



50 Junction Street, Nowra, NSW 2541

P: 4421 4583
T: 0414 315 775

matthew@harwoodacoustics.com.au
www.harwoodacoustics.com.au

ABN: 71634 997 937

Environmental Noise Impact Assessment Shoalhaven Starches - Proposed Flour Mill B

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

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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.

Shoalhaven Starches supplies domestic and export markets with a range of gluten, starch, glucose, ethanol and stock feed products. The plant at Bomaderry converts an approved 20,000 tonnes of industrial grade wheat flour into wheat gluten and starch per week. Of the 20,000 tonnes, 7,700 tonnes are supplied directly from the existing flour mill at the Bomaderry site and the remainder is received via rail from Manildra's other mills.

It is proposed to construct a new flour mill (Flour Mill B) at the Shoalhaven Starches site to reduce the reliance on industrial grade flour from the Manildra mill. Once constructed, the Bomaderry site will supply approximately 16,200 tonnes of flour for processing, reducing the supply from the other Manildra mills to 3,800 tonnes per week. The approved production capacity of 20,000 tonnes per week will not increase.

Flour Mill B will be constructed adjacent to the existing flour mill on the southern side of the site, as shown in Figure 1 and the attached Appendix A. Flour Mill B will comprise a multi-storey building with associated mill feed structure.

The main sources of noise will be from within the building on the roller mill and motor floors as well as from roof top exhaust fans and any other mechanical plant located externally.

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

The noise goals for any new plant are typically a minimum 10 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 28 dBA and 32 dBA depending upon the residential receptor location.

Noise modelling has been undertaken using measured noise levels from existing plant and equipment that is similar in size and capacity to the proposed equipment as well as manufacturer's data for similar exhaust fans to those proposed.

Recommendations are made in Section 6 of this report to reduce the level of noise emission from the overall operation of Flour Mill B to within the design noise goals. These include advice on the construction of the flour mill building, silencing roof mounted exhaust fans and acoustically treating external mechanical plant if required at the time of installation.

Providing the recommendations are satisfactorily implemented the level of noise emitted by the proposal will comply with the Shoalhaven Starches Environment Protection Licence noise limits.

The construction works will consist of the removal of existing structures, potential piling work, pouring of concrete slabs and erection of the Flour Mill B building and silos.

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* at all receptor locations.

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 1400 metres to the south east
- Location 2 – Riverview Road, Nowra approximately 1000 metres to the south west;
- Location 3 – Merroo Street, Bomaderry approximately 640 metres to the north west;
- Location 4 – Coomea Street, Bomaderry approximately 750 metres to the north west;

Locations are listed in keeping with the order shown in Environment Protection Licence number 883, as detailed in Section 3.1 of this report.

The Shoalhaven Starches site, surrounding area and receptor locations are shown in Figure 1.



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

2.2 Description of Proposal

The Shoalhaven Starches plant at Bomaderry primarily converts industrial grade wheat flour into wheat gluten and starch. The starch fraction is further processed into premium grade starch, modified starches, glucose syrups, ethanol and bottled carbon dioxide.

The plant currently converts approximately 20,000 tonnes of industrial grade wheat flour per week. Of the total, 7,700 tonnes are supplied via the existing flour mill on the Bomaderry site and the remaining 12,300 tonnes are received via rail from Manildra's other flour mills.

The other Manildra mills are capable of producing premium grade flour as well as industrial grade flour. In order to 'free-up' Manildra's other mill's production capabilities of premium grade flour, it is proposed to construct a second flour mill at the Shoalhaven Starches site in Bomaderry (Flour Mill B).

Flour Mill B will be constructed on the northern side of the existing flour mill as shown in Appendix A. Once constructed the Shoalhaven Starches site will supply approximately 16,200 tonnes of flour for processing, reducing the reliance on the Manildra mill to 3,800 tonnes, ensuring the approved production capacity of 20,000 tonnes per week is not increased.

