ANNEXURE 5

ANNEXURE 5

Air Quality Impact Assessment

prepared by

GHD Pty Ltd

10 November 2016

John Studdert
Manildra Pty Ltd
36 Bolong Rd
Bomaderry NSW 2541

Our ref: MAN001
Your ref:

Dear Sir

Proposed Modification to Ethanol Distillery Plant Air Quality Assessment

1 Introduction

GHD has been engaged by Manildra Pty Ltd (Manildra) to review the potential air quality (odour) impacts associated with modification application MP06_0028 Proposed Modification to Ethanol Distillery Plant, for Shoalhaven Starches at Bomaderry.

Flour and grains are processed at the factory to produce ethanol, starch, gluten, glucose and distiller's dried grain (DDG). Shoalhaven Starches is the holder of Environment Protection Licence number 883 issued for the plant by the NSW EPA.

Shoalhaven Starches intend to undertake modifications to the existing Ethanol Distillery Plant at their Bomaderry plant to:

- increase the proportion of 'beverage" grade ethanol that is able to be produced on the site. This modification will enable increased flexibility in terms of the range of types of ethanol produced at the site (i.e. between fuel, industrial and beverage grade ethanol) to meet market demands; and
- to modify the type and location of the Water Balance Recovery Evaporator that has been previously approved under MOD 2 adjacent to the Ethanol Plant

GHD has undertaken a review of the proposed operational changes at the site and how these may influence odour levels and potential odour impacts on surrounding sensitive receptors.

2 Limitations

This letter has been prepared by GHD for Manildra Pty Ltd (Manildra) and may only be used and relied on by Manildra Pty Ltd for the purpose agreed between GHD and Manildra Pty Ltd as set out in section 1 of this letter.

GHD otherwise disclaims responsibility to any person other than Manildra Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has not been involved in the preparation of the planning submission and has had no contribution to, or review of the submission. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the submission.

The opinions, conclusions and any recommendations in this report are based on explicit assumptions made by GHD, described in sections 1 and 4 and throughout the body of this document, and limitations of modelling predictions. GHD disclaims liability arising from any of the assumptions being incorrect. GHD has prepared this report on the basis of information provided by Manildra Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

3 Proposed modification.

The proposed changes to site as part of the upgrades are described below.

Central and Eastern Plant Areas

- Relocation of previously approved Evaporator;
- Beverage grade ethanol plant. Existing structures (two water tanks, diesel above ground tanks, a brick pump house, and redundant former plant) will be demolished as part of these works;
- Installation of three above ground tanks. Two 400 kL tanks (tanks 1 and 2) will be installed in the ethanol recovery area. An existing tank will be removed to make room for one of these tanks. A 1,000 kL tank (tank 8) will be installed in the ethanol storage area;
- Cooling towers;
- New gantry pipe connecting the ethanol plant, tanks and cooling towers;
- Electrical substation;
- Emergency ISO tank container storage area, including extension of an access road (as shown in red) from the former Dairy Farmers complex;
- An internal access road to and from the ISO tank container storage; and
- Two railway sidings will be extended along the south-eastern side of a former Dairy Farmers site to accommodate an extension of the railway siding, existing water treatment tanks, pump house and piping will be removed, and existing water treatment ponds will be filled in.

Adjacent the BOC Gas Facility

- Proposed car parking area near the existing BOC gas facility. This will involve the redevelopment of the existing paved car parking in this area of the site, and re-laying of additional pavement for

parking purposes. A relatively minor amount of earthworks may take place in this area (to an assumed depth of 0.5 m below the existing ground level).

The components of the proposed modification relevant to odour have been identified as the beverage grade ethanol plant and cooling towers. The evaporator and storage tanks are also discussed in Section 4 below. The location of the proposed modifications are shown on Drawing No. MN285-002J in Attachment A.

4 Odour emissions

A review of the modifications has been undertaken to establish which components are relevant to the odour assessment.

