EPL. This review identified where sample ports would need to be placed to comply with AS4323.1, whilst considering practicality and safety of access. It is anticipated that all locations within the EPL will be monitored during the next round of sampling and thereafter.

The methodologies chosen by ETC are those stipulated in ROBE's EPL, and as prescribed in the NSW EPA publication, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* 2007.

On the day of sampling the solvent extraction plant scrubber was not operating. The results from EPA point 3 presented in this report represent emissions to atmosphere where the scrubber has been by-passed.

RESULTS

EPA Point 2 – Combined Vent Stack

26 June 2013

Flow Results	Measured MW	DP 2 - Combined Service Vent 130296	
Time of flow test		11:30 & 1255	hrs
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		3.8	m/s
Average temperature		57	°C
Moisture content	Alt008	1.8	% v/v
Flow rate at discharge conditions		3.3	m³/sec
Flow rate at wet NTP conditions		2.7	m³/sec
Flow rate at dry NTP conditions		2.6	m³/sec

Isokinetic Sampling Results DP 2 - Combined Service Vent 130296 160	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Particulate matter	1125-1249	< 2 mg/m3	< 0.3 g/min
No. of sampling points		*16*	
Length of sampling, min		*80*	
Stack gas molecular weight, g/g-mole (wet)		*28.7*	
Stack gas density, kg/m³, at wet NTP		*1.28*	

Continuous Analyser Results DP 2 - Combined Service Vent 130296 160	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Oxygen (dry basis)	1145-1245	20.9 % v/v	-
Carbon dioxide (dry basis)	1145-1245	< 0.3 % v/v	< 60 kg/hour
Dry gas density	1145-1245	1.3 kg/m3	-
Molecular weight of stack gas, dry basis	1145-1245	29 g/g-mole	-

EPA Point 2 – Combined Vent Stack

26 June 2013

Manual Sampling Results	DP 2 - Combined Service Vent 130296 160	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Hydrogen sulphide		1145-1245	< 3 mg/m3	< 0.4 g/min

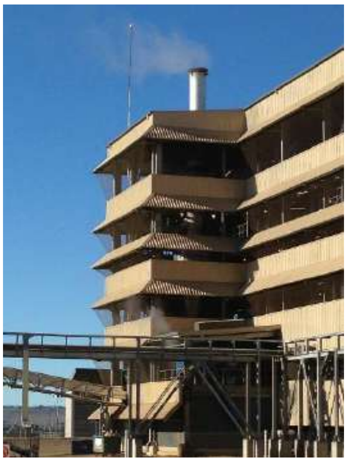
Manual Sampling Results	DP 2 - Combined Service Vent 130296 160	**Sampling Times**	**Concentration at NTP**	**Concentration at NTP**	**Mass rate**
Hydrogen Sulphide	Test 1	1139-1145	< 0.1 ppm	< 0.2 mg/m3	< 0.02 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.2 mg/m3	< 0.02 g/min
	Average		**< 0.1 ppm**	**< 0.2 mg/m3**	**< 0.02 g/min**
Carbonyl Sulphide	Test 1	1139-1145	< 0.1 ppm	< 0.3 mg/m3	< 0.04 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.3 mg/m3	< 0.04 g/min
	Average		**< 0.1 ppm**	**< 0.3 mg/m3**	**< 0.04 g/min**
Methyl Mercaptan	Test 1	1139-1145	< 0.1 ppm	< 0.2 mg/m3	< 0.03 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.2 mg/m3	< 0.03 g/min
	Average		**< 0.1 ppm**	**< 0.2 mg/m3**	**< 0.03 g/min**
Ethyl Mercaptan	Test 1	1139-1145	< 0.1 ppm	< 0.3 mg/m3	< 0.04 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.3 mg/m3	< 0.04 g/min
	Average		**< 0.1 ppm**	**< 0.3 mg/m3**	**< 0.04 g/min**
Dimethyl Sulfide	Test 1	1139-1145	< 0.1 ppm	< 0.3 mg/m3	< 0.04 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.3 mg/m3	< 0.04 g/min
	Average		**< 0.1 ppm**	**< 0.3 mg/m3**	**< 0.04 g/min**
n-Propyl Mercaptan	Test 1	1139-1145	< 0.1 ppm	< 0.3 mg/m3	< 0.05 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.3 mg/m3	< 0.05 g/min
	Average		**< 0.1 ppm**	**< 0.3 mg/m3**	**< 0.05 g/min**
Thiophene	Test 1	1139-1145	< 0.1 ppm	< 0.4 mg/m3	< 0.06 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.4 mg/m3	< 0.06 g/min
	Average		**< 0.1 ppm**	**< 0.4 mg/m3**	**< 0.06 g/min**
n-Butyl Mercaptan	Test 1	1139-1145	< 0.1 ppm	< 0.4 mg/m3	< 0.06 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.4 mg/m3	< 0.06 g/min
	Average		**< 0.1 ppm**	**< 0.4 mg/m3**	**< 0.06 g/min**
Tetrahydrothiophene	Test 1	1139-1145	< 0.1 ppm	< 0.4 mg/m3	< 0.06 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.4 mg/m3	< 0.06 g/min
	Average		**< 0.1 ppm**	**< 0.4 mg/m3**	**< 0.06 g/min**
Total Reduced Sulphur Compounds (as H_2S)	Test 1	1139-1145	< 0.1 ppm	< 0.2 mg/m3	< 0.02 g/min
	Test 2	1147-1153	< 0.1 ppm	< 0.2 mg/m3	< 0.02 g/min
	Average		**< 0.1 ppm**	**< 0.2 mg/m3**	**< 0.02 g/min**

Note: Reduced sulphur compounds were measured to verify results of installed continuous online instrumentation which measures Total Reduced Sulphur (as H_2S).

Refer to "SAMPLING PLANE OBSERVATIONS" on page 9.

EPA Point 3 – Solvent Extraction Plant Scrubber

26 June 2013



Flow Results	Measured MW		DP 3 - SEP Scrubber 130296
Time of flow test		0830 & 0953	hrs
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		2.9	m/s
Average temperature		46	°C
Moisture content	Alt008	11	% v/v
Flow rate at discharge conditions		2.5	m³/sec
Flow rate at wet NTP conditions		2.1	m³/sec
Flow rate at dry NTP conditions		1.9	m³/sec

Continuous Analyser Results DP 3 - SEP Scrubber 130296 110	Sampling Times	Concentration at NTP			Mass rate		
Oxygen (dry basis)	0841-0941		20.9	% v/v		-	
Carbon dioxide (dry basis)	0841-0941	<	0.3	% v/v	<	40	kg/hour
Dry gas density	0841-0941		1.3	kg/m3		-	
Molecular weight of stack gas, dry basis	0841-0941		29	g/g-mole		-	

Volatile Organic Compound (VOC) Results DP 3 - SEP Scrubber 130296 110	Sampling Times	Concentration at NTP		Mass rate	
Hexane	0841-0941	55	mg/m3	6.3	g/min
Cyclohexane	0841-0941	2.6	mg/m3	0.29	g/min
Total VOCs as n-Propane	0841-0941	29	mg/m3	3.4	g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotoluene), Benzoyl Chloride, Naphthalene, Dodecane

EPA Point 3 – Solvent Extraction Plant Scrubber

26 June 2013

Manual Sampling Results	DP 3 - SEP Scrubber 130296 110	Sampling Times	Concentration at NTP			Concentration at NTP			Mass rate		
Hydrogen Sulphide	Test 1	0856-0902		5.6	ppm		8.5	mg/m3		0.97	g/min
	Test 2	0904-0909		4.9	ppm		7.5	mg/m3		0.85	g/min
	Average			**5.3**	**ppm**		**8.0**	**mg/m3**		**0.91**	**g/min**
Carbonyl Sulphide	Test 1	0856-0902		0.10	ppm		0.27	mg/m3		0.031	g/min
	Test 2	0904-0909		0.10	ppm		0.27	mg/m3		0.031	g/min
	Average			**0.10**	**ppm**		**0.27**	**mg/m3**		**0.031**	**g/min**
Methyl Mercaptan	Test 1	0856-0902	<	0.1	ppm	<	0.2	mg/m3	<	0.02	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.2	mg/m3	<	0.02	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.2**	**mg/m3**	**<**	**0.02**	**g/min**
Ethyl Mercaptan	Test 1	0856-0902	<	0.1	ppm	<	0.3	mg/m3	<	0.03	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.3	mg/m3	<	0.03	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.3**	**mg/m3**	**<**	**0.03**	**g/min**
Dimethyl Sulfide	Test 1	0856-0902	<	0.1	ppm	<	0.3	mg/m3	<	0.03	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.3	mg/m3	<	0.03	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.3**	**mg/m3**	**<**	**0.03**	**g/min**
n-Propyl Mercaptan	Test 1	0856-0902	<	0.1	ppm	<	0.3	mg/m3	<	0.04	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.3	mg/m3	<	0.04	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.3**	**mg/m3**	**<**	**0.04**	**g/min**
Thiophene	Test 1	0856-0902	<	0.1	ppm	<	0.4	mg/m3	<	0.04	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.4	mg/m3	<	0.04	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.4**	**mg/m3**	**<**	**0.04**	**g/min**
n-Butyl Mercaptan	Test 1	0856-0902	<	0.1	ppm	<	0.4	mg/m3	<	0.05	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.4	mg/m3	<	0.05	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.4**	**mg/m3**	**<**	**0.05**	**g/min**
Tetrahydrothiophene	Test 1	0856-0902	<	0.1	ppm	<	0.4	mg/m3	<	0.04	g/min
	Test 2	0904-0909	<	0.1	ppm	<	0.4	mg/m3	<	0.04	g/min
	Average		**<**	**0.1**	**ppm**	**<**	**0.4**	**mg/m3**	**<**	**0.04**	**g/min**
Total Reduced Sulphur Compounds (as H_2S)	Test 1	0856-0902		5.7	ppm		8.7	mg/m3		0.99	g/min
	Test 2	0904-0909		5.0	ppm		7.7	mg/m3		0.87	g/min
	Average			**5.4**	**ppm**		**8.2**	**mg/m3**		**0.93**	**g/min**

Note: Reduced sulphur compounds were measured to verify results of installed continuous online instrumentation which measures Total Reduced Sulphur (as H_2S).

Refer to "SAMPLING PLANE OBSERVATIONS" on page 9.

EPA Point 13 – Earth Conveying System

26 June 2013

Flow Results	Measured MW	DP 13 - Earth Conveying System 130296	
Time of flow test		1630 & 1735	hrs
Stack dimensions at sampling plane		130	mm
Velocity at sampling plane		11	m/s
Average temperature		33	°C
Moisture content	Method4	0.96	% v/v
Flow rate at discharge conditions		0.14	m³/sec
Flow rate at wet NTP conditions		0.12	m³/sec
Flow rate at dry NTP conditions		0.12	m³/sec

Isokinetic Sampling Results DP 13 - Earth Conveying System 130296 7.4	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Particulate matter	1631-1731	9.1	mg/m3	0.067	g/min
No. of sampling points			*4*		
Length of sampling, min			*60*		
Stack gas molecular weight, g/g-mole (wet)			*28.8*		
Stack gas density, kg/m^3, at wet NTP			*1.29*		

Continuous Analyser Results DP 13 - Earth Conveying System 130296 7.4	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Oxygen (dry basis)	1631-1731	20.9	% v/v	-	
Carbon dioxide (dry basis)	1631-1731	< 0.3	% v/v	< 3	kg/hour
Dry gas density	1631-1731	1.3	kg/m3	-	
Molecular weight of stack gas, dry basis	1631-1731	29	g/g-mole	-	

Refer to “SAMPLING PLANE OBSERVATIONS” on page 9.

EPA Point 15 – High Pressure Steam Generator

26 June 2013

Flow Results	Measured MW	DP 15 - HP Steam Generator 130296	
Time of flow test		1433 & 1546	hrs
Stack dimensions at sampling plane		305	mm
Velocity at sampling plane		2.9	m/s
Average temperature		180	°C
Moisture content	Alt008	8.5	% v/v
Flow rate at discharge conditions		0.21	m³/sec
Flow rate at wet NTP conditions		0.12	m³/sec
Flow rate at dry NTP conditions		0.11	m³/sec

Continuous Analyser Results DP 15 - HP Steam Generator 130296 6.8	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)	1454-1554	12.9	% v/v	-		-	
Carbon dioxide (dry basis)	1454-1554	4.4	% v/v	-		36	kg/hour
Dry gas density	1454-1554	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis	1454-1554	29	g/g-mole	-		-	
Nitrogen oxides as NO_2	1454-1554	65	mg/m3	150	mg/m3	0.44	g/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 9.

SAMPLING PLANE OBSERVATIONS

EPA Point 2 – Combined Vent Stack

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) from the standard were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.
(e) The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of the highest to lowest gas velocities shall not exceed 3:1.

EPA Point 3 – Solvent Extraction Plant Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) from the standard were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.
(e) The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of the highest to lowest gas velocities shall not exceed 3:1.

EPA Point 13 – Earth Conveying System

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be “ideal” as per AS4323.1. It was more than the required 2 duct diameters upstream from a bend. It was more than the required 6 duct diameters downstream from a bend. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 15 – High Pressure Steam Generator

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) from the standard were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

PLANT OPERATING CONDITIONS

Plant operating conditions were supplied by Riverina Oils & Bio Energy Pty Ltd personnel. Operating conditions were normal at the time of sampling except as outlined below;

EPA Point 3 – Solvent Extraction Plant Scrubber

The scrubber was offline and by-passed during sampling due to equipment issues.

EPA Point 13 – Earth Conveying System

One 650kg bag of bleached earth was added during sampling. The operating time of the conveying system was extended to 60 minutes to allow the sampling to be completed. Normally one bag of bleached earth is required per shift and takes 30 minutes to add.

TEST METHODS

The following methods are accredited with the National Association of Testing Authorities (NATA) and are approved for the sampling and analysis of gases unless otherwise stated. Specific details of the methods are available on request.

All sampling and analysis will be conducted in accordance with the test methods (TM) prescribed in NSW EPA's *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* Jan 2007 and in accordance with the *Protection of the Environment Operations (Clean Air) Regulation* 2010 unless otherwise specified.

All parameters are reported adjusted to dry NTP conditions unless otherwise stated.

Parameter	Sampling			Analysis			
	NATA	NSW TM Method	Sampling Method	NATA	Analytical Laboratory	Analytical Method	Analytical Laboratory Report Number(s)
Selection of sampling positions	Yes	TM-1	AS4323.1	Yes	-	-	
Flow rate	Yes	TM-2	USEPA 2	Yes	-	-	-
Velocity	Yes	TM-2	USEPA 2	Yes	-	-	-
Temperature	Yes	TM-2	USEPA 2	Yes	-	-	-
Moisture	Yes	TM-22	USEPA 4 & ALT008	Yes	-	-	-
Particulate matter	Yes	TM-15	AS4323.2	Yes	Emission Testing Consultants	AS4323.2	130296r
Dry gas Density	Yes	TM-23	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130296r
Molecular weight	Yes	TM-23	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130296r
Carbon dioxide (CO_2)	Yes	TM-24	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130296r
Oxygen (O_2)	Yes	TM-25	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130296r
Nitrogen oxides (NO_x) as NO_2	Yes	TM-11	USEPA 7E	Yes	Emission Testing Consultants	USEPA 7E	130296r
Hydrogen sulphide (H_2S)	Yes	TM-5	USEPA 11	Yes	SGS Australia Pty Ltd	AN513	60495
Volatile organic compounds (VOC)	Yes	TM-34	USEPA 18	Yes	SGS Australia Pty Ltd	AN467	60495
Sulphur Compounds (Hydrogen Sulphide, Carbonyl Sulphide, Methyl Mercaptan, Ethyl Mercaptan, Dimethyl Sulfide, n-Propyl Mercaptan, Thiophene, n-Butyl Mercaptan, Tetrahydrothiophene)	Yes	TM-33	ETC 200	Yes	SGS Leeder Consulting	MA-1113I.AIR.02 Sulphur Gases	M131402

DEFINITIONS

The following symbols and abbreviations are used in test reports:

BSP	British standard pipe.
Concentration	Mass of analyte per cubic metre expressed at NTP dry conditions (ng, µg or mg/m^3).
Dioxins & furans	2,3,7,8-substituted polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans) PCDF
Dioxin & furan TEQ values	Toxic equivalent. The TEQ values have been calculated using the toxicity equivalence factors (TEF) according to the World Health Organisation (2005)
Flow rate at discharge conditions	Volume of gas flow per unit time expressed at discharge temperature, pressure and moisture content (m^3/min).
Flow rate at wet NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and discharge moisture content (m^3/min).
Flow rate at dry NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and 0% moisture content (m^3/min).
Lowerbound	(Lower) results do not include any limit of detection values (< values).
Mass rate	Mass of analyte per unit time (µg, mg or g/min).
Mediumbound	(Medium) results include half limit of detection values (< values).
Moisture content	Percentage of gaseous moisture in the gas expressed on a volume / volume percentage basis. This does not include moisture in the gas stream that is in the liquid phase (free moisture).
NA	Not applicable.
NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry (wet in the case of odour only) basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Odour concentration	Number of odour units (ou).
Odour flux rate	Odour emission rate per unit surface area per unit time (ou/m^2/min).

Odour mass rate	Odour emission rate per unit time (ou/min).
Odour unit	One odour unit (ou) is that concentration of odorant(s) at standard concentrations that elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PAH’s	Polycyclic aromatic hydrocarbons.
PAH’s TEQ values	The TEQ values have been calculated using the toxicity equivalence factors (TEF's) relative to Benzo(a)pyrene, as reported by Larsen & Larsen (1998) (TEF factors reported in the 2003 World Health Organisation (WHO) report E78963 - HEALTH RISKS OF PERSISTENT ORGANIC POLLUTANTS FROM LONG-RANGE TRANSBOUNDARY AIR POLLUTION).
ppm	Parts per million expressed on a volume / volume wet basis.
Sampling plane	Location at which measurements were conducted.
TOC	Total Organic Compounds. Total gaseous organic concentration of vapours consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons) The concentration can be expressed in terms of propane, hexane (or other appropriate organic calibration gas) or in terms of methane.
Velocity	Gas velocity expressed at discharge temperature, pressure and moisture content (m/s)
VOC	Any chemical compound based on carbon in the boiling range 36 to 126°C, with a vapour pressure of at least 0.010kPa at 25°C (or having a corresponding volatility under the particular conditions of use) that adsorb onto activated charcoal and desorb into CS_2, or that can be collected in a tedlar bag and be quantitatively recovered, and that are detected by GCMS. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are CO, CO_2, carbonic acid, metallic carbides and carbonate salts.
>	Greater than.
<	Less than the minimum limit of detection using the specified method.
~	Approximately.

etc
emissiontestingconsultants
Environmental Partners

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QLD
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Geebung QLD 4034

NSW
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ABN 74 474 273 172

Date: 29 August 2013

Report No: 130438r

Page: 1 of 15

Riverina Oils & BioEnergy Pty Ltd
177 Trahairs Rd, Bomen
Wagga Wagga NSW 2650

Emission Testing – August 2013
Quarterly Emission Sampling

Dear Mr Daniel Challis,

Tests were performed 6th and 7th of August 2013 to determine emissions to air from seven locations at the Bomen plant of Riverina Oils & Bio Energy Pty Ltd.

