



50 Junction Street, Nowra, NSW 2541

P: 4421 4583  
T: 0414 315 775

[matthew@harwoodacoustics.com.au](mailto:matthew@harwoodacoustics.com.au)  
[www.harwoodacoustics.com.au](http://www.harwoodacoustics.com.au)

ABN: 71634 997 937

---

# Environmental Noise Impact Assessment Shoalhaven Starches

## Proposed Modification to Ethanol Distillery for Beverage Grade Ethanol Production and Other Works

At:-

22 and 24 Bolong Road,  
Bomaderry, NSW 2541

*Prepared for: -*

Shoalhaven Starches Pty Ltd  
C/- Cowman Stoddart Pty Ltd  
29-31 Kinghorn Street  
Nowra NSW 2541

Attention: Mr Stephen Richardson

Reference: 2007001E-R

*Prepared by: -*

Matthew Harwood MAAS  
1<sup>st</sup> December 2020

# Document Control Page

Revision	Author	Released By	Date
Draft	MH	MH	06/07/2020
Draft 2	MH	MH	24/08/2020
Draft 3	MH	MH	28/08/2020
Final	MH	MH	01/09/2020
Rev A	MH	MH	01/12/2020

Shoalhaven Starches Pty Ltd commissioned Harwood Acoustics to carry out an Environmental Noise Impact Assessment for a proposed modification to the Shoalhaven Starches Expansion Project (SSEP), approval, reference 06\_0228 at their facility at 160 Bolong Road, Bomaderry, NSW.

Accordingly, Harwood Acoustics has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics and may not be suitable for use beyond that scope.

Harwood Acoustics undertakes no duty nor accepts any responsibility to any third party who may rely upon this report.

The concepts and information within this report are the property of Harwood Acoustics and the content herein should not be copied or reproduced, in whole or in part, without prior written consent.

Advice and recommendations provided in this report are in relation to acoustical issues only. No claims of expertise are made, and no liability is accepted, in relation to issues falling outside the field of acoustical consulting. These may include, but are not limited to, structural and waterproofing considerations, fire rating or thermal rating. Relevant authorities and / or experts should be consulted regarding areas other than acoustics.

## TABLE OF CONTENTS

1. INTRODUCTION AND SUMMARY .....	4
2. SITE AND DEVELOPMENT DESCRIPTION.....	6
2.1 Site Description.....	6
2.2 Description of Proposal.....	7
3. NOISE CRITERIA.....	9
3.1 NSW Department of Planning and Environment .....	9
3.1.1 Existing Project Approval.....	9
3.1.2 Existing Project Approval.....	10
3.2 NSW EPA’s Environment Protection Licence .....	10
3.3 Shoalhaven Starches Noise Management Plan .....	11
3.4 Construction Noise Criteria.....	12
3.5 Project Specific Noise Goals.....	14
4. ETHANOL PLANT AND EQUIPMENT NOISE EMISSION .....	14
4.1 Plant and Equipment Source Noise Levels .....	14
4.2 Noise Level Predictions .....	15
4.2.1 Noise Modelling Details and Parameters .....	15
4.2.2 Predicted Noise Levels.....	17
4.2.3 Modifying Factor Correction Assessment .....	19
4.2.4 Post Operational Noise Compliance Assessment.....	21
5. CONSTRUCTION NOISE EMISSION.....	22
6. RECOMMENDED NOISE CONTROLS .....	23
6.1 Ethanol Plant & Equipment Noise Levels .....	23
6.2 Cooling Tower – Sound Level Design Goals.....	23
6.3 Post Construction Noise Compliance Assessment .....	24
6.4 Construction Noise .....	24
7. CONCLUSION .....	25

## 1. INTRODUCTION AND SUMMARY

Shoalhaven Starches Pty Ltd is part of the Manildra Group of companies and their existing facility is located on the southern side of Bolong Road, Bomaderry, NSW, on the northern side of the Shoalhaven River. The surrounding area is a mix of commercial, industrial and residential premises. The nearest residences are located in the township of Bomaderry to the north-west and across the Shoalhaven River in Nowra to the south and Terara to the south-east.

In 2009 Shoalhaven Starches received Project Approval from the Minister for Planning (the Department) for the Shoalhaven Starches Expansion Project (SSEP), reference 06\_0228.

The SSEP included approval to increase ethanol production from 126 million litres per year to 300 million litres per year, which includes a small portion of beverage grade ethanol. Subsequent to the initial approval, modified approvals have been granted for various amendments to the Expansion Project. Once such modification was approved in 2017 (Modification 12) which included modifications to the ethanol plant and equipment on Site to allow for an increase in the production of beverage grade ethanol, as distinct from fuel grade.

It is now proposed to seek approval for a similar modification to allow for a further increase in the proportion of beverage grade ethanol produced at the Site. The modification will allow for an increase in production of beverage grade ethanol of up to 100 million litres per year. The overall approved ethanol production capacity of 300 million litres per year will not change, only the proportion of beverage grade ethanol to overall ethanol production.

In addition to the proposed increase in the proportion of beverage grade ethanol production, this modification also seeks approval for the installation of additional product storage silos and new cooling towers.

The modification will therefore include the following components: -

- The installation of distillation columns and associated processing plant and equipment immediately to the west of the existing Ethanol Distillery Plant,
- An additional three (3) ethanol storage tanks within the existing ethanol storage area,
- The construction of an additional ethanol loadout immediately adjacent to and to the north of the existing loadout facility,
- The relocation of the existing ethanol distillery control room from its current position adjacent the existing ethanol plant, to the old fire pump station building which is located adjacent to the Bolong Road frontage of the site as originally approved under Modification 15.
- Installation of additional product silos near to Starch Dryer No. 5 and the interim packing plant and relocation of electrical substation to the north of the gluten dryer No. 5 building,
- Relocation of approved and installation of additional product tanks,
- Realignment and construction of new pipe bridge,
- Relocation of main electrical substation,
- Extension of south western car park, and

- Installation of new cooling towers at the eastern end of the Site and relocation of approved 150 container storage area.

A site plan showing the location of the relevant components of this modification relative to the existing facility is shown in Figure 2. Full details can be seen in the Manildra Group's building design plans for project number 6963A dated August 2020.

It is a requirement of the NSW Environment Protection Authority and Department of Planning, Industry and Environment, that an Environmental Noise Impact Assessment of the proposed modification is prepared. The assessment is to be prepared in accordance with the NSW EPA's *Noise Policy for industry 2017* and *Interim Construction Noise Guideline 2008* in order to ensure compliance with the noise limits contained in Shoalhaven Starches Environment Protection Licence.

The main sources of noise associated with this modification will be the plant and equipment associated with the beverage grade ethanol plant, the cooling towers and the pump motors associated with the product storage silos. Other facets of the modification such as the realignment of the ISO container storage yard, realignment of the pipe bridge and changes to the car park and substation will not constitute any significant noise producing activity.

Shoalhaven Starches operates under Environment Protection Licence Number 883 (EPL) which sets noise limits for the overall operation of the complex.

Given the number of modifications and construction of new noise sources since the initial approval, the noise goals for any new plant are now set to a minimum 15 dB below the EPL noise limits in accordance with Shoalhaven Starches Noise Management Plan originally prepared 31 October 2009 and revised 7 September 2010 under the Project Approval conditions for the Shoalhaven Starches Expansion Project.

Noise goals have been designed for the proposal so as to ensure existing noise levels are not increased by the introduction of the new plant and equipment. These range between 23 dBA and 27 dBA depending upon the residential receptor location.

Receptor locations are derived from the EPL and are located in Nowra, Bomaderry and Terara as shown in Figure 1.

Noise modelling has been undertaken using a combination of measured noise levels from existing indicative plant and equipment and similar processes at the existing complex, along with manufacturer's sound data.

TECHNIP Group Pty Ltd, suppliers of the main process plant to be installed to facilitate the production of beverage grade ethanol, have stipulated a noise design goal of 'less than 60 dBA at 30 metres' from all processing the plant and equipment. This is in keeping with assessments undertaken by Harwood Acoustics in 2016 and 2020 of existing ethanol processing plant and equipment installed at the Site.

Providing the noise level stipulated by the supplier is not exceeded, calculations show that the level of noise emission from the beverage grade ethanol production process will meet the noise design goals at all receptor locations.