The beverage grade ethanol plant has the potential to produce odours. The Technical Appendix entitled "*For the supply of: Process design package of a rectification unit to produce extra neutral alcohol at 96.5 % vol from raw alcohol at 92 % vol*" states that there is one gas emission from the washing column D500 which is located on the vacuum column. This is VOC (non condensable) and are expected to be emitted at less than 0.3 kg/h. The total air emission from the D500 has a flow rate of 70 kg/h.

In order to determine the potential odour from this source existing measurements at the site were reviewed. An odour sample was taken of emission point D6: Incondensable gases vent, and Manildra has advised this should have a similar odour character to the washing column release. An OER of 24,000 ou.m^3/min was measured based on a flowrate of 1.2 m^3/min.

The flow rate of the new washing column vent will be 70 kg/h of air saturated in water (0.07 m^3/h assuming a density of 1000 kg per m^3) (Technip Technical specification X500 – Vacuum package). This equates to 0.001166 m^3/min of air flow which would have a similar odour character and level to the measured D6 vent. The corresponding OER based on this flowrate is 23.3 ou.m^3/min (~0.4 ou.m^3/s)

This low OER of 23.3 ou.m^3/min represents the closed system being used with most of the odorous VOCs being removed upstream via a series of condensers and scrubbers.

The previously approved but not yet constructed evaporator will be moved as part of the beverage grade ethanol plant modification. The evaporator is not expected to be a significant source of odour and has not been included in previous odour assessments at the site.

The proposed tanks to be located in the ethanol recovery area and storage area are also not a significant odour source. Existing tanks have not been identified as odour sources in previous investigations at the site.

Cooling towers have been identified as a potential odour source. Previous odour measurements were conducted of cooling towers on-site and found to have an OER of 10,320 ou.m^3/min (172 ou.m^3/s). Additional cooling towers have been included in the site emissions inventory in Section 5 below.

5 Emissions inventory

The most recent odour assessment at the site was conducted in May 2016 for a Modification to approved DDG Dryers, Cooling Towers and Biofilters (GHD, 2016). This assessment included odour modelling to assess the following changes at the site:

- 4 distiller's dried grain (DDG) dryers
- A minor modification to footprint of the four DDG dryers
- Relocation of the cooling towers in the DDG Plant
- The addition of two biofilters to cope with the increased number of DDG Dryers

The total site emissions with the above changes are presented in Table 1. Note the additional odour expected from this proposed modification to the ethanol distillery plant is not included in the table below. The total site OER is used to compare the expected odour emissions from the proposed modification against previous odour assessments at the site.

Table 1 Summary of major odour sources- Existing & Approved Scenarios

Source	Source ID	Source type (according to NSW approved)	Total OER – measured (or scaled) OUm^3/s	% of total OER
Combined boiler stack for 5/6 boilers	BOILR5	Tall wake free point	49,270	16.8%
Pellet Plant exhaust stack	PPES	Tall wake free point	48,800	16.7%
Yeast propagators 4 and 5 (combined)	E15Y4 & E15Y5	Wake-affected point	28,330	9.7%
No. 3 Gluten Dryer	S03	Wake-affected point	22,690	7.7%
No. 4 Gluten Dryer	S04	Wake-affected point	14,930	5.1%
Ethanol recovery scrubber discharge	ERESC	Wake-affected point	12,830	4.4%
No. 6 Gluten Dryer	GD6	Wake-affected point	12,570	4.3%
No 7 Gluten Dryer	GD7	Wake-affected point	9,550	3.3%
Fermenters 10-16	FERM	Volume	7,160	2.4%
No 5 Starch Dryer	8	Wake-affected point	6,800	2.3%
No 1 Gluten Dryer	S02	Wake-affected point	6,430	2.2%
Effluent treatment area (environment farm)	SOBAS, POND1-6	Area	6,140	2.1%
All other sources (40 total)*	Miscellaneous	Miscellaneous	67,410	23.0%
		Total	**292,910**	**100**

*Includes the new cooling tower, milo feed silo and two biofilters from the May 2016 odour assessment

The MP06_0028 Proposed Modification to Ethanol Distillery Plant (including cooling tower) will add an additional 172.4 ou.m^3/s to the total site OER, which is an approximate 0.06% increase from the existing approved site. This will bring the predicted total OER up to 293,082 ou.m^3/s.