Flour Mill B will comprise a multi-storey building, approximately 39.5 metres in height. Within the building will be a motor floor, roller mill floor, sifting floor and spouting floor with associated plant and equipment including exhaust fans that will discharge to the roof of the building.

The mill will be supplied with grain from the silos that supply the existing mill.

3. NOISE CRITERIA

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

3.1 NSW EPA's Industrial Noise Policy 2000

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_{A10} (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:

- a) 38 dBA at locations in Terara on the south side of the Shoalhaven River;*
- b) 38 dBA at locations in Nowra on the south side of the Shoalhaven River;*
- c) 42 dBA at locations in Meroo Street, Bomaderry;*
- d) 40 dBA at other locations in Bomaderry."*

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

3.2 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."

3.3 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.

In this instance the entire construction phase may take several months although significant noise producing aspects, such as piling, if required, will last a total of approximately two weeks. 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 ₉₀)
135 Terara Road, Terara March 2012		Day (7 am to 6 pm)	33 dBA
55 Terara Road, Nowra February 2015		Day (7 am to 6 pm)	36 dBA
Cambewarra Rd, Bomaderry 2010	July	Day (7 am to 6 pm)	40 dBA
Shoalhaven Village Caravan Park, Nowra March 2012		Day (7 am to 6 pm)	40 dBA

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_{eq} Noise Management Levels from Construction Activities**

Receptor Location	Noise Management Level	How to Apply
Location 1 (Terara)	43 dBA (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"> Where the predicted or measured L_{Aeq} (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. 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.
Location 2 (Nowra)	50 dBA (40 + 10)	
Locations 3 & 4 (Bomaderry)	48 dBA (38 + 10)	
	Highly noise affected 75 dB(A)	<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"> 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"> 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) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

* 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.

3.4 Project Specific Noise Goals

The most relevant criteria are as follows:-

Operational Phase (Environment Protection Licence noise limits less 10 dB) -

- *28 dBA (L_{10} , 15 minute) at locations in Terara on the south side of the Shoalhaven River;*
- *28 dBA (L_{10} , 15 minute) at locations in Nowra on the south side of the Shoalhaven River;*
- *32 dBA (L_{10} , 15 minute) at locations in Merroo Street, Bomaderry;*
- *30 dBA (L_{10} , 15 minute) at other locations in Bomaderry.*

Construction Phase Noise Management Levels

- *43 dBA (L_{eq} , 15 minute) at locations in Terara;*
- *48 dBA (L_{eq} , 15 minute) at locations in Bomaderry; and*
- *50 BA (L_{eq} , 15 minute) 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. FLOUR MILL B OPERATIONAL NOISE EMISSION

4.1 Mechanical Plant and Equipment Source Noise Levels

The main sources of noise associated with the operation of Flour Mill B are the plant and equipment located within the new building, roof top exhaust fans and other external plant. The author has conducted several noise surveys at the Shoalhaven Starches' complex including noise measurements of similar plant and equipment within the existing flour mill.

Table 3 below provides a schedule of overall 'A' frequency weighted sound power levels, in decibels re: 1 pW, of noise sources associated with Flour Mill B.

Table 3 L₁₀ Sound Power Levels – Flour Mill B

Description	L _{10, 15 minute} Sound Power Level (dBA)
<i>Internal Plant and Equipment</i>	
Roller Mills ¹	104
Sifters ¹	94
Small motors / screw feeds ¹	87
Blower motor ²	85
<i>Roof top exhaust fans (9 off)</i>	
Circa 3000 l/s ³	100
Circa 8000 l/s ³	119
<i>External Plant and Equipment</i>	
Transfer System motors ¹	98
Bucket elevators ¹	94
Temper bin motors ¹	96

1. Derived from noise measurements of similar existing plant and equipment;
2. Derived from noise measurements adjusted to manufacturer's specifications;
3. Derived from manufacturer's data of fans associated with the existing flour mill.