Yours faithfully
Emission Testing Consultants

David Corbett Ba/BCom
Client Manager

LICENCE COMPARISON

EPA No.	Location Description	Pollutant	Unit of measure	Licence limit	Measured values	Measured values (corrected to 3% O$_2$)
2	Combined Vent Stack	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	14	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	< 0.04	NA
3	Solvent Extraction Plant Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	32	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	0.32	NA
4	Boiler House Stack 1	Nitrogen Oxides (as NO^2)	milligrams per cubic meter (mg/m^3)	350	110	110
7	Combined Vent Stack	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	< 2	NA
13	Earth Conveying System	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	8	NA
14	Filter Blowing Vapour Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	370	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	< 0.04	NA
15	High Pressure Steam Generator	Nitrogen Oxides (as NO^2)	milligrams per cubic meter (mg/m^3)	350	56	130

Note: All analytes highlighted in green are below the Licence Limit set by the NSW EPA as per licence 13097 (last amended on 16/08/2013). The analyte highlighted in red is above the Licence Limit. Results from EPA Points 4 and 15 have also been corrected to 3% Oxygen as stipulated in Part 3, Schedule 5 of the *Protection of the Environment Operations (Clean Air) Regulation, (NSW)* 2010.

EXECUTIVE SUMMARY

Emission Testing Consultants (ETC) was engaged by Riverina Oils & BioEnergy Pty Ltd (ROBE) to perform emission monitoring pursuant to Environment Protection Licence (EPL) 13097. Monitoring was performed at seven locations for the following parameters;

Discharge point	Selection of sampling positions	Flow rate	Velocity	Temperature	Moisture	**Particulate matter**	Dry gas Density	Molecular weight	**Carbon dioxide (CO2)**	**Oxygen (O2)**	**Nitrogen oxides (NOx) as NO2**	**Hydrogen sulphide (H2S)**	**Volatile organic compounds (VOC)**	**Total Reduced Sulphur Compounds**
EPA Point 2 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓				✓		
EPA Point 3 Solvent Extraction Plant Scrubber	✓	✓	✓	✓	✓		✓	✓				✓	✓	
EPA Point 4 Boiler House Stack 1	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			
EPA Point 7 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓						
EPA Point 13 Earth Conveying System	✓	✓	✓	✓	✓	✓	✓	✓						
EPA Point 14 Filter Blowing Vapour Scrubber	✓	✓	✓	✓	✓		✓	✓				✓	✓	✓
EPA Point 15 High Pressure Steam Generator	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			

This formed the second round of quarterly monitoring for 2013.

The methodologies chosen by ETC are those stipulated in ROBE's EPL, and as prescribed in the NSW EPA publication, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* 2007.

RESULTS

EPA Point 2 – Combined Vent Stack

7 August 2013

Flow Results	Measured MW	DP 2 - Combined Service Vent 130438	
Time of flow test		1500 & 1630	hrs
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		3.8	m/s
Average temperature		40	°C
Moisture content	Method4	3.4	% v/v
Flow rate at discharge conditions		3.3	m³/sec
Flow rate at wet NTP conditions		2.8	m³/sec
Flow rate at dry NTP conditions		2.7	m³/sec

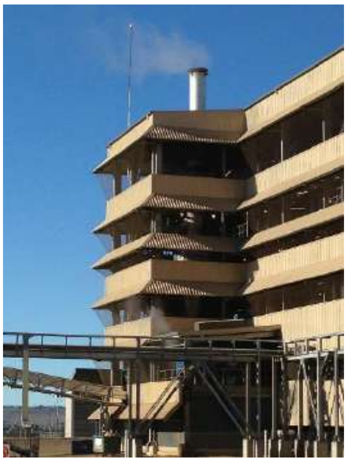
Isokinetic Sampling Results DP 2 - Combined Service Vent 130438 160	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Total Solid Particles	1502-1625	14	mg/m3	2.3	g/min
No. of sampling points			*16*		
Length of sampling, min			*80*		
Stack gas molecular weight, g/g-mole (wet)			*28.5*		
Stack gas density, (kg/m^3) at wet NTP			*1.27*		

Manual Sampling Results DP 2 - Combined Service Vent 130438 160	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Hydrogen sulphide	1530-1630	< 0.04	mg/m3	< 0.007	g/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 11.

EPA Point 3 – Solvent Extraction Plant Scrubber

7 August 2013



Flow Results	Measured MW	DP 3 - SEP Scrubber 130438	
Time of flow test		1153 & 1445	hrs
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		4.9	m/s
Average temperature		46	°C
Moisture content	Alt008	10	% v/v
Flow rate at discharge conditions		4.2	m³/sec
Flow rate at wet NTP conditions		3.5	m³/sec
Flow rate at dry NTP conditions		3.2	m³/sec

Manual Sampling Results DP 3 - SEP Scrubber 130438 190	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Hydrogen sulphide	1242-1255	0.32	mg/m3	0.061	g/min

Volatile Organic Compound (VOC) Results DP 3 - SEP Scrubber 130438 190	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Hexane	1340-1441	59	mg/m3	11	g/min
Cyclohexane	1340-1441	2.9	mg/m3	0.56	g/min
Total VOCs (as n-Propane)	1340-1441	32	mg/m3	6.1	g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotoluene), Benzoyl Chloride, Naphthalene, Dodecane

Refer to "SAMPLING PLANE OBSERVATIONS" on page 11.

EPA Point 4 – Boiler House Stack 1

6 August 2013

Flow Results	Measured MW	DP4 - Boiler House Stack 130438	
Time of flow test		1605 & 1725	hrs
Stack dimensions at sampling plane		1025	mm
Velocity at sampling plane		3.9	m/s
Average temperature		106	°C
Moisture content	Alt008	10	% v/v
Flow rate at discharge conditions		3.2	m³/sec
Flow rate at wet NTP conditions		2.3	m³/sec
Flow rate at dry NTP conditions		2.1	m³/sec

Continuous Analyser Results DP4 - Boiler House Stack 130438 120	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)	1617-1717	2.6	% v/v	-		-	
Carbon dioxide (dry basis)	1617-1717	10.3	% v/v	-		-	
Dry gas density	1617-1717	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis	1617-1717	30	g/g-mole	-		-	
Nitrogen oxides as NO_2	1617-1717	110	mg/m3	110	mg/m3	14	g/min

Refer to “SAMPLING PLANE OBSERVATIONS” on page 11.

EPA Point 7 – Combined Vent Stack

7 August 2013

Flow Results	Measured MW		DP7 - Combined Vent Stack 130438
Time of flow test		1658 & 1830	hrs
Stack dimensions at sampling plane		845	mm
Velocity at sampling plane		10	m/s
Average temperature		25	°C
Moisture content	Method4	0.96	% v/v
Flow rate at discharge conditions		5.8	m³/sec
Flow rate at wet NTP conditions		5.1	m³/sec
Flow rate at dry NTP conditions		5.1	m³/sec

Isokinetic Sampling Results DP7 - Combined Vent Stack 130438 310	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Total Solid Particles	1701-1826	< 2 mg/m3	< 0.5 g/min
No. of sampling points		*16*	
Length of sampling, min		*80*	
Stack gas molecular weight, g/g-mole (wet)		*28.8*	
Stack gas density, (kg/m^3) at wet NTP		*1.29*	

Refer to "SAMPLING PLANE OBSERVATIONS" on page 11.

EPA Point 13 – Earth Conveying System

7 August 2013

Flow Results	Measured MW	DP 13 - Earth Conveying System 130438	
Time of flow test		0828 & 0856	hrs
Stack dimensions at sampling plane		130	mm
Velocity at sampling plane		10	m/s
Average temperature		30	°C
Moisture content	Method4	4.0	% v/v
Flow rate at discharge conditions		0.14	m³/sec
Flow rate at wet NTP conditions		0.12	m³/sec
Flow rate at dry NTP conditions		0.11	m³/sec

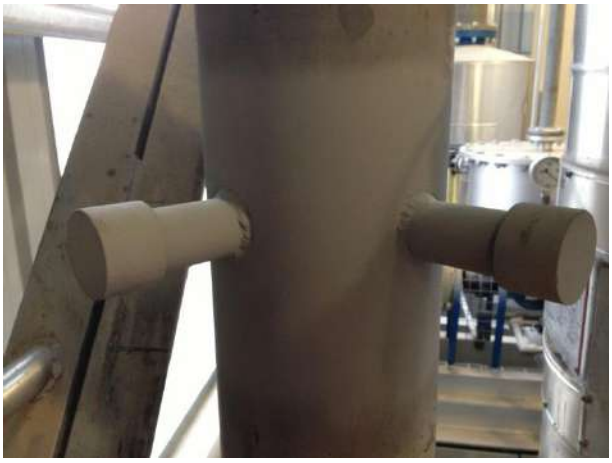
Isokinetic Sampling Results	DP 13 - Earth Conveying System 130438 6.8	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Total Solid Particles		0830-0852	8.0	mg/m3	0.055	g/min
No. of sampling points			*2*			
Length of sampling, min			*22*			
Stack gas molecular weight, g/g-mole (wet)			*28.5*			
Stack gas density, (kg/m ^{3}), at wet NTP			*1.27*			

Refer to “SAMPLING PLANE OBSERVATIONS” on page 11.

Refer to “DEVIATION FROM TEST METHODS” on page 12.

EPA Point 14 – Filter Blowing Vapour Scrubber

7 August 2013



Flow Results	Measured MW			DP14 - Filter Blowing Vapour Scrubber 130438
Time of flow test			1000 & 1120	hrs
Stack dimensions at sampling plane			310	mm
Velocity at sampling plane		<	2	m/s
Average temperature			32	°C
Moisture content	Alt008		11	% v/v
Flow rate at discharge conditions		<	0.2	m³/sec
Flow rate at wet NTP conditions		<	0.1	m³/sec
Flow rate at dry NTP conditions		<	0.1	m³/sec

Volatile Organic Compound (VOC) Results DP14 - Filter Blowing Vapour Scrubber 130438 7	**Sampling Times**	**Concentration at NTP**		**Mass rate**		
Hexane	1015-1115	380	mg/m3	<	3	g/min
Cyclohexane	1015-1115	260	mg/m3	<	2	g/min
Benzene	1015-1115	31	mg/m3	<	0.2	g/min
Toluene	1015-1115	31	mg/m3	<	0.2	g/min
Ethylbenzene	1015-1115	1.4	mg/m3	<	0.01	g/min
m&p-Xylenes	1015-1115	18	mg/m3	<	0.1	g/min
o-Xylene	1015-1115	0.59	mg/m3	<	0.004	g/min
Total VOCs (as n-Propane)	1015-1115	370	mg/m3	<	3	g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotolune), Benzoyl Chloride, Naphthalene, Dodecane

Refer to “SAMPLING PLANE OBSERVATIONS” on page 11.

EPA Point 14 – Filter Blowing Vapour Scrubber

7 August 2013

Manual Sampling Results	DP14 - Filter Blowing Vapour Scrubber 130438 7	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Hydrogen sulphide		1015-1115	< 0.04 mg/m3	< 0.0003 g/min

Manual Sampling Results	DP14 - Filter Blowing Vapour Scrubber 130438 7	**Sampling Times**	**Concentration at NTP**	**Concentration at NTP**	**Mass rate**
Hydrogen sulphide	Test 1	1035-1039	< 0.1 ppm	< 0.2 mg/m3	< 0.001 g/min
	Test 2	1040-1044	< 0.1 ppm	< 0.2 mg/m3	< 0.001 g/min
	Average		**< 0.1 ppm**	**< 0.2 mg/m3**	**< 0.001 g/min**
Carbonyl Sulphide	Test 1	1035-1039	0.40 ppm	1.1 mg/m3	< 0.008 g/min
	Test 2	1040-1044	0.40 ppm	1.1 mg/m3	< 0.008 g/min
	Average		**0.40 ppm**	**1.1 mg/m3**	**< 0.008 g/min**
Methyl Mercaptan	Test 1	1035-1039	0.60 ppm	1.3 mg/m3	< 0.009 g/min
	Test 2	1040-1044	0.60 ppm	1.3 mg/m3	< 0.009 g/min
	Average		**0.60 ppm**	**1.3 mg/m3**	**< 0.009 g/min**
Ethyl Mercaptan	Test 1	1035-1039	< 0.1 ppm	< 0.3 mg/m3	< 0.002 g/min
	Test 2	1040-1044	< 0.1 ppm	< 0.3 mg/m3	< 0.002 g/min
	Average		**< 0.1 ppm**	**< 0.3 mg/m3**	**< 0.002 g/min**
Dimethyl Sulphide	Test 1	1035-1039	5.2 ppm	14 mg/m3	< 0.1 g/min
	Test 2	1040-1044	4.9 ppm	14 mg/m3	< 0.10 g/min
	Average		**5.1 ppm**	**14 mg/m3**	**< 0.10 g/min**
N-Propyl Mercaptan	Test 1	1035-1039	< 0.1 ppm	< 0.3 mg/m3	< 0.002 g/min
	Test 2	1040-1044	< 0.1 ppm	< 0.3 mg/m3	< 0.002 g/min
	Average		**< 0.1 ppm**	**< 0.3 mg/m3**	**< 0.002 g/min**
Thiophene	Test 1	1035-1039	< 0.1 ppm	< 0.4 mg/m3	< 0.003 g/min
	Test 2	1040-1044	< 0.1 ppm	< 0.4 mg/m3	< 0.003 g/min
	Average		**< 0.1 ppm**	**< 0.4 mg/m3**	**< 0.003 g/min**
N-Butyl Mercaptan	Test 1	1035-1039	< 0.1 ppm	< 0.4 mg/m3	< 0.003 g/min
	Test 2	1040-1044	< 0.1 ppm	< 0.4 mg/m3	< 0.003 g/min
	Average		**< 0.1 ppm**	**< 0.4 mg/m3**	**< 0.003 g/min**
Tetrahydrothiophene	Test 1	1035-1039	< 0.1 ppm	< 0.4 mg/m3	< 0.003 g/min
	Test 2	1040-1044	< 0.1 ppm	< 0.4 mg/m3	< 0.003 g/min
	Average		**< 0.1 ppm**	**< 0.4 mg/m3**	**< 0.003 g/min**
Total Reduced Sulphur Compounds (as H2S)	Test 1	1035-1039	6.2 ppm	9.433 mg/m3	< 0.07 g/min
	Test 2	1040-1044	5.4 ppm	8.976 mg/m3	< 0.06 g/min
	Average		**5.8 ppm**	**9.2 mg/m3**	**< 0.06 g/min**

EPA Point 15 – High Pressure Steam Generator

6 August 2013

Flow Results	Measured MW	DP 15 - HP Steam Generator 130438	
Time of flow test		1255 & 1406	hrs
Stack dimensions at sampling plane		305	mm
Velocity at sampling plane		3.9	m/s
Average temperature		198	°C
Moisture content	Alt008	8.4	% v/v
Flow rate at discharge conditions		0.29	m³/sec
Flow rate at wet NTP conditions		0.16	m³/sec
Flow rate at dry NTP conditions		0.15	m³/sec

Continuous Analyser Results DP 15 - HP Steam Generator 130438 9.0	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)	1303-1402	13.1	% v/v	-		-	
Carbon dioxide (dry basis)	1303-1402	4.4	% v/v	-		-	
Dry gas density	1303-1402	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis	1303-1402	29	g/g-mole	-		-	
Nitrogen oxides as NO_2	1303-1402	56	mg/m3	130	mg/m3	0.50	g/min

Refer to “SAMPLING PLANE OBSERVATIONS” on page 11.

SAMPLING PLANE OBSERVATIONS

EPA Point 2 – Combined Vent Stack

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.
(e) The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of the highest to lowest gas velocities shall not exceed 3:1.

EPA Point 3 – Solvent Extraction Plant Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 4 – Boiler House Stack 1

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 2.5 duct diameters less than the required 6 duct diameters downstream from a bend. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 7 – Combined Vent Stack

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 13 – Earth Conveying System

The sampling plane had 1 x 2 inch BSP Ports. The location was determined to be “ideal” as per AS4323.1. It was more than the required 2 duct diameters upstream from a bend. It was more than the required 6 duct diameters downstream from a bend. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 14 – Filter Blowing Vapour Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be "ideal" as per AS4323.1. It was more than the required 2 duct diameters upstream from the exit. It was more than the required 6 duct diameters downstream from a centrifugal fan. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore "non-compliant". The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

EPA Point 15 – High Pressure Steam Generator

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be "non-ideal" as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore "non-compliant". The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

DEVIATION FROM TEST METHODS

EPA Point 13 – Earth Conveying System

Sampling for Total Solid Particles was conducted for 22 minutes instead of the 60 minute minimum duration specified in Schedule 5 of *Protection of the Environment Operations (Clean Air) Regulation* 2010. The 22 minute duration equates to the time taken to unload a 650kg bag of bleached earth. The earth conveying system only operates when this unloading occurs, normally once per shift. The sampling conducted is thus representative of normal operating conditions.

PLANT OPERATING CONDITIONS

Plant operating conditions were supplied by Riverina Oils & BioEnergy Pty Ltd personnel. Operating conditions were considered normal for duration of all testing.

TEST METHODS

The following methods are accredited with the National Association of Testing Authorities (NATA) and are approved for the sampling and analysis of gases unless otherwise stated. Specific details of the methods are available on request.

All sampling and analysis will be conducted in accordance with the test methods (TM) prescribed in NSW EPA's *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* Jan 2007 and in accordance with the *Protection of the Environment Operations (Clean Air) Regulation* 2010 unless otherwise specified.

All parameters are reported adjusted to dry NTP conditions unless otherwise stated.