Due to such an insignificant predicted increase in site OER (0.06%) additional odour dispersion modelling is not needed. There would be no noticeable change in predicted odour experienced at the nearby sensitive receivers compared to the May 2016 assessment.

For the purpose of comparison, four scenarios are provided in Table 2 below as follows:

- Scenario C ethanol expansion (2008)
- Scenario 1 was the addition of DDG 4 and the buildings (May 2016)
- Scenario 2 was the addition of DDG dryers 5 to 7 (May 2016)
- Scenario 3 is the additional odour from the proposed modification to the ethanol distillery plant

Table 2 Total site wide emissions

Modelled Scenario	Description		Total OER – OU.m^3/s
Comparison to previous assessments			
C	2008 AQ assessment – factory odour Stage 1 plus upgrade (scenario C): after control *does not include environmental farm sources		207,897 (factory + upgrade) 192,147 (boilers and scrubber) **TOTAL – 328,252**
-	Odour audit – existing sources July 2015	EPA sources	127,590
		All existing sources, at 300 ML	243,790
May 2016 assessment – Proposed modification to DDG dryers, cooling towers and biofilters			
Existing and Approved	Existing and approved operations (Baseline scenario) – 300 ML		**291,350** total
Scenario 1	Proposed operations (Scenario 1)		**291,690**
Scenario 2	Proposed operations (Scenario 2)		**292,910**
Percentage increase in total OER from approved/existing scenario to Scenario 2			0.5%
This assessment – Proposed modification for ethanol distillery plant (including cooling tower)			
Scenario 3	Proposed operations (Scenario 3)		**293,082**
Percentage increase in total OER from scenario 2 to Scenario 3			0.06%

Significant dust emissions including total suspended particulates (TSP) and particulates 10 microns or less (PM_{10}) are not expected to arise from operation of the proposal. Shoalhaven Starches have existing

dust controls in place to manage dust emissions at the site and impacts from the proposal are not expected at nearby sensitive receptors.

6 Predicted odour levels

The predicted odour levels based on scenario 2 for existing and approved operations at the plant from the May 2016 odour impact assessment are shown in Table 3. A predicted increase of less than 0.1% from the distillery plant modification will not have any noticeable impact on the predicted odour levels at surrounding sensitive receptors. The predicted odour levels modelled for Scenario 2 represent a worst-case scenario in terms of site odour levels and the levels predicted at Receptors 1 to 4 are not expected to change as a result of this proposal.

Table 3 Predicted peak (99th percentile, short term averaged) odour impact at nearby receptors

Receptor	Range, m	To nearest odour source	Direction	Odour criterion	Odour impact, OU, 99th percentile, nose-response time
					Scenario 2
R1 Bomaderry	150	Packing Plant	W	6	6.4
R2 North Nowra	1300	Factory	SW	3	3.0
R3 Nowra	700	Factory	S	5	6.3
R4 Terara	1300	Factory	SE	5	6.0

7 Conclusion

GHD was engaged by Manildra to conduct a review of potential odour impacts from a proposed modification to the Ethanol Distillery Plant. Two minor odour sources were identified in this assessment, the washing column D500 which is located on the vacuum column, and cooling towers.

An insignificant increase of 0.06% was observed in the site OER due to the modification. The predicted odour impacts as a result of the proposal will not change and it is highly unlikely there will be an increase in odour detected at sensitive receptors.

As a result, it is predicted that no discernible increase in perceived odour impacts would be evident as a result of the proposed modifications to the plant.