A final design will be undertaken at the time of the Design Noise Verification or during construction or commissioning of the plant.

In the event that a reduction in noise from the equipment associated with the plant and equipment is required this will be achieved through a combination of localised acoustical treatment including, for example, localised screening, construction of acoustical enclosures, the lagging of pipe work and the judicious location of the plant. Any additional noise controls, if required will not be particularly onerous and the noise design goals can easily be achieved for this modification.

The construction works will consist potentially of piling, pouring of concrete slabs for the erection of the additional storage tanks and ‘beer columns’ and the installation of the ethanol plant and equipment.

Calculations show that the level of noise emission from the construction phase will be within noise management levels set by the NSW EPA’s *Interim Construction Noise Guideline* 2008 at all receptor locations for the majority of the construction phases. There is potential for the noise management levels to be exceeded during piling works by up to approximately 2 dB at the nearest receptors. This is not considered to be a significant impact, however it is recommended that piling works are carried out during day time hours only, as recommended in the Project Approval.

Construction noise mitigation measures are included in the *Construction Safety & Environmental Management Plan* prepared by Shoalhaven Starches.

## **2. SITE AND DEVELOPMENT DESCRIPTION**

### **2.1 Site Description**

The Shoalhaven Starches complex is located on the southern side of Bolong Road across the Shoalhaven River from Nowra.

The area surrounding Shoalhaven Starches is a mix of commercial, industrial and residential premises with vacant land, owned by the Manildra Group, to the north.

The nearest residential receptor locations to the proposal are as follows:-

- Location 1 – Nobblers Lane, Terara approximately 1450 metres to the south east,
- Location 2 – Riverview Road, Nowra approximately 1090 metres to the south west,
- Location 3 – Meroo Street, Bomaderry approximately 630 metres to the north west,
- Location 4 – Coomera Street, Bomaderry approximately 700 metres to the north west.

Locations are listed in keeping with the order shown in Environment Protection Licence number 883, as detailed in Section 3.2 of this report.

Distances are based on the location of the main ethanol distillery plant area as a reference only. The Shoalhaven Starches site and receptor locations are shown in Figure 1 along with some of the main components of the proposal.



**Figure 1. Location Plan – Shoalhaven Starches, Bomaderry, NSW** (source: Google Maps © 2016)

## 2.2 Description of Proposal

In 2009 Shoalhaven Starches received Project Approval from the Minister for Planning (the Department) for the Shoalhaven Starches Expansion Project (SSEP), reference 06\_0228.

The SSEP included approval to increase ethanol production from 126 million litres per year to 300 million litres per year, which includes a small portion of beverage grade ethanol. Subsequent to the initial approval, modified approvals have been granted for various amendments to the Expansion Project. Once such modification was approved in 2017 (Modification 12) which included modifications to the ethanol plant and equipment on Site to allow for an increase in the production of beverage grade ethanol, as distinct from fuel grade.

It is now proposed to seek approval for a similar modification to allow for a further increase in beverage grade ethanol production. The modification will allow for an increase in production of beverage grade ethanol of up to 100 million litres per year. The overall approved ethanol production capacity of 300 million litres per year will not change, only the proportion of beverage grade ethanol to overall ethanol production.

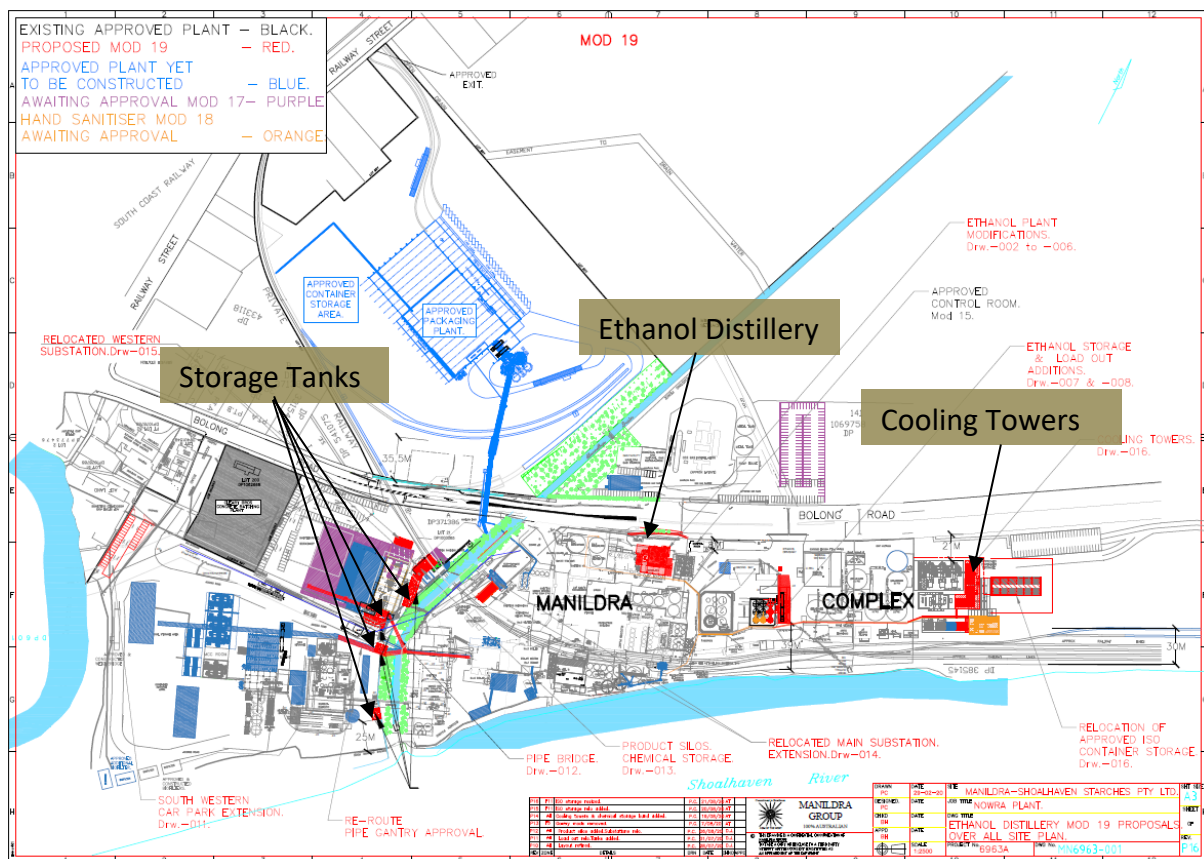
In addition to the proposed increase in the proportion of beverage grade ethanol production, this modification also seeks approval for the installation of additional product storage silos and new cooling towers.

The modification will therefore include the following components: -

- The installation of distillation columns and associated processing plant and equipment immediately to the west of the existing Ethanol Distillery Plant,
- An additional three (3) ethanol storage tanks within the existing ethanol storage area,
- The construction of an additional ethanol loadout immediately adjacent to and to the north of the existing loadout facility,
- The relocation of the existing ethanol distillery control room from its current position adjacent the existing ethanol plant, to the old fire pump station building which is located adjacent to the Bolong Road frontage of the site as originally approved under Modification 15.
- Installation of additional product silos near to Starch Dryer No. 5 and the interim packing plant and associated relocation of an electrical substation to the north of the starch dryer No. 5 building,
- Relocation of approved and installation of additional product tanks,
- Realignment and construction of new pipe bridge,
- Relocation of main electrical substation,
- Extension of south western car park, and
- Installation of new cooling towers at the eastern end of the Site and associated relocation of approved 150 container storage area.

A site plan showing the location of the relevant components of this modification relative to the existing facility is shown in Figure 2. Full details can be seen in the Manildra Group's building design plans for project number 6963A dated August 2020.





**Figure 2. Proposed Ethanol Distillery Modification, Cooling Towers and Storage Silos – Shoalhaven Starches, Bomaderry, NSW**

(source: Manildra Group's building design plans for Project No. 6963A)

### 3. NOISE CRITERIA

This section outlines the noise guidelines applicable to this proposal and establishes the project specific noise goals.