Parameter	**Sampling**			**Analysis**			
	NATA	**NSW TM Method**	**Sampling Method**	**NATA**	**Analytical Laboratory**	**Analytical Method**	**Analytical Laboratory Report Number(s)**
Selection of sampling positions	Yes	TM-1	AS4323.1	Yes	Emission Testing Consultants	AS4323.1	130438r
Flow rate	Yes	TM-2	USEPA 2	Yes	Emission Testing Consultants	USEPA 2	130438r
Velocity	Yes	TM-2	USEPA 2	Yes	Emission Testing Consultants	USEPA 2	130438r
Temperature	Yes	TM-2	USEPA 2	Yes	Emission Testing Consultants	USEPA 2	130438r
Moisture	Yes	TM-22	USEPA 4 & ALT008	Yes	Emission Testing Consultants	USEPA 4 & ALT008	130438r
Particulate matter	Yes	TM-15	AS4323.2	Yes	Emission Testing Consultants	AS4323.2	130438r
Dry gas Density	Yes	TM-23	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130438r
Molecular weight	Yes	TM-23	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130438r
Carbon dioxide (CO_2)	Yes	TM-24	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130438r
Oxygen (O_2)	Yes	TM-25	USEPA 3A	Yes	Emission Testing Consultants	USEPA 3A	130438r
Nitrogen oxides (NO_x) as NO_2	Yes	TM-11	USEPA 7E	Yes	Emission Testing Consultants	USEPA 7E	130438r
Hydrogen sulphide (H_2S)	Yes	TM-5	USEPA 11	Yes	Eurofins/MGT	USEPA11	389203-A
Volatile organic compounds (VOC)	Yes	TM-34	USEPA 18	Yes	SGS Australia Pty Ltd	AN467	62716
Sulphur Compounds (Hydrogen Sulphide, Carbonyl Sulphide, Methyl Mercaptan, Ethyl Mercaptan, Dimethyl Sulfide, n-Propyl Mercaptan, Thiophene, n-Butyl Mercaptan, Tetrahydrothiophene)	Yes	TM-33	ETC 200	Yes	SGS Leeder Consulting	MA-1113I.AIR.02 Sulphur Gases	M131739

DEFINITIONS

The following symbols and abbreviations are used in test reports:

BSP	British standard pipe.
Concentration	Mass of analyte per cubic metre expressed at NTP dry conditions (ng, µg or mg/m^3).
Dioxins & furans	2,3,7,8-substituted polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans) PCDF
Dioxin & furan TEQ values	Toxic equivalent. The TEQ values have been calculated using the toxicity equivalence factors (TEF) according to the World Health Organisation (2005)
Flow rate at discharge conditions	Volume of gas flow per unit time expressed at discharge temperature, pressure and moisture content (m^3/min).
Flow rate at wet NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and discharge moisture content (m^3/min).
Flow rate at dry NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and 0% moisture content (m^3/min).
Lowerbound	(Lower) results do not include any limit of detection values (< values).
Mass rate	Mass of analyte per unit time (µg, mg or g/min).
Mediumbound	(Medium) results include half limit of detection values (< values).
Moisture content	Percentage of gaseous moisture in the gas expressed on a volume / volume percentage basis. This does not include moisture in the gas stream that is in the liquid phase (free moisture).
NA	Not applicable.
NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry (wet in the case of odour only) basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Odour concentration	Number of odour units (ou).
Odour flux rate	Odour emission rate per unit surface area per unit time (ou/m^2/min).

Odour mass rate	Odour emission rate per unit time (ou/min).
Odour unit	One odour unit (ou) is that concentration of odorant(s) at standard concentrations that elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PAH's	Polycyclic aromatic hydrocarbons.
PAH's TEQ values	The TEQ values have been calculated using the toxicity equivalence factors (TEF's) relative to Benzo(a)pyrene, as reported by Larsen & Larsen (1998) (TEF factors reported in the 2003 World Health Organisation (WHO) report E78963 - HEALTH RISKS OF PERSISTENT ORGANIC POLLUTANTS FROM LONG-RANGE TRANSBOUNDARY AIR POLLUTION).
ppm	Parts per million expressed on a volume / volume wet basis.
Sampling plane	Location at which measurements were conducted.
TOC	Total Organic Compounds. Total gaseous organic concentration of vapours consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons) The concentration can be expressed in terms of propane, hexane (or other appropriate organic calibration gas) or in terms of methane.
Velocity	Gas velocity expressed at discharge temperature, pressure and moisture content (m/s)
VOC	Any chemical compound based on carbon in the boiling range 36 to 126°C, with a vapour pressure of at least 0.010kPa at 25°C (or having a corresponding volatility under the particular conditions of use) that adsorb onto activated charcoal and desorb into CS_2, or that can be collected in a tedlar bag and be quantitatively recovered, and that are detected by GCMS. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are CO, CO_2, carbonic acid, metallic carbides and carbonate salts.
>	Greater than.
<	Less than the minimum limit of detection using the specified method.
~	Approximately.

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emissiontestingconsultants
Environmental Partners

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Date: 21 January 2014

Report No: 130641r

Page: 1 of 20

Riverina Oils & BioEnergy Pty Ltd
177 Trahairs Rd, Bomen
Wagga Wagga NSW 2650

Emission Testing – October 2013

Quarterly Emission Sampling & Investigatory Odour Monitoring

Dear Mr Daniel Challis,

Tests were performed on the 23rd and 24th of October 2013 to determine emissions to air from 7 plant locations as well as 3 boundary locations at the Bomen plant of Riverina Oils & Bio Energy Pty Ltd.

Yours faithfully
Emission Testing Consultants

Steven Cooper BEng (Env)
Quality Manager

sc@emission.com.au

EXECUTIVE SUMMARY

Emission Testing Consultants (ETC) was engaged by Riverina Oils & BioEnergy Pty Ltd (ROBE) to perform investigatory odour monitoring and emission monitoring pursuant to Environment Protection Licence (EPL) 13097. Monitoring was performed at seven plant locations and three boundary locations for the following parameters;

This report includes results pursuant to additional sampling undertaken to gain information on potential sources of odour at the ROBE site. This sampling is additional to that required by the EPL which has been reported separately in 130613r.

Discharge point	Selection of sampling positions	Flow rate	Velocity	Temperature	Moisture	**Particulate matter**	Dry gas Density	Molecular weight	**Carbon dioxide (CO2)**	**Oxygen (O2)**	**Nitrogen oxides (NOx) as NO2**	**Hydrogen sulphide (H2S)**	**Volatile organic compounds (VOC)**	**Total Reduced Sulphur Compounds**	**Odour**
EPA Point 2 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓
EPA Point 3 Solvent Extraction Plant Scrubber	✓	✓	✓	✓	✓		✓	✓				✓	✓	✓	✓
EPA Point 4 Boiler House Stack 1	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				
EPA Point 7 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓							
EPA Point 13 Earth Conveying System	✓	✓	✓	✓	✓	✓	✓	✓							
EPA Point 14 Filter Blowing Vapour Scrubber	✓	✓	✓	✓	✓		✓	✓				✓	✓	✓	✓
EPA Point 15 High Pressure Steam Generator	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				
Upwind Boundary - SW Boundary															✓
Downwind Boundary - E Boundary															✓
Downwind Boundary - N Boundary															✓

This formed the third round of quarterly monitoring for 2013.

The methodologies chosen by ETC are those stipulated in ROBE's EPL, and as prescribed in the NSW EPA publication, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* 2007*.* There were no technical issues in terms of sampling on the days of testing. Plant operating conditions have been noted in the report.

LICENCE COMPARISON

EPA No.	Location Description	Pollutant	Unit of measure	Licence limit	Measured values	Measured values (corrected to 3% O_2)
2	Combined Vent Stack	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**17**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**< 0.04**	NA
3	Solvent Extraction Plant Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	**16**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**0.37**	NA
4	Boiler House Stack 1	Nitrogen Oxides (as NO^2)	milligrams per cubic meter (mg/m^3)	350	**110**	**110**
7	Combined Vent Stack	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**< 2**	NA
13	Earth Conveying System	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**11**	NA
14	Filter Blowing Vapour Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	**63**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**< 0.04**	NA
15	High Pressure Steam Generator	Nitrogen Oxides (as NO^2)	milligrams per cubic meter (mg/m^3)	350	**63**	**150**

Note: All analytes highlighted in green are below the Licence Limit set by the NSW EPA as per licence 13097 (last amended on 16/08/2013). The analyte highlighted in red is above the Licence Limit. Results from EPA Points 4 and 15 have also been corrected to 3% Oxygen as stipulated in Part 3, Schedule 5 of the *Protection of the Environment Operations (Clean Air) Regulation, (NSW)* 2010.

RESULTS

EPA Point 2 – Combined Vent Stack

23 October 2013

Flow Results	Measured MW	DP 2 - Combined Service Vent 130641	
Date and time of flow test		23/10/2013 10:45	
Date and time of flow test		23/10/2013 12:15	
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		3.2	m/s
Average temperature		39	°C
Moisture content	Method4	4.6	% v/v
Flow rate at discharge conditions		2.7	m³/sec
Flow rate at wet NTP conditions		2.3	m³/sec
Flow rate at dry NTP conditions		2.2	m³/sec

Isokinetic Sampling Results DP 2 - Combined Service Vent 130641 130	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Particulate matter	1050-1212	17	mg/m3	2.2	g/min
No. of sampling points		*16*			
Length of sampling, min		*80*			
Stack gas molecular weight, g/g-mole (wet)		*28.4*			
Stack gas density, (kg/m^3) at wet NTP		*1.27*			

EPA Point 2 – Combined Vent Stack

24 October 2013

Flow Results	Measured MW	DP 2 - Combined Service Vent 130641	
Date and time of flow test		24/10/2013 14:28	
Date and time of flow test		24/10/2013 15:35	
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		2.9	m/s
Average temperature		42	°C
Moisture content	Method4	4.6	% v/v
Flow rate at discharge conditions		2.5	m³/sec
Flow rate at wet NTP conditions		2.2	m³/sec
Flow rate at dry NTP conditions		2.1	m³/sec

Manual Sampling Results DP 2 - Combined Service Vent 130613 120	**Sampling Times**	**Concentration at NTP**			**Mass rate**		
Hydrogen Sulphide	1430-1530	<	0.04	mg/m3	<	0.005	g/min
Hydrogen Sulphide (TM-33)	1433-1436	<	2	mg/m3	<	0.3	g/min
Carbonyl Sulphide	1433-1436	<	0.8	mg/m3	<	0.10	g/min
Methyl Mercaptan	1433-1436	<	0.6	mg/m3	<	0.08	g/min
Ethyl Mercaptan	1433-1436	<	0.8	mg/m3	<	0.1	g/min
Dimethyl Sulphide	1433-1436		1.3	mg/m3		0.16	g/min
N-Propyl Mercaptan	1433-1436	<	1	mg/m3	<	0.1	g/min
Thiophene	1433-1436	<	1	mg/m3	<	0.1	g/min
N-Butyl Mercaptan	1433-1436	<	1	mg/m3	<	0.1	g/min
Tetrahydrothiophene	1433-1436	<	1	mg/m3	<	0.1	g/min

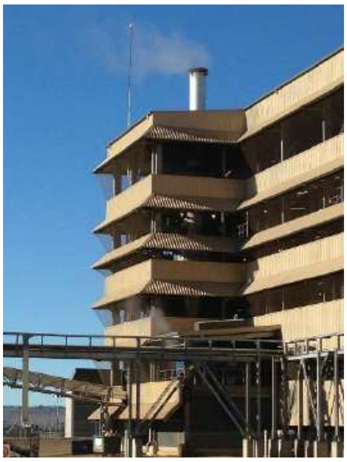
These results indicate the dimethyl sulphide was the main sulphur based compound measured at this location.

Odour Results DP 2 - Combined Service Vent 130641 120	**Sampling Times**	**Concentration at NTP Wet**		**Mass rate**	
Odour	1443-1453	4,200	ou	540,000	ouv/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 16.

EPA Point 3 – Solvent Extraction Plant Scrubber

24 October 2013



Flow Results	Measured MW		DP 3 - SEP Scrubber 130641
Date and time of flow test		24/10/2013 12:05	
Date and time of flow test		24/10/2013 13:23	
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		5.6	m/s
Average temperature		45	°C
Moisture content	Alt008	9.3	% v/v
Flow rate at discharge conditions		4.8	m³/sec
Flow rate at wet NTP conditions		4.0	m³/sec
Flow rate at dry NTP conditions		3.7	m³/sec

Continuous Analyser Results DP 3 - SEP Scrubber 130641220	**Sampling Times**	**Concentration at NTP**	
Dry gas density	1219-1319	1.3	kg/m3
Molecular weight of stack gas, dry basis	1219-1319	29	g/g-mole

Manual Sampling Results DP 3 - SEP Scrubber 130613 220	**Sampling Times**	**Concentration at NTP**			**Concentration at NTP**			**Mass rate**		
Hydrogen Sulphide (TM-5)	1215-1238					0.37	mg/m3		0.081	g/min
Hydrogen Sulphide (TM-33)	1224-1226		13	ppm		20	mg/m3		4.4	g/min
Carbonyl Sulphide	1224-1226	<	1	ppm	<	3	mg/m3	<	0.7	g/min
Methyl Mercaptan	1224-1226	<	1	ppm	<	3	mg/m3	<	0.6	g/min
Ethyl Mercaptan	1224-1226	<	1	ppm	<	3	mg/m3	<	0.7	g/min
Dimethyl Sulphide	1224-1226	<	1	ppm	<	3	mg/m3	<	0.7	g/min
N-Propyl Mercaptan	1224-1226	<	1	ppm	<	4	mg/m3	<	0.9	g/min
Thiophene	1224-1226	<	1	ppm	<	5	mg/m3	<	1.0	g/min
N-Butyl Mercaptan	1224-1226	<	1	ppm	<	5	mg/m3	<	1	g/min
Tetrahydrothiophene	1224-1226	<	1	ppm	<	5	mg/m3	<	1	g/min

These results indicate the hydrogen sulphide was the main sulphur based compound measured at this location.

EPA Point 3 – Solvent Extraction Plant Scrubber

24 October 2013

Odour Results DP 3 - SEP Scrubber 130641220	**Sampling Times**	**Concentration at NTP Wet**	**Mass rate**
Odour	1230-1242	110,000 ou	27,000,000 ouv/min

Volatile Organic Compound (VOC) Results DP 3 - SEP Scrubber 130641220	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Hexane	1219-1319	18 mg/m3	3.9 g/min
Cyclohexane	1219-1319	0.84 mg/m3	0.19 g/min
Toluene	1219-1319	0.54 mg/m3	0.12 g/min
Acetone	1219-1319	8.4 mg/m3	1.9 g/min
Total VOC as n-propane	1219-1319	16 mg/m3	3.5 g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotolune), Benzoyl Chloride, Naphthalene, Dodecane

Refer to "SAMPLING PLANE OBSERVATIONS" on page 16.

EPA Point 4 – Boiler House Stack 1

23 October 2013

Flow Results	Measured MW	DP4 - Boiler House Stack 130641	
Date and time of flow test		23/10/2013 12:20	
Date and time of flow test		23/10/2013 13:35	
Stack dimensions at sampling plane		1025	mm
Velocity at sampling plane		2.4	m/s
Average temperature		105	°C
Moisture content	Alt008	10	% v/v
Flow rate at discharge conditions		2.0	m³/sec
Flow rate at wet NTP conditions		1.4	m³/sec
Flow rate at dry NTP conditions		1.3	m³/sec

Continuous Analyser Results DP4 - Boiler House Stack 13064176	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)	1129-1228	4.1	% v/v	-		-	
Carbon dioxide (dry basis)	1129-1228	9.8	% v/v	-		880	kg/hour
Dry gas density	1129-1228	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis	1129-1228	30	g/g-mole	-		-	
Nitrogen oxides as NO_2	1129-1228	110	mg/m3	110	mg/m3	8.1	g/min

Refer to “SAMPLING PLANE OBSERVATIONS” on page 16.

EPA Point 7 – Combined Vent Stack

23 October 2013

Flow Results	Measured MW		DP7 - Combined Vent Stack 130641
Date and time of flow test		23/10/2013 9:00	
Date and time of flow test		23/10/2013 10:30	
Stack dimensions at sampling plane		845	mm
Velocity at sampling plane		10	m/s
Average temperature		28	°C
Moisture content	Method4	0.11	% v/v
Flow rate at discharge conditions		5.9	m³/sec
Flow rate at wet NTP conditions		5.1	m³/sec
Flow rate at dry NTP conditions		5.1	m³/sec

Isokinetic Sampling Results DP7 - Combined Vent Stack 130641310	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Particulate matter	0905-1027	< 2 mg/m3	< 0.5 g/min
No. of sampling points		*16*	
Length of sampling, min		*80*	
Stack gas molecular weight, g/g-mole (wet)		*28.9*	
Stack gas density, (kg/m ^{3}) at wet NTP		*1.29*	

Refer to “SAMPLING PLANE OBSERVATIONS” on page 16.

EPA Point 13 – Earth Conveying System

24 October 2013

Flow Results	Measured MW	DP 13 - Earth Conveying System 130641	
Date and time of flow test		24/10/2013 8:46	
Date and time of flow test		24/10/2013 9:25	
Stack dimensions at sampling plane		130	mm
Velocity at sampling plane		12	m/s
Average temperature		24	°C
Moisture content	Method4	3.0	% v/v
Flow rate at discharge conditions		0.16	m³/sec
Flow rate at wet NTP conditions		0.14	m³/sec
Flow rate at dry NTP conditions		0.14	m³/sec

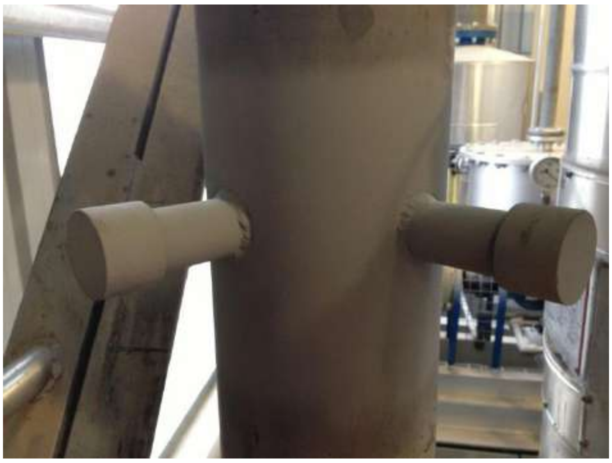
Isokinetic Sampling Results	DP 13 - Earth Conveying System 1306418.4	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Particulate matter		0847-0923	11	mg/m3	0.091	g/min
No. of sampling points			*4*			
Length of sampling, min			*36*			
Stack gas molecular weight, g/g-mole (wet)			*28.6*			
Stack gas density, (kg/m ^{3}) at wet NTP			*1.28*			

Refer to "SAMPLING PLANE OBSERVATIONS" on page 16.