4.2 Noise Level Predictions

4.2.1 Modelling Equations

For plant and equipment located within the Flour Mill B building, the external noise level at each receptor has been calculated from the formula:-

$$Lp_2 = Lp_1 - R_w + 10 \log_{10} S - 20 \log_{10} r - 14 + DI \text{ dBA}$$

Where:

- Lp₂ is the predicted noise level at the receiver;
- Lp₁ is the internal noise level;
- R_w is the weighted sound reduction index of the building element (wall, roof, roller door, etc);
- S is the area of the building element (m²);
- r is the distance between the receiver and the building element;
- DI is the directivity index of the façade.

For all outdoor noise sources, the external noise level at each receptor has been calculated from the formula:-

$$L_{eq} = L_w + Dc - A$$

Where:

- L_w is the sound power level of the noise source;
- Dc is directivity correction; and
- A is the attenuation that occurs during the propagation from source to receiver.

The term A in the equation includes attenuation from geometric divergence (distance loss), atmospheric absorption, ground absorption, barrier effects and miscellaneous other effects.

This model derives from the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*'.

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 sound attenuation. The method allows for propagation conditions with the wind blowing from the source to the receiver.

4.2.2 Predicted Noise Levels

The predicted noise levels at each receptor are shown in Table 4 below.

Table 4 Predicted Noise Levels at Receptor Locations – Flour Mill B

Description	Predicted Noise Level $L_{10, 15 \text{ minute}}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Flour Mill B building	<15	<20	28	27
External plant	<15	22	19	17
Roof top fans	21	23	27	27
Combined	22	26	31	30
Design Noise Goal ($L_{10, 15 \text{ minute}}$)	28	28	32	30
Complies	✓	✓	✓	✓

The above calculations and predictions consider distance loss to each receptor as well as the following:-

- Barrier attenuation from existing, and / or proposed site structures at Locations 1, 3 and 4;
- Flour mill building is constructed as outlined in Section 6.1; and
- Noise controls outlined in Section 6 are implemented and adhered to.

5. CONSTRUCTION NOISE EMISSION

The construction process will involve removal / relocation of existing structures, pouring of concrete slabs, erection and fit out of the buildings and silos and installation of the plant within the building.

Table 5 below shows a schedule of sound power levels for typical construction equipment.

Table 5 Construction Equipment – L_{eq} Sound Power Levels

Description	L_{eq} Sound Power Level (dBA)
Piling Rig	118
Mobile Crane (Diesel)	110
30 Tonne Excavator	110
Concrete Truck / Pump	105
Grinder	105
Power Saw	101

Table 6 below shows the predicted level of potential noise emission from construction activities at each of the receptor locations.

Table 6 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
Construction Activity*	<20	26	31	29
Acceptable Noise Limit ($L_{eq, 15 \text{ minute}}$)	43	50	48	48
Complies	✓	✓	✓	✓

* Includes piling activity.

It can be seen from Table 6 that the construction noise management levels will be met at each receptor location during the construction phase. However, a construction noise management plan may be required prior to the commencement of any site works to ensure best practices are employed in accordance with NSW EPA's *Interim Construction Noise Guideline*.

6. RECOMMENDED NOISE CONTROLS

The predictions in Section 5.1 assume the following noise controls have been implemented.

These noise controls provided are in principal only and are based on the indicative mechanical plant selections made in Section 4.1 of this report. This is to demonstrate that compliance with the project specific noise goals can be achieved for the proposal without onerous mitigation measures. A final assessment may be required once mechanical plant selections have been made.

6.1 Flour Mill B Construction

Walls

The walls of the Flour Mill B building should have a minimum weighted sound reduction index (R_w) 24. In this instance calculations are based on 'Kingspan' Architectural Wall Panelling system AWP 80.

Roof / Ceiling

The roof and ceiling of the flour mill building should have a minimum weighted sound reduction index (R_w) 23. In this instance calculations are based on 'Kingspan' Architectural Roof Panelling system 'K-Dek (KS 1000 KD)'.