#### 3.1 NSW Department of Planning and Environment

##### 3.1.1 Existing Project Approval

Project Approval for Application No. 06\_0228, provided by the Minister for Planning, dated January 2009, Schedule 2, 'Terms of Approval' states:-

##### *"Condition 2*

*The applicant shall carry out the development generally in accordance with the:*

- a) EA and associated site plans (see Appendix 2).*

##### *Condition 2A*

*The applicant shall carry out the development generally in accordance with the:*

- a) Statement of commitments,*
- b) Conditions of this consent, and*
- c) Revised statement of commitments for Appendix 6."*

The original Project Approval incorporates noise mitigation measures recommended in the 'Acoustical Assessment, Proposed Ethanol Upgrade, Shoalhaven Starches' – prepared by The Acoustic Group Pty Ltd, ref 38.3849.R52:ZJM, dated 26 June 2008. This document forms part of the EA and statement of commitments and it is implicit that the noise control recommendations within this document are required to be implemented as part of the Project Approval.

Schedule 3, Conditions 11 to 14 inclusive of the Project Approval, also refer to noise emission and are summarised as follows:-

Condition 11 relates to restricted hours of construction activities. Condition 12 reiterates the noise limits contained with Environment Protection Licence 883. Condition 13 requires that all feasible and reasonable noise mitigation measures must be implemented during the construction phase of the project. Condition 14 required the preparation of a noise management plan (see Section 3.3 below).

### 3.1.2 Existing Project Approval

In response to a request for information relating to noise emission from the proposed modification, the NSW Department of Planning and Environment requires an assessment of the potential for noise impact.

## 3.2 NSW EPA's Environment Protection Licence

Shoalhaven Starches operates under Environment Protection Licence 883 issued by the NSW Environment Protection Authority.

Section L5 'Noise Limits' of the licence states:-

*"L5.1 the  $L_{Aeq (15min)}$ \* sound pressure level contribution generated from the premises must not exceed the following levels when measured at or near the boundary of any residential premises:*

Location	Day Time (7 am to 6 pm) $L_{Aeq (15 min)}$	Evening Time (6 pm to 10 pm) $L_{Aeq (15 min)}$	Night Time (10 pm to 7 am) $L_{Aeq (15 min)}$	Night Time (10 pm to 7 am) $L_{A1 (1 min)}$
<i>All locations in Terara on the south side of the Shoalhaven River</i>	<b>38</b>	<b>38</b>	<b>38</b>	<b>48</b>
<i>All locations in Nowra on the south side of the Shoalhaven River</i>	<b>38</b>	<b>38</b>	<b>38</b>	<b>48</b>
<i>at locations in Meroo Street, Bomaderry</i>	<b>42</b>	<b>42</b>	<b>42</b>	<b>52</b>
<i>other locations in Bomaderry</i>	<b>40</b>	<b>40</b>	<b>40</b>	<b>50</b>

These noise limits apply to the overall operation of the Shoalhaven Starches complex.

*L5.2 Noise from the premises is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30m of a dwelling where the dwelling is more than 30m from the boundary, to determine compliance with condition L5.1.*

*The modification factors in Fact Sheet C of the Noise Policy for Industry shall also be applied to the measured noise levels where applicable.*

*L5.3 Noise from the premises is to be measured at 1 metre from the dwelling facade to determine compliance with the  $L_{A1(1 \text{ minute})}$  noise limit in condition L5.1.*

*L5.4 Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the Noise Policy for Industry).*

*L5.5 The noise emission limits identified in condition L5.1 apply under meteorological conditions of:*

- a) Wind speeds up to 3 metres per second at 10 metres above ground level; or*
- b) Temperature inversion conditions of up to 3°C/100 metres and wind speeds up to 2 metres per second at 10 metres above ground level.*

### **3.3 Shoalhaven Starches Noise Management Plan**

Previous approval for the Shoalhaven Starches Expansion Project, required the preparation of a Noise Management Plan for addressing and managing noise emission from the expansion project.

The Shoalhaven Starches Noise Management Plan originally prepared 31 October 2009 and revised 7 September 2010 addresses, among other things, acoustic criteria relating to the Shoalhaven Starches complex and any new developments. Section 3 of the plan lists noise limits from the Environmental Protection Licence as shown in Section 4.1 above and states:-

*“Compliance testing conducted on a regular basis on behalf of the Mill*

*[Shoalhaven Starches complex] has found noise emission from the premises satisfies the EPA criteria as a result of works on the Shoalhaven Starches site. In order to ensure that there is no increase in noise emission from the subject premises, with respect to the noise criteria nominated by the EPA in License Condition 6.3 [now 5.1], the design goal for such additional plant should be at least 10 dB below the criteria nominated by the EPA.”*

Given the number of modifications subsequent to the original approval and location of new noise sources, it is recommended that the noise design goals are set to a minimum 15 dB below the EPL noise limits henceforth.

### 3.4 Construction Noise Criteria

The NSW EPA published the *Interim Construction Noise Guideline* in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

The Guideline presents two ways of assessing construction noise impacts; the quantitative method and the qualitative method.

The quantitative method is generally suited to longer term construction projects and involves predicting noise levels from the construction phase and comparing them with noise management levels given in the guideline.

The qualitative method for assessing construction noise is a simplified way to identify the cause of potential noise impacts and may be used for short-term works, such as repair and maintenance projects of short duration.

Consideration is given to the potential for noise impact from construction activities on residential receptors in Section 6 of this report.

Table 2 in Section 4 of the Guideline sets out noise management levels at affected residences and how they are to be applied during normal construction hours. The noise management level is derived from the rating background level (RBL) plus 10 dB in accordance with the Guideline. This level is considered to be the 'noise affected level' which represents the point above which there may be some community reaction to noise.

The author has carried out numerous noise surveys in Nowra, Bomaderry and Terara and has found daytime background noise levels range between 33 and 40 dBA depending on the location, as shown in Table 1 below.

**Table 1 Rating Background Levels – Nowra, Terara and Bomaderry, NSW**

Location	Time of Day	Rating Background Level (L <sub>90</sub> )
135 Terara Road, Terara March 2012	Day (7 am to 6 pm)	<b>33 dBA</b>
55 Terara Road, Nowra February 2015	Day (7 am to 6 pm)	<b>36 dBA</b>
Cambewarra Rd, Bomaderry July 2010	Day (7 am to 6 pm)	<b>40 dBA</b>
Shoalhaven Village Caravan Park, Nowra March 2012	Day (7 am to 6 pm)	<b>40 dBA</b>

For the purpose of determining the potential for community reaction to noise emission from construction activities, previously measured background noise levels in the vicinity of each receptor location have been used to determine the noise management levels as shown in Table 2 below.

**Table 2** **L<sub>eq</sub> Noise Management Levels from Construction Activities**

Receptor Location	Noise Management Level	How to Apply
Location 1 (Terara)	<b>43 dBA</b> (33 + 10)	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> <li>Where the predicted or measured L<sub>Aeq</sub> (15 min) noise level is greater than the noise affected level, the proponent should apply all feasible and reasonable* work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
Location 2 (Nowra)	<b>50 dBA</b> (40 + 10)	
Locations 3 & 4 (Bomaderry)	<b>48 dBA</b> (38 + 10)	
	<b>Highly noise affected</b> <b>75 dB(A)</b>	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ol style="list-style-type: none"> <li>times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)</li> <li>if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol> </li> </ul>

\* Section 6, “work practices” of The *Interim Construction Noise Guideline*, states:- “there are no prescribed noise controls for construction works. Instead, all feasible and reasonable work practices should be implemented to minimise noise impacts.

*This approach gives construction site managers and construction workers the greatest flexibility to manage noise”.*

Definitions of the terms feasible and reasonable are given in Section 1.4 of the Guideline.

The ‘highly noise affected’ level of 75 dBA represents the point above which there may be strong community reaction to noise. This level is provided in the Guideline and is not based on the RBL.

### 3.5 Project Specific Noise Goals

The most relevant criteria are as follows:-

#### Operational Phase (Environment Protection Licence noise limits less 15 dB) –

*L<sub>eq, 15 minute</sub> noise design goals during the day, evening and night time periods*

- 23 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Terara on the south side of the Shoalhaven River
- 23 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Nowra on the south side of the Shoalhaven River,
- 27 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Meroo Street, Bomaderry,
- 25 dBA (*L<sub>eq, 15 minute</sub>*) at other locations in Bomaderry.