Refer to "DEVIATION FROM TEST METHODS" on page 18.

EPA Point 14 – Filter Blowing Vapour Scrubber

24 October 2013



Flow Results	Measured MW	DP14 - Filter Blowing Vapour Scrubber 130641	
Date and time of flow test		24/10/2012 15:12	
Date and time of flow test		24/10/2013 16:25	
Stack dimensions at sampling plane		310	mm
Velocity at sampling plane		2.5	m/s
Average temperature		59	°C
Moisture content	Alt008	20	% v/v
Flow rate at discharge conditions		0.19	m³/sec
Flow rate at wet NTP conditions		0.15	m³/sec
Flow rate at dry NTP conditions		0.12	m³/sec

Continuous Analyser Results	DP14 - Filter Blowing Vapour Scrubber 1306417.3	**Sampling Times**	**Concentration at NTP**	
Dry gas density		1520-1620	1.3	kg/m3
Molecular weight of stack gas, dry basis		1520-1620	29	g/g-mole

Manual Sampling Results DP14 - Filter Blowing Vapour Scrubber 130613 7.3	**Sampling Times**	**Concentration at NTP**			**Concentration at NTP**			**Mass rate**		
Hydrogen Sulphide (TM-5)	1515-1615				<	0.04	mg/m3	<	0.0003	g/min
Hydrogen Sulphide (TM-33)	1525-1528	<	2	ppm	<	2	mg/m3	<	0.02	g/min
Carbonyl Sulphide	1525-1528	<	0.4	ppm	<	1	mg/m3	<	0.008	g/min
Methyl Mercaptan	1525-1528	<	0.4	ppm	<	0.9	mg/m3	<	0.006	g/min
Ethyl Mercaptan	1525-1528	<	0.4	ppm	<	1	mg/m3	<	0.008	g/min
Dimethyl Sulphide	1525-1528		1.6	ppm		4.4	mg/m3		0.032	g/min
N-Propyl Mercaptan	1525-1528	<	0.4	ppm	<	1	mg/m3	<	0.010	g/min
Thiophene	1525-1528	<	0.4	ppm	<	2	mg/m3	<	0.01	g/min
N-Butyl Mercaptan	1525-1528	<	0.4	ppm	<	2	mg/m3	<	0.01	g/min
Tetrahydrothiophene	1525-1528	<	0.4	ppm	<	2	mg/m3	<	0.01	g/min

These results indicate the dimethyl sulphide was the main sulphur based compound measured at this location.

EPA Point 14 – Filter Blowing Vapour Scrubber

24 October 2013

Odour Results	DP14 - Filter Blowing Vapour Scrubber 1306417.3	**Sampling Times**	**Concentration at NTP Wet**		**Mass rate**	
Odour		1515-1525	120,000	ou	1,100,000	ouv/min

Volatile Organic Compound (VOC) Results	DP14 - Filter Blowing Vapour Scrubber 1306417.3	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Hexane	Test 1	1520-1620	49	mg/m3	0.35	g/min
	Test 2	1520-1620	48	mg/m3	0.35	g/min
	Average		**48**	**mg/m3**	**0.35**	**g/min**
Cyclohexane	Test 1	1520-1620	42	mg/m3	0.31	g/min
	Test 2	1520-1620	42	mg/m3	0.31	g/min
	Average		**42**	**mg/m3**	**0.31**	**g/min**
Benzene	Test 1	1520-1620	8.5	mg/m3	0.062	g/min
	Test 2	1520-1620	8.4	mg/m3	0.062	g/min
	Average		**8.5**	**mg/m3**	**0.062**	**g/min**
Toluene	Test 1	1520-1620	6.2	mg/m3	0.045	g/min
	Test 2	1520-1620	6.0	mg/m3	0.044	g/min
	Average		**6.1**	**mg/m3**	**0.045**	**g/min**
Ethylbenzene	Test 1	1520-1620	0.46	mg/m3	0.0034	g/min
	Test 2	1520-1620	0.46	mg/m3	0.0034	g/min
	Average		**0.46**	**mg/m3**	**0.0034**	**g/min**
m+p-Xylene	Test 1	1520-1620	4.3	mg/m3	0.031	g/min
	Test 2	1520-1620	4.3	mg/m3	0.031	g/min
	Average		**4.3**	**mg/m3**	**0.031**	**g/min**
Acetone	Test 1	1520-1620	12	mg/m3	0.084	g/min
	Test 2	1520-1620	5.8	mg/m3	0.042	g/min
	Average		**8.7**	**mg/m3**	**0.063**	**g/min**
Total VOC as n-propane	Test 1	1520-1620	66	mg/m3	0.48	g/min
	Test 2	1520-1620	61	mg/m3	0.44	g/min
	Average		**63**	**mg/m3**	**0.46**	**g/min**

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotolune), Benzoyl Chloride, Naphthalene, Dodecane

Duplicate samples were taken to confirm the composition of VOC emissions from this location.

Refer to “SAMPLING PLANE OBSERVATIONS” on page 16.

EPA Point 15 – High Pressure Steam Generator

24 October 2013

Flow Results	Measured MW		DP 15 - HP Steam Generator 130641
Date and time of flow test		24/10/2013 8:45	
Date and time of flow test		24/10/2013 9:58	
Stack dimensions at sampling plane		305	mm
Velocity at sampling plane		3.9	m/s
Average temperature		202	°C
Moisture content	Alt008	8.7	% v/v
Flow rate at discharge conditions		0.29	m³/sec
Flow rate at wet NTP conditions		0.16	m³/sec
Flow rate at dry NTP conditions		0.15	m³/sec

Continuous Analyser Results DP 15 - HP Steam Generator 1306418.8	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)	0856-0955	13.3	% v/v	-		-	
Carbon dioxide (dry basis)	0856-0955	4.4	% v/v	-		46	kg/hour
Dry gas density	0856-0955	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis	0856-0955	29	g/g-mole	-		-	
Nitrogen oxides as NO_2	0856-0955	63	mg/m3	150	mg/m3	0.55	g/min

Refer to “SAMPLING PLANE OBSERVATIONS” on page 16.

Boundary Odour Sampling

24 October 2013

Site	Sample ID	Sampling Time	Odour Concentration	Approx. Distance to Plant Centre	Wind Direction	Approximate Wind Speed
1 - SW (upwind)	92	0954-1004	< 30 OU	200m	S - SW	5 - 9.2 m/s
2 - E (downwind)	38	1048-1057	120 OU	220m	S - SW	5 - 9.2 m/s
3 - N (downwind)	167	1103-1114	< 30 OU	250m	S - SW	5 - 9.2 m/s

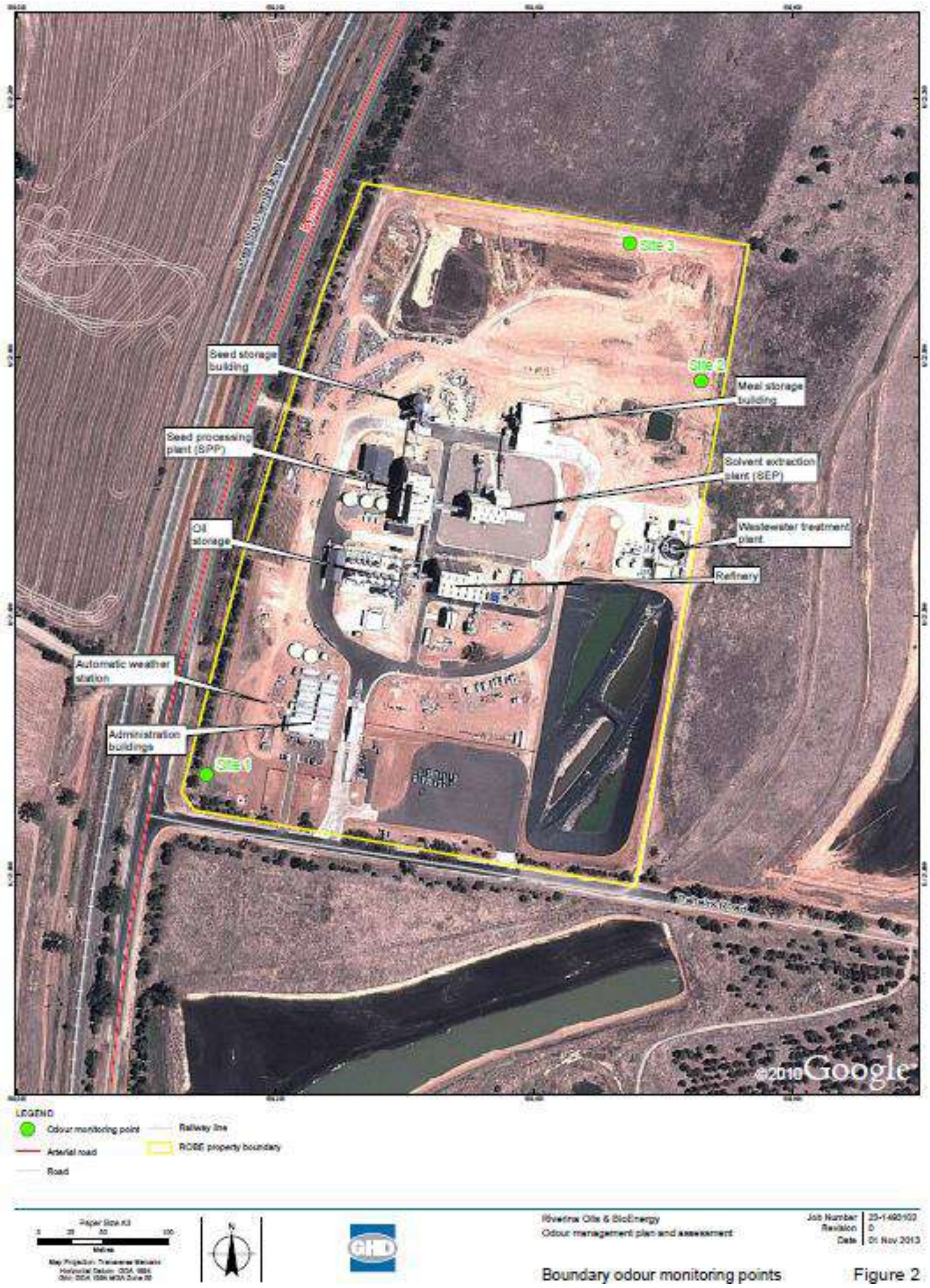
Site 1
SW Boundary (upwind)

Site 2
E Boundary (downwind)

Site 3
N Boundary (downwind)

Boundary Odour Sampling

24 October 2013



ODOUR SAMPLING AND ANALYSIS PARAMETERS

Technique: 130641		**AS4323.3 - Forced Choice**
Date and time of analysis:		24/10/2013 , 1600-1715
Sample pre-dilution ratio:	137	**Nil ,** *All sample gas*
	64	**11 ,** *10 (neutral gas) + 1 (sample gas)*
	12	**11 ,** *10 (neutral gas) + 1 (sample gas)*
	92	**Nil ,** *All sample gas*
	38	**Nil ,** *All sample gas*
	167	**Nil ,** *All sample gas*
Pre-dilution equipment:		Dry Gas Meter 040

Quality Requirements	**Acceptance**	**Current value**
n-Butanol threshold value (ppb)	20-80	32
Repeatability "r"	≤0.477	0.305
Repeatability "10r"	≤3.00	2.02
Accuracy "A"	<0.217	0.0840

SAMPLING PLANE OBSERVATIONS

EPA Point 2 – Combined Vent Stack

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be "non-ideal" as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore "non-compliant". The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.
(e) The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of the highest to lowest gas velocities shall not exceed 3:1.

EPA Point 3 – Solvent Extraction Plant Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be "non-ideal" as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore "compliant".

EPA Point 4 – Boiler House Stack 1

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be "non-ideal" as per AS4323.1. It was 2.5 duct diameters less than the required 6 duct diameters downstream from a bend. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore "non-compliant". The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

EPA Point 7 – Combined Vent Stack

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be "non-ideal" as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore "compliant".

EPA Point 13 – Earth Conveying System

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be "ideal" as per AS4323.1. It was more than the required 2 duct diameters upstream from a bend. It was more than the required 6 duct diameters downstream from a bend. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore "compliant".

EPA Point 14 – Filter Blowing Vapour Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be "ideal" as per AS4323.1. It was more than the required 2 duct diameters upstream from the exit. It was more than the required 6 duct diameters downstream from a centrifugal fan. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore "non-compliant". The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

EPA Point 15 – High Pressure Steam Generator

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be "non-ideal" as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore "compliant".

PLANT OPERATING CONDITIONS

Plant operating conditions were supplied by Riverina Oils & BioEnergy Pty Ltd personnel. Operating conditions were considered normal for duration of all testing.

TEST METHODS

The following methods are accredited with the National Association of Testing Authorities (NATA) and are approved for the sampling and analysis of gases unless otherwise stated. Specific details of the methods are available on request.

All sampling and analysis will be conducted in accordance with the test methods (TM) prescribed in NSW EPA's *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* Jan 2007 and in accordance with the *Protection of the Environment Operations (Clean Air) Regulation* 2010 unless otherwise specified.

All parameters are reported adjusted to dry NTP conditions unless otherwise stated.

Parameter	Sampling			Analysis			
	NATA	**NSW TM Method**	**Sampling Method**	**NATA**	**Analytical Laboratory**	**Analytical Method**	**Analytical Laboratory Report Number(s)**
Selection of sampling positions	Yes	TM-1	AS4323.1	Yes	Emission Testing Consultants	AS4323.1	130641r
Flow rate	Yes	TM-2	USEPA 2	Yes		USEPA 2	
Velocity	Yes	TM-2	USEPA 2	Yes		USEPA 2	
Temperature	Yes	TM-2	USEPA 2	Yes		USEPA 2	
Moisture	Yes	TM-22	USEPA 4 & ALT008	Yes		USEPA 4 & ALT008	
Odour	Yes	OM-7	AS4323.3	Yes		AS4323.3	
Solid Particles	Yes	TM-15	AS4323.2	Yes		AS4323.2	
Dry gas Density	Yes	TM-23	USEPA 3A	Yes		USEPA 3A	
Molecular weight	Yes	TM-23	USEPA 3A	Yes		USEPA 3A	
Carbon dioxide (CO_2)	Yes	TM-24	USEPA 3A	Yes		USEPA 3A	
Oxygen (O_2)	Yes	TM-25	USEPA 3A	Yes		USEPA 3A	
Nitrogen oxides (NO_x) as NO_2	Yes	TM-11	USEPA 7E	Yes		USEPA 7E	
Hydrogen sulphide (H_2S)	Yes	TM-5	USEPA 11	Yes	Eurofins/MGT	USEPA11	398137-A
Volatile organic compounds (VOC)	Yes	TM-34	USEPA 18	Yes	SGS Australia Pty Ltd	AN467	68964
Sulphur Compounds (Hydrogen Sulphide, Carbonyl Sulphide, Methyl Mercaptan, Ethyl Mercaptan, Dimethyl Sulfide, n-Propyl Mercaptan, Thiophene, n-Butyl Mercaptan, Tetrahydrothiophene)	Yes	TM-33	ETC 200	Yes	SGS Leeder Consulting	NIOSH 6013 H2S in Air & TO-15.ADD.02 Additionals	M132383

DEVIATION FROM TEST METHODS

EPA Point 13 – Earth Conveying System

Sampling for Total Solid Particles was conducted for 36 minutes instead of the 60 minute minimum duration specified in Schedule 5 of *Protection of the Environment Operations (Clean Air) Regulation* 2010. The 36 minute duration equates to the time taken to unload a 650kg bag of bleached earth. The earth conveying system only operates when this unloading occurs, normally once per shift. The sampling conducted is thus representative of normal operating conditions.

DEFINITIONS

The following symbols and abbreviations are used in test reports:

BSP	British standard pipe.
Concentration	Mass of analyte per cubic metre expressed at NTP dry conditions (ng, µg or mg/m^3).
Dioxins & furans	2,3,7,8-substituted polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans) PCDF
Dioxin & furan TEQ values	Toxic equivalent. The TEQ values have been calculated using the toxicity equivalence factors (TEF) according to the World Health Organisation (2005)
Flow rate at discharge conditions	Volume of gas flow per unit time expressed at discharge temperature, pressure and moisture content (m^3/min).
Flow rate at wet NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and discharge moisture content (m^3/min).
Flow rate at dry NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and 0% moisture content (m^3/min).
Lowerbound	(Lower) results do not include any limit of detection values (< values).
Mass rate	Mass of analyte per unit time (µg, mg or g/min).
Mediumbound	(Medium) results include half limit of detection values (< values).
Moisture content	Percentage of gaseous moisture in the gas expressed on a volume / volume percentage basis. This does not include moisture in the gas stream that is in the liquid phase (free moisture).
NA	Not applicable.
NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry **(wet in the case of odour only)** basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Odour concentration	Number of odour units (ou).
Odour flux rate	Odour emission rate per unit surface area per unit time (ou/m^2/min).

Odour mass rate	Odour emission rate per unit time (ou/min).
Odour unit	One odour unit (ou) is that concentration of odorant(s) at standard concentrations that elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PAH's	Polycyclic aromatic hydrocarbons.
PAH's TEQ values	The TEQ values have been calculated using the toxicity equivalence factors (TEF's) relative to Benzo(a)pyrene, as reported by Larsen & Larsen (1998) (TEF factors reported in the 2003 World Health Organisation (WHO) report E78963 - HEALTH RISKS OF PERSISTENT ORGANIC POLLUTANTS FROM LONG-RANGE TRANSBOUNDARY AIR POLLUTION).
ppm	Parts per million expressed on a volume / volume wet basis.
Sampling plane	Location at which measurements were conducted.
TOC	Total Organic Compounds. Total gaseous organic concentration of vapours consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons) The concentration can be expressed in terms of propane, hexane (or other appropriate organic calibration gas) or in terms of methane.
Velocity	Gas velocity expressed at discharge temperature, pressure and moisture content (m/s)
VOC	Any chemical compound based on carbon in the boiling range 36 to 126°C, with a vapour pressure of at least 0.010kPa at 25°C (or having a corresponding volatility under the particular conditions of use) that adsorb onto activated charcoal and desorb into CS_2, or that can be collected in a tedlar bag and be quantitatively recovered, and that are detected by GCMS. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are CO, CO_2, carbonic acid, metallic carbides and carbonate salts.
>	Greater than.
<	Less than the minimum limit of detection using the specified method.
~	Approximately.

emissiontestingconsultants
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Date: 3 April 2014

Report No: 140037r

Page: 1 of 21

Riverina Oils & Bio Energy Pty Ltd
177 Trahairs Rd
Wagga Wagga NSW 2650

Emission Testing – February 2014
Quarterly Emission Sampling & Investigatory Odour Monitoring

Dear Mr Daniel Challis,

Tests were performed on the 25th and 26th of February 2014 to determine emissions to air from 7 plant locations as well as 3 boundary locations at the Bomen plant of Riverina Oils & Bio Energy Pty Ltd.