Ventilation Penetrations

There should be no acoustically untreated penetrations in the walls or roof. Any doors to the building must remain closed at all times the plant is in operation.

If natural ventilation is required, sections of the northern and eastern walls only may be fitted with acoustic louvres.

The required insertion loss of acoustic louvres will depend on the maximum surface area of louvered sections required to facilitate adequate ventilation.

As an example, based on a maximum 20 m² of louvered sections on each of the floors, other than the top floor, acoustic louvres should have minimum insertion losses shown in Table 7 below:-

Table 7 Example Acoustic Louvre Sound Transmission Loss

Description	Minimum Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Acoustic Louvre*	5	10	14	22	27	25	21	17

* Based on Fantech SBL2 louvre

A larger area may result in a higher required insertion loss and consequently a deeper blade depth. A final assessment should be made prior to the issue of a Construction Certificate once the location and size of any openings for ventilation are finalised.

6.2 External Mechanical Plant

Roof Mounted Fans

It is proposed to install a selection of nine (9) exhaust fans of varying capacity which will discharge to the roof of the building and each fan will be fitted with a silencer. However, selections of fan make and model have not been finalised at this stage.

Calculations in Section 5.2 of this report assume similar fan types to those recently installed during an upgrade to the existing flour mill, ranging in capacity from approximately 3000 to 8000 l/s with reported sound power levels ranging from 100 to 119 dBA.

In order for the noise goals to be met at the closest residential receptors to Flour Mill B, we recommend the following:-

- the level of noise emission from each individual fan (maximum 9) should not exceed a sound pressure level of 65 dBA ($L_{10, 15 \text{ minute}}$) when measured at a distance of 3 metres from the discharge silencer;
- this can be achieved by fitting silencers to the discharge side of each of the fans and as an example, predictions shown in Table 4 are based on the minimum insertion losses shown in Table 8 below.

Table 8 Example Discharge Silencers for Roof Mounted Fans –Insertion Loss Data

Description	Minimum Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Fan circa 8000 l/s (4 off) Silencer - NAP Silentflo H45/300	14	23	41	50	52	35	22	20
Fan circa 3000 l/s (5 off) Silencer - NAP Silentflo H45/120	4	11	17	25	24	17	15	10

A final assessment will be required prior to the installation of all fans to ensure the minimum noise reduction is achieved and the correct silencers selected, once selections are finalised.

Additional External Mechanical Plant

In addition to the roof mounted exhaust fans, new external mechanical plant is likely to be located beneath the mill feed silos at ground level and include small motors, bucket elevators, etc, as detailed in Table 3.

The specific selection, location and height of any new externally located mechanical plant is not yet finalised. There is potential for there to be line of sight from the new mill feed plant to Location 2.

In this event, localised acoustical treatment may be required to reduce the level of noise emission from external mechanical plant to within acceptable limits at Location 2 only.

The type and final location of external mechanical plant will determine the extent to which acoustical treatment is required, prior to commissioning.

Acoustical treatment is unlikely to be extensive, as an example, predictions shown in Table 4 assume a sound barrier screen erected no further than 3 metres to the south of any item of plant to a minimum height of 1.5 metres above the highest item of mechanical plant.

7. CONCLUSION

An assessment of the potential noise impact from the proposed construction and operation of a Flour Mill B at Shoalhaven Starches on Bolong Road, Bomaderry, NSW has been undertaken.

Calculations show that the level of noise emission from the operation of Flour Mill B will be within the noise design goals derived from Environment Protection Licence 883 noise limits at each receptor location providing noise control recommendations made in Section 6 of this report are implemented and adhered to.

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*.



Matthew Harwood, MAAS

Principal Acoustic Consultant

Attachments:-

Appendix A – Site plan showing Flour Mill B and proposed mill feed silo / structure

Appendix A