*L<sub>1, 1 minute</sub> noise design goals during the night time periods*

- 33 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Terara on the south side of the Shoalhaven River
- 33 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Nowra on the south side of the Shoalhaven River,
- 37 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Meroo Street, Bomaderry,
- 35 dBA (*L<sub>eq, 15 minute</sub>*) at other locations in Bomaderry.

#### Construction Phase Noise Management Levels

- 43 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Terara;
- 48 dBA (*L<sub>eq, 15 minute</sub>*) at locations in Bomaderry; and
- 50 BA (*L<sub>eq, 15 minute</sub>*) at locations in Nowra.

The criteria are to be assessed at the most-affected point on or within the residential property boundary or, if that is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence. For upper floors, the noise is assessed outside the nearest window.

## 4. ETHANOL PLANT AND EQUIPMENT NOISE EMISSION

### 4.1 Plant and Equipment Source Noise Levels

The main sources of noise associated with the modification proposal will be the plant and equipment associated with the modification to the ethanol distillery to facilitate beverage grade production.

The main processing plant is the Extra Neutral Alcohol Unit 2 which will be supplied by TechnipFMC Pty Ltd.

Given that there will be no increase to the overall production of ethanol at the facility there will be no significant increase in heavy vehicle or mobile plant movements associated with this modification.

All existing noise sources that are associated with the production of ethanol, including the beverage grade production are considered as part of the cumulative noise from the Site. For this reason, the noise design goals are stringent, to ensure that any new noise sources that are not part of current operations, do not increase overall site noise. To this end, there is no consideration given to modelling existing noise sources, such as truck movements, that

already form part of the existing site operations despite potentially being utilised in beverage grade ethanol production.

Table 3 below provides a schedule of overall 'A' frequency weighted sound power levels, in decibels re: 1 pW, of noise sources associated with proposed modification. These are derived from manufacturer's data, previously measured noise levels of indicative plant and equipment and the author's data base of similar items of plant and equipment.

**Table 3** **L<sub>eq</sub>, 15 minute Sound Power Levels – Plant and Equipment**

Description	L <sub>eq</sub> , 15 minute Sound Power Level (dBA)	L <sub>1</sub> , 1 minute * Sound Power Level (dBA)
Beverage Grade Ethanol Plant (combined)	90	92
Cooling Tower (Low noise) x 12 (per two fan units)	87	89
Storage Tanks (bunded pump motor) (per two tanks)	80	83

The author has carried several noise assessments at the Shoalhaven Starches facility including for the previous modification application for an increase to beverage grade ethanol production in 2016 (Modification 12). Noise validation testing was then undertaken for Modification 12 once all plant and equipment was installed and operational in 2019.

The sound power level shown in Table 3 above for the beverage grade ethanol plant is derived from measurements of similar plant on site within the distillery. Similarly, this is the case with the bunded pump motors and the cooling towers, which are in keeping with manufacturer's data for a low noise model (Baltimore) unit installed under Modification 15.

\* The L<sub>1</sub>, 1 minute sound power level is also derived from on-site measurements. The noise sources are predominantly steady state at Shoalhaven Starches, particularly cooling towers and pumps and motors. The difference between the energy average (L<sub>eq</sub>) noise levels and the maximum and L<sub>1</sub>, 1 minute noise levels are between 2 and 3 dB.

## 4.2 Noise Level Predictions

### 4.2.1 Noise Modelling Details and Parameters

A noise model has been developed using *SoundPLAN* Essential version 5.1.

Table 4 below provides details on the specific parameters used to develop the noise model.

**Table 4 Computer Noise Model Parameters**

Parameter	Details
Buildings and structures	<p>Significant structures at the Shoalhaven Starches facility (including buildings, plant, and equipment) have been constructed in the model to determine the extent to which on-site structures may provide attenuation for new noise sources. The height of the structures is scaled from Shoalhaven Starches elevation drawings.</p> <ul style="list-style-type: none"> <li>A 3D example of the model is provided in Appendix B</li> </ul>
Noise Sources	<p>Cooling towers</p> <ul style="list-style-type: none"> <li>Cooling tower fans located at 7.8 metres above ground,</li> <li>Sound Power Level (<math>L_w</math>) 87 dBA per two fan unit,</li> <li>Total six (6) lots of two fan units (e.g. 12 cooling towers),</li> <li>Location of noise sources shown in Appendices C.</li> </ul> <p>Ethanol Distillery Plant</p> <ul style="list-style-type: none"> <li>Modelled as area sources over three levels (heights) of the distillery being 4 metres, 8 metres and 12 metres above ground level <sup>1</sup>,</li> <li>Each separate level with an <math>L_w</math> 85 dBA, totalling <math>L_w</math> 90 dBA for the plant associated with ethanol modifications <sup>2</sup>,</li> <li>Location of sources shown in Appendix D.</li> </ul> <p>Bunded pump motors</p> <ul style="list-style-type: none"> <li>Point sources located at 1.5 metres above ground level,</li> <li>Ten (10) motors located on the western side of the Site, near Starch Dryer 5 and south of there, as indicated in drawing MN6963-001 and as shown in Appendix B,</li> <li>Each motor with a Sound Power Level (<math>L_w</math>) of 80 dBA <sup>3</sup>.</li> <li>Location of sources shown in Appendix E</li> </ul>
Algorithm & Meteorological conditions	<p>Noise sources are modelled in accordance with the International Standard ISO 9613-2 (1996(E)) '<i>Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation</i>'.</p> <p>The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation.</p> <p>The method allows for downwind propagation conditions namely:-</p>



**Table 4 Computer Noise Model Parameters *Cont...***

Parameter	Details
	<ul style="list-style-type: none"> <li>wind direction within an angle of <math>\pm 45^\circ</math> of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and</li> <li>wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground,</li> </ul> <p>The equations for calculating downwind sound pressure level, including the equations for attenuation... are the average for meteorological conditions within these limits.</p> <p>These equations also hold, equivalently, for average propagation under well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.</p>

**Notes:-**

1. The heights of the levels (platforms) of noise sources associated with the distillation plant are in keeping with existing plant measured and assessed during the noise validation report for Modification 12,
2. The sound level arising from the noise sources associated with the distillation plant is in keeping with noise measurements made of the plant and equipment associated with the beverage grade upgrade for Modification 12,
3. Sound power level of bundled pump motors is derived from measurements of similar motors on-site during several noise assessments previously undertaken.

**4.2.2 Predicted Noise Levels**

Predicted noise levels at each receptor location are shown in Tables 5 and 6 below.

**Where:-**

- Table 5 shows the predicted  $L_{eq, 15 \text{ minute}}$  noise levels at each receptor for comparison against the noise design goal for the day, evening and night time periods, and
- Table 6 shows the predicted  $L_{1, 1 \text{ minute}}$  noise levels for comparison against the sleep disturbance noise goals at night.

The predicted noise levels assume recommendations made in Section 6 of this report have been implemented.

**Table 5 Predicted  $L_{eq, 15 \text{ minute}}$  Noise Levels at Receptor Locations**

Description	Predicted Noise Level $L_{eq, 15 \text{ minute}}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
<b>Design Noise Goal (<math>L_{eq, 15 \text{ minute}}</math>)</b>	<b>23</b>	<b>23</b>	<b>27</b>	<b>25</b>
Ethanol Distillery Plant & Equipment	<10	11	21	22
Cooling Towers	16	16	14	18
Storage Tanks and Silos	<10	14	11	10
Combined	17	20	22	23
<b>Complies</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>

**Table 6 Predicted  $L_{1, 1 \text{ minute}}$  Noise Levels at Receptor Locations**

Description	Predicted Noise Level $L_{1, 1 \text{ minute}}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
<b>Design Noise Goal (<math>L_{eq, 15 \text{ minute}}</math>)</b>	<b>33</b>	<b>33</b>	<b>37</b>	<b>35</b>
Ethanol Distillery Plant & Equipment	<10	13	23	24
Cooling Towers	18	18	16	20
Storage Tanks and Silos	10	17	14	13
Combined	20	22	24 to 25	25 to 26
<b>Complies</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>