Yours faithfully
Emission Testing Consultants

Steven Cooper BEng (Env)
Quality Manager

sc@emission.com.au

EXECUTIVE SUMMARY

Emission Testing Consultants (ETC) was engaged by Riverina Oils & BioEnergy Pty Ltd (ROBE) to perform investigatory odour monitoring and emission monitoring pursuant to Environment Protection Licence (EPL) 13097. Monitoring was performed at seven plant locations and three boundary locations for the following parameters;

Discharge point	Selection of sampling positions	Flow rate	Velocity	Temperature	Moisture	Particulate matter	Dry gas Density	Molecular weight	Carbon dioxide (CO2)	Oxygen (O2)	Nitrogen oxides (NOx) as NO2	Hydrogen sulphide (H2S)	Volatile organic compounds (VOC)	Total Reduced Sulphur Compounds	Odour
EPA Point 2 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓
EPA Point 3 Solvent Extraction Plant Scrubber	✓	✓	✓	✓	✓		✓	✓				✓	✓	✓	✓
EPA Point 4 Boiler House Stack 1	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				
EPA Point 7 Combined Vent Stack	✓	✓	✓	✓	✓	✓	✓	✓							
EPA Point 13 Earth Conveying System	✓	✓	✓	✓	✓	✓	✓	✓							
EPA Point 14 Filter Blowing Vapour Scrubber	✓	✓	✓	✓	✓		✓	✓				✓	✓	✓	✓
EPA Point 15 High Pressure Steam Generator	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				
Upwind Boundary - E Boundary															✓
Downwind Boundary - SW Boundary															✓
Downwind Boundary - NW Boundary															✓

This report includes results pursuant to additional sampling undertaken to gain information on potential sources of odour at the ROBE site. This sampling is additional to that required by the EPL.

This formed the fourth round of quarterly monitoring for 2013 - 2014.

The methodologies chosen by ETC are those stipulated in ROBE's EPL, and as prescribed in the NSW EPA publication, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* 2007. There were no technical issues in terms of sampling on the days of testing. Plant operating conditions have been noted in the report.

LICENCE COMPARISON

EPA No.	Location Description	Pollutant	Unit of measure	Licence limit	Measured values	Measured values (corrected to 3% O_2)
2	Combined Vent Stack	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**12**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**< 4**	NA
3	Solvent Extraction Plant Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	**17**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**< 3**	NA
4	Boiler House Stack 1	Nitrogen Oxides (as NO^2)	milligrams per cubic meter (mg/m^3)	350	**120**	**120**
7	Combined Vent Stack	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**< 2**	NA
13	Earth Conveying System	Total Solid Particles	milligrams per cubic meter (mg/m^3)	50	**3.9**	NA
14	Filter Blowing Vapour Scrubber	Volatile Organic Compounds (as n-Propane)	milligrams per cubic meter (mg/m^3)	40	**360**	NA
		Hydrogen Sulphide	milligrams per cubic meter (mg/m^3)	5	**< 3**	NA
15	High Pressure Steam Generator	Nitrogen Oxides (as NO^2)	milligrams per cubic meter (mg/m^3)	350	**63**	**150**

Note: All analytes highlighted in green are below the Licence Limit set by the NSW EPA as per licence 13097 (last amended on 16/08/2013). The analyte highlighted in red is above the Licence Limit. Results from EPA Points 4 and 15 have also been corrected to 3% Oxygen as stipulated in Part 3, Schedule 5 of the *Protection of the Environment Operations (Clean Air) Regulation, (NSW)* 2010.

RESULTS

EPA Point 2 – Combined Vent Stack

25 February 2014

Flow Results	Measured MW	DP 2 - Combined Service Vent 140037	
Date and time of flow test		25/02/2014 12:08	
Date and time of flow test		25/02/2014 13:15	
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		3.6	m/s
Average temperature		41	°C
Moisture content	Method4	6.2	% v/v
Flow rate at discharge conditions		3.1	m³/sec
Flow rate at wet NTP conditions		2.6	m³/sec
Flow rate at dry NTP conditions		2.5	m³/sec

Isokinetic Sampling Results DP 2 - Combined Service Vent 140037 150	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Solid particles	1145-1307	12	mg/m3	1.8	g/min
No. of sampling points			*16*		
Length of sampling, min			*80*		
Stack gas molecular weight, g/g-mole (wet)			*28.2*		
Stack gas density, (kg/m ^{3}) at wet NTP			*1.26*		

Refer to “SAMPLING PLANE OBSERVATIONS” on page 17.

EPA Point 2 – Combined Vent Stack

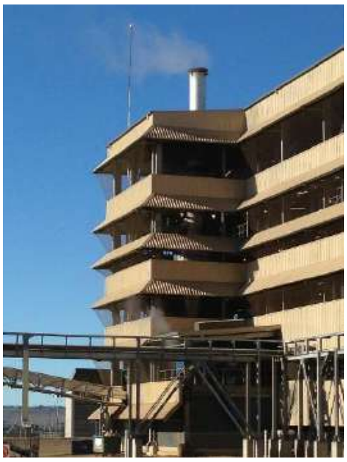
25 February 2014

Manual Sampling Results DP 2 - Combined Service Vent 140037 150	**Sampling Times**	**Concentration at NTP**			**Concentration at NTP**			**Mass rate**		
Hydrogen sulphide (TM-5)	1205-1305				<	4	mg/m3	<	0.6	g/min
Hydrogen sulphide (TM-33)	1245-1250	<	0.1	ppm	<	0.2	mg/m3	<	0.02	g/min
Carbonyl sulphide	1245-1250	<	0.1	ppm	<	0.3	mg/m3	<	0.04	g/min
Methyl mercaptan	1245-1250		0.10	ppm		0.21	mg/m3		0.032	g/min
Ethyl mercaptan	1245-1250	<	0.1	ppm	<	0.3	mg/m3	<	0.04	g/min
Dimethyl sulphide	1245-1250		0.30	ppm		0.83	mg/m3		0.12	g/min
n-Propyl mercaptan	1245-1250	<	0.1	ppm	<	0.3	mg/m3	<	0.05	g/min
Thiophene	1245-1250	<	0.1	ppm	<	0.4	mg/m3	<	0.06	g/min
n-Butyl mercaptan	1245-1250	<	0.1	ppm	<	0.4	mg/m3	<	0.06	g/min
Tetrahydrothiophene	1245-1250	<	0.1	ppm	<	0.4	mg/m3	<	0.06	g/min

Odour Results DP 2 - Combined Service Vent 140037 150	**Sampling Times**	**Concentration at NTP Wet**		**Mass rate**	
Odour	1232 - 1241	18,000	ou	2,800,000	ouv/min

EPA Point 3 – Solvent Extraction Plant Scrubber

25 February 2014



Flow Results	Measured MW	DP 3 - SEP Scrubber 140037	
Date and time of flow test		25/02/2014 10:08	
Date and time of flow test		25/02/2014 11:22	
Stack dimensions at sampling plane		1050	mm
Velocity at sampling plane		5.2	m/s
Average temperature		45	°C
Moisture content	Alt008	12	% v/v
Flow rate at discharge conditions		4.5	m³/sec
Flow rate at wet NTP conditions		3.8	m³/sec
Flow rate at dry NTP conditions		3.3	m³/sec

Continuous Analyser Results	DP 3 - SEP Scrubber 140037 200	**Sampling Times**	**Concentration at NTP**	
Dry gas density		1014-1114	1.3	kg/m3
Molecular weight of stack gas, dry basis		1014-1114	29	g/g-mole

Manual Sampling Results	DP 3 - SEP Scrubber 140037 200	**Sampling Times**	**Concentration at NTP**			**Concentration at NTP**			**Mass rate**		
Hydrogen sulphide (TM-5)		1014-1114				<	3	mg/m3	<	0.6	g/min
Hydrogen sulphide (TM-33)		1030-1035		0.80	ppm		1.2	mg/m3		0.24	g/min
Carbonyl sulphide		1030-1035		0.30	ppm		0.80	mg/m3		0.16	g/min
Methyl mercaptan		1030-1035		0.20	ppm		0.43	mg/m3		0.085	g/min
Ethyl mercaptan		1030-1035	<	0.1	ppm	<	0.3	mg/m3	<	0.06	g/min
Dimethyl sulphide		1030-1035	<	0.1	ppm	<	0.3	mg/m3	<	0.06	g/min
n-Propyl mercaptan		1030-1035	<	0.1	ppm	<	0.3	mg/m3	<	0.07	g/min
Thiophene		1030-1035	<	0.1	ppm	<	0.4	mg/m3	<	0.07	g/min
n-Butyl mercaptan		1030-1035	<	0.1	ppm	<	0.4	mg/m3	<	0.08	g/min
Tetrahydrothiophene		1030-1035	<	0.1	ppm	<	0.4	mg/m3	<	0.08	g/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 17.

EPA Point 3 – Solvent Extraction Plant Scrubber

25 February 2014

Odour Results DP 3 - SEP Scrubber 140037 200	**Sampling Times**	**Concentration at NTP Wet**		**Mass rate**	
Odour	1014-1028	91,000	ou	21,000,000	ouv/min

Volatile Organic Compound (VOC) Results DP 3 - SEP Scrubber 140037 200	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Hexane	1014-1114	32	mg/m3	6.3	g/min
Cyclohexane	1014-1114	1.8	mg/m3	0.36	g/min
Total VOC as n-propane	1014-1114	17	mg/m3	3.4	g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotolune), Benzoyl Chloride, Naphthalene, Dodecane

EPA Point 4 – Boiler House Stack 1

26 February 2014

Flow Results	Measured MW	DP4 - Boiler House Stack 140037	
Date and time of flow test		26/02/2014 12:30	
Date and time of flow test		26/02/2014 13:37	
Stack dimensions at sampling plane		1025	mm
Velocity at sampling plane		3.5	m/s
Average temperature		117	°C
Moisture content	Alt008	11	% v/v
Flow rate at discharge conditions		2.9	m³/sec
Flow rate at wet NTP conditions		2.0	m³/sec
Flow rate at dry NTP conditions		1.7	m³/sec

Continuous Analyser Results DP4 - Boiler House Stack 140037 100	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)	1233-1333	2.9	% v/v	-		-	
Carbon dioxide (dry basis)	1233-1333	10.5	% v/v	-		1,300	kg/hour
Dry gas density	1233-1333	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis	1233-1333	30	g/g-mole	-		-	
Nitrogen oxides as NO_2	1233-1333	120	mg/m3	120	mg/m3	12	g/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 17.

EPA Point 7 – Combined Vent Stack

26 February 2014

Flow Results	Measured MW	DP7 - Combined Vent 140037	
Date and time of flow test		26/02/2014 11:35	
Date and time of flow test		26/02/2014 13:01	
Stack dimensions at sampling plane		845	mm
Velocity at sampling plane		10	m/s
Average temperature		37	°C
Moisture content	Method4	0.39	% v/v
Flow rate at discharge conditions		5.7	m³/sec
Flow rate at wet NTP conditions		4.9	m³/sec
Flow rate at dry NTP conditions		4.8	m³/sec

Isokinetic Sampling Results DP7 - Combined Vent 140037 290	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Solid particles	1135-1256	< 2 mg/m3	< 0.6 g/min
No. of sampling points		*16*	
Length of sampling, min		*80*	
Stack gas molecular weight, g/g-mole (wet)		*28.9*	
Stack gas density, (kg/m^3) at wet NTP		*1.29*	

Refer to “SAMPLING PLANE OBSERVATIONS” on page 17.

EPA Point 13 – Earth Conveying System

26 February 2014

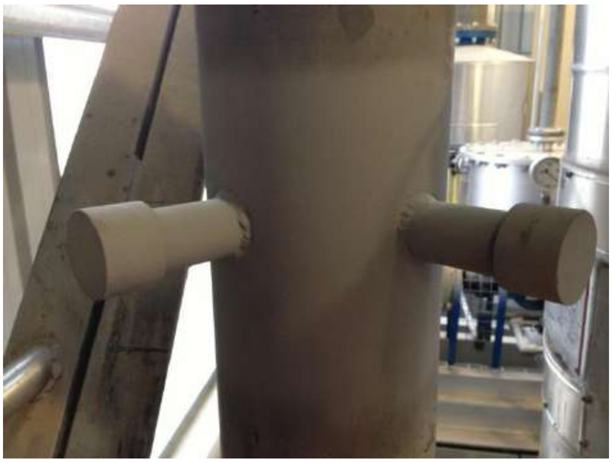
Flow Results	Measured MW	DP 13 - Earth Conveying System 140037	
Date and time of flow test		26/02/2014 8:50	
Date and time of flow test		26/02/2014 9:50	
Stack dimensions at sampling plane		130	mm
Velocity at sampling plane		12	m/s
Average temperature		36	°C
Moisture content	Method4	1.1	% v/v
Flow rate at discharge conditions		0.17	m³/sec
Flow rate at wet NTP conditions		0.14	m³/sec
Flow rate at dry NTP conditions		0.14	m³/sec

Isokinetic Sampling Results DP 13 - Earth Conveying System 140037 8.4	**Sampling Times**	**Concentration at NTP**		**Mass rate**	
Solid particles	0850-0950	3.9	mg/m3	0.033	g/min
No. of sampling points		*4*			
Length of sampling, min		*60*			
Stack gas molecular weight, g/g-mole (wet)		*28.8*			
Stack gas density, (kg/m^3) at wet NTP		*1.28*			

Refer to “SAMPLING PLANE OBSERVATIONS” on page 17.

EPA Point 14 – Filter Blowing Vapour Scrubber

25 February 2014



Flow Results	Measured MW		DP14 - Filter Blowing Vapour Scrubber 140037	
Date and time of flow test			25/02/2014 14:00	
Date and time of flow test			25/02/2014 15:40	
Stack dimensions at sampling plane			310	mm
Velocity at sampling plane		<	2	m/s
Average temperature			43	°C
Moisture content	Alt008		8.9	% v/v
Flow rate at discharge conditions		<	0.2	m³/sec
Flow rate at wet NTP conditions		<	0.1	m³/sec
Flow rate at dry NTP conditions		<	0.1	m³/sec

Continuous Analyser Results	DP14 - Filter Blowing Vapour Scrubber 1400377	**Sampling Times**	**Concentration at NTP**	
Dry gas density		1411-1511	1.3	kg/m3
Molecular weight of stack gas, dry basis		1411-1511	29	g/g-mole

Manual Sampling Results	DP14 - Filter Blowing Vapour Scrubber 1400377	**Sampling Times**	**Concentration at NTP**			**Concentration at NTP**			**Mass rate**		
Hydrogen sulphide (TM-5)		1432-1532				<	3	mg/m3	<	0.02	g/min
Hydrogen sulphide (TM-33)		1422-1427	<	0.1	ppm	<	0.2	mg/m3	<	0.001	g/min
Carbonyl sulphide		1422-1427	<	0.1	ppm	<	0.3	mg/m3	<	0.002	g/min
Methyl mercaptan		1422-1427		0.20	ppm		0.43	mg/m3	<	0.003	g/min
Ethyl mercaptan		1422-1427	<	0.1	ppm	<	0.3	mg/m3	<	0.002	g/min
Dimethyl sulphide		1422-1427		0.50	ppm		1.4	mg/m3	<	0.010	g/min
n-Propyl mercaptan		1422-1427	<	0.1	ppm	<	0.3	mg/m3	<	0.002	g/min
Thiophene		1422-1427	<	0.1	ppm	<	0.4	mg/m3	<	0.003	g/min
n-Butyl mercaptan		1422-1427	<	0.1	ppm	<	0.4	mg/m3	<	0.003	g/min
Tetrahydrothiophene		1422-1427	<	0.1	ppm	<	0.4	mg/m3	<	0.003	g/min

Refer to “SAMPLING PLANE OBSERVATIONS” on page 17.

EPA Point 14 – Filter Blowing Vapour Scrubber

25 February 2014

Odour Results DP14 - Filter Blowing Vapour Scrubber 1400377	**Sampling Times**	**Concentration at NTP Wet**	**Mass rate**
Odour	1410-1421	110,000 ou	< 800,000 ouv/min

Volatile Organic Compound (VOC) Results DP14 - Filter Blowing Vapour Scrubber 1400377	**Sampling Times**	**Concentration at NTP**	**Mass rate**
Benzene	1407-1507	11 mg/m3	< 0.08 g/min
Toluene	1407-1507	13 mg/m3	< 0.09 g/min
Ethylbenzene	1407-1507	0.82 mg/m3	< 0.006 g/min
m+p-Xylene	1407-1507	12 mg/m3	< 0.08 g/min
Hexane	1407-1507	380 mg/m3	< 3 g/min
Cyclohexane	1407-1507	280 mg/m3	< 2 g/min
Total VOC as n-propane	1407-1507	360 mg/m3	< 3 g/min

Note: If not listed above, the following compounds were not detected above the analytical range of the instrument. Please contact ETC should you wish to discuss detection limits of specific undetected compounds; Acetone (2-propanone), Propylene Oxide, Acrylonitrile, Methylene Chloride, MEK (2-butanone), Hexane, Ethyl Acetate, 1,2-dichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, Ethyl Acrylate, Trichloroethene (Trichloroethylene,TCE), 1,4-Dioxane, Epichlorohydrin, MIBK (4-methyl-2-pentanone), Toluene, Tetrachloroethene (Perchloroethylene,PCE), n-Butyl Acetate, Chlorobenzene, Ethylbenzene, m/p-xylene, Styrene (Vinyl benzene), o-xylene, Cyclohexanone, Nonane, Isopropylbenzene (Cumene), DIBK (Diisobutyl Ketone), α-Methylstyrene, Decane, Benzyl Chloride (α-chlorotoluene), Benzoyl Chloride, Naphthalene, Dodecane

EPA Point 15 – High Pressure Steam Generator

26 February 2014

Flow Results	Measured MW		DP 15 - HP Steam Generator 140037
Date and time of flow test		26/02/2014 8:50	
Date and time of flow test		26/02/2014 10:02	
Stack dimensions at sampling plane		305	mm
Velocity at sampling plane		3.9	m/s
Average temperature		213	°C
Moisture content	Alt008	9.5	% v/v
Flow rate at discharge conditions		0.28	m³/sec
Flow rate at wet NTP conditions		0.16	m³/sec
Flow rate at dry NTP conditions		0.14	m³/sec

Continuous Analyser Results	DP 15 - HP Steam Generator 140037 8.4	**Sampling Times**	**Concentration at NTP**		**Concentration at 3% O2**		**Mass rate**	
Oxygen (dry basis)		0856-0956	13.3	% v/v	-		-	
Carbon dioxide (dry basis)		0856-0956	4.4	% v/v	-		44	kg/hour
Dry gas density		0856-0956	1.3	kg/m3	-		-	
Molecular weight of stack gas, dry basis		0856-0956	29	g/g-mole	-		-	
Nitrogen oxides as NO_2		0856-0956	63	mg/m3	150	mg/m3	0.53	g/min

Refer to "SAMPLING PLANE OBSERVATIONS" on page 17.