Sincerely
GHD Pty Ltd

Evan Smith
Senior Environmental Engineer - Air and Noise Assessments
+61 2 9239 7695

Attachment A – Proposed beverage grade ethanol plant plan view

EXISTING – BLACK.
PROPOSED MODIFICATION WORKS–RED
RELOCATED APPROVAL – BLUE
ORIGINAL MOD 2 APPROVAL–MAGENTA

50M 28.17M

N

TANK 1,000,000 LT

TWO TANKS
400,000 LT EACH
EXISTING TANK
TO BE REMOVED.

EXISTING DME STRUCTURE
TO BE REMOVED.
S.C.C. DEMOLITION
APPROVAL NUMBER
DA13/1713.(15/07/2016).

Shoalhaven River

COOLING TOWERS

SUBSTATION

NEW PIPE GANTRY

APPROX RAILWAY LINES

EMERGENCY ISO TANK CONTAINER STORAGE.

PROPOSED WALKWAY

PROPOSED COMPRESSOR ROOM

RECEIVER

ELECT.SUBSTATION 7

EXISTING DRAINAGE SUMP
19M/3M/3.5M DEEP
VOLUME = 465.5 m³
CAPACITY = 465,500 Litres

EXISTING PUMP HOUSE

EXISTING AMENITIES

FM

SHED

ROAD OUTLOADING SILOS

ROADWAY

EXISTING CONCRETE STRUCTURE

GRAIN SILO No.1

FLOUR SILOS

STORAGE AREA

FLOUR UNLOADING

ION CONVERTER

GLUCOSE PLANT

AMMONIA TANK

GLUCOSE TANKS

PRODUCTION BUILDING

FERMENTATION AREA

1000m3

ETHANOL RECOVERY AREA

ETHANOL STORAGE AREA

5

PROCESS TANKS

COMPRESSOR

SERVICE ROADWAY

FUTURE 17

CIP TANK SLAB

FENCING

PROPOSED SECURITY GATE

LOADING BAY

REMOVE WATER TANKS

CONTROL ROOM

LABORATORY

DISTILLERY

No.3 FERMENTER

No.2 FERMENTER

PUMP HOUSE

LANDSCAPE

DRIVEWAY

BEVERAGE GRADE ETHANOL PLANT

5M SERVICES EASEMENT

5M BUFFER

BOLONG RD.

EVAPORATORS

WATER TANKS,PUMP HOUSE &
FIRE STATION TO BE REMOVED.
FIRE MONITOR TO REMAIN.

RELOCATE APPROVED MOD 2 EVAPORATOR.

PROPOSED CAR PARK
46 CARS
MANILDRA LAND

OPEN PADDOCK
MANILDRA LAND

37 CARS
PROPOSED CAR PARK

BOC GAS FACILITY

Q.A. OFFICE

PROPOSED PUMP HOUSE CAR PARK.
46 CARS.

APPROVED RECTIFIER &
STRIPPER SHOWN RELOCATED.

PUMP HOUSE

METAL TANK

RELOCATE APPROVED MOD 3 CAR PARK.

PROPOSED Q.A. OFFICE
CAR PARK.
37 CARS.

BRIDGE

0 10 METRE

PLAN VIEW

ISS	DATE	ZONE	CHANGE AMENDMENTS	BY	CKD
J	31/10/16	D3	Entrance road relocated.Wording	P.C.	B.H.
H	26/10/16	ALL	Tanks capacity adjusted.	P.C.	B.H.
G	26/10/16	ALL	Syrups tank removed.	P.C.	B.H.
E	15/9/16	ALL	Car parks relocated.	P.C.	B.H.
D	30/8/16	A L L	Pipe runs revised.Approved Manildra.	P.C.	K.L.

Commitment to Excellence
GEM OF THE WEST

MANILDRA GROUP
100% AUSTRALIAN

DRAWN P.J.C.
TRACED----
CHECKED
APPROVED
DRG PRACTICE AS1100

TITLE MODIFICATION TO SHOALHAVEN STARCHES EXPANSION PROJECT.
PROPOSED BEVERAGE GRADE ETHANOL PLANT.
PLAN VIEW.

SIZE A3 | SCALES 1:1000 | SHT

MR–5927

DRG No MN285–002J