Predictions in Tables 5 and 6 assume the following:-

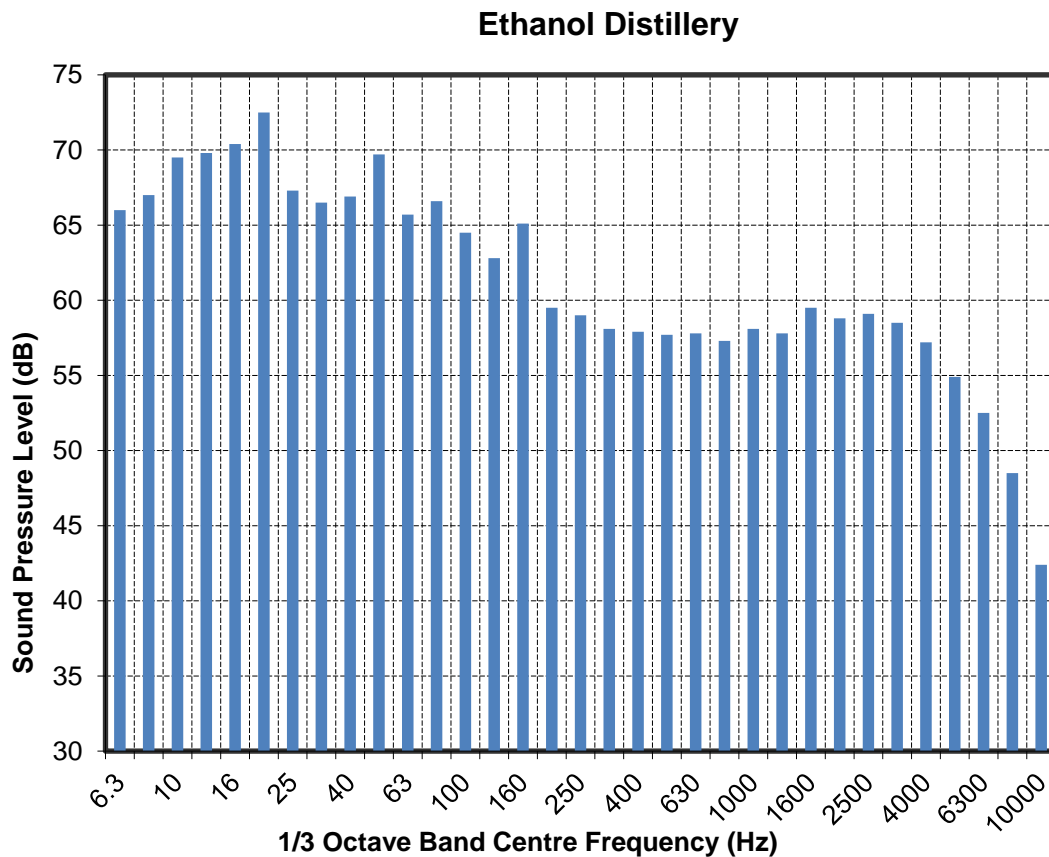
- Distance loss to each receptor,
- Acoustical shielding from structures on the Site,
- Sound power levels for each item of plant and equipment do not exceed those shown in Table 3.

A Table of predicted noise levels at each receptor location along with the contribution from each individual noise source is provided in Appendix F and is produced by the *SoundPLAN* computer model.

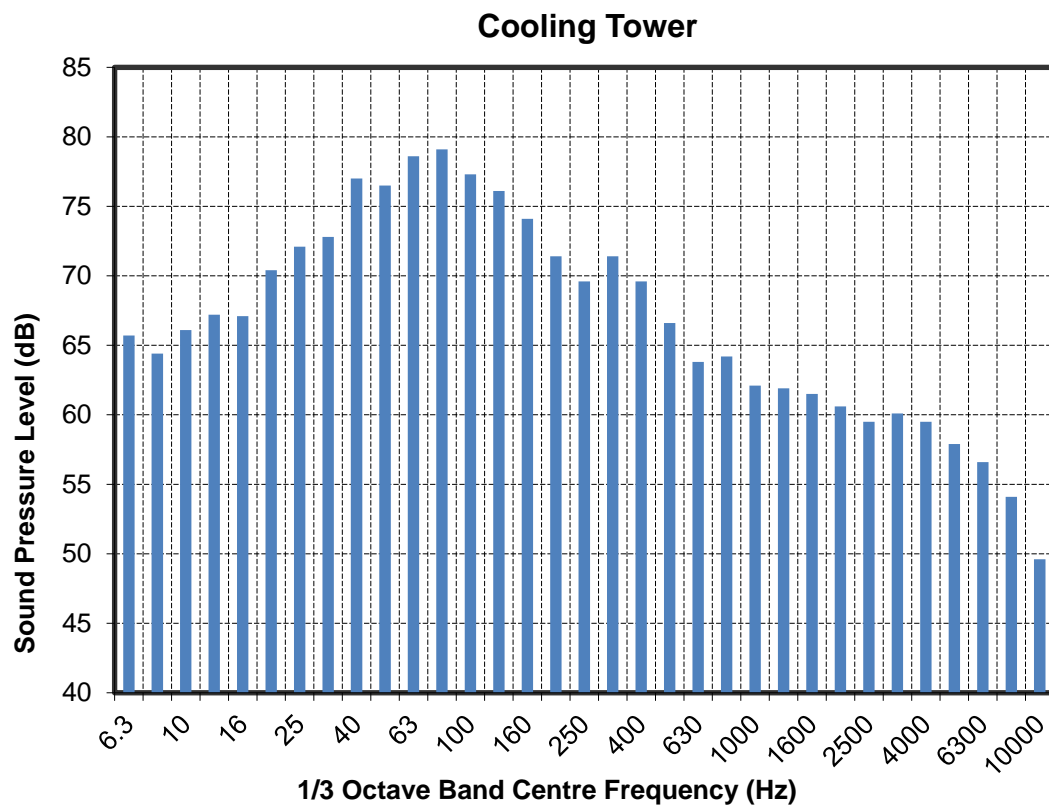
#### 4.2.3 Modifying Factor Correction Assessment

An assessment of potential annoying characteristics has been undertaken for the noise sources in accordance with Fact Sheet C of the EPA's *Noise Policy for Industry* 2017.

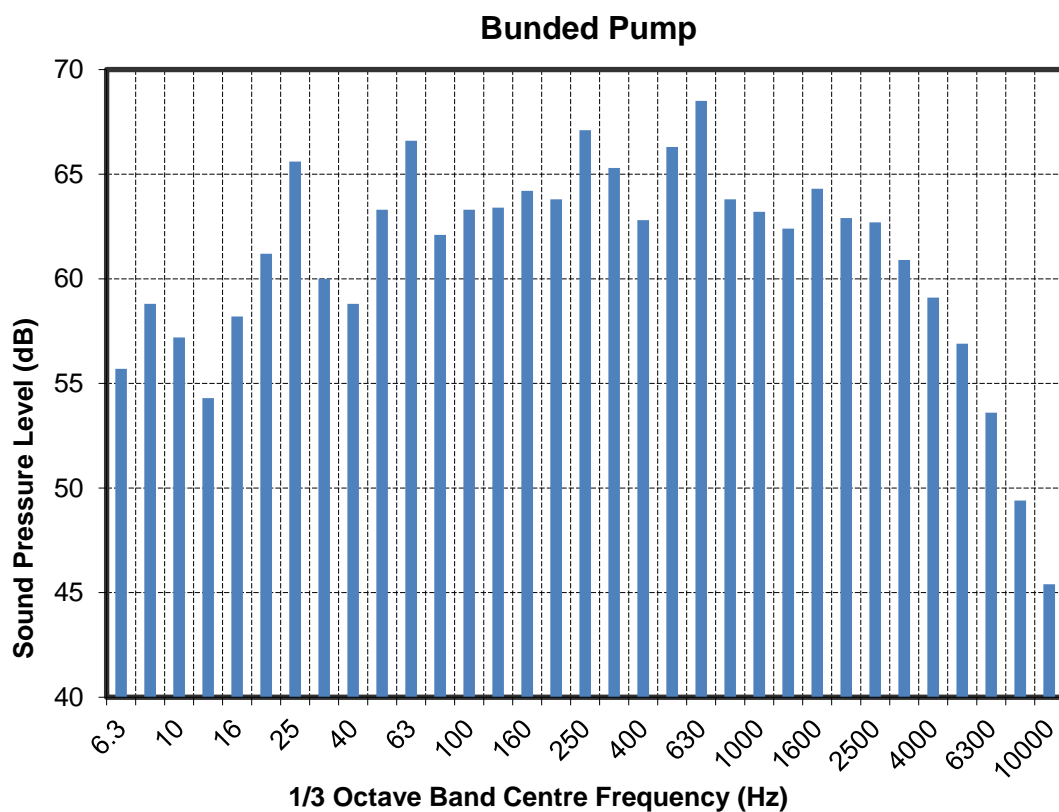
Figures 3, 4 and 5 below show the energy average short-term sound pressure level ( $L_{eq}$ ) one-third octave band spectra for the ethanol distillery plant, cooling towers and bunded pump motor from measurements taken in close proximity of the plant.