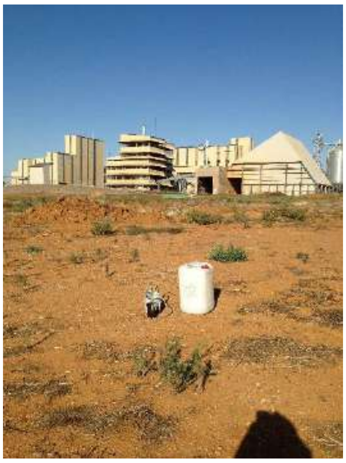
Boundary Odour Sampling

25 February 2014

Site	Sample ID	Sampling Time	GPS Co-ordinates		Odour Concentration	Approx. Distance to Plant Centre	Wind Direction	Approximate Wind Speed
1 - SW (downwind)	162	0834 - 0843	35°2'47" S	147°25'45" E	101	190m	E - NE	0 - 1.9 m/s
2 - NW (downwind)	141	0847 - 0856	35°2'42" S	147°25'48" E	37	160m	E - NE	1.4 - 2.6 m/s
3 - E (upwind)	22	0901 - 0910	35°2'39" S	147°25'49" E	86	220m	E - NE	1.8 - 2.9 m/s

Site 1
SW Boundary (downwind)

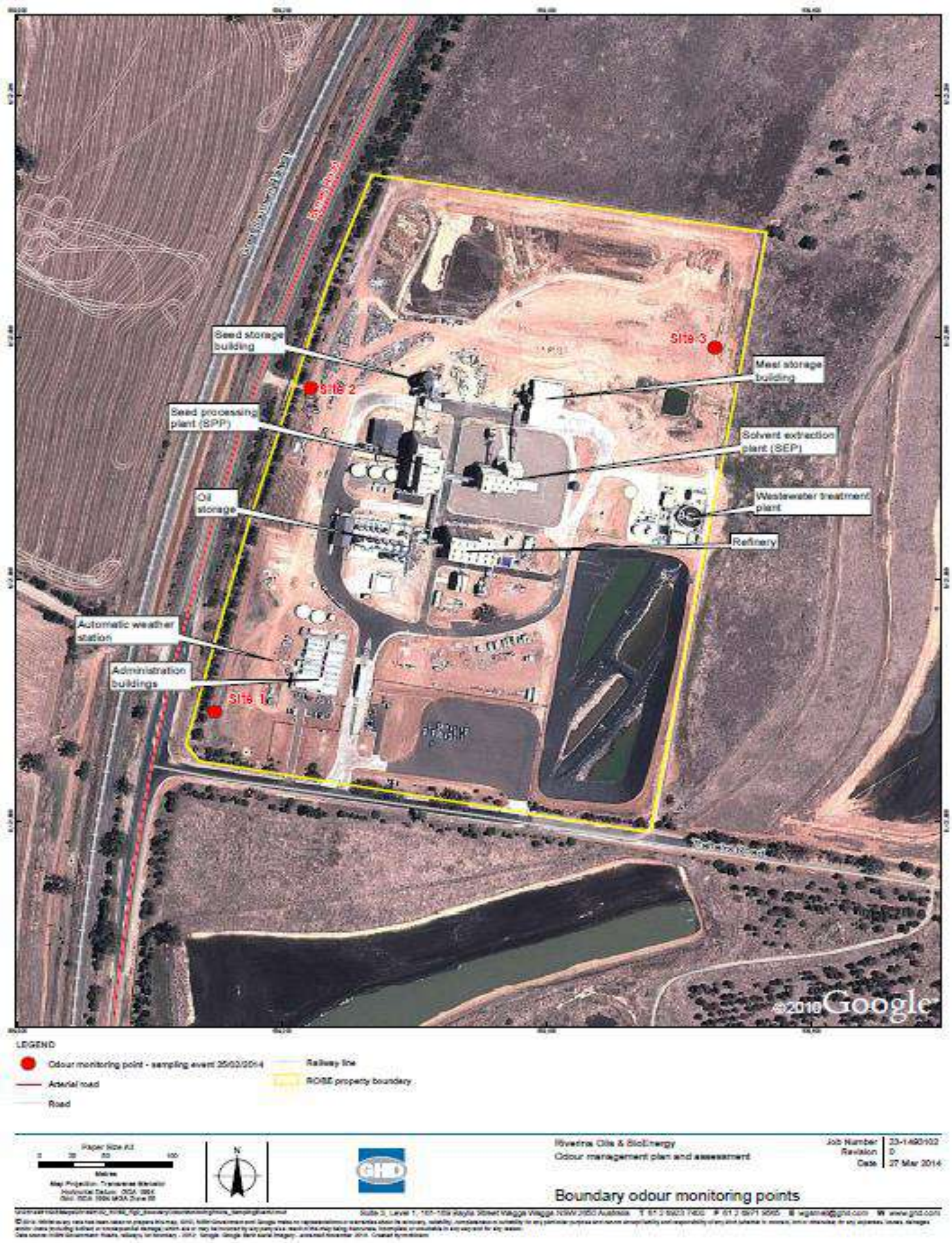
Site 2
NW Boundary (downwind)



Site 3
E Boundary (upwind)

Boundary Odour Sampling

25 February 2014



ODOUR SAMPLING AND ANALYSIS PARAMETERS

Technique: 140037		**AS4323.3 - Forced Choice**	
Date and time of analysis:		25/02/2014	, 1500-1600
Sample pre-dilution ratio:	162	**Nil ,**	*All sample gas*
	141	**Nil ,**	*All sample gas*
	22	**Nil ,**	*All sample gas*
	5	**11 ,**	*10 (neutral gas) + 1 (sample gas)*
	115	**11 ,**	*10 (neutral gas) + 1 (sample gas)*
	92	**11 ,**	*10 (neutral gas) + 1 (sample gas)*
Pre-dilution equipment:			Dry Gas Meter 040

Quality Requirements	**Acceptance**	**Current value**
n-Butanol threshold value (ppb)	20-80	73
Repeatability “r”	≤0.477	0.434
Repeatability “10r”	≤3.00	2.72
Accuracy “A”	<0.217	0.140

PLANT OPERATING CONDITIONS

Plant operating conditions were supplied by Riverina Oils & BioEnergy Pty Ltd personnel. Operating conditions were considered normal for duration of all testing.

Discharge Point	**Scrubber pH**	**TRS CEM reading (ppm)**
EPA Point 2 Combined Vent Stack	10.3	0.01
EPA Point 3 Solvent Extraction Plant Scrubber	10.85 - 10.7	0.01 - 0.1

SAMPLING PLANE OBSERVATIONS

EPA Point 2 – Combined Vent Stack

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.
(e) The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of the highest to lowest gas velocities shall not exceed 3:1.

EPA Point 3 – Solvent Extraction Plant Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 5 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 4 – Boiler House Stack 1

The sampling plane had 2 x 4 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 2.5 duct diameters less than the required 6 duct diameters downstream from a bend. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

EPA Point 7 – Combined Vent Stack

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from a junction. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 13 – Earth Conveying System

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be “ideal” as per AS4323.1. It was more than the required 2 duct diameters upstream from a bend. It was more than the required 6 duct diameters downstream from a bend. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

EPA Point 14 – Filter Blowing Vapour Scrubber

The sampling plane had 2 x 2 inch BSP Ports. The location was determined to be “ideal” as per AS4323.1. It was more than the required 2 duct diameters upstream from the exit. It was more than the required 6 duct diameters downstream from a centrifugal fan. The sampling plane did not pass the flow assessment (items (a) to (f) of AS4323.1) and was therefore “non-compliant”. The following items (a) to (f) were not met:

(b) The gas velocity at all sampling points is greater than 3 m/sec.

EPA Point 15 – High Pressure Steam Generator

The sampling plane had 2 x 1 inch BSP Ports. The location was determined to be “non-ideal” as per AS4323.1. It was 2 duct diameters less than the required 6 duct diameters downstream from a junction. It was more than the required 2 duct diameters upstream from the exit. The number of sampling points was increased as per AS4323.1. The sampling plane passed the flow assessment (items (a) to (f) of AS4323.1) and was therefore “compliant”.

TEST METHODS

The following methods are accredited with the National Association of Testing Authorities (NATA) and are approved for the sampling and analysis of gases unless otherwise stated. Specific details of the methods are available on request.

All sampling and analysis will be conducted in accordance with the test methods (TM) prescribed in NSW EPA's *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales,* Jan 2007 and in accordance with the *Protection of the Environment Operations (Clean Air) Regulation* 2010 unless otherwise specified.

All parameters are reported adjusted to dry NTP conditions unless otherwise stated.

Parameter	Sampling			Analysis			
	NATA	NSW TM Method	Sampling Method	NATA	Analytical Laboratory	Analytical Method	Analytical Laboratory Report Number(s)
Selection of sampling positions	Yes	TM-1	AS4323.1	Yes	Emission Testing Consultants	AS4323.1	140037r
Flow rate	Yes	TM-2	USEPA 2	Yes		USEPA 2	
Velocity	Yes	TM-2	USEPA 2	Yes		USEPA 2	
Temperature	Yes	TM-2	USEPA 2	Yes		USEPA 2	
Moisture	Yes	TM-22	USEPA 4 & ALT008	Yes		USEPA 4 & ALT008	
Odour	Yes	OM-7	AS4323.3	Yes		AS4323.3	
Solid Particles	Yes	TM-15	AS4323.2	Yes		AS4323.2	
Dry gas Density	Yes	TM-23	USEPA 3A	Yes		USEPA 3A	
Molecular weight	Yes	TM-23	USEPA 3A	Yes		USEPA 3A	
Carbon dioxide (CO_2)	Yes	TM-24	USEPA 3A	Yes		USEPA 3A	
Oxygen (O_2)	Yes	TM-25	USEPA 3A	Yes		USEPA 3A	
Nitrogen oxides (NO_x) as NO_2	Yes	TM-11	USEPA 7E	Yes		USEPA 7E	
Hydrogen sulphide (H_2S)	Yes	TM-5	USEPA 11	Yes	SGS Australia Pty Ltd	AN513	77607
Volatile organic compounds (VOC)	Yes	TM-34	USEPA 18	Yes		AN467	
Sulphur Compounds (Hydrogen Sulphide, Carbonyl Sulphide, Methyl Mercaptan, Ethyl Mercaptan, Dimethyl Sulfide, n-Propyl Mercaptan, Thiophene, n-Butyl Mercaptan, Tetrahydrothiophene)	Yes	TM-33	ETC 200	Yes	SGS Leeder Consulting	NIOSH 6013 H2S in Air & TO-15.ADD.02 Additionals	M140323

DEFINITIONS

The following symbols and abbreviations are used in test reports:

BSP	British standard pipe.
Concentration	Mass of analyte per cubic metre expressed at NTP dry conditions (ng, µg or mg/m^3).
Dioxins & furans	2,3,7,8-substituted polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans) PCDF
Dioxin & furan TEQ values	Toxic equivalent. The TEQ values have been calculated using the toxicity equivalence factors (TEF) according to the World Health Organisation (2005)
Flow rate at discharge conditions	Volume of gas flow per unit time expressed at discharge temperature, pressure and moisture content (m^3/min).
Flow rate at wet NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and discharge moisture content (m^3/min).
Flow rate at dry NTP conditions	Volume of gas flow per unit time expressed at 0°C, an absolute pressure of 101.325 kPa and 0% moisture content (m^3/min).
Lowerbound	(Lower) results do not include any limit of detection values (< values).
Mass rate	Mass of analyte per unit time (µg, mg or g/min).
Mediumbound	(Medium) results include half limit of detection values (< values).
Moisture content	Percentage of gaseous moisture in the gas expressed on a volume / volume percentage basis. This does not include moisture in the gas stream that is in the liquid phase (free moisture).
NA	Not applicable.
NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry **(wet in the case of odour only)** basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Odour concentration	Number of odour units (ou).
Odour flux rate	Odour emission rate per unit surface area per unit time (ou/m^2/min).

Odour mass rate	Odour emission rate per unit time (ou/min).
Odour unit	One odour unit (ou) is that concentration of odorant(s) at standard concentrations that elicits a physiological response from a panel (detection threshold) equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PAH's	Polycyclic aromatic hydrocarbons.
PAH's TEQ values	The TEQ values have been calculated using the toxicity equivalence factors (TEF's) relative to Benzo(a)pyrene, as reported by Larsen & Larsen (1998) (TEF factors reported in the 2003 World Health Organisation (WHO) report E78963 - HEALTH RISKS OF PERSISTENT ORGANIC POLLUTANTS FROM LONG-RANGE TRANSBOUNDARY AIR POLLUTION).
ppm	Parts per million expressed on a volume / volume wet basis.
Sampling plane	Location at which measurements were conducted.
TOC	Total Organic Compounds. Total gaseous organic concentration of vapours consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons) The concentration can be expressed in terms of propane, hexane (or other appropriate organic calibration gas) or in terms of methane.
Velocity	Gas velocity expressed at discharge temperature, pressure and moisture content (m/s)
VOC	Any chemical compound based on carbon in the boiling range 36 to 126°C, with a vapour pressure of at least 0.010kPa at 25°C (or having a corresponding volatility under the particular conditions of use) that adsorb onto activated charcoal and desorb into CS_2, or that can be collected in a tedlar bag and be quantitatively recovered, and that are detected by GCMS. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are CO, CO_2, carbonic acid, metallic carbides and carbonate salts.
>	Greater than.
<	Less than the minimum limit of detection using the specified method.
~	Approximately.

Template version 200613

Appendix C – CEMS data

ROBE Pty Ltd
EPL 13097

EPA Identification No. 2 - Air emissions monitoring, Combined vent servicing TAG 704,705,2705,2713,2782C

Continuous Emissions Monitoring Data Summary

	TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3		
	Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min
				1-May-13				1-Jun-13				1-Jul-13				1-Aug-13	0.568	1	0.3	1-Sep-13				1-Oct-13	4.21	4.7	3.72
				2-May-13				2-Jun-13				2-Jul-13				2-Aug-13	0.335	0.9	0.2	2-Sep-13				2-Oct-13	3.88	4.31	3.46
				3-May-13				3-Jun-13				3-Jul-13				3-Aug-13	0.448	1.3	0.3	3-Sep-13				3-Oct-13	4.44	4.93	3.96
				4-May-13				4-Jun-13				4-Jul-13				4-Aug-13	0.321	0.4	0.3	4-Sep-13				4-Oct-13	5.77	6.4	5.15
				5-May-13				5-Jun-13				5-Jul-13				5-Aug-13	0.277	0.3	0.2	5-Sep-13				5-Oct-13	3.24	3.61	2.87
				6-May-13				6-Jun-13				6-Jul-13				6-Aug-13	0.23	0.3	0.2	6-Sep-13				6-Oct-13	0.36	0.41	0.32
				7-May-13				7-Jun-13				7-Jul-13				7-Aug-13	0.229	0.4	0.2	7-Sep-13				7-Oct-13	0.02	0.03	0
				8-May-13				8-Jun-13				8-Jul-13				8-Aug-13	0.245	0.4	0.1	8-Sep-13				8-Oct-13	-	-	-
				9-May-13				9-Jun-13				9-Jul-13				9-Aug-13	0.216	0.3	0.1	9-Sep-13				9-Oct-13	-	-	-
				10-May-13				10-Jun-13				10-Jul-13				10-Aug-13	0.197	0.3	0.1	10-Sep-13				10-Oct-13	0.26	0.29	0.23
				11-May-13				11-Jun-13				11-Jul-13				11-Aug-13	0.141	0.2	0.1	11-Sep-13				11-Oct-13	2.43	2.7	2.16
				12-May-13				12-Jun-13				12-Jul-13				12-Aug-13	0.218	0.3	0.1	12-Sep-13				12-Oct-13	4.02	4.46	3.59
				13-May-13				13-Jun-13				13-Jul-13				13-Aug-13	0.142	0.2	0.1	13-Sep-13				13-Oct-13	7.08	7.87	6.3
14-Apr-13				14-May-13				14-Jun-13				14-Jul-13				14-Aug-13				14-Sep-13				14-Oct-13	0.79	0.89	0.69
15-Apr-13				15-May-13				15-Jun-13				15-Jul-13				15-Aug-13				15-Sep-13				15-Oct-13	0.86	0.95	0.76
16-Apr-13				16-May-13				16-Jun-13				16-Jul-13				16-Aug-13				16-Sep-13				16-Oct-13	0.97	1.08	0.86
17-Apr-13				17-May-13				17-Jun-13				17-Jul-13				17-Aug-13				17-Sep-13				17-Oct-13	1.96	2.18	1.73
18-Apr-13				18-May-13				18-Jun-13				18-Jul-13				18-Aug-13				18-Sep-13				18-Oct-13	5.48	6.08	4.88
19-Apr-13				19-May-13				19-Jun-13				19-Jul-13				19-Aug-13				19-Sep-13				19-Oct-13	0.69	0.77	0.61
20-Apr-13				20-May-13				20-Jun-13				20-Jul-13				20-Aug-13				20-Sep-13				20-Oct-13	0.65	0.72	0.58
21-Apr-13				21-May-13				21-Jun-13				21-Jul-13				21-Aug-13				21-Sep-13				21-Oct-13	0.59	0.65	0.52
22-Apr-13				22-May-13				22-Jun-13				22-Jul-13				22-Aug-13				22-Sep-13				22-Oct-13	2.07	2.3	1.85
23-Apr-13				23-May-13				23-Jun-13				23-Jul-13				23-Aug-13				23-Sep-13				23-Oct-13	1.61	1.78	1.44
24-Apr-13				24-May-13				24-Jun-13				24-Jul-13				24-Aug-13				24-Sep-13				24-Oct-13	0.98	1.09	0.86
25-Apr-13				25-May-13				25-Jun-13				25-Jul-13				25-Aug-13				25-Sep-13				25-Oct-13	0.71	0.8	0.63
26-Apr-13				26-May-13				26-Jun-13				26-Jul-13				26-Aug-13				26-Sep-13				26-Oct-13	0.34	0.39	0.3
27-Apr-13				27-May-13				27-Jun-13				27-Jul-13				27-Aug-13				27-Sep-13				27-Oct-13	0.13	0.14	0.12
28-Apr-13				28-May-13				28-Jun-13				28-Jul-13				28-Aug-13				28-Sep-13				28-Oct-13	0.33	0.37	0.29
29-Apr-13				29-May-13				29-Jun-13				29-Jul-13				29-Aug-13				29-Sep-13				29-Oct-13	0.39	0.44	0.38
30-Apr-13				30-May-13				30-Jun-13				30-Jul-13				30-Aug-13				30-Sep-13				30-Oct-13	0.21	0.24	0.18
				31-May-13								31-Jul-13				31-Aug-13								31-Oct-13	0	0	0
																								Ave	1.88	2.09	

	TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3		
	Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min
1-Nov-13				1-Dec-13	-	-	-	1-Jan-14	0.08	0.1	0	1-Feb-14	0	0	0	1-Mar-14	0.01	0.8	0	1-Apr-14	0.14	10.7	0
2-Nov-13				2-Dec-13	-	-	-	2-Jan-14	0	0	0	2-Feb-14	0	0	0	2-Mar-14	0	0	0	2-Apr-14	0.02	1.2	0
3-Nov-13				3-Dec-13	-	-	-	3-Jan-14	0.01	0.3	0	3-Feb-14	0.01	0.2	0	3-Mar-14	0.02	1.3	0	3-Apr-14	0.02	1.1	0
4-Nov-13				4-Dec-13	-	-	-	4-Jan-14	0.02	0.4	0	4-Feb-14	-	-	0	4-Mar-14	0.02	0.8	0	4-Apr-14	0.02	1	0
5-Nov-13				5-Dec-13	-	-	-	5-Jan-14	0.01	0.1	0	5-Feb-14	0	0	0	5-Mar-14	0.01	0.7	0	5-Apr-14	0.01	0.9	0
6-Nov-13				6-Dec-13	-	-	-	6-Jan-14	0.01	0.4	0	6-Feb-14	0.01	0.3	0	6-Mar-14	0.01	0.7	0	6-Apr-14	0.003	0.2	0
7-Nov-13				7-Dec-13	-	-	-	7-Jan-14	0.01	0.4	0	7-Feb-14	0	0	0	7-Mar-14	0.02	1.2	0	7-Apr-14	0.02	0.9	0
8-Nov-13				8-Dec-13	-	-	-	8-Jan-14	0	0.2	0	8-Feb-14	0.01	0.09	0	8-Mar-14	0.02	1.3	0	8-Apr-14	0.02	1.2	0
9-Nov-13				9-Dec-13	-	-	-	9-Jan-14	0	0.3	0	9-Feb-14	0	0	0	9-Mar-14	0.01	0.9	0	9-Apr-14	0	0	0
10-Nov-13				10-Dec-13	-	-	-	10-Jan-14	0	0	0	10-Feb-14	0.17	4.1	0	10-Mar-14	0.03	1.2	0	10-Apr-14	0.006	0.5	0
11-Nov-13				11-Dec-13	-	-	-	11-Jan-14	0	0.1	0	11-Feb-14	0.28	10.7	0	11-Mar-14	0.02	0.8	0	11-Apr-14	0.007	0.6	0
12-Nov-13				12-Dec-13	-	-	-	12-Jan-14	0	0	0	12-Feb-14	0.07	1.7	0	12-Mar-14	0.02	0.7	0	12-Apr-14	0.02	1.1	0
13-Nov-13				13-Dec-13	-	-	-	13-Jan-14	0	0.2	0	13-Feb-14	0.05	1.1	0	13-Mar-14	0.03	1.1	0	13-Apr-14	0.02	2.7	0
14-Nov-13				14-Dec-13	-	-	-	14-Jan-14	0	0.2	0	14-Feb-14	0.05	1.1	0	14-Mar-14	0.03	1.3	0	14-Apr-14	0.02	0.8	0
15-Nov-13				15-Dec-13	-	-	-	15-Jan-14	0.01	0.2	0	15-Feb-14	0.03	0.7	0	15-Mar-14	0.02	1.1	0				
16-Nov-13				16-Dec-13	-	-	-	16-Jan-14	0	0	0	16-Feb-14	0.01	0.5	0	16-Mar-14	0.01	0.2	0				
17-Nov-13				17-Dec-13	-	-	-	17-Jan-14	0	0.2	0	17-Feb-14	0.02	1.2	0	17-Mar-14	0.03	1.4	0				
18-Nov-13				18-Dec-13	-	-	-	18-Jan-14	0	0.2	0	18-Feb-14	0.02	1	0	18-Mar-14	0.03	1.3	0				
19-Nov-13				19-Dec-13	-	-	-	19-Jan-14	0.01	0.1	0	19-Feb-14	0.01	0.8	0	19-Mar-14	0.03	1.6	0				
20-Nov-13				20-Dec-13	-	-	-	20-Jan-14	0	0.2	0	20-Feb-14	0.02	1	0	20-Mar-14	0.02	1.4	0				
21-Nov-13				21-Dec-13	-	-	-	21-Jan-14	-	-	-	21-Feb-14	0.01	1.2	0	21-Mar-14	0.02	1.4	0				
22-Nov-13				22-Dec-13	-	-	-	22-Jan-14	0	0	0	22-Feb-14	0.02	1.2	0	22-Mar-14	0.03	1.4	0				
23-Nov-13				23-Dec-13	-	-	-	23-Jan-14	0	0.3	0	23-Feb-14	0	0	0	23-Mar-14	0.02	0.1	0				
24-Nov-13				24-Dec-13	-	-	-	24-Jan-14	0.01	0.1	0	24-Feb-14	0.03	1	0	24-Mar-14	0.02	1.3	0				
25-Nov-13				25-Dec-13	-	-	-	25-Jan-14	0.01	0.1	0	25-Feb-14	0.03	1.4	0	25-Mar-14	0.04	1.2	0				
26-Nov-13				26-Dec-13	-	-	-	26-Jan-14	0	0	0	26-Feb-14	0.02	1.2	0	26-Mar-14	0.01	1.2	0				
27-Nov-13				27-Dec-13	-	-	-	27-Jan-14	0	0.1	0	27-Feb-14	0.03	1.5	0	27-Mar-14	0.01	0.8	0				
28-Nov-13				28-Dec-13	-	-	-	28-Jan-14	0	0.1	0	28-Feb-14	0.02	1.2	0	28-Mar-14	0.02	1	0				
29-Nov-13				29-Dec-13	-	-	-	29-Jan-14	0	0.1	0					29-Mar-14	0.01	0.8	0				
30-Nov-13				30-Dec-13	-	-	-	30-Jan-14	0	0.1	0					30-Mar-14	0.01	3.1	0				
				31-Dec-13	-	-	-	31-Jan-14	0.03	0.5	0					31-Mar-14	0.02	0.8	0				
								Ave	0.01	0.17		Ave	0.03	1.23		Ave	0.02	1.06					

ROBE Pty Ltd
EPL 13097

EPA Identification No. 3 - Air emissions monitoring, Solvent Extraction Plant Scrubber Combined vent TAG 14A, 14B 136

Continuous Emissions Monitoring Data Summary

	TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3		
	Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min
				1-May-13				1-Jun-13				1-Jul-13				1-Aug-13	0.475	1.5	0.4	1-Sep-13				1-Oct-13			
				2-May-13				2-Jun-13				2-Jul-13				2-Aug-13	0.347	1.5	0.2	2-Sep-13				2-Oct-13			
				3-May-13				3-Jun-13				3-Jul-13				3-Aug-13	0.435	1.1	0.3	3-Sep-13				3-Oct-13			
				4-May-13				4-Jun-13				4-Jul-13				4-Aug-13	0.35	0.5	0.3	4-Sep-13				4-Oct-13			
				5-May-13				5-Jun-13				5-Jul-13				5-Aug-13	0.291	0.3	0.2	5-Sep-13				5-Oct-13			
				6-May-13				6-Jun-13				6-Jul-13				6-Aug-13	0.254	0.6	0.2	6-Sep-13				6-Oct-13			
				7-May-13				7-Jun-13				7-Jul-13				7-Aug-13	0.223	0.2	0.3	7-Sep-13				7-Oct-13			
				8-May-13				8-Jun-13				8-Jul-13				8-Aug-13	0.258	0.4	0.2	8-Sep-13				8-Oct-13			
				9-May-13				9-Jun-13				9-Jul-13				9-Aug-13	0.212	0.3	0.1	9-Sep-13				9-Oct-13			
				10-May-13				10-Jun-13				10-Jul-13				10-Aug-13	0.2	0.2	0.1	10-Sep-13				10-Oct-13			
				11-May-13				11-Jun-13				11-Jul-13				11-Aug-13	0.154	0.2	0.1	11-Sep-13				11-Oct-13			
				12-May-13				12-Jun-13				12-Jul-13				12-Aug-13	0.208	0.4	0.1	12-Sep-13				12-Oct-13			
				13-May-13				13-Jun-13				13-Jul-13				13-Aug-13	0.161	0.2	0.01	13-Sep-13				13-Oct-13			
14-Apr-13				14-May-13				14-Jun-13				14-Jul-13				14-Aug-13				14-Sep-13				14-Oct-13			
15-Apr-13				15-May-13				15-Jun-13				15-Jul-13				15-Aug-13				15-Sep-13				15-Oct-13			
16-Apr-13				16-May-13				16-Jun-13				16-Jul-13				16-Aug-13				16-Sep-13				16-Oct-13			
17-Apr-13				17-May-13				17-Jun-13				17-Jul-13				17-Aug-13				17-Sep-13				17-Oct-13			
18-Apr-13				18-May-13				18-Jun-13				18-Jul-13				18-Aug-13				18-Sep-13				18-Oct-13			
19-Apr-13				19-May-13				19-Jun-13				19-Jul-13				19-Aug-13				19-Sep-13				19-Oct-13			
20-Apr-13				20-May-13				20-Jun-13				20-Jul-13				20-Aug-13				20-Sep-13				20-Oct-13			
21-Apr-13				21-May-13				21-Jun-13				21-Jul-13				21-Aug-13				21-Sep-13				21-Oct-13			
22-Apr-13				22-May-13				22-Jun-13				22-Jul-13				22-Aug-13				22-Sep-13				22-Oct-13			
23-Apr-13				23-May-13				23-Jun-13				23-Jul-13				23-Aug-13				23-Sep-13				23-Oct-13			
24-Apr-13				24-May-13				24-Jun-13				24-Jul-13				24-Aug-13				24-Sep-13				24-Oct-13			
25-Apr-13				25-May-13				25-Jun-13				25-Jul-13				25-Aug-13				25-Sep-13				25-Oct-13			
26-Apr-13				26-May-13				26-Jun-13				26-Jul-13				26-Aug-13				26-Sep-13				26-Oct-13			
27-Apr-13				27-May-13				27-Jun-13				27-Jul-13				27-Aug-13				27-Sep-13				27-Oct-13			
28-Apr-13				28-May-13				28-Jun-13				28-Jul-13				28-Aug-13				28-Sep-13				28-Oct-13			
29-Apr-13				29-May-13				29-Jun-13				29-Jul-13				29-Aug-13				29-Sep-13				29-Oct-13			
30-Apr-13				30-May-13				30-Jun-13				30-Jul-13				30-Aug-13				30-Sep-13				30-Oct-13			
				31-May-13								31-Jul-13				31-Aug-13								31-Oct-13			
																Ave	0.27	0.57									

	TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3				TRS (as H2S) mg/m3		
	Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min		Daily Ave	Daily max	Daily min
1-Nov-13				1-Dec-13	0	0	0	1-Jan-14	-	-	-	1-Feb-14	-	-	-	1-Mar-14	0.03	0.1	0	1-Apr-14	0.53	10.7	0
2-Nov-13				2-Dec-13	0	0	0	2-Jan-14	-	-	-	2-Feb-14	1.5	1.5	0	2-Mar-14	0.18	3.1	0	2-Apr-14	0.04	0.1	0
3-Nov-13				3-Dec-13	0	0.1	0	3-Jan-14	-	-	-	3-Feb-14	0.3	0.4	0.2	3-Mar-14	0.03	0.1	0	3-Apr-14	0.07	0.2	0
4-Nov-13				4-Dec-13	0.02	0.1	0	4-Jan-14	-	-	-	4-Feb-14	0.2	0.4	0	4-Mar-14	0.03	0.2	0	4-Apr-14	0.05	0.1	0
5-Nov-13				5-Dec-13	0.01	0.1	0	5-Jan-14	0	0	0	5-Feb-14	0.1	0.2	0	5-Mar-14	0.02	0.1	0	5-Apr-14	0.04	0.1	0
6-Nov-13				6-Dec-13	0	0	0	6-Jan-14	-	-	-	6-Feb-14	0.1	0.2	0	6-Mar-14	0.02	0.1	0	6-Apr-14	0.13	3.1	0
7-Nov-13				7-Dec-13	0	0.1	0	7-Jan-14	-	-	-	7-Feb-14	0.1	0.2	0	7-Mar-14	0.02	0.2	0	7-Apr-14	0.02	0.1	0
8-Nov-13				8-Dec-13	0	0	0	8-Jan-14	-	-	-	8-Feb-14	0	0	0	8-Mar-14	0.04	0.1	0	8-Apr-14	0.05	0.1	0
9-Nov-13				9-Dec-13	0	0	0	9-Jan-14	-	-	-	9-Feb-14	0	0	0	9-Mar-14	0.2	3.1	0	9-Apr-14	0	0	0
10-Nov-13				10-Dec-13	0	0	0	10-Jan-14	-	-	-	10-Feb-14	0.8	3.9	0	10-Mar-14	0.09	0.2	0	10-Apr-14	0	0	0
11-Nov-13				11-Dec-13	0	0.2	0	11-Jan-14	-	-	-	11-Feb-14	0.9	3	0	11-Mar-14	0.09	0.1	0	11-Apr-14	0.02	0.3	0
12-Nov-13				12-Dec-13	0	0.2	0	12-Jan-14	0	0	0	12-Feb-14	0.3	1.8	0	12-Mar-14	0.09	0.1	0	12-Apr-14	0.02	0.1	0
13-Nov-13				13-Dec-13	0	0.1	0	13-Jan-14	-	-	-	13-Feb-14	0.1	0.3	0	13-Mar-14	0.09	0.1	0	13-Apr-14	0.1	2.9	0
14-Nov-13				14-Dec-13	0	0.1	0	14-Jan-14	-	-	-	14-Feb-14	0.1	0.3	0	14-Mar-14	0.09	0.1	0	14-Apr-14	0.01	0.2	0
15-Nov-13				15-Dec-13	0	0	0	15-Jan-14	-	-	-	15-Feb-14	0.1	0.2	0	15-Mar-14	0.1	0.1	0				
16-Nov-13				16-Dec-13	0	0.1	0	16-Jan-14	0.32	1	0.2	16-Feb-14	0.1	2.9	0	16-Mar-14	0.22	3.1	0				
17-Nov-13				17-Dec-13	0	0.1	0	17-Jan-14	-	-	-	17-Feb-14	0.1	0.2	0	17-Mar-14	0.1	0.2	0				
18-Nov-13				18-Dec-13	0.05	0.2	0	18-Jan-14	-	-	-	18-Feb-14	0	0.1	0	18-Mar-14	0.1	0.2	0				
19-Nov-13				19-Dec-13	0.09	0.1	0	19-Jan-14	0	0	0	19-Feb-14	0	0.1	0	19-Mar-14	0.09	0.1	0				
20-Nov-13				20-Dec-13	0.1	0.2	0	20-Jan-14	0.08	0.1	0	20-Feb-14	0	0.1	0	20-Mar-14	0.1	0.2	0.1				
21-Nov-13				21-Dec-13	0.11	0.2	0	21-Jan-14	0.02	0.1	0	21-Feb-14	0	0.1	0	21-Mar-14	0.09	0.1	0				
22-Nov-13				22-Dec-13	0.07	0.1	0	22-Jan-14	0.03	0.1	0	22-Feb-14	0	0.1	0	22-Mar-14	0.1	0.3	0				
23-Nov-13				23-Dec-13	0.26	0.3	0	23-Jan-14	-	-	-	23-Feb-14	0.3	3	0	23-Mar-14	0.25	3.1	0				
24-Nov-13				24-Dec-13	0.26	0.4	0	24-Jan-14	-	-	-	24-Feb-14	0.1	0.2	0	24-Mar-14	0.09	0.2	0				
25-Nov-13				25-Dec-13	0.2	0.3	0	25-Jan-14	-	-	-	25-Feb-14	0.1	0.2	0	25-Mar-14	0.1	0.1	0.1				
26-Nov-13				26-Dec-13	0.45	1.1	0	26-Jan-14	0	0	0	26-Feb-14	0.1	0.2	0	26-Mar-14	0.1	0.3	0				
27-Nov-13				27-Dec-13	0.87	1	0	27-Jan-14	-	-	-	27-Feb-14	0.1	0.2	0	27-Mar-14	0.1	0.2	0.1				
28-Nov-13				28-Dec-13	1.2	2.6	0	28-Jan-14	-	-	-	28-Feb-14	0.1	0.2	0	28-Mar-14	0.06	0.2	0				
29-Nov-13				29-Dec-13	1	1.1	0	29-Jan-14	-	-	-					29-Mar-14	0.01	0.1	0				
30-Nov-13				30-Dec-13	1.3	8.6	0	30-Jan-14	-	-	-					30-Mar-14	0.11	0.3	0				
				31-Dec-13	-	-	-	31-Jan-14	-	-	-					31-Mar-14	0.04	0.1	0				
												Ave	0.21	0.74		Ave	0.09	0.54					

Appendix D – AUSPLUME text file output

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                      ROBE RUN 1

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     Concentration or deposition                 Concentration
     Emission rate units                         OUV/min
     Concentration units                         Odour_Units
     Units conversion factor                      1.67E-02
     Constant background concentration                    0.00E+00
     Terrain effects                             None
     Smooth stability class changes?                  No
     Other stability class adjustments ("urban modes")    None
     Ignore building wake effects?                   No
     Decay coefficient (unless overridden by met. file)   0.000
     Anemometer height                             10 m
     Roughness height at the wind vane site             0.300 m
     Use the convective PDF algorithm?                  No

              DISPERSION CURVES
     Horizontal dispersion curves for sources <100m high  Pasquill-Gifford
     Vertical  dispersion  curves for sources <100m high  Pasquill-Gifford
     Horizontal dispersion curves for sources >100m high  Briggs Rural
     Vertical  dispersion  curves for sources >100m high  Briggs Rural
     Enhance horizontal plume spreads for buoyancy?       Yes
     Enhance  vertical  plume spreads for buoyancy?       Yes
     Adjust horizontal P-G formulae for roughness height? Yes
     Adjust  vertical  P-G formulae for roughness height? Yes
     Roughness height                              0.100m
     Adjustment for wind directional shear              None
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                PLUME RISE OPTIONS
Gradual plume rise?                          Yes
Stack-tip downwash included?                 Yes
Building downwash algorithm:               PRIME method.
Entrainment coeff. for neutral & stable lapse rates 0.60,0.60
Partial penetration of elevated inversions?      No
Disregard temp. gradients in the hourly met. file?   No

and in the absence of boundary-layer potential temperature gradients
given by the hourly met. file, a value from the following table
(in K/m) is used:

  Wind Speed            Stability Class
   Category      A     B     C     D     E     F
 _____________________________________________________
     1        0.000  0.000  0.000  0.000  0.020  0.035
     2        0.000  0.000  0.000  0.000  0.020  0.035
     3        0.000  0.000  0.000  0.000  0.020  0.035
     4        0.000  0.000  0.000  0.000  0.020  0.035
     5        0.000  0.000  0.000  0.000  0.020  0.035
     6        0.000  0.000  0.000  0.000  0.020  0.035

WIND SPEED CATEGORIES
Boundaries between categories (in m/s) are:  1.54,  3.09,  5.14,  8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

AVERAGING TIMES
 1 hour


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1                  ___________________________

                         ROBE RUN 1
                    SOURCE CHARACTERISTICS
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              STACK SOURCE: DP2

   X(m)    Y(m)   Ground Elev.  Stack Height  Diameter Temperature  Speed
 539319  6121890        0m          30m        1.05m       41C     3.6m/s

          ______ Effective building dimensions (in metres) ______
Flow direction                10°  20°  30°  40°  50°  60°  70°  80°  90° 100° 110° 120°
Effective building width         75   30   36   41   45   48   49   48   46   43   47   49
Effective building height        27   29   29   29   29   29   29   29   29   29   29   29
Along-flow building length       94   47   49   49   48   46   42   37   31   24   30   36
Along-flow distance from stack  -75  -27  -30  -31  -31  -31  -30  -27  -24  -20  -22  -24
Across-flow distance from stack -17    7    6    5    4    3    2    0   -1   -3   -4   -5

Flow direction               130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width         50   49   46   42   37   31   75   30   36   41   45   48
Effective building height        29   29   29   29   29   29   27   29   29   29   29   29
Along-flow building length       41   45   48   48   48   46   94   46   49   49   48   46
Along-flow distance from stack  -26  -27  -27  -26  -25  -22  -19  -19  -19  -18  -17  -15
Across-flow distance from stack  -6   -7   -8   -8   -8   -9   17   -7   -6   -5   -4   -3

Flow direction               250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width         48   48   46   43   47   49   49   49   46   42   37   31
Effective building height        29   29   29   29   29   29   29   29   29   29   29   29
Along-flow building length       42   37   31   24   30   36   41   45   48   49   48   46
Along-flow distance from stack  -13  -10   -7   -4   -8  -12  -16  -18  -21  -23  -24  -24
Across-flow distance from stack  -2    0    1    3    4    5    6    7    8    8    9    9

            (Constant) emission rate = 6.44E+06 OUV/min
               No gravitational settling or scavenging.

              STACK SOURCE: DP3

   X(m)    Y(m)   Ground Elev.  Stack Height  Diameter Temperature  Speed
 539378  6121881        0m          24m        1.05m       45C     5.2m/s
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          ______ Effective building dimensions (in metres) ______
Flow direction                    10°  20°  30°  40°  50°  60°  70°  80°  90° 100° 110° 120°
Effective building width          39   43   46   47   48   46   49   48   46   43   47   49
Effective building height         27   27   27   27   27   27   29   29   29   29   29   29
Along-flow building length        29   35   40   44   47   48   42   37   31   24   30   36
Along-flow distance from stack   -76  -82  -87  -88  -86  -82  -82  -84  -83  -80  -80  -80
Across-flow distance from stack   24   13    2  -10  -21  -32   30   20    8   -4  -15  -27

Flow direction                   130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width          50   44   45   44   42   43   39   43   46   47   48   46
Effective building height         29   23   23   23   23   27   27   27   27   27   27   27
Along-flow building length        41   39   38   35   32   34   29   35   40   44   47   48
Along-flow distance from stack   -77  -27  -25  -21  -17   40   48   48   47   44   40   34
Across-flow distance from stack  -37   -9  -10  -11  -12  -35  -24  -13   -1   10   21   32

Flow direction                   250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width          48   48   46   43   47   49   49   44   44   44   42   43
Effective building height         29   29   29   29   29   29   29   23   23   23   23   27
Along-flow building length        42   37   31   24   30   36   41   40   38   36   32   34
Along-flow distance from stack    40   47   52   56   50   44   36  -13  -14  -15  -15  -74
Across-flow distance from stack  -31  -20   -8    4   16   27   37    9   10   11   12   35

              (Constant) emission rate = 4.83E+07 OUV/min
                No gravitational settling or scavenging.


                  STACK SOURCE: DP14

  X(m)     Y(m)    Ground Elev.  Stack Height  Diameter Temperature  Speed
 539361  6121826        0m           28m         0.31m       43C     2.0m/s

          ______ Effective building dimensions (in metres) ______
Flow direction                    10°  20°  30°  40°  50°  60°  70°  80°  90° 100° 110° 120°
Effective building width          39   43   46   47   48   46   44   39   34   29   35   49
Effective building height         27   27   27   27   27   27   27   27   27   27   27   29
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Along-flow building length        29   35   40   44   47   48   48   46   43   39   43   36
Along-flow distance from stack   -19  -25  -30  -35  -38  -40  -41  -41  -39  -36  -37  -93
Across-flow distance from stack   17   16   14   12   10    7    4    1   -2   -4   -7   29

Flow direction                  130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width          50   49   46   42   46   43   39   43   46   47   48   46
Effective building height         29   29   29   29   27   27   27   27   27   27   27   27
Along-flow building length        41   45   48   48   40   34   29   35   40   44   47   48
Along-flow distance from stack   -99 -103 -103 -100  -21  -15  -10  -10  -10  -10   -9   -8
Across-flow distance from stack   16    2  -12  -26  -17  -18  -17  -16  -14  -12  -10   -7

Flow direction                  250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width          43   39   34   29   34   49   49   49   46   42   46   43
Effective building height         27   27   27   27   27   29   29   29   29   29   27   27
Along-flow building length        48   46   43   39   43   36   41   45   48   49   40   34
Along-flow distance from stack    -7   -6   -4   -2   -6   57   58   58   56   52  -19  -19
Across-flow distance from stack   -4   -1    2    5    8  -29  -16   -2   12   26   18   18

        (Constant) emission rate = 1.84E+06 OUV/min
          No gravitational settling or scavenging.


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1                ________________________

                     ROBE RUN 1

                   RECEPTOR LOCATIONS

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The Cartesian receptor grid has the following x-values (or eastings):
537390.m  537440.m  537490.m  537540.m  537590.m  537640.m  537690.m
537740.m  537790.m  537840.m  537890.m  537940.m  537990.m  538040.m
538090.m  538140.m  538190.m  538240.m  538290.m  538340.m  538390.m
```

```
538440.m  538490.m  538540.m  538590.m  538640.m  538690.m  538740.m
538790.m  538840.m  538890.m  538940.m  538990.m  539040.m  539090.m
539140.m  539190.m  539240.m  539290.m  539340.m  539390.m  539440.m
539490.m  539540.m  539590.m  539640.m  539690.m  539740.m  539790.m
539840.m  539890.m  539940.m  539990.m  540040.m  540090.m  540140.m
540190.m  540240.m  540290.m  540340.m  540390.m  540440.m  540490.m
540540.m  540590.m  540640.m  540690.m  540740.m  540790.m  540840.m
540890.m  540940.m  540990.m  541040.m  541090.m  541140.m  541190.m
541240.m  541290.m  541340.m  541390.m  541440.m  541490.m  541540.m
541590.m  541640.m  541690.m  541740.m  541790.m  541840.m  541890.m

and these y-values (or northings):
6119783.m 6119833.m 6119883.m 6119933.m 6119983.m 6120033.m 6120083.m
6120133.m 6120183.m 6120233.m 6120283.m 6120333.m 6120383.m 6120433.m
6120483.m 6120533.m 6120583.m 6120633.m 6120683.m 6120733.m 6120783.m
6120833.m 6120883.m 6120933.m 6120983.m 6121033.m 6121083.m 6121133.m
6121183.m 6121233.m 6121283.m 6121333.m 6121383.m 6121433.m 6121483.m
6121533.m 6121583.m 6121633.m 6121683.m 6121733.m 6121783.m 6121833.m
6121883.m 6121933.m 6121983.m 6122033.m 6122083.m 6122133.m 6122183.m
6122233.m 6122283.m 6122333.m 6122383.m 6122433.m 6122483.m 6122533.m
6122583.m 6122633.m 6122683.m 6122733.m 6122783.m 6122833.m 6122883.m
6122933.m 6122983.m 6123033.m 6123083.m 6123133.m 6123183.m 6123233.m
6123283.m 6123333.m 6123383.m 6123433.m 6123483.m 6123533.m 6123583.m
6123633.m 6123683.m 6123733.m 6123783.m 6123833.m 6123883.m 6123933.m
6123983.m 6124033.m 6124083.m 6124133.m 6124183.m 6124233.m 6124283.m


DISCRETE RECEPTOR LOCATIONS (in metres)

No.    X       Y    ELEVN  HEIGHT      No.    X       Y    ELEVN  HEIGHT
 1  539151 6121677    0.0    0.0        3  539537 6121988    0.0    0.0
 2  539292 6122120    0.0    0.0
```

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                METEOROLOGICAL DATA : ROBE 2012


1          Peak values for the 100 worst cases  (in Odour_Units)
                Averaging time = 1 hour

 Rank     Value   Time Recorded        Coordinates
                  hour,date       (* denotes polar)

    1  2.28E+02   20,17/01/13   (539240, 6122133,    0.0)
    2  2.23E+02   20,05/01/13   (539340, 6121933,    0.0)
    3  2.19E+02   22,05/01/13   (539790, 6121733,    0.0)
    4  2.17E+02   17,14/01/13   (539340, 6121933,    0.0)
    5  2.07E+02   19,06/02/13   (539540, 6121583,    0.0)
    6  2.05E+02   13,14/01/13   (539340, 6121933,    0.0)
    7  2.04E+02   14,12/02/13   (539340, 6121933,    0.0)
    8  2.03E+02   17,30/12/12   (539340, 6121933,    0.0)
    9  1.98E+02   21,10/01/13   (538990, 6121983,    0.0)
   10   1.97E+02   15,12/02/13   (539340, 6121933,    0.0)
   11   1.97E+02   03,26/01/13   (538940, 6121983,    0.0)
   12   1.91E+02   05,18/01/13   (538990, 6121983,    0.0)
   13   1.91E+02   23,24/11/12   (538890, 6121983,    0.0)
   14   1.89E+02   20,07/02/13   (539340, 6121933,    0.0)
   15   1.88E+02   22,25/11/12   (539740, 6121733,    0.0)
   16   1.88E+02   11,02/02/13   (539340, 6121933,    0.0)
   17   1.88E+02   18,30/12/12   (539340, 6121933,    0.0)
   18   1.86E+02   15,10/11/12   (539340, 6121933,    0.0)
   19   1.86E+02   23,15/03/13   (539440, 6121583,    0.0)
   20   1.85E+02   21,04/02/13   (539540, 6121533,    0.0)
   21   1.85E+02   24,24/11/12   (539240, 6122233,    0.0)
   22   1.84E+02   21,22/11/12   (539240, 6122183,    0.0)
   23   1.83E+02   18,20/01/13   (539340, 6121933,    0.0)
   24   1.83E+02   23,12/01/13   (538840, 6121983,    0.0)
   25   1.82E+02   03,27/02/13   (538840, 6121983,    0.0)
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26  1.81E+02  16,23/11/12  (539340, 6121933,    0.0)
27  1.81E+02  17,19/02/13  (539340, 6121933,    0.0)
28  1.81E+02  22,21/12/12  (539290, 6122133,    0.0)
29  1.80E+02  19,06/09/13  (539240, 6122233,    0.0)
30  1.80E+02  05,08/12/12  (539290, 6122283,    0.0)
31  1.79E+02  17,24/01/13  (539340, 6121783,    0.0)
32  1.78E+02  03,14/12/12  (538990, 6121933,    0.0)
33  1.77E+02  03,18/01/13  (538840, 6121833,    0.0)
34  1.77E+02  20,09/02/13  (539340, 6122083,    0.0)
35  1.77E+02  03,16/03/13  (538940, 6121983,    0.0)
36  1.76E+02  15,23/11/12  (539340, 6121933,    0.0)
37  1.76E+02  02,16/01/13  (539340, 6122133,    0.0)
38  1.76E+02  18,10/05/13  (538840, 6122033,    0.0)
39  1.75E+02  01,28/11/12  (538940, 6121933,    0.0)
40  1.75E+02  21,30/05/13  (539440, 6121533,    0.0)
41  1.74E+02  18,19/10/12  (539290, 6121883,    0.0)
42  1.74E+02  02,10/03/13  (538840, 6122033,    0.0)
43  1.74E+02  01,29/12/12  (539440, 6121583,    0.0)
44  1.73E+02  16,10/01/13  (539290, 6121883,    0.0)
45  1.73E+02  20,06/09/13  (539240, 6122283,    0.0)
46  1.72E+02  04,18/01/13  (538990, 6121933,    0.0)
47  1.71E+02  17,09/03/13  (539340, 6121933,    0.0)
48  1.71E+02  04,28/01/13  (538840, 6121833,    0.0)
49  1.71E+02  04,31/01/13  (538890, 6121933,    0.0)
50  1.70E+02  22,22/12/12  (538990, 6121883,    0.0)
51  1.70E+02  16,18/02/13  (539290, 6121883,    0.0)
52  1.70E+02  13,10/03/13  (539340, 6121933,    0.0)
53  1.70E+02  22,22/04/13  (539440, 6121483,    0.0)
54  1.70E+02  16,09/04/13  (539340, 6121933,    0.0)
55  1.69E+02  01,22/01/13  (538990, 6121783,    0.0)
56  1.69E+02  23,05/10/12  (539340, 6122183,    0.0)
57  1.69E+02  14,16/10/12  (539290, 6121883,    0.0)
58  1.69E+02  14,18/03/13  (539340, 6121933,    0.0)
59  1.68E+02  21,18/10/12  (539190, 6122233,    0.0)
60  1.68E+02  19,24/10/12  (539290, 6121883,    0.0)
61  1.68E+02  23,07/04/13  (539140, 6122133,    0.0)
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62  1.68E+02  19,04/11/12  (539290, 6121883,   0.0)
63  1.68E+02  01,23/01/13  (538940, 6121883,   0.0)
64  1.67E+02  19,30/11/12  (539340, 6121933,   0.0)
65  1.67E+02  02,25/03/13  (539490, 6121483,   0.0)
66  1.67E+02  17,06/01/13  (539290, 6121883,   0.0)
67  1.67E+02  10,19/11/12  (539340, 6121933,   0.0)
68  1.66E+02  01,01/05/13  (539340, 6122283,   0.0)
69  1.66E+02  23,30/12/12  (539840, 6121683,   0.0)
70  1.66E+02  21,15/03/13  (539840, 6121833,   0.0)
71  1.66E+02  16,09/03/13  (539290, 6121883,   0.0)
72  1.66E+02  18,25/02/13  (539290, 6121883,   0.0)
73  1.65E+02  05,16/01/13  (538940, 6121933,   0.0)
74  1.65E+02  21,10/03/13  (539090, 6121483,   0.0)
75  1.65E+02  23,02/04/13  (539290, 6122183,   0.0)
76  1.65E+02  13,30/11/12  (539340, 6121933,   0.0)
77  1.64E+02  20,10/05/13  (538890, 6121883,   0.0)
78  1.64E+02  02,26/03/13  (539140, 6122233,   0.0)
79  1.64E+02  02,10/04/13  (539140, 6122183,   0.0)
80  1.64E+02  17,25/02/13  (539290, 6121883,   0.0)
81  1.64E+02  02,24/03/13  (538840, 6121933,   0.0)
82  1.64E+02  15,06/03/13  (539340, 6121783,   0.0)
83  1.64E+02  04,20/10/12  (539290, 6122283,   0.0)
84  1.63E+02  23,30/04/13  (538890, 6122033,   0.0)
85  1.63E+02  22,21/01/13  (539790, 6121783,   0.0)
86  1.63E+02  15,03/01/13  (539290, 6121883,   0.0)
87  1.63E+02  22,26/11/12  (538990, 6121933,   0.0)
88  1.62E+02  21,02/02/13  (539340, 6121933,   0.0)
89  1.62E+02  24,10/04/13  (539290, 6122183,   0.0)
90  1.62E+02  16,22/10/12  (539340, 6121933,   0.0)
91  1.62E+02  21,26/04/13  (539140, 6122233,   0.0)
92  1.62E+02  20,05/02/13  (539090, 6122083,   0.0)
93  1.62E+02  22,02/04/13  (539240, 6122233,   0.0)
94  1.62E+02  17,11/02/13  (539290, 6121883,   0.0)
95  1.61E+02  03,26/03/13  (539090, 6122183,   0.0)
96  1.61E+02  06,23/03/13  (539440, 6121533,   0.0)
97  1.61E+02  15,12/03/13  (539290, 6121883,   0.0)
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 98   1.61E+02   24,06/12/12   (538890, 6121833,     0.0)
 99   1.61E+02   22,30/04/13   (539190, 6122133,     0.0)
100   1.61E+02   02,23/03/13   (539190, 6122183,     0.0)
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