**Figure 3. One-third octave band spectrum Ethanol Distillery Plant and Equipment**



**Figure 4. One-third octave band spectrum Cooling Towers**



**Figure 5. One-third octave band spectrum Bunded Pump Motor**

Table 7 below shows the difference between the C and A frequency weighted sound pressure levels for assessment of the potential for low frequency noise.

**Table 7 Low Frequency Noise Assessment**

Description	Plant and Equipment		
	Ethanol Plant	Cooling Tower	Bunded Pump Motors
Measured Sound Pressure Level - dBA	69	75	69
Measured Sound Pressure Level - dBC	76	86	75
Difference	7	11	6
Allowable Difference	≤ 14	≤ 14	≤ 14
Low Frequency Factor	No	No	No

The noise sources are of a steady state nature and are not considered intermittent.

It can therefore be seen that the noise sources associated with this modification application do not display characteristics requiring modifying factor adjustments.

#### 4.2.4 Post Operational Noise Compliance Assessment

Once the plant and equipment associated with this modification has been installed at the Site and is operational, a noise compliance assessment will be undertaken.

The noise compliance assessment will adopt the following methodology, in summary:-

- Direct noise measurement (where practicable) and assessment of the level of noise emission from the Shoalhaven Starches facility at each of the identified receptor locations in Nowra, Bomaderry and Terara,
- This will be done prior to commissioning of the Modification 19 noise sources and after commissioning, to determine the contribution of the new plant and equipment to the overall noise levels,
- The assessment will determine compliance with the noise design goals for the Mod 19 plant and equipment as well as compliance with the EPL noise limits at all receptors for the overall operation of the Site,
- The noise surveys will include an assessment of modifying factor corrections,
- If the noise design goals are exceeded for the Mod 19 plant and equipment and / or that overall Site noise exceeds the EPL noise limits at any receptor locations, a detailed noise control assessment and design will be undertaken.

## 5. CONSTRUCTION NOISE EMISSION

The construction works will consist of piling, pouring of concrete slabs for the buildings and silos, construction of the industrial buildings and the installation of all plant and equipment.

Table 8 below shows a schedule of sound power levels for typical construction equipment.

**Table 8 Typical Construction Equipment –  $L_{eq}$  Sound Power Levels**

Description	$L_{eq}$ Sound Power Level (dBA)
Auger Piling (CFA Rig)	113
Mobile Crane (Diesel)	110
30 Tonne Excavator	110
Concrete Truck / Pump	105
Dump Truck	110
Grinder	105
Power Saw	101

Table 9 below shows the predicted level of potential noise emission from construction activities at each of the receptor locations.

**Table 9 Predicted Noise Levels at Receptor Locations – Construction Phase**

Description	Predicted Noise Level $L_{eq, 15 \text{ minute}}$ (dBA) at Receptor Locations			
	Location 1	Location 2	Location 3	Location 4
Noise Design Goal ( $L_{eq, 15 \text{ minute}}$ )	43	50	48	48
Construction Activity*	36 – 40	37 – 41	46 - 50	44 – 48
Complies	Yes	Yes	No + 2 dB (during piling)	Yes

\* Range provided with and without piling activity.

Predictions include an increase in truck movements during the construction phase. Noise generated by the increase in construction worker personal vehicle movements will not be perceptible at the residential receptor locations.

## 6. RECOMMENDED NOISE CONTROLS

Noise controls are based on the assumed sound levels of typical plant and equipment as outlined in Section 4.1.

### 6.1 Ethanol Plant & Equipment Noise Levels

The sound power level used in this assessment for the ethanol distillery is based on previous measurements on-site during the noise validation assessment for Modification 12 which comprised an upgrade to beverage grade ethanol.

The sound power derived from these measurements is **90 dBA ( $L_w$ )** for all plant and equipment associated with the new beverage grade modifications combined.

The supplier has provided a noise design goal of 60 dBA  $L_{eq}$ , at 30 metres from the plant and equipment to be installed at the site that is the main process equipment in the beverage grade ethanol production.

This equates to a sound power level of **98 dBA** for all plant and equipment combined, that will be located within the distillery.

An overall reduction of 8 dB will therefore be required for these items of plant and equipment. However, this does not consider any removal of existing motors, plant or equipment associated with the existing distillery that may be removed to make way for the upgrade.

None the less the manufacturer should be instructed, in the first instance to amend the noise design goal to **52 dBA at 30 metres** for all plant and equipment combined.

If this cannot be achieved prior to installation of the plant, then localised acoustical treatment will be required.

This will include acoustical screening of the motors associated with the upgrade and, where necessary the lagging of pipes.

Additional noise reduction for individual items of plant, if required, will be required for the receptors R3 and R4 in Bomaderry only. As such, noise controls will be focused on the northern and north western side of the distillery. Motors may easily be screened on this side, again if required, and detailed noise control design can be undertaken during the noise verification process once details of all noise producing plant and equipment is finalised and sound levels are known.

Noise controls, if necessary, will not be onerous or expensive and the noise design goals can readily be achieved for the beverage grade plant within the modified section of the distillery.

### 6.2 Cooling Tower – Sound Level Design Goals

The noise modelling of the cooling towers is based on a sound power level ( **$L_w$** ) of 87 dBA for a two fan unit with a maximum number of 12 fans to be installed over time.

Noise modelling has been undertaken and includes attention from structures on Site and shows that, in conjunction with the noise emission arising from the beverage grade ethanol plant, that the noise design goals will be met at all receptors without the need for noise controls.

A noise contour map is provided in Appendix A and shows the predicted level of noise emission from the modification at receptors R3 and R4 in Bomaderry, being the most affected residential receptors to the Site.

Appendix F shows a table of the predicted noise levels at all four receptors and includes the contribution from each of the individual noise sources.

However, as with the ethanol plant and equipment, a final design will be undertaken at the time of the Design Noise Verification process once all of the details of the cooling tower plant and equipment are finalised, or during construction or commissioning of the plant.

### 6.3 Post Construction Noise Compliance Assessment

As detailed in section 4.2.4 a noise compliance assessment will be undertaken prior to and after commissioning of the plant associated with this Modification.

The noise compliance assessment will adopt the following methodology, in summary:-

- a) Direct noise measurement (where practicable) and assessment of the level of noise emission from the Shoalhaven Starches facility at each of the identified receptor locations in Nowra, Bomaderry and Terara,
- b) This will be done prior to commissioning of the Modification 19 noise sources and after commissioning, to determine the contribution of the new plant and equipment to the overall noise levels,
- c) The assessment will determine compliance with the noise design goals for the Mod 19 plant and equipment as well as compliance with the EPL noise limits at all receptors for the overall operation of the Site,
- d) The noise surveys will include an assessment of modifying factor corrections,
- e) If the noise design goals are exceeded for the Mod 19 plant and equipment and / or that overall Site noise exceeds the EPL noise limits at any receptor locations, a detailed noise control assessment and design will be undertaken.

### 6.4 Construction Noise

The Project Approval prescribes allowable operation hours for construction activities in Clause 11 and Clause 13, which states:-

*“During construction, the Applicant shall implement all reasonable and feasible measures to minimise the construction noise impacts of the project development.”*

It can be seen from Table 6 that the construction noise management levels are likely to be met at each receptor location during general construction activity, with the exception of piling. During piling there is potential for the noise management levels to be exceeded on some occasions and most likely only in Bomaderry at Meroo Street residences, closest to the Site. This is not considered a significant exceedance during day time hours for short and sporadic duration.

Construction noise mitigation measures are included in the Construction Safety & Environmental Management Plan prepared by Shoalhaven Starches.



## 7. CONCLUSION

An assessment of the potential noise impact from the proposed modification to the existing ethanol distillery at Shoalhaven Starches on Bolong Road, Bomaderry, NSW to facilitate an increase in the proportion of beverage grade ethanol that is produced at the Site, has been undertaken.

Noise producing aspects of this proposed modification include the processing plant and equipment associated with the modifications to the distillery, the proposed cooling towers and the pump motors associated with the product storage silos.

Computer noise modelling has been undertaken based on the manufacture's data that has been calibrated to previous noise measurements of similar equipment taken at the Site. Calculations show that the level of noise emission from the modification to the ethanol distillery will be within the noise design goals derived from Environment Protection Licence 883 noise limits at each receptor location without the need for additional noise controls at this stage.

A final assessment of required noise controls will be undertaken at the time of the Design Noise Verification process prior to construction, or during commissioning, as required, to ensure the noise design goals are met at all receptors.

The level of noise emission from the construction phase of the project will be within the noise management levels set by the NSW EPA's *Interim Construction Noise Guideline* with the exception of piling activity on some occasions.

Construction noise mitigation measures are included in the Construction Safety & Environmental Management Plan prepared by Shoalhaven Starches.



**Matthew Harwood**, MAAS

Principal Acoustical Consultant

Attachments:-

Important Note

Appendix A – *SoundPLAN* noise model contours for Receptors R3 and R4

Appendix B – Example of the *SoundPLAN* Noise Model – Showing 3D structures on Site,

Appendix C – Example of the *SoundPLAN* Noise Model noise sources – Cooling Towers,

Appendix D – Example of the *SoundPLAN* Noise Model noise sources – Ethanol Distillery,

Appendix E – Example of the *SoundPLAN* Noise Model noise sources – Bunded Pump Motors,

Appendix F – Predicted noise levels at each receptor including contribution of all noise sources.

**Important Note**

*All products and materials suggested by Harwood Acoustics are selected for their acoustical properties only. Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, ventilation etc. are outside Harwood Acoustic's field of expertise and **must** be checked with the supplier or suitably qualified specialist before purchase.*

**Disclaimer**

*While every reasonable effort has been made to ensure that this document is correct at the time of printing, Harwood Acoustics, their Associates, Subcontractors and employees make no representation, undertake no duty and accept no responsibility to any third party who use or rely upon this document or the information contained in it. No guarantees are either expressed or implied.*

*This report has been prepared solely for use by the Client identified on the title page as per our agreement for providing noise assessment services.*

*Although all due care has been taken in the preparation of this report, no warranty is given, nor liability accepted (except that required by law) in relation to the information contained within this document.*

*The Client identified on the title page is entitled to rely upon the findings in the report within the scope of work described in this report.*

*This report and information therein cannot be relied on or used by any third party. Any representation, statement, opinion or advice, expressed or implied in this report is made in good faith but on the basis that Harwood Acoustics are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in any respect of any representation, statement, or advice referred to above.*

*No responsibility is accepted for the use of any part of the report in any other context or for any other purpose.*

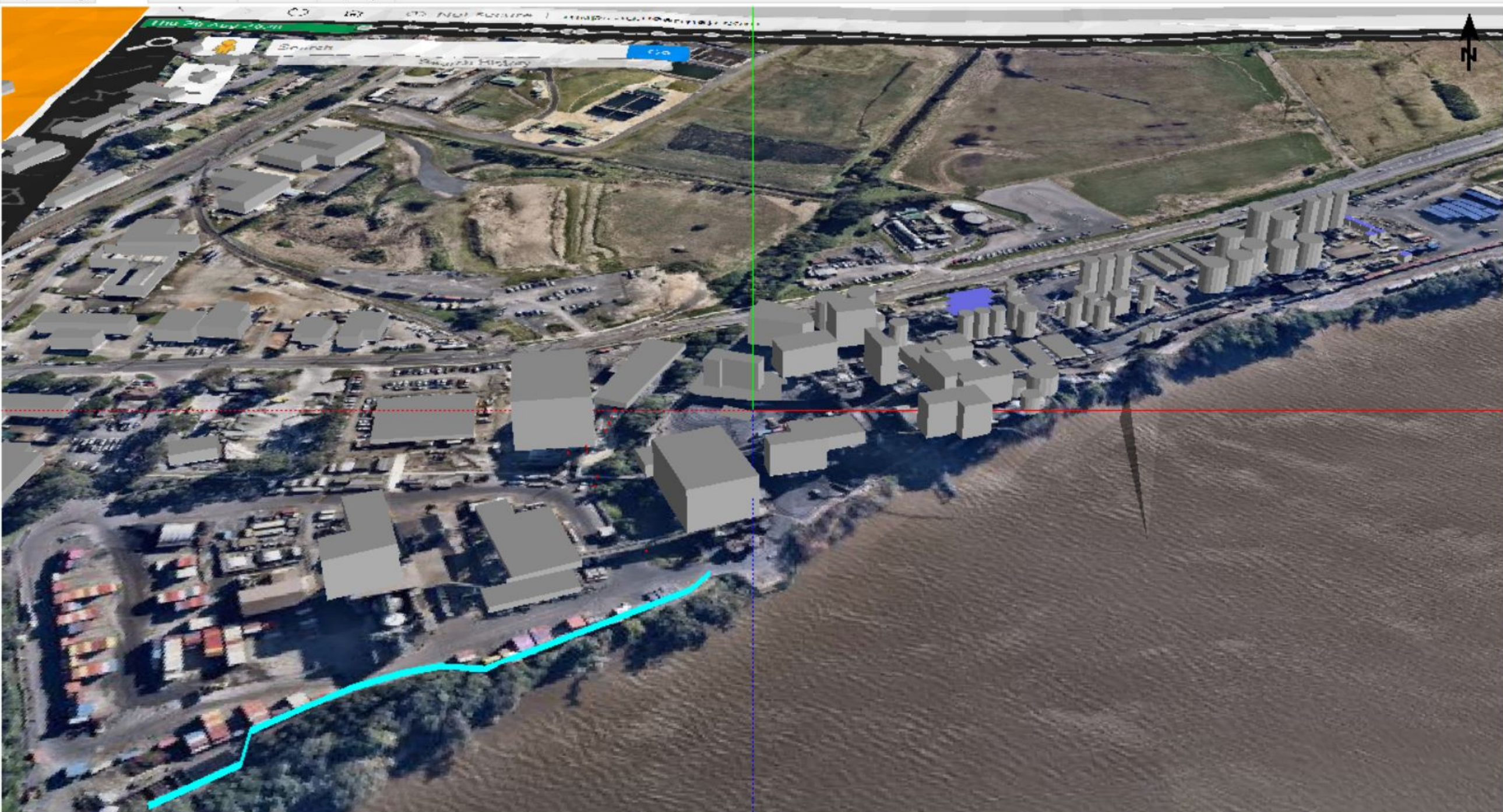
*Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.*

*Harwood Acoustics reserves all copyright of intellectual property in any or all of Harwood Acoustics documents. No permission, license or authority is granted by Harwood Acoustics to any person or organisation to use any of Harwood Acoustics documents for any purpose without the written consent of Harwood Acoustics*





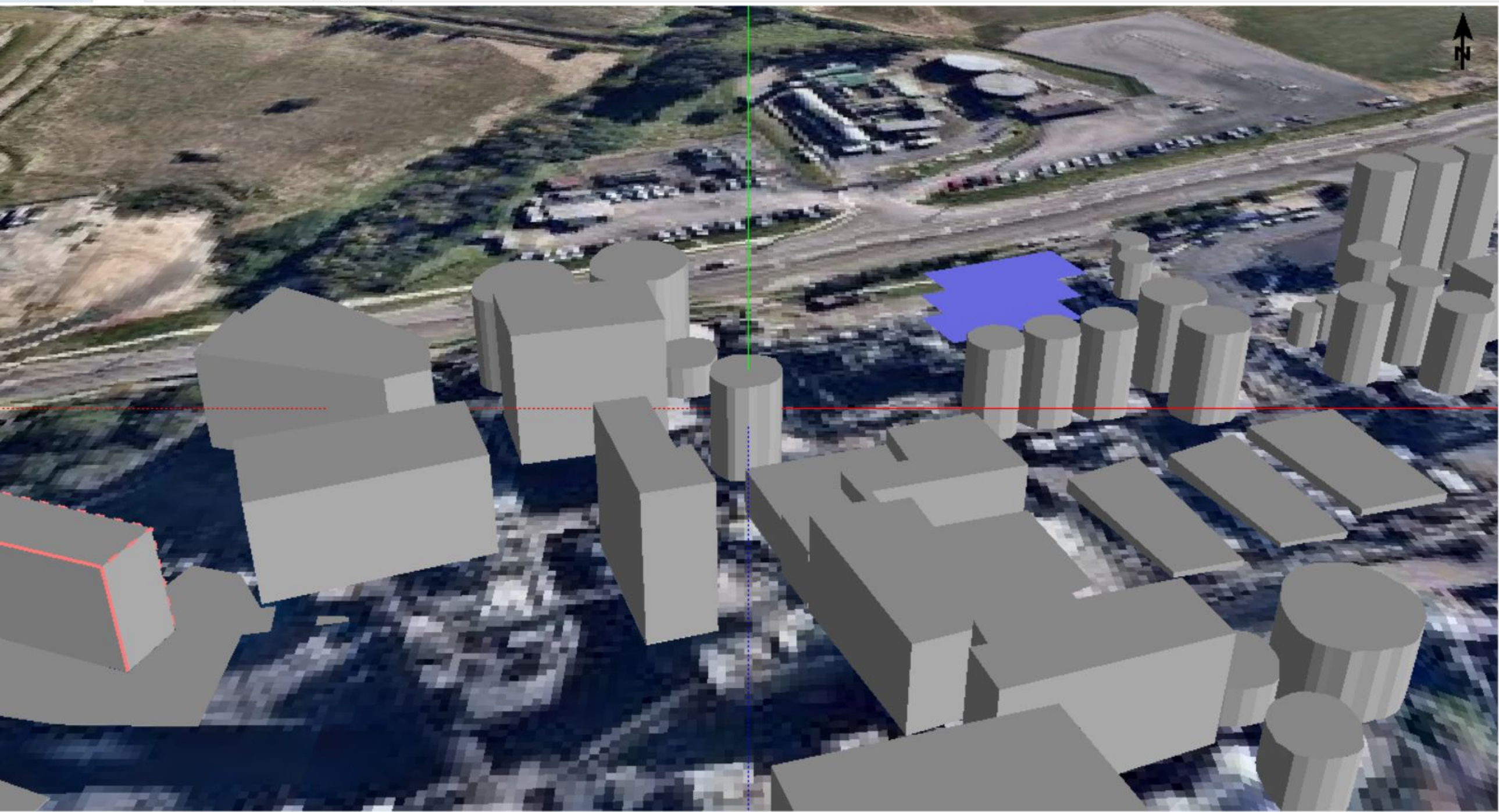




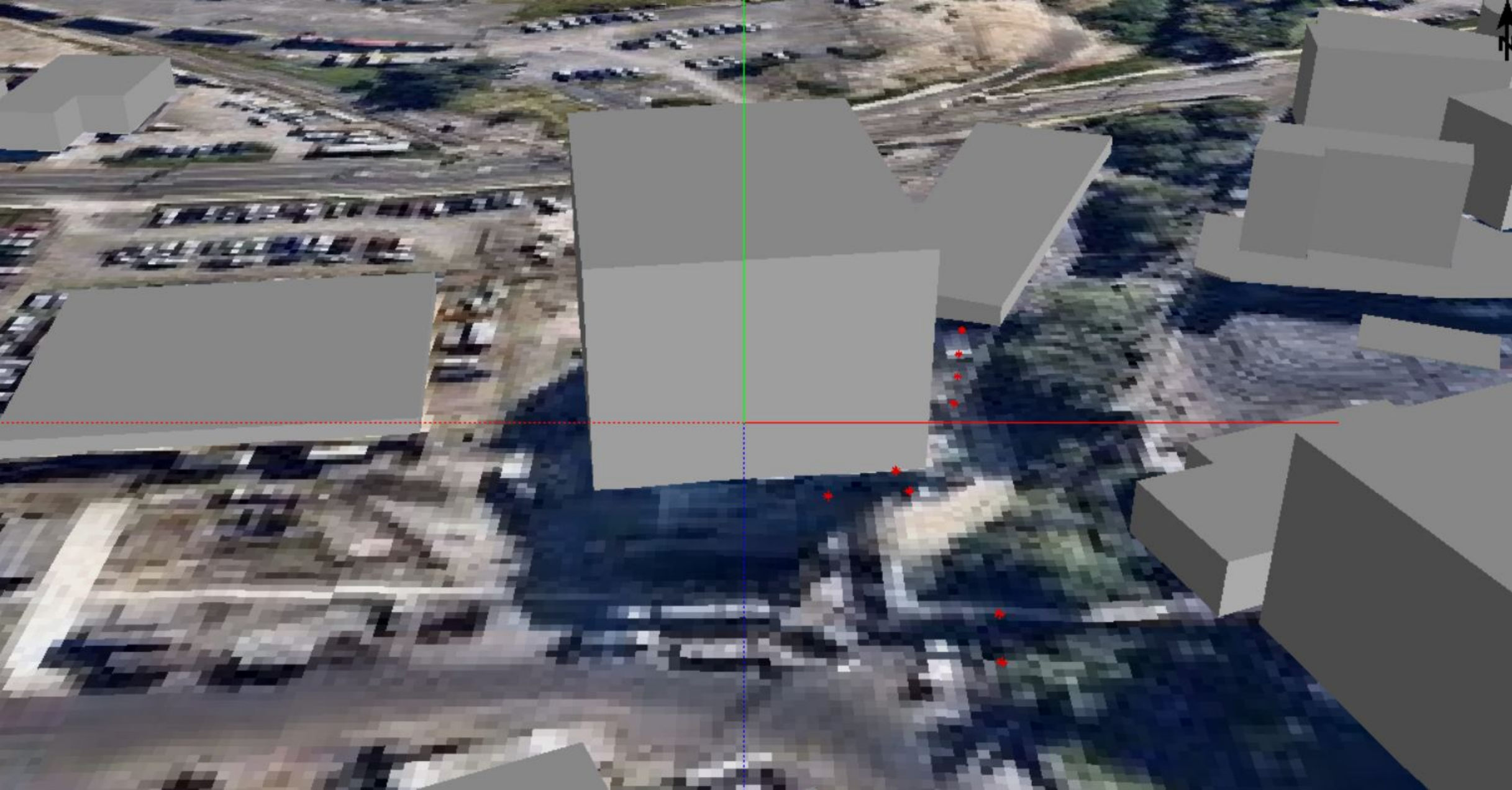












**Table E1 Individual Noise Source Contributions at Receptor Locations**

Description	Predicted Noise Level $L_{eq, 15 \text{ minute}}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
<b>Overall Noise Level all Mod 19 Plant Combined</b>	<b>17</b>	<b>20</b>	<b>22</b>	<b>23</b>
Cooling Tower 1	7.7	7.8	8.7	13.2
Cooling Tower 2	7.7	8.4	-3.3	4.8
Cooling Tower 3	7.7	8.4	-1.2	7.7
Cooling Tower 4	7.8	8.5	7.3	9.1
Cooling Tower 5	7.8	8.5	8.3	8.0
Cooling Tower 6	8.0	8.7	7.6	12.0
Ethano plant level 1	1.1	-2.3	14.6	14.9
Ethanol plant Level 2	4.2	4.9	16.7	17.3
Ethanol plant Level 3	5.8	7.5	16.8	16.9
Bunded pump motor 1	-0.8	7.1	-7.2	5.4
Bunder pump motor 2	-0.6	4.7	-7.7	-5.2
Bunder pump motor 3	-0.4	4.8	-8.0	-7.0
Bunder pump motor 4	-8.1	4.8	-8.1	-8.1
Bunder pump motor 5	-8.9	7.5	-7.8	-9.6
Bunder pump motor 6	-14.2	7.5	-8.0	-9.4
Bunder pump motor 7	-10.5	7.5	-8.1	-9.4
Bunder pump motor 8	-12.6	7.6	-5.6	-9.7
Bunder pump motor 9	-9.7	7.6	10.9	-9.7
Bunder pump motor 10	0	5.9	10.1	-5.3